



FIXED ASSETS GROWTH AND FINANCIAL DISTRESS: *Evidence from Chemical Companies working under Public Sector in Kerala, India*

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Abstract : The growth of the firm is depends on increasing of assets and business activities of a firm in the long-run. Growth of the fixed assets of the firm determines the solvency. Assets growth is an indication of efficient use of capital and existing assets towards building financial strength and thereby future earnings capacity. The Firms having lower levels or negative net worth indicate that they are going through financial distress. Financial distress is a serious problem faced by PSU's in Kerala. Financial distress is a situation where firm's operating cash flows are not sufficient to satisfy current obligations and the firm is forced to take half cooked measures. According to RBI's definition negative working capital, cash loss and negative networth are the factors influencing Financial Distresses. There are lots of causes of corporate failure which includes Profitability, Liquidity and solvency complications. Bankruptcy prediction models are among the techniques and tools for predicting future status of companies which can estimate the bankruptcy probability by compounding a set of financial ratios. This research paper has attempted to device models for predicting probability of financial distresses among the PSUs working under the Chemical Sector in Kerala. In order to evaluate the ratios that can influence group status and quantify their connection, Logit analysis tool is administered.

Key Terms - Financial Distress, Logistic Regression, Solvency Tribulations, Fixed assets growth, Negative Networth, Public Sector Undertakings, Chemical Sector

1. INTRODUCTION

Assets growth is an indication of efficient use of capital and existing assets towards building financial strength and thereby future earnings capacity. The growth of the firm is depends on increasing of assets and business activities of a firm in the long-run. Growth of the fixed assets of the firm determines the solvency. The Firms having lower levels or negative net worth indicate that they are going through financial distress. Financial distress is a serious problem faced by PSU's in Kerala. Financial distress is a situation where firm's operating cash flows are not sufficient to satisfy current obligations and the firm is forced to take half cooked measures. As more debt financing is used, fixed legal obligations increase (interest and principal repayments), and the ability of the company to satisfy these increasing fixed payment commitments decreases. Financial distress may lead a firm to default on contract commitments and subsequently to their pre-closure and resultant penalties. While an extensive literature on financial distress prediction has emerged, many commonly used technique would rate as primitive dated in other fields of social science especially in accounting research. . In order to evaluate the ratios that can influence group status and quantify their influence, Multiple Logistic Regression tool is administered. The main uses of logistic regression are that prediction of group membership and provide knowledge of the relationships and strength among the variables.

2. REVIEW OF LITERATURE

Fitz Patrick analyzed ratios for failed and non-failed firms, at three years period to failure, by selecting 19 companies randomly which had failed during the period of 1920-1929, and choosing a matching sample of 19 successful companies using financial soundness, asset size, sales volume, product line and physical year as matching criteria. Arthur Winker and Raymond F. Smith examined 183 firms, which failed between 1923 and 1931 for 10 years prior to the year of failure. The prior 10 years trends of the means of 21 ratios of failed firms were analyzed. M.Tamaris (1956-1960) was the first multivariate study in which weighted composite of several ratios were used to indicate the possibility of failure. W. H. Beaver for the first time in 1966 attempted to demonstrate that the failure of an enterprise could be predicted reliably through the combined utilization of sophisticated quantitative techniques and financial ratio analysis. Altman is known for the development of the Z-Score formula, which he published in 1968. The Z-Score for predicting Bankruptcy is a multivariate formula for a measurement of the financial

health of a company and a powerful diagnostic tool that forecasts the probability of a company entering bankruptcy within a 2 year period. David Ewert investigated in 1968 on the basis of information supplied in the Dun and Bradstreet credit reports that ratio can predict non repayment of receivables, keeping 82% accuracy. In 1969 Mare P. Blum constructed a theoretical model based on accounting and financial market data, which was designed to discriminate between failing and non-failing firms. In 1970, Meyer and Pifer attempted to build up a model of prediction of bank failure. Their study indicated the factors affecting bank failure. Such factors were divided into 4 groups, local economic conditions, general economic conditions, quality of management, and integrity of employees. Edminister in 1971 found that using a ratio function could make good predictions. Edward Deakin searched for the linear combination of the 14 ratios used by Beaver which best predicts potential failure in each of five years prior to failure. In 1978 at St. Francisco University by Gordon L.V. Springate, following procedures developed by Altman in the U.S. Springate used step-wise multiple discriminate analysis to select four out of 19 popular financial ratios that best distinguished between sound business and those that actually failed. Fulmer (1984) used step-wise multiple discriminate analysis to evaluate 40 financial ratios applied to a sample of 60 companies - 30 failed and 30 successful. The average asset size of these firms was \$455,000.

3. OBJECTIVES OF THE STUDY:

1. To identify the financially distressed and non-distressed stage of companies on account of solvency tribulations.
2. To quantify the determinants influencing financial distress on account of solvency tribulations.
3. To identify any association between Fixed asset growth and Financial distress

4. HYPOTHESIS:

The following hypothesis null hypotheses are framed:

1. H_0 : There is no significant difference between the mean of financial ratios of financially distressed and non-distressed stages.
2. H_0 : There is no association between Fixed asset growth and Financial distress

5. SAMPLING DESIGN

5.1 Population

The population of the study consists of PSUs working under the administration of Industries Department in Kerala. As per the Economic Review 2023 published by Government of Kerala, there are 51 units working under the Industries Department.

5.2 Units Selected for the study

Out of 51 PSUs working under the Industries Department, 8 units were working under engineering sector. The sample size is arrived based on the following additional criteria.

1. The units are established after the year 1985 are excluded from the sample size though the data covering 1985-86 to 2022-23.
2. Inactive/merged/transferred/liquidated/closed during the year 2022-23 are excluded. (SAIL-SCL Kerala Limited).

The sample units are limited to 5 and given in the Table No.I

5.3 Observations

To study about financial distress, units are classified into financially distressed and financially non-distressed based on the basis of the sickness definition given by RBI as “one which has incurred cash losses for one year and, in the judgment of the financing bank, is likely to incur cash losses for the current as well as the following year, and/or there is an imbalance in the unit's financial structure, that is, the current ratio is less than 1:1 and debt/equity ratio (total outside liabilities as a ratio of net worth) is worsening”. Observations based on financial distress indicators are listed in the Table I.

TABLE No.I

LISTS OF SELECTED COMPANIES FOR THE STUDY AND OBSERVATIONS

Sl.No	COMPANY	DISTRESSED STAGE (1)	NON-DISTRESSED STAGE (0)	TOTAL
1	The Kerala State Drugs and Pharmaceutical Ltd	1	37	38
2	Kerala Minerals and Metals Ltd	14	24	38
3	Malabar Cements Ltd	13	25	38
4	The Travancore Cements Ltd	3	35	38
5	The Travancore-Cochin Chemicals Limited	8	30	38
Total		39	151	190

Source: Computed from Financial Statements

5.4 Period of the study

To investigate the financial distress of PSUs in Kerala, the duly audited secondary data from 1984-85 to 2022-23 were collected. The justification for selecting the base year as 1984-85 is that there was no uniform accounting policies followed by these undertakings while preparing and presenting their annual accounts before 1984-85 and also to ensure normality in behavior of the variables selected for the study. This study facilitates the evaluation of financial distress of PSUs in the long run as it covers data of 38 years.

5.5 Collection of data

For the purpose of the study secondary data has been used. Secondary data is collected from the annual reports published by respective units. Apart from accounting statements from annual review reports of State Level Public Enterprises (SLPEs) published by Bureau of Public Enterprise, Government of Kerala. To support this research, information also used from Report of the Comptroller and Auditor General of India, Economic Review of Kerala by Planning and Development Board, Public Sector Restructuring and Internal Audit Board (RIAB), Office of the Ministry of Industries department etc.

6. VARIABLES USED IN THE ANALYSIS

Independent variables under this study comprises of 17 financial ratios from four specific groups like Liquidity ratios, Cash Flow ratios, Profitability ratios and Solvency ratios. As a problem of a lack of theoretical underpinning as a guide to variable

selection has been covered earlier, the use of the independent variables under this study is based on the popularity of the ratios from past research and their past performance in reviewed literature. The selected variables are listed in the Table No.II

TABLE No.II

Lists of Ratios used for Analysis

Variables		
Ratio	Acronym	Symbol
LIQUIDITY RATIOS		
Current Assets to Current Liabilities	CACL	X ₁
Working Capital to Sales	WCS	X ₂
Current Assets to Total Asset	CATA	X ₃
Working Capital to Total Assets	WCTA	X ₄
CASH FLOW RATIOS		
Cash flow to Total Debt	CFTD	X ₅
Cash flow to Sales	CFS	X ₆
Cash flow to Current Liabilities	CFCL	X ₇
PROFITABILITY RATIOS		
Net profit to Total Assets	NPTA	X ₈
Return on Invested Capital	ROIC	X ₉
Return on Equity	ROE	X ₁₀
Return on Capital Employed	ROCE	X ₁₁
SOLVENCY RATIOS		
Total Debt to Total Assets	TDTA	X ₁₂
Total Debt ratio	TDR	X ₁₃
Networth to Total Debt	NWTD	X ₁₄
Networth to Current Liabilities	NWCL	X ₁₅
Networth to Fixed Assets	NWFA	X ₁₆
Share holders Fund to Total Assets	SHFTA	X ₁₇

7. EMPIRICAL FINDINGS

In this study, financially distressed or non-distressed on account of solvency tribulations is based on RBI's definition. If an enterprise's total outside liabilities to networth is worsening, it can be reckoned as a distressed enterprise. For analysis, a company shows negative networth coded as '1' and positive networth is coded as '0'. The details of companies showing financial distress on account of solvency tribulations are given in Table No.I.

Table No. III illustrated the descriptive of variables under distressed and non-distress stage on account of solvency tribulations. The mean values of liquidity ratios consists of CACL, WCS, CATA and WCTA in the distressed stages are 1.67, -0.42, 0.63 and -0.16 respectively and 2.22, 0.28, 0.60 and 0.27 respectively in the non-distressed stages. The working capital ratios like WCS and WCTA revealed that when they are in financially distressed stage due to solvency problems also suffers from liquidity problem. Overall the liquidity ratio indicated that their short-term solvency is worse in their distressed stage along with long-term solvency problem.

The cash flow ratios of distressed stages are 0.21 (CFTD), -0.04 (CFS), and 0.34 (CFCL) and non-distressed stages are 0.24, 0.11 and 0.48 respectively. Considering profitability ratios, the variables NPTA, ROIC, ROE and ROCE shows that there is negative values in their distressed and non-distressed stage.

Networth ratio indicated that there are positive values among the variables NWTD and NWCL in their distressed stage and non-distressed stage except the variable NWFA. The mean values of NWTD, NWCL and NWFA in their distressed stages are 0.65, 0.25 and -4.87 respectively and 1.21, 2.04 and 1.77 respectively in their non-distressed stage. The variables TDTA and SHFTA show the claim by the owner and outsider. The claim by the owner against the assets of the company is only 62% and by the outsider is 55% in their non-distressed stage whereas 6% and 176% respectively by the owner and outsider in their distressed stage. The total capitalization ratio suggested that 48% is debt in their total capitalization when they are in financially non-distressed stage and 176% in their distressed stage.

Casting an eye over these ratios, we would expect that the differences between these two stages of affairs are significant. ANOVA test is sued to test the following hypothesis:

H₀ : There is no significant difference between the mean of independent variables of financially distressed and non-distressed stages.

H₁ : There is significant difference between the mean of independent variables of financially distressed and non-distressed stages.

TABLE No.III
Descriptive of Variables in the Financially Distressed and Non-distressed stage

Variables	Symbol	Group Status	N	Minimum	Maximum	Mean	Std. Deviation
LIQUIDITY RATIOS							
CACL	X ₁	0	39	.5107	5.0050	2.2225	1.0528
		1	151	.0526	4.8660	1.6641	1.1058
WCS	X ₂	0	39	-.2432	1.4059	.2840	.2881
		1	151	-34.2989	1.1688	-.4236	3.0212
CATA	X ₃	0	39	.1162	.9393	.6073	.2191
		1	151	.1133	.9501	.6343	.2020
WCTA	X ₄	0	39	-.2274	.6684	.2773	.2008
		1	151	-9.4961	.6481	-.1639	1.2450
CASH FLOW RATIOS							
CFTD	X ₅	0	39	-.4073	1.6102	.2384	.3427
		1	151	-.3860	1.4719	.2077	.3123
CFS	X ₆	0	39	-.0961	.4346	.1136	.1166
		1	151	-9.3078	.4292	-.0374	.8195
CFCL	X ₇	0	39	-.4073	1.7407	.4831	.6129
		1	151	-.6947	3.3179	.3424	.5539
PROFITABILITY RATIOS							
NPTA	X ₈	0	39	-.2357	.7525	.0581	.1717
		1	151	-2.1774	.5578	-.0867	.3374
ROIC	X ₉	0	39	-.8258	1.5121	.0868	.3550
		1	151	-9.2552	3.2356	-.0133	1.2343
ROE	X ₁₀	0	39	-.6376	1.2830	.0835	.3312
		1	151	-2.0493	3.6050	-.1199	.5770
ROCE	X ₁₁	0	39	-5.7400	2.0761	-.0399	1.3642
		1	151	-4.2800	4.1800	.2968	.9358
SOLVENCY RATIOS							
TDTA	X ₁₂	0	39	.2326	.9720	.5550	.2150
		1	151	.1707	16.1956	1.7698	2.6439
TDR	X ₁₃	0	39	.2326	.8299	.4813	.1865
		1	151	.2365	16.1956	1.0903	2.0378
NWTD	X ₁₄	0	39	.0288	3.2996	1.2058	.9158
		1	151	-.9383	4.8584	.6544	1.2977
NWCL	X ₁₅	0	39	.0382	5.7293	2.0494	1.4996
		1	151	-6.7989	5.7296	.2518	2.5539
NWFA	X ₁₆	0	39	.0319	4.5303	1.7674	1.1224
		1	151	-83.4668	19.9186	-4.8766	16.8009
SHFTA	X ₁₇	0	39	.1859	1.1198	.6248	.2662
		1	151	-15.1956	1.2370	.0646	2.0729

Source: Computed from Secondary data

Note: Non-distressed group distinguished by status 0 and distressed group by status 1

Looking at the ANOVA test statistics of the Table No.IV suggested that there is a significant difference between the ratios of CACL, WCTA, NPTA, ROE, TDTA, NWTD, NWCL and NWFA in their distressed and non-distressed stages @5% level of significance. These ratios would be a good predictor of financial distress on account of profitability tribulations.

TABLE No.IV

TEST RESULTS OF ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
CACL	Between Groups	9.662	1	9.662	8.053	.005*
	Within Groups	225.553	188	1.200		
	Total	235.215	189			
WCS	Between Groups	15.517	1	15.517	2.126	.147
	Within Groups	1372.319	188	7.300		
	Total	1387.836	189			
CATA	Between Groups	.023	1	.023	.535	.466
	Within Groups	7.943	188	.042		
	Total	7.966	189			
WCTA	Between Groups	6.032	1	6.032	4.846	.029*
	Within Groups	234.034	188	1.245		
	Total	240.066	189			
CFTD	Between Groups	.029	1	.029	.286	.594
	Within Groups	19.098	188	.102		
	Total	19.127	189			
CFS	Between Groups	.706	1	.706	1.311	.254
	Within Groups	101.246	188	.539		
	Total	101.952	189			
CFCL	Between Groups	.614	1	.614	1.914	.168
	Within Groups	60.302	188	.321		
	Total	60.916	189			
NPTA	Between Groups	.649	1	.649	6.708	.010*
	Within Groups	18.199	188	.097		
	Total	18.848	189			
ROIC	Between Groups	.310	1	.310	.250	.618
	Within Groups	233.298	188	1.241		
	Total	233.608	189			
ROE	Between Groups	1.282	1	1.282	4.454	.036*
	Within Groups	54.112	188	.288		
	Total	55.394	189			
ROCE	Between Groups	3.512	1	3.512	3.267	.072
	Within Groups	202.080	188	1.075		
	Total	205.592	189			
TDTA	Between Groups	45.742	1	45.742	8.188	.005*
	Within Groups	1050.278	188	5.587		
	Total	1096.020	189			
TDR	Between Groups	11.493	1	11.493	3.462	.064
	Within Groups	624.216	188	3.320		
	Total	635.709	189			

NPTA	Between Groups	9.425	1	9.425	6.229	.013*
	Within Groups	284.480	188	1.513		
	Total	293.905	189			
NWCL	Between Groups	100.152	1	100.152	17.700	.000*
	Within Groups	1063.779	188	5.658		
	Total	1163.931	189			
NWFA	Between Groups	1368.187	1	1368.187	6.068	.015*
	Within Groups	42388.414	188	225.470		
	Total	43756.601	189			
SHFTA	Between Groups	9.728	1	9.728	2.826	.094
	Within Groups	647.226	188	3.443		
	Total	656.954	189			

*at 5% level of significance

8. LOGIT MODEL

Table No.V exhibits the results of the Multiple Logistic Regression analysis. According to Wald statistics, the significant variables are NPTA, ROCE, NWTD and NWCL at 5% level of significance. Among the significant variables, NPTA and NWCL are inversely related to financial distress and ROCE and NWTD are positively related with financial distress. Holding other variables are constant, one unit increases in NPTA and NWCL, the log odds of the firm being reclassified from distress to non-distressed decreases by 3.606 and 1.201 respectively.. For a one unit increase in ROCE and NWTD, the log odds of the firm being reclassified as distressed to non-distressed increases by 0.608 and 1.487 respectively. The Exp(B) column in the table presents the extent to which raising the corresponding measure by one unit influence the odds ratio. Odds ratios calculate the probability unit change in the variable which leads to the financially distressed or non-distressed stages. The Exp(B) of the variables are greater than 1 which suggest that the occurrence of financial distress is more on account of changes in these variables. The prominent is NWTD. When other variables are controlled, for every unit increase in NWTD, the logit analysis argues that the odds distress occurring are approximately 4.4 times more likely to be a member of distressed group.

TABLE No.V

LOGIT MODEL RESULTS OF VARIABLES INFLUENCING FINANCIAL DISTRESS

Variables in the Equation							
Variables	Symbol	B	S.E.	Wald	df	Sig.	Exp(B)
NPTA	X ₈	-3.607	1.544	5.461	1	.019*	.027
ROCE	X ₁₁	.608	.230	6.954	1	.008*	1.836
NWTD	X ₁₄	1.487	.444	11.221	1	.001*	4.425
NWCL	X ₁₅	-1.201	.297	16.322	1	.000*	.301
Constant	β ₀	1.488	.295	25.509	1	.000	4.427
Model Summary							
-2 Log likelihood			149.348	Chi-square			43.5444
Cox & Snell R Square			0.705	df			4
Nagelkerke R Square			0.821	P-value			.000
Classification Table							
Observed		Predicted					
		Non-Distressed		Distressed	Percentage Correct		
		0		1			
Non-Distressed		0	14		25	35.9	
Distressed		1	8		143	94.7	
Overall percentage						82.6	
Cut value :0.5							

*at 5% level of significance

The Equation would be:

$$P = \frac{e^{1.488 + (-3.607X_8) + (0.608X_{11}) + (1.487X_{14}) + (-1.201X_{15})}}{1 + e^{1.488 + (-3.607X_8) + (0.608X_{11}) + (1.487X_{14}) + (-1.201X_{15})}}$$

Where P is the probability, if the value of P is greater than 0.5, then the company is categorized under financially distressed group.

The model summary part of the table highlighted that the model is statistically significant [-2log likelihood (149.348), chi-square value = 45.5444, p<0.000 with df 4]. Nagelkerke R Square (0.821) indicates that a moderately strong relationship

exists between prediction and grouping. The classification part of the table indicates that the overall prediction success for distressed groups is 94.7%. As the theoretical probability for being a distressed or a non-distressed is greater than or less than 0.50, so the cut off value is taken as 0.50

9. ASSOCIATION OF FIXED ASSET GROWTH AND FINANCIAL DISTRESS

The growth of the firm depends on increasing of assets and business activities of a firm in the long-run. Growth of the fixed assets of the firm determines the solvency. Assets growth is an indication of efficient use of capital and existing assets towards building financial strength and thereby future earnings capacity. Following hypothesis are framed and tested to assess the association between fixed asset growth and financial distressed stages.

H₀: There is no significant association between fixed assets growth and indicators of financial distress.

H₁: There is significant association between fixed assets growth and indicators of financial distress.

In order to measure growth in fixed assets, fixed assets growth ratio is taken as the experiment variable and converts the ratio variables into dichotomous variable. Negative fixed asset growth is coded as '1' and positive fixed asset growth is coded as '0'. On account of solvency, financially distressed stage is coded as '1' and financially non-distressed stage is coded as '0'. The results of chi-square test are given in Table VI.

TABLE No.VI
Chi-square Test results of Fixed assets Growth and Financial Distress

Variable	Financially Non-Distressed (0)	Financially Distressed (1)	N	Chi-square	p-value
Fixed asset growth (0)	22	53	75	5.892	0.015*
Fixed asset growth (1)	17	98	115		
Total	39	151	190		

*at 5% level of significance

Looking into Table No. VI, it is observed that there is an association between negative fixed asset growth and financial distress on account of solvency and rejects the null hypothesis at 5% level of significance.

10. CONCLUSION

The results of this study put forward some forewarning of financial distress by establishing statistical relationships between account data of financially distressed and non-distressed stages. Financial ratios play a vital role in identifying the problems of financial distress. By comparing the descriptive statistics of distressed and non-distressed stages, the results of the study concluded that there is a significant difference exists between two groups. Use of Multiple Logistic Regression for predicting financial distress is a breakthrough in the field of accounting. Logit analysis provides a probability of financial distress. The results of the study propounded that the significant predictor variables of financial distress NPTA, ROCE, NWTD and NWCL. This findings leads to an insight for identify the factors or determinants that differentiates distressed and non-distressed firms, financial ratios can be used to predict the troubled firm. This study fails to reject the null hypothesis as there is no significant difference between ratios of financially distressed and non-distressed stage and proved there is an association of fixed asset growth and financial distress.

REFERENCES

- Altman Edward I. (1968). Financial Ratios, Discriminant Analysis and Prediction of Corporate Bankruptcy. *Journal of Finance*, 23, 589-609.
- Altman Edward. (1979). Financial Ratios, Discriminant Analysis and Prediction of Corporate Bankruptcy. *The Journal of Finance*, 23, 586-609.
- AlenC.Elliot Wayne A.Woodward (2007) Statistical Analysis Quick Reference Guide Book, Sage Publications, New Delhi
- Beaver W.H. (1967, January). Financial Ratios as Prediction of Failure. *Empirical Research in Accounting* , 71-111.
- Beaver William H. (1968). Alternative Accounting Measures as Predictors of Failure. *The Accounting Review*, 20, 113-122.
- Beaver William. (1968, Autumn). Market Prices, Financial Ratios and the Prediction of Business Failure. *Journal of Accounting Research* , 192.
- Biswasroy,P.K., J.Panda, and P.K.Sahu (1990). Corporate Sickness and Industrial Financing in India, Ashish Publishing House, New Delhi.
- Blum, Mare. (1974, Spring). Failing Company Discriminant Analysis. *Journal of Accounting Research* , 3-4.
- Bureau of Public Enterprises, Ministry of Industry, Government of Kerala, *A Review of Public Enterprises in Kerala* (1984-85 to 2014-15)

10. Carlos A. Molina and Lorenzo A.Preve. (2012, Spring). An Empirical Analysis of Financial Distress on Trade Credit. *Financial Management* , 187-205.
11. Deakin Edward. (1972, Spring). A Discriminant Analysis of Predictors of Business Failure. *Journal of Accounting Research* , 167-179.
12. Deakin Edward. (1976, January). Distribution of Financial Accounting Ratios: Some Empirical Evidence. *The Accounting Review* , 90-96.
13. Devakumar.P.S. (2008). *Financial Perfomance of Slected Industrial Undertakings under Revival in Kerala*. PhD Thesis, University of Kerala, Department of Commerce, Thiruvananthapuram.
14. Dr.S.N.Maheswari (2004), Cost and Management Accounting, Sulthan Chand and Sons, New Delhi,pp.B.31-B130
15. Ewert David, "trade Credit Management: Selection of Accounts Receivables using statistical model; Unpublished PhD Dissertation, Stanford University, 1968 quoted by Sibul.C .Chithran , PhD Thesis submitted to the University of Kerala
16. Fitz Partick, Paul, "A Comparison of Ratios of Successful Industrial Enterprises with those of failed firms", Certified Public Accountants, October-November-December 1932 cited by Green Donald, "To predict failure, Management Accounting", July 1978 PP.40
17. Fulmer, John G Jr, James E,Gavin, Thomas A, Erwin, Michael J. (1984, July). A Bankruptcy Classification Model for Small Firm. *Journal of Commercial Bank Lending* , 25-37.
18. Jannie Poletti-Hughes and Aydi Ozkan. (2014). Ultimate Controllers, Ownership and the Probability of Insolvency in Financially Distressed Firms. *Manegerial and Decision Economics* , 36-50.
19. John R.Graham, Sonali Hazarika and Krishna Moorthy. (2011, Winter). Finnacial Distress in Great Depression. *Financial Management* , 821-844
20. Mayor Paul A and Pilfer Howard W. (1970). Prediction of Bank Failure. *The Journal of iFnance*, 25, 853-865.
21. M.N.Dayanandan. (1991). *The Kerala State Cashew Development Corporation-An Evaluative Study*. PhD Thesis, University of Kerala, Department of Commerce, Thiruvananthapuram.
22. Nazrinn Fariss Idris. (2008). *Financial Ratios as the Predictor of Corporate Financial Distress in Malaysia*. Dissertation in partial fulfillment of the requirement for the Masters of Business Administration, Wichita State University, USA
23. Pandey L.M. (1997), Financial Management, Vikas Publishing HousePvt. Ltd, New Delhi, pp.109-116
24. Reserve Bank of India, *Handbook of Statistics on Indian Economy*, (2002-03), Mumbai.
25. Springate, Gordon L.V. (1978). *Predicting the possibility of failure in a Canadian firm*. Unpublished MBA Research Project, Simon Fraser University.
26. Tamari.M. (1966). Financial Ratios as a means of Forecasting Bankruptcy. *Management International Review*, 4, 19.
27. Tim C. Opler and Sheridan Titman. (1994). Financial Distress and Corporate Finance. *The Journal of Finance*, 49 (3), 1015-1040.
28. Vide Circular, DBOD,No.CAS 133/C 446 (SIU)76 dated 26th November 1976, RBI Bombay
29. V. Anil Prasad. (2001). *Financial Management of Public Sector Undertakings in Kerala*. PhD Thesis, University of Kerala, Department of Commerce, Thiruvananthapuram.
30. Winakor A, and Smith R, "Changes in financial structure of Unsuccessful Industrial Companies", Bureau of Business Research Bulletine, No.51, University of Illinios Press, 1935 and Marwin C, "Financing Small Corporation; New York" , Bureau of Economic Research 1942.