PREDICTING SOLVENCY OF NON-BANKING FINANCIAL INSTITUTIONS IN INDIA USING FULMER AND SPRINGATE MODEL

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The study of solvency is becoming more relevant and important as even large companies across the world are failing, resulting in economic and social problems to the society. Using financial distress models to predict failure in advance is absolutely essential for most businesses in their decision making process. Hence, this study involves a critical investigation using Fulmer H-Score and Springate Z-score models in predicting solvency of Non-Banking Financial Institutions in India. The Fulmer and Springate models were however developed in a different economic environment, time horizon, industry and country. Testing these models in the Indian context is important to determine the practical applicability and relevance of the models. The study is confined to 25 Non-Banking Finance companies including housing finance companies catering to asset finance, infrastructure finance, investment finance and housing finance. The study employed an analysis of financial statements for a period of 5 years (2005-2009). The study examined not only solvency position but also factors which have an impact on solvency position of NBFCs (Non Banking Financial Corporation).

INTRODUCTION

Famous non-banking financial institutions in western countries had become insolvent or were becoming insolvent due to recession or other reasons. Few Indian companies also have gone insolvent. To protect the interest of people, it is recommended to measure the solvency status of our domestic non-banking financial institutions due to impact of global crisis, which will help to give an early warning message to the stakeholders. The prediction and prevention of financial distress is one of the major factors that should be analyzed in advance as an early warning signal to avoid the high cost of insolvency. Insolvency involves costs for both the shareholders and stakeholders. From the firm's standpoint, insolvency includes direct and indirect costs. Direct insolvency costs are the tangible, out-of-pocket expenses of either liquidating a failing enterprise or the costs involved in the attempt to reorganise the enterprise which is failing. In addition to the awareness of factors that can make a company successful, it is also useful for managers to have an understanding

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of business failures and insolvency, its causes and its possible remedies. It is also important for financial managers of successful firms to know their firm's rights and possible actions that should be taken when their customers or suppliers go into insolvency.

The rate of insolvency has been increasing every year in the recent past. Few companies in the past like CRB Capital Markets, RBF Nidhi Limited, PNL Nidhi Limited, and Nagarjuna Finance Limited have gone insolvent and public lost money due to non-receipt of deposits. The use of financial distress models, derived from financial statement analysis, as a financial distress predicting technique is common in modern times. The Fulmer and Springate models are some of the most notable prediction models, which are routinely used to analyze the financial well being of companies. The primary objective of this research study is to predict the solvency of non-banking financial institutions in India by application of Fulmer and Springate model on financial data of selected non-banking financial institution. The secondary objective is to comment on usefulness of these two models for predicting solvency of financial firms as these models were developed for forecasting solvency of manufacturing firms.

REVIEW OF LITERATURE

The importance of solvency prediction has a long history in the literature. Zavgren (1985) stated that Beaver (1966) pioneered empirical research in business failure prediction using a univariate model. The approach was used to achieve a moderate level of predictive accuracy, although it had certain shortcomings especially a lack of integration of the various ratios. Multivariate studies usually employed discriminant analysis. Solvency prediction has been a major research topic in accounting and finance. Altman's (1968) employed multiple discriminant analysis for researching on solvency prediction and researched on this furtehr in Altman (1984). It has also been studied extensively by many researchers such as Edmister (1972) and Dugan & Zavgren (1988), who furthers stated that "a prediction can be made without making a decision, but a decision cannot be made without, at least implicitly, making a prediction."

Pacey & Pham (1990*)* referring to Altman (1984) stated that the international survey of business failure models, which covers ten countries, identified that corporate failure can be predicted with an exceptionally high degree of accuracy ranging from 70% to 95%.

Nowadays big, successful and promising companies are seen going insolvent due to lack of prediction of future financial status. Failure prediction also helps companies to know the financial status of other companies who do business with them. The consequences of a large company's insolvency can be especially devastating as it affects so many other businesses and individuals and because many of its suppliers and other business associates depend disproportionately on this one customer. The lack of sound credit and evaluation policy may cause financial problems and even insolvency.

According to Timmons & Spinelli (2004) the obvious benefit of being able to predict crisis is that owners, employees, and significant outsiders, such as investors, lenders, trade creditors and even customers, could see trouble brewing in time to take corrective actions. According to Bruno & Leidecker (2001), no two experts agree on a definition of business failure. Some conclude that failure only occurs when a firm files for some form of insolvency. Others contend that there are numerous forms of organizational death, including insolvency, merger, or acquisition. Still others argue that failure occurs if the firm fails to meet its responsibilities to the stakeholders of the organization, including employees, suppliers, the community as a whole, customers, as well as the owners. According to Doukas (1986) Springate modified Altman's MDA formula for Canadian use. Subsequently testing showed that this formula was accurate 88% of the time. The model was developed in 1978 at Simon Fraser University by Gordon L.V. Springate, following procedures developed by Altman in the US, using a 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.

This model achieved an accuracy rate of 92.5% using the 40 companies tested by Springate. Botheras (1979) tested the Springate Model on 50 companies with an average asset size of $2.5 million and found an 88.0% accuracy rate. Sands (1980) tested the Springate Model on 24 companies with an average asset size of $63.4 million and found an accuracy rate of 83%.

The Fulmer's model of solvency prediction takes into account more indicators than any other method, hence, it is considered as more reliable. Besides that, the model also factors into a company's size. The Fulmer's model is reported to have 98% accuracy rate, one year before failure and

an 81% accuracy rate, more than one year before insolvency (Fulmer et al., 1984).

Financial statement analysis is one of these methods that can be used in predicting financial distress, which focuses on financial variables. This analysis can be categorized and defined as profitability ratios; ratios relating to the efficiency of asset management; risk, short-term cash management and debt ratios; and stock market data (Samuels et al., 1995). Financial ratios can give a good overview of a company and highlights its strengths and weaknesses. They can also show a company's position and performance and indicate trends. Ratio analysis can be applied cross-sectionally (i.e., by comparing different companies at the same point in time) or longitudinally (i.e., by comparing the same over different points in time).

Bardia et al., (2011) have conducted a study on pharmaceutical companies and used ratio analysis in conjunction with the techniques of inferential statistics to draw inferences regarding short-term solvency of the companies. In addition, statistical tools like, mean, standard deviation, coefficient of variation (CV), analysis of variation (ANOVA) and student's t-test of hypothesis testing, have been applied. In the end, the study offers some meaningful suggestions in order to improve the short-term solvency of the pharmaceutical companies selected for this study.

Thomas et al., (2011) have used financial ratios and the Altman Z-score modeling methodology to develop an insolvency warning model in order to evaluate the performance of construction contractors in China. It combines seven financial ratios, covering a company's finance of operation, profitability, solvency and cash flow. A single performance index is derived to differentiate whether a company has good financial standing or exhibits characteristics of insolvent companies. Alamelu. (2011) has made an attempt to analyze the financial soundness of Indian life lnsurance companies in terms of capital adequacy, asset quality, reinsurance, management soundness, earnings and profitability, liquidity and solvency ratios.

Arun. and Kasilingam (2011) have used Altman Z score model to predict the solvency status of IT companies. EBIT (earnings before interest and taxes) is the predominant factor for the solvency status of the IT companies. Hence more the earnings, more the solvency for IT companies with moderate asset value.

METHODOLOGY

The models used in this study require key financial data from audited and published annual reports containing balance sheets, profit & loss account statements and cash flow statements of organizations, for the computation of scores. Hence data used in this study is primarily of secondary in nature. Published annual reports of the companies containing audited financial results were collected from respective company websites and also from website report junction, where digitized annual reports of different companies are available for users to download at an affordable cost. For this study famous solvency prediction models, namely Fulmer and Springate Model were used.

Springate Model

The Springate model takes the following form:

$$Z = 1.03\,\mathbf{X1} + 3.07\,\mathbf{X2} + 0.66\,\mathbf{X3} + 0.4\,\mathbf{X4} \qquad \text{Failed } Z < 0.862$$

X1 = Working Capital / Total Assets, X2 = Net Income before Interest and Taxes (EBIT) / Total Assets, X3 = Net Income before Taxes (EBIT) / Current liabilities X4 = Sales / Total Assets

Fulmer Model

The Fulmer model takes the following form:

$$H = 5.528v1 + 0.212v2 + 0.073v3 + 1.270v4 - 0.120v5 + 2.335v6 + 0.575v7 + 1.083v8 + 0.894v9 - 6.075 \quad \text{Failed } H < 0$$

v1 = Retained Earnings / Total Assets, v2 = Sales / Total Assets

v3 = Net Income before Taxes (EBIT) / Equity, v4 = Cash Flow / Total Debt

v5 = Debt / Total Assets, v6 = Current liabilities / Total Assets

v7 = Log Tangible Total Assets, v8 = Working Capital / Total Debt

v9 = Log EBIT / Interest

PROPOSED SAMPLING METHODS

Sample units were decided based on RBI (Reserve Bank of India) classification of NBFCs. Asset Finance, Investment Finance and Infrastructure Finance segment companies were considered under NBFCs. Also, Home finance companies under the regulation of National Housing Board, were taken into account for the study.

Figure 1: Data Sampling – Type of NBFC

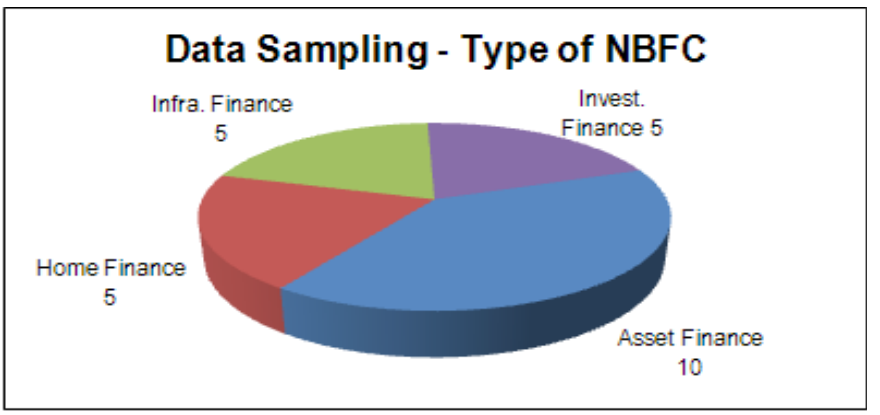

Fig. 1 shows the sample count of NBFCs based on their classification. The sample size is more for 'Asset Finance' companies because they enjoy huge market share.

A total of 183 annual reports were collected and analyzed for financial data accuracy. 59 annual reports were excluded due to insufficient and incorrect data. Remaining 124 reports were taken into consideration for the study. Hence the sample size for the research is 124. The researchers have selected the sample based on the convenience of the researchers and availability of financial data of different companies from company websites and Report Junction. Hence sampling technique adopted for this study is convenience sampling.

SOLVENCY ANALYSIS

Solvency status of the NBFC's has been analysed using Springate and Fulmer models. Solvency analysis is carried for each category of NBFC separately.

HOME FINANCE COMPANIES

In the home finance segment the companies taken for the study are Can Fin Homes (CFHL), Devan Housing (DHFL), State Bank of India Home Finance Ltd. Gruh Finance (GRUH), and (RBIHF) IDBI Home Finance (IDBIHFL). By using Springate and Fulmer formulae Z score and H score have been calculated which indicate level of solvency.

Table 1: Z and H Scores – Home Finance Companies

HOME FINANCE COMPANIES											
Z Score	2004-05	2005-06	2006-07	2007-08	2008-09	H Score	2004-05	2005-06	2006-07	2007-08	2008-09
CFHL	*1.84*	*2.025*	*2.15*	*1.346*	*1.684*	CFHL	*0.014*	*0.10*	*0.133*	*0.132*	*0.151*
DHFL	*1.33*	*1.399*	*1.45*	*1.873*	*1.519*	DHFL	*0.064*	*0.16*	*0.235*	*0.358*	*0.573*
GRUH	*0.66*	*1.548*	*1.43*	*2.062*	*2.188*	GRUH	*0.019*	*0.07*	*0.149*	*0.346*	*0.417*
IDBIHFL	*3.07*	*3.405*	*5.55*	*7.495*	*7.229*	IDBIHFL	*-0.254*	*0.10*	*0.115*	*-0.001*	*0.029*

Table 1 shows the Z score and H Score of the home finance companies except SBI Home Finance Limited. Since SBI Home Finance's score is way beyond the control it has been listed separately in Table 2. From the table it is evident that Z score for GRUH finance in 2005 is below the required minimum score of 0.862. GRUH has not performed well in 2005 as per Z score and H score and it is also low compared to the rest of the years. This is due to the fact that current liability for that year is high compared to rest of the years. H Scores for IDBIHFL in 2005 and 2008 were less than the required minimum score of zero. IDBIHFL didn't perform well in 2005 and 2008 as per Fulmer H Score. This is due to the fact that working capital and cash flow dipped for those two years. As cash flow is not an independent variable required in Springate, the Z scores didn't report this problem.

Table 2: Z and H Scores – SBI Home Finance

SBIHF	**2004-05**	**2005-06**	**2006-07**	**2007-08**
Z Score	-14.979	-16.306	-12.807	-19.574
H Score	-50.442	-54.724	-54.242	-68.538

From Table 2 it is evident that SBI Home Finance has not been performing well, and it's Z scores and H scores are way below the minimum required score of 0.862 and 0. This is due to the following reasons

a) Working capital for all the years were on the negative side
b) Interest charges almost remained constant
c) Profit before taxes and retained earnings were on the negative side.

SBI Home Finance has been able to continue the operations due to the backing from its parent company which is SBI. If the situation continues and scores remain at the same level, it may soon get into an insolvency stage.

SEGMENT LEADERS

The average value or the mean value of Z and H score of all the five years are taken for further analysis. The following tables contain average Z score and average H score of different NBFC's.

Table 3: Average Z Scores of NBFCs for the period 2005 – 2009

Average Z Scores (2005 - 2009)									
Home Finance		Infrastructure Finance		Investment Finance		Asset Finance (0-250)		Asset Finance (251-1600)	
IDBIHFL	5.35	SREI	1.90	VLSF	13.88	FLCIL	2.40	SCUFL	1.69
CFHL	1.81	PFCL	1.48	AKCSL	10.05	SEIL	1.92	STFCL	1.65
GRUH	1.58	IDFC	1.41	PNBG	4.15	TCIFL	1.35	CDBS	1.55
DHFL	1.52	REC	1.17	KMIL	1.55	MGFL	0.88	MAGMA	1.26
SBIHF	-15.9	LTFL	0.66	IFCI	1.09	IFCL	-1.49	SFL	0.76

Table 4: Average H Scores of NBFCs for the period 2005 - 2009

Average H Scores (2005 - 2009)									
Home Finance		Infrastructure Finance		Investment Finance		Asset Finance (0-250)		Asset Finance (251-1600)	
DHFL	0.28	SREI	1.29	VLSF	43.37	FLCIL	1.62	MAGMA	2.69
GRUH	0.20	REC	1.04	AKCSL	17.49	SEIL	1.25	STFCL	2.11
CFHL	0.11	PFCL	1.02	KMIL	1.45	TCIFL	0.35	SCUFL	1.99
IDBIHFL	0.00	IDFC	1.01	PNBG	1.43	IFCL	-3.71	CDBS	1.46
SBIHF	-56.9	LTFL	0.34	IFCI	0.36	MGFL	-5.52	SFL	1.03

From Table 3 and Table 4, it is evident that SREI Infrastructure (SREI), VLS Finance (VLSF) and First Leasing Company of India (FLCIL) are leaders in infrastructure finance, investment finance, asset finance as per Springate Model as well as Fulmer Model. IDBIHFL and Shriram City Union Finance are the leaders in home finance and asset finance respectively as per Springate Model. Devan Housing Finance and Magma

are the leaders respectively as per Fulmer Model. This means that these companies have very high level solvency when compared to others.

ANALYSIS OF VARIANCE – SPRINGATE Z SCORE

To find out whether there exist any significant differences among companies with respect to their level of solvency, analysis of variance is used. The significant value for the analysis of variance is less than 0.05, which means there exists significant difference between companies with respect to their level of solvency. This further means that the companies have different level of solvency.

Table 5: Duncan's Multiple Range Test Results

NBFC	N	Subset for alpha = 0.05					
		1	2	3	4	5	6
SBIHF	4	-15.91					
IFCL	5		-1.486				
LTFL	5		0.661	0.661			
SFL	5		0.762	0.762			
MGFL	5		0.882	0.882	0.882		
IFCI	5		1.088	1.088	1.088		
SEIL	5		1.918	1.918	1.918		
FLCIL	5		2.405	2.405	2.405		
PNBG	5			4.150	4.150		
IDBIHFL	5				5.350		
AKCSL	5					10.04	
VLSF	5						13.88

Duncan post hoc test divided the NBFC's into six homogeneous subsets based on the mean value of Z score. SBI home finance is in set one which has a very low level of Z score. VLS finance is in set six which has a very high level of Z score. The AK capital service also has a high level of solvency. From the table it is clear that the companies can be divided into six sets based on their level of solvency.

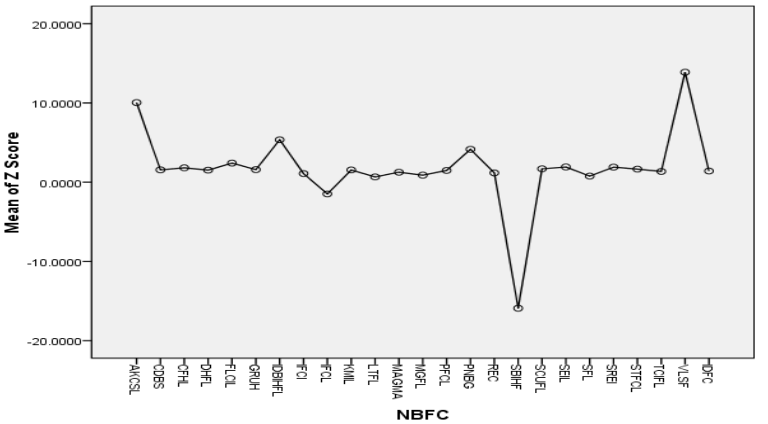

Figure 2: ANOVA – Mean of Z Score

The above figure (Fig. 2) displays the mean value of Z score of different companies. Some up and downs are clearly visible.

RELATIONSHIP AMONG SPRINGATE VARIABLES

To calculate Z score using Springate model four variables have been taken, which are X1, X2, X3 and X4 are taken. The X1, X2, X3 and X4 are derived by taking profit before tax, current liabilities, working capital, total assets, total sales and profit before interest and tax, as base variables. To find out relationship between base variables correlation is used.

Table 6: Correlation – Springate model variables

Correlation	Z Score	PBT	CL	WC	TA	TS	PBIT
Z Score	1.000						
PBT (Profit before Tax)	-0.023	1.000					
CL (Current Liabilities)	-0.145	0.772	1.000				
WC (Working Capital)	0.010	0.200	0.470	1.000			
TA (Total Assets)	-0.049	0.914	0.824	0.152	1.000		
TS (Total Assets)	0.110	0.889	0.826	0.242	0.937	1.000	
PBIT (Profit Before Interest and Tax)	-0.042	0.961	0.841	0.225	0.980	0.947	1.000

Table 6 represents the correlation between the independent variables and also shows the relationship between the dependent variable Z and the independent variables. From the table it is clear that dependent variable Z score, is highly (positively) correlated with independent variable 'Total sales' and highly (negatively) correlated with 'Current Liabilities'. 'Total Assets' is highly correlated with 'Profit before Interest and Taxes' and the correlation coefficient is 0.9805. Next set of highly correlated variables are

a) 'Profit before taxes' with 'Profit before interest and taxes'
b) 'Profit before taxes' with 'Total Assets'
c) 'Total Sales' with 'Profit before interest and taxes'
d) 'Total sales' with 'Total Assets'

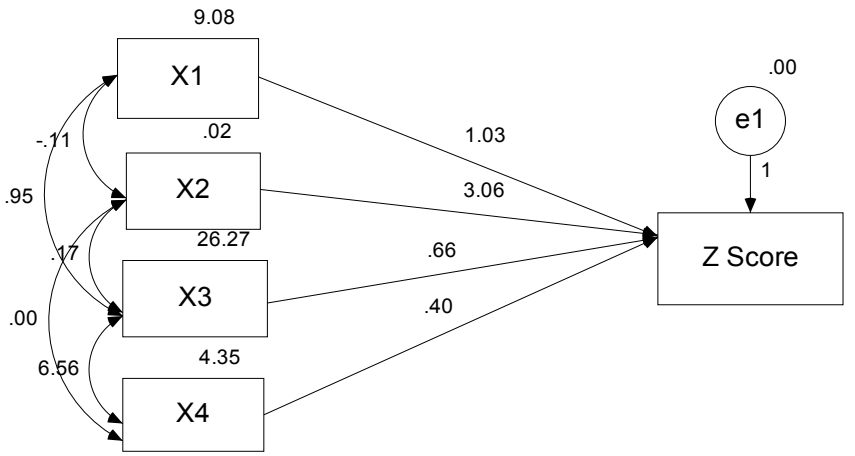

Figure 3: Path Diagram for Springate Variables

The path diagram (Fig. 3) shows relationship among Springate variables and Z score. The numbers in the arrow is the co-efficient for the relationship. The coefficient value indicates extent of influence of Springate variables on Z score. The influence of X2 (PBIT/Total Assets) on Z score is more (three times). The path diagram also shows relationship within Springate variables. There is a negative relationship between X1 (WC/TA) and X2 (PBIT/TA).

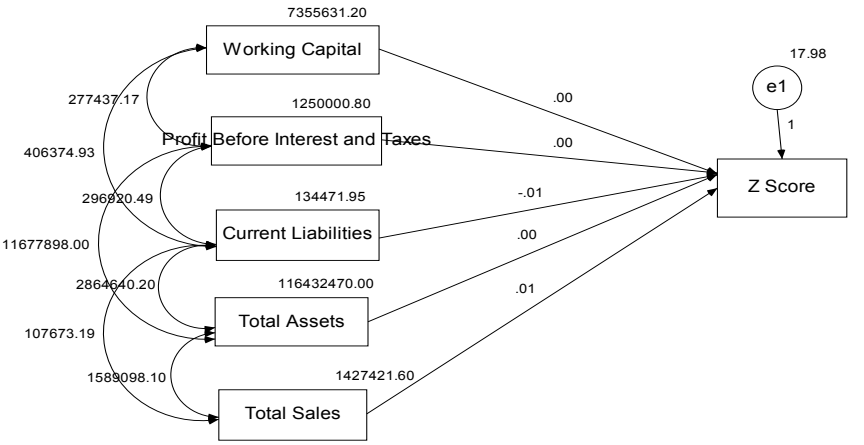

Figure 4: Path Diagram for Springate Base Variables

The above path diagram (Fig. 4) shows relationship among the Springate base variables. As the values for the base variables are very high when compared to Z score, the constant value for the linear equation is also very high.

RELATIONSHIP AMONG FULMER MODEL VARIABLES

The H score is calculated by taking current liabilities (CL), working capital (WC), total assets (TA), total sales (TS), profit before interest and taxes (PBIT), equity, total tangible assets (TTA), interest, total debt (TD), retained earnings (RE) and cash flow (CF) as base variables.

Table 7: Correlation – Fulmer Model Variables

	H Score	CL	WC	TA	TS	PBIT	EQ	TD	TTA	INT	RE	CF
H Score	1.00											
CL	-0.07	1.00										
WC	0.03	0.47	1.00									
TA	0.00	0.82	0.15	1.00								
TS	0.15	0.82	0.24	0.93	1.00							
PBIT	0.00	0.84	0.22	0.98	0.94	1.00						
EQ	0.00	0.65	0.07	0.81	0.76	0.79	1.00					
TD	-0.00	0.84	0.17	0.99	0.93	0.97	0.80	1.00				
TTA	0.00	0.82	0.15	1.00	0.93	0.98	0.81	0.99	1.000			
INT	-0.00	0.85	0.23	0.98	0.94	0.98	0.76	0.98	0.983	1.00		
RE	0.08	0.08	0.14	0.25	0.26	0.34	0.04	0.23	0.259	0.28	1.00	
CF	0.01	0.68	0.61	0.51	0.55	0.57	0.51	0.54	0.518	0.53	0.13	1.00

Table 7 represents the correlation between the independent variables and also shows the relationship between the dependent variable H and the independent variables. From that table it is clear that dependent variable H is positively correlated with independent variable 'Total Sales' and negatively correlated with independent variable 'Current Liabilities'. 'Total Assets' and 'Total Tangible Assets' are one and the same and they have the highest correlation coefficient of 1.00. Next set of highly correlated variables are

a) 'Total Debts' with 'Total Assets' (0.998)
b) 'Total Debts' with 'Total Tangible Assets' (0.998)
c) 'Profit before interest and taxes' with 'Interest Charges' (0.984)
d) 'Total Assets' with 'Interest Charges' (0.983)
e) 'Profit before interest and taxes' with 'Total Tangible Assets' (0.981)

'Equity Shares' does not have any relationship with 'Retained Earnings' and the correlation coefficient is 0.047.

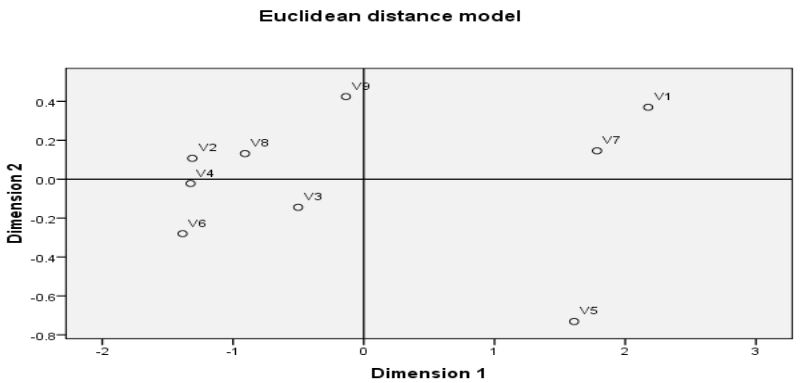

Figure 5: Multi-dimensional Scaling – Fulmer Variables

Figure 5 is the multi-dimensional scaling diagram for Fulmer variables from V1 to V9. From the figure it is clear that V2, V8 and V9 are in one segment but V9 is away from other two. This means that V2 and V8 are closely related. V2 represents Sales/ Total Assets and V8 represents Working Capital/Total Debt. The figure also shows that V1 and V7 are at close proximity to each other. V1 is a ratio of Retained Earnings and Total

Assets and V7 is log of Total Tangible Assets. V1 is the most negatively correlated variable with V6 the correlation coefficient is -0.998 and they are in two different places in the diagram with large gap in between. V5 represents Debt/ Total Assets which is not related to any other variable.

SIMPLE REGRESSION – SPRINGATE MODEL VARIABLES

To find out the extent of influence of independent variables on Z score simple regression analysis is used.

Table 8: Simple Regression on all Springate Model Independent Variables

Model	Regression Statistics				ANOVA								Durbin -Watson Statistic
					Degrees of Freedom (DF)		Sum of Square (SS)		Mean Square(MS)		F Values		
	mR	R^2	aR^2	SE	Reg	Res	Reg	Res	Reg	Res	F	Sig.F	
1	0.58	0.34	0.31	4.33	6	11	1139	2196	189	18.7	10.11	0.00	1.02

A simple regression with residuals calculation is carried out with all the independent variables of Springate model. Table 8 shows that all independent variables contribute 34% variance in Z score. The significant F value indicates that significant variance in Z score is contributed by independent variables.

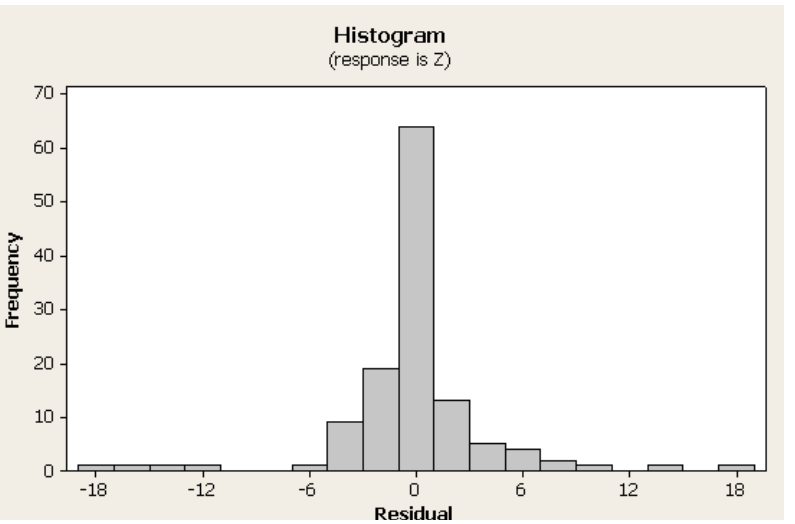

Figure 6: Histogram of Residuals – Springate Variables

Figure 6 depicts a histogram for residuals which is normally distributed. This means that the residuals are within the expected deviation.

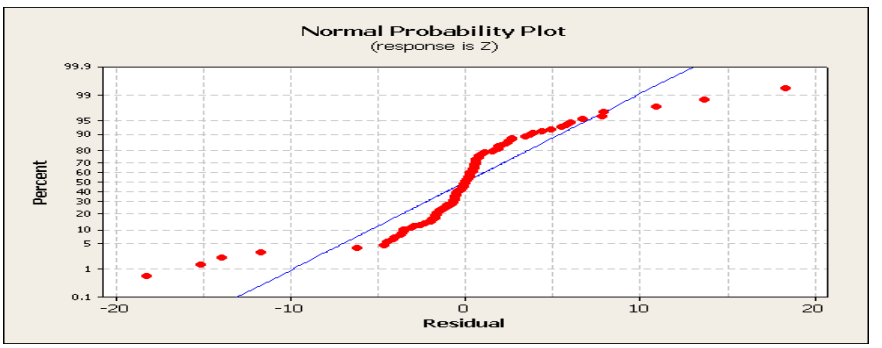

Figure 7: Normal Probability Plot – Springate Variables

Figure 7 shows that the predicted values are located in and around the linear line and there is no significant deviation from future possible values of Z.

SIMPLE REGRESSION – FULMER MODEL VARIABLES

To find out the extent of determination of all the Fulmer variables on H score simple regression analysis is used.

Table 9: Simple Regression on all Fulmer Model Independent Variables

Model	Regression Statistics				ANOVA								Durbin -Watson Statistic
					Degrees of Freedom(DF)		Sum of Square (SS)		Mean Square(MS)		F Values		
	mR	R^2	aR^2	SE	Reg	Res	Reg	Res	Reg	Res	F	Sig. F	
1	0.56	0.31	0.24	12.60	11	112	7973	17784	724	158	4.57	0.00	0.94

Table 9 shows that all independent variables contribute to 31 percent of variance in H Score. The significant value (0.00) indicates the level of significance. It can also be inferred that significant amount of variance in H score is a result of independent variables.

STEPWISE REGRESSION – SPRINGATE MODEL VARIABLES

To find out the extent of influence of each variable on Z score and to find out the most significant variables stepwise backward regression is used.

Table 10: Regression – Stepwise – Springate Variables (Backward Elimination)

Stepwise Regression on Springate Variables													
Model	Regression Statistics				ANOVA								DW Stat
					df		SS		MS		F Values		
	mR	R^2	aR^2	SE	Reg	Res	Reg	Res	Reg	Res	F	Sig.	
A	0.58	0.34	0.31	4.33	6	117	1139	2196	189	18.78	10.11	0.00	1.02
B	0.58	0.34	0.31	4.32	5	118	1139	2197	227	18.62	12.24	0.00	1.02
C	0.57	0.33	0.31	4.34	4	119	1095	2240	273	18.83	14.55	0.00	1.02
D	0.55	0.31	0.29	4.39	3	120	1020	2315	340	19.30	17.63	0.00	0.96

Model A: All independent variables

In the model A, Z value is calculated by taking all the variables. The equation can be written as

$$Z = 1.2485 + (0.0052 \times PBT) - (0.0077 \times CL) + (0.0003 \times WC) + (0.00001 \times TA) + (0.0074 \times TS) - (0.0075 \times PBIT) \quad (1)$$

Model B: Leaving independent variable – TA

In the model B the least important variable which is total asset (TA), is not included.

$$Z = 1.2544 + (0.00502 \times PBT) - (0.00769 \times CL) + (0.0003 \times WC) + (0.0074 \times TS) - (0.0072 \times PBIT) \quad (2)$$

Model C: Leaving independent variable – PBT

In the model C next least important variable is excluded, which is profit before tax. The Z score equation for the model C is

$$Z = 1.2754 - (0.00837 \times CL) + (0.000348 \times WC) + (0.0071 \times TS) - (0.0047 \times PBIT) \quad (3)$$

Model D: Leaving independent variable – WC

In the model D, working capital (WC), is excluded

$$Z = 1.3930 - (0.0063x\ CL) + (0.0071x\ TS) - (0.0052x\ PBIT) \quad (4)$$

Based on the stepwise regression, it is clear that all independent variables combined together contribute 34 percent of Springate Z Score. Current liabilities, total sales and profit before interest and taxes are the key determinants as per equation (4) and they contribute 31 percent of variance in Z score.

BEST SUBSETS REGRESSION – FULMER MODEL VARIABLES

Table 11: Regression – Best Subsets – H versus independent variables

Best Subsets Regression: H versus CL, WC, TA, TS, PBIT, EQ, TD, INT, RE, CF														
Years	R-Sq	R-Sq (adj)	Mallows Cp	S	CL	WC	TA	TS	PBIT	EQ	TD	INT	RE	CF
1	2.30	1.50	39.00	14.36				□						
1	0.70	0.00	41.60	14.47									□	
2	23.10	21.90	7.20	12.79				□				□		
2	21.50	20.20	9.90	12.93				□	□					
3	27.20	25.40	2.50	12.49	□			□				□		
3	26.80	25.00	3.10	12.53	□			□	□					
4	29.00	26.60	1.60	12.39	□	□		□				□		
4	28.70	26.30	2.10	12.42	□	□		□	□					
5	29.80	26.80	2.30	12.38	□	□		□	□			□		
5	29.40	26.40	2.90	12.41	□	□		□		□		□		
6	30.10	26.50	3.80	12.40	□		□	□			□	□		
6	30.00	26.40	4.00	12.41	□	□		□	□		□	□		
7	30.40	26.20	5.40	12.43	□	□	□	□	□		□	□		
7	30.30	26.10	5.40	12.43	□	□	□	□			□	□		□
8	30.50	25.70	7.10	12.47	□	□	□	□	□		□	□	□	
8	30.50	25.70	7.10	12.47	□	□	□	□	□	□	□	□		
9	30.60	25.1	9.00	12.52	□	□	□	□	□		□	□	□	□
9	30.60	25.10	9.10	12.52	□	□	□	□	□	□	□	□	□	
10	30.60	24.50	11.00	12.57	□	□	□	□	□	□	□	□	□	□

Table 11 shows the best subsets regression for Fulmer model variables CL, WC, TA, TS, PBIT, EQ, TD, INT, RE and CF. Total tangible assets has been removed from the calculation as it is highly correlated to Total Assets with a correlation coefficient of 1. Interpretations from the above best subsets regression are as follows.

The model with all the variables, except TTA has the highest adjusted R^2 (24.5%), a low Mallows' Cp value (11.0), and the lowest S value (12.578). The nine predictor model with all the variables except TTA and EQ has slightly lower adjusted R^2 (25.1%), a low Mallows' Cp value (9.000), and slightly higher S value (12.526). The eight predictor model with all the variables except TTA, EQ and CF has the slightly lower ad-

justed R^2 (25.7%), a low Mallows' Cp value (7.10), and slightly higher S value (12.476).

The seven predictor model with all variables except TTA, EQ, RE and CF has the slightly lower adjusted R^2 (26.2%), a low Mallows' Cp value (5.4), and slightly higher S value (12.436).The six predictor model with all variables except TTA, EQ, RE, CF and PBIT has the slightly lower adjusted R^2 (26.5%), a low Mallows' Cp value (3.8), and slightly higher S value (12.408). The five predictor model with all variables except TTA, EQ, TD, RE, CF and TA has the slightly lower adjusted R^2 (26.4%), a low Mallows' Cp value (2.3), and slightly higher S value (12.382).

Similarly, further predictor models with lesser variables can be evidently in table 11. Also evident from the table is that total sales, current liabilities and interest charges in sequence are significant predictor variables and stepwise regression with backward elimination done previously, also arrived at the same conclusion.

GROUPING OF COMPANIES – SPRINGATE Z AND FULMER H SCORES

To segment or group the companies based on the level of solvency cluster analysis is performed. For the purpose of study K means cluster analysis is used. The segmentation is done based on the mean values of H and Z score.

Table 12: Cluster Analysis of Springate Z and Fulmer H Scores

Final Cluster Centers						
	Cluster					
	1	2	3	4	5	6
Z	10.05	1.486	-15.92	13.88	-0.305	4.75
H	17.49	1.089	-56.99	43.37	-4.615	0.715
ANOVA						
	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
Z	111.19	5	0.34	19	327.20	0
H	1097.97	5	0.619	19	1775	0

The companies that have a high score in both Z score and H score are included in group four. The companies which are have very high negative

score are included in the group three. The significant values in analysis of variance (0.0 for both Z and H) indicate that both variables (H and Z) are used to segment the companies. This also indicates that the groups differ significantly in both H score and Z score.

Table 13: Number of cases in each cluster

Number of Cases in each Cluster		
Cluster	1	1
	2	18
	3	1
	4	1
	5	2
	6	2
Valid		25

The companies are segmented into six groups. Out of 25 companies 18 companies, which are CanFin Homes Limited (CFHL), GRUH Finance Limited (GRUH), Dewan Housing Finance Limited (DHFL), SREI Infrastructure Finance Limited (SREI), Power Finance Corporation Limited (PFCL), Infrastructure Development Finance Corporation Limited (IDFC), Rural Electrification Corporation Limited (REC), L & T Finance Limited (LTFL), Kotak Mahindra Investments Limited (KMIL), Industrial Finance Corporation of India Limited (IFCI), First Leasing Company of India Limited (FLCIL), S.E. Investments Limited (SEIL), TCI Finance Limited (TCIFL), Shriram City Union Finance Limited (SCUFL), Shriram Transport Finance Company Limited (STFCL), Cholamandalam DBS Finance Limited (CDBS), Magma Fincorp Limited (MAGMA), and Sundaram Finance Limited (SFL), fall under cluster 2, 2 companies fall under cluster 5 and cluster 6, 1 company each is in cluster 1, cluster 3 and cluster 4. From the above cluster analysis, it is clear that SBI Home Finance is the worst performer and VLS Finance is the best performer. SBI Home Finance, Integrated Finance and Motor General Finance are the companies which are not performing well in an overall perspective and if these companies continue to operate in the same way in future, they are likely to get into an insolvency state.

GROUPING OF VARIABLES-FULMER VARIABLES

Depending upon the relationship among the variables, the variables can be grouped. For the purpose of grouping factor analysis is performed. As KMO (Kaiser-Meyer-Olkin Measure of Sampling Adequacy) value is

0.694 and significant value in Bartlett's test is 0.00, factor analysis can be performed for the taken variables.

Table 14: Variance Explained

Component	Initial Eigen values			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.446	38.289	38.289	3.124	34.714	34.714
2	2.555	28.394	66.682	2.709	30.102	64.817
3	1.073	11.920	78.602	1.241	13.785	78.602
4	.876	9.733	88.335			
5	.547	6.078	94.414			
6	.222	2.465	96.878			
7	.182	2.025	98.904			
8	.097	1.073	99.977			
9	.002	.023	100.000			

the factor analysis result shows that the nine Fulmer variables can be grouped into three variables. If the nine variables are reduced into three then the total variance explained is 78 percent which is very significant. This means that the nine variables can be reduced into three variables.

Table 15: Rotated Component Matrix

	Component		
	1	2	3
V9	0.924		
V8	0.901		
V2	0.895		
V6		-0.925	
V1		0.922	
V7		0.675	
V5		0.674	
V4			0.735
V3			0.640

The rotated component matrix shows that variables V9, V8 and V2 can be grouped into first factor and variables V6, V1 and V7 and V5 can be grouped into second factor and V4 and V3 can be put under third factor. The multidimensional scaling has also given the same result. As the variables within the group are related, the number of variables can be eliminated by taking one from one each. From the group one, V9 can be taken which is EBIT/ Interest. V9 is very important variable because repaying capacity mainly depends upon interest coverage ratio (EBIT/Interest). In the group two, V6 can be retained which is calculated by Current Liabilities/ Total Assets. From the third group, V4 (Cash Flow/ Total Debt) can be taken. V9 and V4 are positive because rise in these ratios will have positive impact on solvency whereas V6 is negative because increase in current liabilities will have negative impact on solvency of the firm. The regression analysis is performed to find new equation taking only V6, V4 and V9.

Table 16: Regression Analysis

R=0.946	R^2=0.896	Coefficients	Sig.
Model		B	
1	(Constant)	-.823	0.089
	V9	8.304	0.000
	V6	-2.803	0.000
	V4	1.468	0.000

The degree of determination is 0.896 which means that around 90 percent of variance in H score can be determined by using these three variables. As these variables alone can determine maximum percentage of variance the new equation can be written as H score= -0.823 + 8.304 * V9 -2.803 * V6 + 1.468*V4.

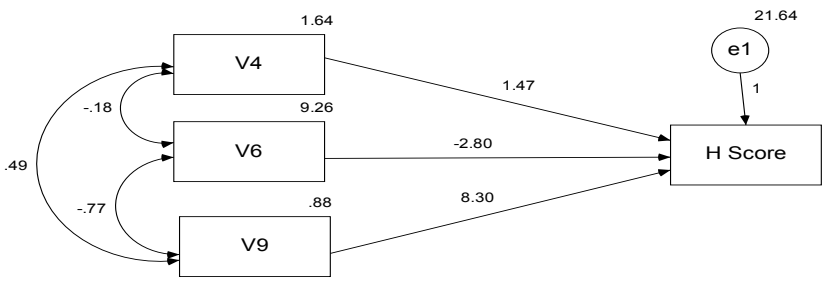

Figure 8: Model Fit for New Variables

The path analysis is performed to find out goodness of fit. The chi-square value for the analysis is 0.0 which means that this model is good and acceptable. The interdependence among these variables is less and co-efficient is significant. This means that all variables (V4, V6 and V9) are independent of each other and each variable plays a significant role in determining H score.

RELATIONSHIP BETWEEN Z SCORE AND H SCORE

To find out the relationship between Z score and H score the correlation analysis is performed.

Table 17: Correlation – Z and H Scores

Correlation	Z	H
Z	1.0000	
H	0.8108	1.0000

Table 17 represents the correlation between Z and H scores. From the table, it is clear that Z and H Scores are highly correlated (positively) with correlation coefficient of 0.811 and there is no negative relationship. This indicates that both Fulmer model and Springate model, predict the solvency of the companies in a similar fashion.

CONCLUSION

After the year 2001, due to stringent norms laid down by RBI in reporting financial status of companies, there have not been many incidences of NBFC getting into an insolvent situation. RBI's Capital Adequacy Ratio norms help to protect the shareholders' interests. Financial soundness of SBI Home Finance seems to be very weak and if the situation continues, it may get into an insolvency state. GRUH finance and IDBI Housing Finance though having problems for a few years were able to recover and improve on the solvency score. Devan Housing and IDBIHFL were able to improve consistently on the scoring over the period of 5 years. In Infrastructure finance segment, the solvency score of L & T Finance Limited is less than the expected ceiling because it had negative working capital. SREI has been the true leader in this segment with high average scores. Findings in investment finance segment reveals that solvency score for IFCI for a period of two years have not crossed the limits, however the scores improved after that and were able to move beyond the danger line. Kodak Mahindra and PNB Gilts were in red line for one year, but later they improved. Findings in asset finance segment show that Integrated Finance and Motor General Finance have not been doing well for all the 5 years and their Z and H scores have not crossed expected minimum limits. If situation continues, these two may get into an insolvency state. Sundaram Finance's profit before interest and taxes and profit before taxes, were not as significant as total assets and current liabilities and hence their Z scores are weak. However this may not potentially put the company into an insolvency situation, as Fulmer scores seem to be on the positive side. TCI Finance has not performed well in the last year due to increased total debts and interest charges. In both Springate and Fulmer models, key determinant independent variables for the final score are 'Current Liabilities' and 'Total Sales'. Next set of key determinant independent variables are 'Profit before interest and taxes' and 'Interest Charges'. Cluster analysis revealed SBI Home Finance as the worst performer, Integrated Finance

and Motor General Finance as bad performers, VLS Finance and AK Capital Services as good performers and rest of the companies as moderate performers. Both Springate and Fulmer models demonstrate the financial soundness of the companies based on the financial data. Their scores definitely represent the actual status of solvency of the companies as seen in this study. There is significant relationship among Fulmer variables. Therefore by using factors analysis the nine variables are grouped into three variables (V4, V6 and V9). V4, V6 and V9 alone explain more than 90 percent variance in H score. The Fulmer equation is redrawn by using these three variables and the new model is tested for its goodness.

IMPLICATIONS OF THE STUDY

The study indicates that both Fulmer and Springate model can be used to predict the solvency of not only manufacturing industry but also NBFC's and banks. An alternative methodology is developed with three variables instead of nine variables to predict solvency. The new methodology is also tested for its accuracy in predicting solvency and proved good. Therefore the firms can use new model to ascertain their level of solvency.

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