

An Analytical Study on Financial Health of Selected Public Sector Companies of India Using Grover Model

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ABSTRACT

Now a day many large companies at international and national level face the problems of bankruptcy. So, it is necessary to identify tools for prediction of bankruptcy of companies. One of these tools is Financial Health Models. Suppliers, Managers, Investors and Financial Institutions all are interested in prediction of financial health of companies. The primary objective of this study is to check Financial Health of selected Public Sector Companies of India using Grover Model. For this study, total 20 Public Sector Companies are selected for the period of 05 years from 2014-15 to 2018-19. The present research is useful to the investors, financial institutions and suppliers for investments, loans and supplying raw materials. Result of this study reveals that Miniratna-II Companies are financially very healthy as compared to other categories.

Keywords: Financial Health, Public Sector Company and Grover Model

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1. Introduction

Nowadays, the fast technological and environmental changes have increasingly improved economy and the increasing competition of institutions has limited profit and increased the possibility of bankruptcy. Therefore, financial decisions have become more strategic. Financial health is a very key aspect in present competitive market. Financial health is a situation where company has to manage its income resources for expenses and for payment of debt obligation. Financial health is a different tool for investors and analyst to determine whether company is financially healthy or not. Though 'use of financial healthy models to check financial instability' has been a subject of interest, the crisis has emphasized the need for such studies. So, for this study Grover Model used by the researcher to know the Financial Health of Selected Public Sector Companies.

Grover Model: This model is developed to measuring Financial Health of business in the year 2001. Grover Model is developed through recreated of Altman's Z-score model. At the time of development of this model X1 and X3 variables of Z-score model have been considered and profitability is added which is identified by Return on Assets Ratio.

$$G = 1.650 X1 + 3.404 X2 - 0.016 ROA + 0.057$$

Description:

X1: Total Assets/Working Capital

X2: Total Assets/Income before Interest and Taxes

ROA: Total Assets/Net Profit

GS ≥ 0.01 then the company is called as "Financially Healthy"

GS ≤ -0.02 then the company is called "Bankrupt"

2. Review of Literature

Agrawal Ankit and Patni Ity (2019) have compared Z-score, Ohlson, Zmijewski, Springate and Grover model to check the ability of models in prediction of financial soundness of companies. Five companies are taken as a sample of the study. The data is accumulated for ten years from financial statements of companies and it is evaluate through websites of BSE, stock screener and money control. For data analysis data was put as per the formula of models. This study is totally focused on comparison of 5 financial models to check its accuracy. Result shows that Zmijewski and Springate model is best model for prediction of financial health. This study also recommended that at the time of investment, investors have to focus on Zmijewski and Springate model because both are early forecaster models. (Patni, 2019)

Indriyanti Mia (2019) has tried to measure the accuracy of financial distress models in predicting the financial health of world's largest technological companies in 2015-16 as per Forbes version. Researcher has compared Ohlson, Z-score, Taffler, Fulmer, Springate, Grover and Zmijewski financial distress models. The population of the study includes world's all leading technological companies, which are listed in Forbes version. 25 largest technological companies selected from Forbes version were the sample of the study. The data has been sought from annual reports of companies. Prediction of value of company divided by entire data and multiplies by 100 determined the accuracy of models. Based on the reality of accuracy and Robustness check, Grover model got highest accuracy level i.e. 96.6%. It was followed by Z-score model with the accuracy level of 86.60%. Hence, it can be concluded that Grover financial distress model is superior in predicting financial health of companies. This study concludes that all technological companies, except Ericson and Yahoo, are financially strong. (Indriyanti, 2019)

3. Objective of the study

The primary objective of this study is to determine Financial Health of selected Public Sector Companies of India using Grover Model.

4. Research Methodology

The present study is analytical in nature. The study is based on secondary data only. The data is collected from annual reports and website of Public Sector Companies of India. The period of the study is 05 years from 2014-15 to 2018-19. In this study selection of samples is done through multi stage sampling method. For selection of sample lottery method and convenient sampling method have been used. 20 Public Sector Companies are selected as a sample of the study, 05 companies are selected from each category i.e. Maharatna, Navratna, Miniratna-I and Miniratna-II. After collecting annual reports of Public Sector Companies, data analysis is done as per the formula of model, cross tabulation, Multiple Discriminant Analysis, Probit and Logit Analysis using SPSS 25 (Demo version).

Table No. 1 List of Sample Companies

Sr. No.	Name of Company	Category
1	Bharat Petroleum Corporation Ltd.	Maharatna
2	Coal India Ltd.	Maharatna
3	Gas Authority of India Ltd.	Maharatna
4	Indian Oil Corporation Ltd.	Maharatna
5	Steel Authority of India Ltd.	Maharatna
6	Bharat Electronics Ltd.	Navratna
7	Container Corporation of India Ltd.	Navratna
8	Hindustan Aeronautics Ltd.	Navratna
9	Hindustan Petroleum Corporation Ltd.	Navratna
10	National Aluminum Company Ltd.	Navratna
11	Bridge & Roof Co. (India) Ltd.	Miniratna-I
12	Bharat Sanchar Nigam Ltd.	Miniratna-I
13	Indian Renewable Energy Development Agency Ltd.	Miniratna-I
14	North Eastern Electric Power Corporation	Miniratna-I
15	Pawan Hans	Miniratna-I
16	Artificial Limbs Manufacturing Corporation of India	Miniratna-II

17	Central Mine Planning & Design Institute Ltd.	Miniratna-II
18	FCI Aravali Gypsum and Minerals India Ltd.	Miniratna-II
19	Ferro Scrap Nigam Ltd.	Miniratna-II
20	Rajasthan Instruments & Electronics Ltd.	Miniratna-II

5. Measuring Financial Health of Selected Public Sector Companies of India

Table No. 2 Financial Health of Maharatna Companies

Name of Company	Grover Score
BPCL	-46.66
CIL	30.45
GAIL	161.12
IOCL	-4.30
SAIL	1.64

The above table no.2 shows financial health of Maharatna Companies as per the result of Grover Model. It can be said that Financial Health of CIL, GAIL and SAIL is better because Grover Score of this companies are more than 0.01, while BPCL and IOCL are under distressed zone because Grover Score of this Companies is less than -0.02.

Table No. 3 Financial Health of Navratna Companies

Name of Company	Grover Score
BEL	36.90
CONCOR	46.19
HAL	15.40
HPCL	8.39
NALCO	41.05

The above table no. 3 represents Financial Health of Navratna Companies as per the result of Grover Model. It can be inferred that all these selected Navratna Companies are Financially Healthy because Grover Score of this companies is more than 0.01.

Table No. 4 Financial Health of Miniratna-I Companies

Name of Company	Grover Score
BR	150.99
BSNL	-57.55
IREDA	80.47
NEEPCO	21.52
PH	99.78

The above table no. 4 portrays Financial Health of Miniratna-I Companies as per the result of Grover Model. As per the above table it can be said that Financial Health of all Selected Miniratna-I Companies is better except BSNL, because Grover Score of BSNL is less than -0.02.

Table No. 5 Financial Health of Miniratna-II Companies

Name of Company	Grover Score
ALMCI	27.90
CAMPDL	63.25
FAGML	79.44
FSNL	49.80
REIL	69.82

The above table no. 5 displays Financial Health of Miniratna-II Companies as per the result of Grover Model. Here, we can say that Financial Health of all Selected Miniratna-II companies is better because Grover Score of all this companies is more than 0.01.

6. Comparison of Financial Health of Selected Public Sector Companies as per the Category and Company

Table No. 6 Category Wise Comparison of Financial Health as per the Grover Model

Category	Financially Healthy		Financially Distressed		Total	%
	Freq.	%	Freq.	%		
Maharatna	16	64	09	36	25	100
Navratna	23	92	02	08	25	100
Miniratna-I	19	76	06	24	25	100
Miniratna-II	25	100	---	---	25	100

The above table no. 6 depicts category wise comparison of financial health as per the Grover Model. As per the result of Grover Model, Miniratna-II category is 25 (100%) financially healthy, followed by Navratna category is 23 (92%) times financially healthy. It can be inferred that financial health of Maharatna category is not well as compared to the other categories.

Table no. 7 Company Wise Comparison of Financial Health as per the Grover Model

Name of Company	Grover Model					
	Financially Healthy		Financially Distressed		Total	Percentage
	Fre.	%	Fre.	%		
BPCL	01	20	04	80	05	100
CIL	05	100	---	---	05	100
GAIL	04	80	01	20	05	100
IOCL	03	60	02	40	05	100
SAIL	03	60	02	40	05	100
BEL	05	100	---	---	05	100
CONCOR	05	100	---	---	05	100
HAL	05	100	---	---	05	100
HPCL	03	60	02	40	05	100
NALCO	05	100	---	---	05	100
BR	05	100	---	---	05	100
BSNL	01	20	04	80	05	100
IREDA	05	100	---	---	05	100
NEEPCO	04	80	01	20	05	100
PH	04	80	---	---	05	100
ALMCI	05	100	---	---	05	100
CAMPDL	05	100	---	---	05	100
FAGML	05	100	---	---	05	100
FSNL	05	100	---	---	05	100
REIL	05	100	---	---	05	100

The above table no. 7 depicts comparison of companies as per the Grover Model. It can be inferred that CIL, BEL, CONCOR, HAL, NALCO, BR, IREDA, ALMCI, CAMPDL, FAGML, FSNL and REIL were financially very healthy during the entire study period. Here, GAIL, NEEPCO and PH were 04 times financially healthy and only 01 time financially poor during the study period. The IOCL, SAIL & HPCL were 02 times financially strong and 02 times financially poor out of 05 times. As per the Grover Model financial health of BPCL & BSNL was worst because both were only 01 time financially healthy and 04 times under financial distressed zone. Here, we can say that all the companies of Miniratna-I & Miniratna-II category were financially sound except BSNL. It can be concluded that as per the Grover Model majority of companies were financially sound.

7. To find out which is the Most Significant Variable in the Result of Grover Model?

Multiple Discriminant Analysis Eigen Values

Function	Eigen value	% of Variance	Cumulative %	Canonical Correlation
1	0.420	100.0	100.0	0.544
a. First 1 canonical discriminant functions were used in the analysis.				

The above table displays value of canonical correlation. This table demonstrates the maximum possible number of discriminant functions. It is computed as the smaller of one less than the number of groups defined by the number of dependent variables and independent variables. In Grover Model there were 01 group defined by 2 dependent variables and 03 independent variables, so the maximum possible number of discriminant functions was 1. Here, we take square value of canonical correlation. The square of canonical correlation is 0.2959 (29.59%). It can be said that the value of canonical correlation is 0.2959 (29.59%), mean only 29.59% discriminant is raised between the groups.

Wilks' Lambda

Test of Function(s)	Wilks' Lambda	Chi-square	Df	Sig.
1	0.704	33.870	3	0.000

The above table presents result of the Wilk's Lambda test. Functions of discriminant are being tested by it. The Wilks' lambda statistic for the test of function 1 (chi-square = 33.870) had a probability of > 0.05 which was more than level of significance i.e. 0.05. It can be inferred that the value of Wilk's Lambda is near to 01 i.e. 0.704, mean very much discriminant is not happened between the mean of groups.

Structure Matrix

Variables	Function 1
X1	0.742
X2	0.526
ROA	0.170

The above table signifies result of structure matrix. In general, it can be said that if the value of any variable in structure matrix is more than 0.20 then that variable is taken as a significant variable in the result of the model. Here, the value of variable X1 & X2 are more than 0.20 i.e., 0.742 and 0.526, mean both the variables play important role in the result of the model. The most impactful variable in Grover Model is X1 (Total Assets/Working Capital) because this variable got highest value i.e., 0.742 as compared to other variables. It can be said that ROA has not played very much important role in the result of Grover Model because value of it is less than 0.20.

Classification of Results

Grover Score			PREDICTED GROUP		Total
			Membership		
			Distressed	Healthy	
Original	Count	Bankrupt	17	0	17
		Financially Healthy	1	82	83
	%	Bankrupt	100.0	.0	100.0
		Financially Healthy	1.2	98.8	100.0
a. 99.0% of original grouped cases correctly classified.					

The above table shows the result of classification. The chance accuracy criteria were 62.5% ($1.25 \times 50\% = 62.5\%$). The cross-validated accuracy rate computed by SPSS was 99%, which was greater than or equal to the proportional by chance accuracy criteria, the criterion for classification correctness is satisfied because 99% of original grouped cases were properly distributed.

8. Evaluation of Performance of Grover Model Using Probit & Logit Analysis

Probit Analysis Model Information

Dependent Variable	Grover Score
Probability Distribution	Binomial
Link Function	Probit
a. The procedure models Bankrupt as the response, treating Financially Healthy as the reference category.	

Categorical Variable Information

Particulars			N	Percent
Dependent Variable	Grover Score	Bankrupt	17	17.0%
		Financially Healthy	83	83.0%
		Total	100	100.0%

The above table shows Grover Score is taken as dependent variable which has two categories, financial healthy and financial distressed. To check the Grover Score, three different independent variables X1, X2 and ROA are used. It can be seen that Grover Score is classified in financially healthy (n=83) and financially distressed (n=17) zone.

Continuous Variable Information

Variables		N	Minimum	Maximum	Mean	Std. Deviation
Covariate	X1	100	-156.51	308.16	-0.3625	43.71165
	X2	100	-49.19	113.07	13.1436	19.50781
	ROA	100	-410.24	657.12	26.1047	82.85079

The above table reveals descriptive analysis of independent variables of Grover Model. It can be seen that for variable X1, minimum value is -156.51 and maximum value is 308.16. The mean value of X1 is -0.3625 with the standard deviation of 43.71165. It can be said that for variable X2, maximum value is 113.07 with the minimum value of -49.19. The mean value of X2 is 13.1436 with the standard deviation of 19.50781. It can be inferred that for variable X3, minimum variable is -410.24 and maximum value is 657.12. The mean value of ROA is 26.1047 with the standard deviation of 82.85079.

Omnibus Test

Likelihood Ratio Chi-Square	df	Sig.
91.177	3	0.000

The above table expresses result of Omnibus test. A chi-square probability test of the actual model against the null (in this case, intercept) function is the omnibus test. The significant value is less than 0.05 i.e., 0.00 explains that the actual model goes above the null model.

Coefficient

Parameter	B	Std. Error	Hypothesis Test		
			Wald Chi-Square	Df	Sig.
(Intercept)	-6.624	59.17	2.236	1	0.041
X1	-3.335	16.86	1.985	1	0.045
X2	-7.492	13.50	2.235	1	0.038
ROA	0.776	12.81	2.658	1	0.029

The Probit model can be created by using above table.

$$\text{Grover Model} = -6.624 - 3.335 (X1) - 7.492 (X2) + 0.776 (ROA)$$

The above table depicts result of coefficient. Here, it can be said that ROA have positive impact on Grover Score and X1 & X2 have negative impact on Grover Score. It can be seen that if the Grover Score is increased by 1 unit then ROA also increases by 0.776 units. It can be said that if the Grover Score increase by 1 unit than X1 & X2 also increases by -3.335 & -7.492 units. As the p value of all the variables are less than 0.05, mean there is a significant relationship between dependent and independent variables.

Logit Analysis

For Logit analysis of Grover Model, result of Grover Score is taken as dependent variable which has two categories, financial healthy and financially distressed. To estimate the result of Grover Model, three different independent variables X1, X2 and ROA are used.

Omnibus Tests of Model Coefficients

Particulars		Chi-square	Df	Sig.
Step 1	Step	91.177	3	0.000
	Block	91.177	3	0.000
	Model	91.177	3	0.000

The above table specifies the chi-square statistics and its level of significance. In this case, the statistics for Step, Model and Block are the parallel because researcher did not use step by step or block method. The probability of acquiring the chi-square statistic is shown through the value in the Sig. column. The null hypothesis is true. The model is statistically fitted since the p-value is less than 0.000 i.e., 0.000.

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
	0.000	0.598	0.97

The above table explains model summary for the final model. The table clarifies the result of -2-log likelihood, Cox & Snell R Square and Nagelkerke R Square. The value of Cox & Snell R Square and the values of the Nagelkerke R Square reveal the amount of variation in the model's dependent variable (from minimum 0 to max. 1) i.e., 0.598 & 0.97. As the R square of Cox & Snell & Nagelkerke are more than 0.50 i.e., 0.598 & 0.97, mean model is significant. From the above table it can be seen that R square of Nagelkerke & Cox & Snell is giving suitable description of dependent variable

Classification Table

Observed			PREDICTED GROUPS		
			Grover Score		Percentage Correct
			Distressed	Healthy	
Step 1	Grover Score	Bankrupt	16	1	94.11
		Financially Healthy	0	83	100.0
	Overall Percentage		---	---	97.05
a. The cut value is 0.5					

Table above demonstrates the result of classification. The calculated values are based on the complete logistic regression model in the dependent variable. It can be inferred that the number of cases predicted to be correct (16 are reported to be 0 and predicted to be correctly 0, 83 are reported to be 1 and are predicted to be correctly zero) and how many cases are forecasted not correctly (0 is reported to be 0, but predicted to be 1; 1 is reported to be 0 but are expected to be 00. It can be seen that overall 97.05% percent of cases are distributed correctly.

Coefficient

Variables		B	S.E.	Wald	Df	Sig.
Step 1	X1	8.171	11.996	2.002	1	0.042
	X2	18.403	44.612	3.125	1	0.018
	ROA	-1.902	3.372	3698	1	0.014
	Constant	15.800	78.528	3.254	1	0.017

The Logistic Regression equation can be formed by using above table.

Grover Model= 15.800 + 8.171 (X1) + 18.403 (X2) – 1.902 (ROA)

The above table shows result of coefficient. Here, it can be seen that X1 & X2 have positive impact on Grover Score and ROA have negative impact on Grover Score. It can be said that if the Grover Score is increase by 1 unit then X1 & X3 are also increases by 8.171 & 18.403 units. It can be inferred that if the Grover Score increases by 1 unit then ROA also increases by -1.902 units. As the p value of all three variables are less than 0.05 i.e., 0.042, 0.018 and 0.014, mean all three variables are found significant at 5% level of significant.

9. Key findings of the study

- 1) In this study it has been found that Financial Health models play very vital role in the prediction of Financial Health of Public Sector Companies.
- 2) In this study it has been found that Companies of Miniratna-II category is financially very healthy as compared to another category.
- 3) In this study it has been found that Financial Health of BSNL is very poor as compared to other selected Public Sector Companies.

10. Conclusion

Financial health of a company is a matter of concern for every stakeholder of the organization. Financial health represents the growth prospect of the concerned and indirectly it also shows the investment capacity of the company. If the company is financially healthy, it leads to better prospect. In this context, the present study is carried out to determine financial health of Selected Public Sector Companies with sophisticated model Grover Financial health Models. From the result of the study, it can be concluded that companies of Miniratna-II category are financially very healthy among all the categories. The performance of BSNL is very poor among all selected Public Sector Companies.

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