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Cashflow growth and liquidity tribulations: evidence from public sector chemical companies in Kerala

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Abstract

Cash flow problems and liquidity tribulations are closely related in financial distress situation. 'Insufficient cash flows are the reasons for non-repayment of loan amount'. When a firm experience financial distress, news about cash flow become more dominant than future return. Financial distress is a situation where a company is not able to meet or face difficulty to pay off its financial obligations. According to RBI's definition negative working capital, cash loss and negative networth are the factors influencing Financial Distresses. 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, Multiple Logistic Regression analysis tool is administered. 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.

Keywords: Financial Distress, Logit Model, Liquidity Tribulations, Cash flow, Cash profit, Negative Working Capital

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1. Introduction

The increasing role of modern state as an entrepreneur in the spheres of industry and commerce is one of the focal point in this new era. The need to achieve the objective of welfare of the state and social justice is the responsibility of the government by establishing Public sector Undertakings. The Indian public sector is at the cross roads. Its productivity and effectiveness have been questioned widely. The efficient and effective working of public enterprises is vital to social and economic development in view of the massive investment and crucial role assigned to them.

Cash flow ratios focus on the cash being generated in terms of how much is being generated and the safety net that it provides to the company. Generally we know that profits are very important for the company. However, through the magic of accounting and non-cash based transactions, companies that appear very profitable can actually be at a financial risk if they are generating little cash from these profits. Here cash flow is the sum of Operating profit plus depreciation and provisions.[1-3]

Financial Distress is a situation where a company cannot meet or face difficulty to pay off its financial obligations to the creditors. When a company is deemed to be under financial distress and does not take necessary actions to improve its performance or when the situation is not administered properly, the company may experience bankruptcy or be forced to liquidating its company in the worst case scenario. In addition to that, financial distressed may brings bad reputation for the company because investors would see the company as an incompetent firm.

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

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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.[4-5] 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.6 In 1969 Mare P.[8] 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.[2,11,12] In 1978 at St. Francisco University by Gordon L.V. Springate, following procedures developed by Altman in the U.S.1 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. V. Anil Prasad (2001) states that 'insufficient cash flows are the reasons for non-repayment of loan amount'. AssafEisdorfer (2007) perceived that when a firm experience financial distress, news about cash flow become more dominant than future return.Carlos A.[10] Molina and Lorenzo A. Preve (2009) explored the nature of financial distress in two different stages which includes profitability problems faced by firm in the initial stage and the problem of cash flow is predominant in the full-blown distressed stage.

3. Objectives of the Study

1. To identify the financially distressed and non-distressed stage of companies on account of liquidity tribulations.
2. To quantify the determinants influencing financial distress on account of liquidity tribulations.
3. To identify any association between cash flow growth and financial distress.

3.1. Hypothesis

The following null hypotheses were framed:

1. H0: There is no significant difference between the mean of financial ratios of financially distressed and non-distressed stages on account of liquidity tribulations.

2. H0: There is no association between cash flow growth and financial distress on account of liquidity tribulations.

4. Variables Used in the Analysis

Following variables are used for the study:

4.1. Independent variables

Current Assets to Current Liabilities, Working Capital to Sales, Current assets to Total assets, Working Capital to Total assets, Cash Flow to Total Debt, Cash Flow to Sales, Cash Flow to Current Liabilities, Net Profit to Total Assets, Return on Invested Capital, Return on Equity, Return on Capital Employed, Total Debt to Total Assets, Total Debt Ratio, Networth to Total Debt, Networth to Current Liabilities, Networth to Fixed assets, Shareholders fund to Total assets and Cash Flow Growth ratio.

4.2. Dependent variables

Financial distressed stage and Financial Non-distressed stage.

4.3. Sampling design

4.3.1. 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.

4.3.2. 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 year1985 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 1**.

4.4. 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.

4.5. 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.

5. Empirical Findings

5.1. Financilly distressed and non-distressed cases on account of liquidity tribulations

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. In this study, financially distressed or non-distressed on account of liquidity tribulations is based on the RBI's definition. If the current ratio is less than 1, it is a clear indication of incipient of sickness. Current ratio is less than one indicated that the company's working capital is negative. Hence under this study, if their current ratio is less than '1' considered as financially distressed and is coded as '1' and if current ratio more than '1',it is considered as the financially non-distressed and coded as '0' on account of liquidity tribulations. The details of companies showing financial distress on account of liquidity tribulations are given in **Table 1**.

Table 1: Company-3wise financially distressed and non-distressed cases on account of liquidity tribulations

Sl. No	Company	Distressed stage (1)	Non-distressed stage (0)	Total
1	The Kerala State Drugs and Pharmaceutical Ltd	19	19	38
2	Kerala Minerals and Metals Ltd	30	8	38
3	Malabar Cements Ltd		2	38
4	The Travancore Cements Ltd	28	10	38
5	The Travancore-Cochin Chemicals Limited	18	20	38
Total		131	59	190

*negative working capital is considered as Distressed stage and positive working capital as Non-Distressed stage.

Looking over the

Table 3, 131 distressed cases and 59 non-distressed cases were identified.

5.2. Quantifying the determinants of financial distress

In order to quantify the determinants of financial distress, firstly demarcating any significant difference exists between stressed and non-distressed cases. Secondly, logistic regression analysis is administered for quantifying the influence of variable on financial distresses

Table 2. illustrated the descriptive of variables of distressed and non-distress stage on account of liquidity tribulations. Looking at the difference in mean values of liquidity ratios for both financially distressed and non-distressed stages, difference between the two groups appear large and significant. The mean values of liquidity ratios of financially non-distressed stages are 2.31 (CACL), 0.35 (WCS), 0.66(CATA) and 0.32 (WCTA) which are significantly greater than those which are present in the financially distressed stages.

Liquidity is important as it is the ability to meet unexpected needs for settlement of debt when they are in due. As the mean values of WCS and WCTA are negative in their distressed stages and the negative working capital indicated that they do not carry sufficient liquid asset to meet short-

term obligations. Should an unexpected obligation suddenly arise, the need for cash will require from external sources of working capital as the level of cash and near cash assets held won't be enough.

For cash flow ratios, a positive cash flow is an asset to the company. The mean values of cash flow ratios of distressed group and non-distressed stages are negative which indicated that they could not generate sufficient cash flow from its operations. The mean values of distressed groups are 0.02 (CFTD), -0.29 (CFS) and 0.14 (CFCL), the negative values suggested that should the need for cash arise, other source of income will be needed to meet both expected and unexpected obligations.

On account of liquidity tribulations, the median values of profitability ratios when they are in financially distressed suggested that there exist a significant difference while looking at the mean values of ROE and ROCE indicated that negative values in their distressed and non-distressed stages. Negative values of these ratios indicated that these firms had suffered significant losses during the distressed period. Test statistics suggested there is significant difference existed between groups.

Table 2: Descriptive of variables influencing financial distress

Variables	Symbol	Group Status	N	Minimum	Maximum	Mean	Std. Deviation
Liquidity Ratios							
CACL	X1	0	131	1.002	5.005	2.3151	0.9205
		1	59	0.0526	0.9757	0.5878	0.2525
WCS	X2	0	131	0.0021	1.4059	0.348	0.2391
		1	59	-34.2989	-0.0115	-1.6691	4.5767
CATA	X3	0	131	0.1734	0.9494	0.6581	0.1783
		1	59	0.1133	0.9501	0.5636	0.2447
WCTA	X4	0	131	0.0019	0.6684	0.3291	0.1579
		1	59	-9.4961	-0.0051	-0.9668	1.7045
Cash Flow Ratios							
CFTD	X5	0	131	-0.4073	1.6102	0.3028	0.3403
		1	59	-0.386	0.3083	0.0168	0.1133
CFS	X6	0	131	-0.4308	0.4346	0.1234	0.1321
		1	59	-9.3078	0.3605	-0.2945	1.2634
CFCL	X7	0	131	-0.6947	3.3179	0.532	0.6045
		1	59	-0.5267	0.4766	0.0143	0.2078
Profitability Ratios							
NPTA	X8	0	131	-0.6845	0.7525	0.0453	0.1829
		1	59	-2.1774	0.2521	-0.2841	0.417
ROIC	X9	0	131	-1.1657	1.5121	0.0581	0.3543
		1	59	-9.2552	3.2356	-0.1054	1.9307
ROE	X10	0	131	-1.4704	1.283	0.0215	0.3523
		1	59	-2.0493	3.605	-0.2994	0.7776
ROCE	X11	0	131	-5.74	4.18	0.3478	1.2097
		1	59	-2.267	0.7364	-0.0391	0.3996
Solvency Ratios							
TDTA	X12	0	131	0.1707	5.2209	0.7656	0.8418
		1	59	0.4203	16.1956	3.1963	3.6283
TDR	X13	0	131	0.2326	0.9287	0.5479	0.2032
		1	59	0.4203	16.1956	1.8919	3.0986
NWTD	X14	0	131	-0.8085	4.8584	1.2367	1.1986
		1	59	-0.9383	1.3795	-0.274	0.497
NWCL	X15	0	131	-6.7989	5.7296	1.2784	2.5511
		1	59	-5.0629	1.8284	-0.8395	1.5277
NWFA	X16	0	131	-83.4668	19.9186	0.3097	11.0435
		1	59	-76.5337	1.1868	-12	19.3594
SHFTA	X17	0	131	0.095	1.1198	0.5876	0.1952
		1	59	-15.1956	1.237	-0.7265	3.1671

Source: Computed from Secondary data

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

Table 3: Test results of Anova

		Sum of Squares	df	Mean Square	F	Sig.
CACL	Between Groups	121.364	1	121.364	200.405	.000*
	Within Groups	113.851	188	0.606		
	Total	235.215	189			
WCS	Between Groups	165.507	1	165.507	25.456	.000*
	Within Groups	1222.33	188	6.502		
	Total	1387.84	189			
CATA	Between Groups	0.363	1	0.363	8.984	.003*
	Within Groups	7.602	188	0.04		
	Total	7.966	189			
WCTA	Between Groups	68.312	1	68.312	74.774	.000*
	Within Groups	171.754	188	0.914		
	Total	240.066	189			
CFTD	Between Groups	3.328	1	3.328	39.605	.000*
	Within Groups	15.799	188	0.084		
	Total	19.127	189			
CFS	Between Groups	7.103	1	7.103	14.079	.000*
	Within Groups	94.849	188	0.505		
	Total	101.952	189			
CFCL	Between Groups	10.905	1	10.905	40.994	.000*
	Within Groups	50.011	188	0.266		
	Total	60.916	189			
NPTA	Between Groups	4.414	1	4.414	57.486	.000*
	Within Groups	14.434	188	0.077		
	Total	18.848	189			
ROIC	Between Groups	1.087	1	1.087	0.879	0.35
	Within Groups	232.521	188	1.237		
	Total	233.608	189			
ROE	Between Groups	4.189	1	4.189	15.379	.000*
	Within Groups	51.205	188	0.272		
	Total	55.394	189			
ROCE	Between Groups	6.091	1	6.091	5.74	.018*
	Within Groups	199.501	188	1.061		
	Total	205.592	189			
TDTA	Between Groups	240.334	1	240.334	52.803	.000*
	Within Groups	855.686	188	4.552		
	Total	1096.02	189			
TDR	Between Groups	73.47	1	73.47	24.567	.000*
	Within Groups	562.239	188	2.991		
	Total	635.709	189			
NWTD	Between Groups	92.828	1	92.828	86.791	.000*
	Within Groups	201.077	188	1.07		
	Total	293.905	189			
NWCL	Between Groups	182.474	1	182.474	34.953	.000*
	Within Groups	981.457	188	5.221		
	Total	1163.93	189			
NWFA	Between Groups	6164.18	1	6164.18	30.827	.000*
	Within Groups	37592.4	188	199.96		
	Total	43756.6	189			

SHFTA	Between Groups	70.245	1	70.245	22.509	.000*
	Within Groups	586.709	188	3.121		
	Total	656.954	189			

*at 5% level of significance

Table 4: Lists of ratios used for analysis

Variables		
Ratio	**Acronym**	**Symbol**
Liquidity Ratios		
Current Assets to Current Liabilities	CACL	X1
Working Capital to Sales	WCS	X2
Current Assets to Total Asset	CATA	X3
Working Capital to Total Assets	WCTA	X4
Cash Flow Ratios		
Cash flow to Total Debt	CFTD	X5
Cash flow to Sales	CFS	X6
Cash flow to Current Liabilities	CFCL	X7
Profitability Ratios		
Net profit to Total Assets	NPTA	X8
Return on Invested Capital	ROIC	X9
Return on Equity	ROE	X10
Return on Capital Employed	ROCE	X11
Solvency Ratios		
Total Debt to Total Assets	TDTA	X12
Total Debt ratio	TDR	X13
Networth to Total Debt	NWTD	X14
Networth to Current Liabilities	NWCL	X15
Networth to Fixed Assets	NWFA	X16
Share holders Fund to Total Assets	SFTA	X17

Long-term solvency is often measured by examining the solvency ratios. The mean and median values of TDTA, TDR, NWTD, NWCL, NWFA and SHFTA suggested that there exist a significant difference between distressed and non-distressed stage. When the company is distress due to liquidity problem, their TDTA (319%) is significantly larger than when it is in non-distressed stage (76%). Capitalization ratio (TDR) indicated that their usage of debt is 189 % out of total capital in their distressed stage.[7] Networth ratios (NWTD, NWCL and NWFA) indicated that group which is distressed due to liquidity problem. They are also suffering from solvency tribulations due to negative networth.

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:

1. H0: There is no significant difference between the mean of independent variables of financially distressed and non-distressed stages.
2. H1: There is significant difference between the mean of independent variables of financially distressed and non-distressed stages.

Looking at the ANOVA test statistics of the

Table 3 suggested that there is a significant difference in ratios (CACL, WCS, WCTA, CFTD, CFS, CFCL, NPTA, ROE, ROCE, TDTA, TDR, NWTD, NWCL, NWFA and SHFTA) between distressed and non-distressed groups @5% level of significance. These ratios would be a good predictor of financial distress on account of liquidity problems.

6. Multiple Logistic Regression Analysis

To quantify the determinants of financial distress, Multiple Logistic Regression is administered. 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.[9] 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 4**.

The result of the Multiple Logistic Analysis is shown in the

Table 5 considering all 17 variables. Column B indicated the strength of relationship between the variables in the equation. Variables with positive B co-efficient increase the probability of financially distress because they increase ey towards 1 and negative B co-efficient decrease the probability of financial distress because they reduce ey towards 1.The Wald statistics is used to test the significant contribution of the variable in the equation. According to Wald statistics, the deemed predictors influencing financial distress are CFTD, CFS, NPTA and ROIC at 5 % level of significance. The negative co-efficient value observed for CFTD, NPTA and ROIC indicates an inverse relationship with financial distress. Holding other variables are constant, one unit increases in CFTD, NPTA and ROIC, the log odds of the firm being reclassified from distress to non-distressed decreases by 36.95, 10.11 and 1.7respectively. The variables CFS having positive relationships with financial distress. For a one unit increase in CFS, the log odds of the firm being reclassified as distressed to non-distressed increases by 1.022. 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 CFS. When other variables are controlled, for every unit increase in CFS, the logit analysis argues that the odds distress occurring are approximately 2.7 times more likely to be a member of distressed group.

The equation would be:

$$P = \left[\frac{e^{1.471+(-36.948X_5)+(1.002X_6)+(-10.106X_8)+(-1.724X_9)}}{1+e^{1.471+(-36.948X_5)+(1.002X_6)+(-10.106X_8)+(-1.724X_9)}} \right]$$

Where P is the probability, $X_5$is CFTD and X_6 is CFS,X_8 is NPTA and X_9 is ROICand if the value of P is greater than 0.5, then the company assorted to a financially distressed group.

Model summary part of the table indicated that the model is statistically significant [-2log likelihood (55.05), Chi-square = 193.97, p<0.001 with df=4]. Nagelkerke R square is 0.876 and indicated a perfectly strong relationship between prediction and grouping. Classification part of the table suggested that prediction success overall was 95.8% in both distressed and non-distressed group.As the theoretical probability for being distress or non-distress is greater than or less than 0.50, the cut off value is taken as 0.50.

Table 5: Lodit model results of variables influencing financial distress

Variables in the Equation							
Variables	**Symbol**	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**
CFTD	X5	-36.948	9.017	16.789	1	.000*	0
CFS	X6	1.022	0.426	5.748	1	.017*	2.777
NPTA	X8	-10.106	3.865	6.839	1	.009*	0
ROIC	X9	-1.724	0.748	5.318	1	.021*	0.178
Constant	β0	1.471	0.675	4.753	1	0.029	4.352
Model Summary							
-2 Log likelihood			55.05	Chi-square			193.976
Cox & Snell R Square			0.64	df			4
Nagelkerke R Square			0.876	P-value			0
Classification Table							
Observed			**Predicted**				
			Non-Distressed	**Distressed**	**Percentage Correct**		
			0	1			
Non-Distressed		0	117	4	96.7		
Distressed		1	4	65	94.2		
Overall percentage					95.8		
Cut value :0.5							

*significant @ 5% level

Table 6: Chi-square test results of cash flow growth and financial distress

Variable	Financially Non-Distressed (0)	Financially Distressed (1)	N	Chi-square	p-value
Cash Flow Growth (0)	76	22	98	6.997	0.008*
Cash Flow Growth (1)	55	37	92		
Total	131	59	190		

Source: Computed

7. Association of Cash Flow Problems and Financial Distress

V. Anil Prasad (2001) states that 'insufficient cash flows are the reasons for non-repayment of loan amount'. Assaf Eisdorfer (2007) perceived that when a firm experience financial distress, news about cash flow become more dominant than future return.Carlos A. Molina and Lorenzo A. Preve (2009) explored the nature of financial distress in two different stages which includes profitability problems faced by firm in the initial stage and the problem of cash flow is predominant in the full-blown distressed stage.[13-16] So, the following hypothesis is framed and tested to verify the association between cash flow growth and financial distress stages.

1. H_0: There is no association between cash flow growth and financial distress.
2. H_1: There is association between cash flow growth and financial distress.

In order to measure cash flow growth, cash flow growth ratio is taken as the experiment variable and converts the ratio variables into dichotomous variable. Negative cash flow growth is coded as '1' and positive cash flow growth is coded as '0'. On account of liquidity, profitability, solvency and full-blown distress, 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 6**. Look-over the Table,it expounded that there is an association between negative cash flow growth and financial distress on account of liquidity tribulation and rejects the null hypothesis at 5% level of significance.

8. Conclusion

There are a number of reasons why business entities disappear from the market place. They may be financially distressed, or liquidated, or they may be acquired by another company. Stakeholders, for instance employees, bank, creditors, stockholders, community and government are likely to suffer from their investment no matter what he event that triggered the entity's disappearance. Given that business failure can cause significant trauma to these stakeholders, its prediction is highly beneficial. This motivates me to find out a tool to detect unfavourable symptoms before the PSUs disappear. 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 are CFS, CFTD, NPTA andROIC. The probability calculated might be considered as a measure of the effectiveness of management, i.e. effective management will not lead a company on the verge of financial distress.

9. Source of Funding

None.

10. Conflict of Interest

None.

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