

An Empirical Enquiry on the Financial Distress of Navratna Companies in India

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Public sector enterprises or undertakings have been the back bone of the Indian economy since the time of independence. These companies are involved in various industrial activities like manufacturing and producing several products, raw materials and offering numerous other services for the benefit of the citizens of India. The main aim of this research work is to investigate on the status of Indian Navratna Companies in terms of their health, more specifically enquiring the financial distress / health. For measurement of sound health, sophisticated bankruptcy prediction models like Springate (1978), Fulmer (1984) and CA- Score (1987) were used. The study found that 6 out of 14 Navratna companies were financially sound all the years, remaining 8 companies were found financially weak for some of the years. Hence it has been suggested that, even though government funds these organization and they may not go bankrupt due to financial distress, still they must check their financial position frequently, which will help the company to sustain their business with better financial credibility.

INTRODUCTION

Studying financial health in terms of financial distress / bankruptcy prediction is an important topic of accounting and finance, which has been widely studied since the 1990s. The initial journey of bankruptcy prediction was done by Beaver (1966), using univariate analysis, followed by Altman (1968) who extended multivariate discriminant methodology using the financial ratios of United States business failures. Prediction of financial health / distress in a way is important, as it gives a signal to the stakeholders and the investors of the company, as regards to worthiness of the company in terms of investment or stake in the company. After global financial crisis it has become all the more essential to study bankruptcy prediction of public companies or private sectors which can help one to understand the company's financial wellbeing. The prediction of financial health will be of interest to the firm's regulator, shareholders, creditors and any other user of the financial statement of the company. According to Jones (1987), prediction of financial health / distress has its own quality because it can perfectly point out the financial status of the company. Prediction of distress / insolvency in any organization helps the interested groups inside the companies i.e. stakeholders, financiers, employees, contractors, customers

and the government in taking appropriate decision. A perfect model for financial distress can be followed by the auditor who can make the statement on the particular company for its potential for growth. Before going to the core investigation of financial distress prediction, it is necessary to undertake some of the preliminary exercises. The foremost is the selection of the techniques to be used to predict the financial health. Before predicting the insolvency of organization the common questions to be thought of, are the reason behind the prediction of insolvency. Consequently the research questions are (i) how to predict the financial distress on a specific companies or firms? (ii) How to characterize the possibilities of financial distress and classes of risk to these predictions? (iii) How to determine the contributing variables to a predicted ruin and to benefit from it? If the company is identified to be financially weak, it indicates the inability to sustain the current scenario of financial position. It is common for every firm having debt load to expand its operations or to survive. If the degree of firm's debt exceeds the assets or it is unable to pay off the debt then the firm will tend towards bankruptcy.

The Indian industries got exposed to large scale domestic and international competition with the advent of economic liberalization in 1992. While few firms were able to take up the challenge, a large number of firms were adversely affected by the competition and were in financial distress. The detection of companies operating in financial difficulties hence, is a matter which has been particularly subject to in-depth analysis. Through at one extreme, many learned academicians question the validity of financial distress prediction models using financial ratios (Raiyani, 2010). The interest of academic world to the financial distress prediction models, using univariate analysis methodology for classifying bankrupt and non-bankrupt firms, are ample. In the year 1968, the journal of finance published a paper authored by Edward I. Altman which introduced to the world the "Altman Z-score", a technique designed to predict corporate bankruptcy. The Z-score model examines liquidity, profitability, reinvested earnings and leverage which are integrated into a single composite score. Another model was developed on bankruptcy prediction in 1978 by Gordon L.V. Springate along with procedures developed by Altman. Later different important models were developed by Fulmer (1984) and CA- score (1987) predicting the organizations bankruptcy.

Public Sector Companies in India

With the adoption of mixed economy in India public sector assumed the strategic importance in nation building. Since then public sector enterprises or undertakings have been treated as the back bone of Indian economy and were involved in various industrial activities like manufacturing and producing various products, raw materials and offering numerous other services for the benefit of the citizens of India. Most of the industrial activities of PSUs have been related to core sectors like Mining, Oil and Natural Gas, Electrical Power Generation and Distribution, Telecommunication, Iron and Steel, Heavy Water Resources, as well as industries in other verticals like Fertilizers and Petro-Chemicals. Many of these units have been in operation since last 4 or 5 decades and have provided employment opportunities to millions of people in a gross estimation. The government is also able to earn revenue as a result of profitable functioning of these companies. Importance of such organizations is almost indescribable and to honor such contributions, the Government of India has conferred special status to some of these industrial organizations, so that they can charter their path of progress towards growth and prosperity. They have been categorized into three i.e. Maharatna, Navratna and Miniratna CPSEs.

Navratna Companies in India

Navratna was the title originally given to nine most successful public sector enterprises (PSEs) which were identified by Government of India during 1997 as having comparative advantages over other PSEs, and allowed them greater autonomy to compete in the global market. At present 14 companies are functioning under the Navratna status. These are;

1. Bharat Electronics Limited (BEL)
2. Bharat Petroleum Corporation Limited (BPCL)
3. Hindustan Aeronautics Limited (HAL)
4. Hindustan Petroleum Corporation Limited (HPCL)

5. Mahanagar Telephone Nigam Limited (MNTL)
6. National Aluminum Corporation Limited (NALCO)
7. National Mineral Development Corporation Limited (NMDC)
8. Neyveli Lignite Corporation Limited (NLC)
9. Oil India Limited (OIL)
10. Power Finance Corporation of India Limited (PFCI)
11. Power Grid Corporation of India Limited (PGCI)
12. Rashriya Ispat Nigam Limited (RINL)
13. Rural Electrification Corporation Limited (RECL)
14. Shipping Corporation of India Limited (SCI)

But as these public sector enterprises are backed by the government, the financial distress in term of bankruptcy does not comes to the lime light. Unless one investigates into the financial health it is difficult to assess the financial wellbeing or otherwise of the company. Hence this paper aims at investigating the financial status of Navratna companies of Government of India in terms of financial health / distress.

LITERATURE REVIEW

Over the past decades numerous studies have attempted predicting the corporate bankruptcy in and around the world. The pioneering study was attempted on publicly available data with the multivariate statistical test in order to predict the business failures, by Beaver (1966) followed by Altman (1968), who examined with the help of multiple discriminate analysis that could identify 94% of bankrupt companies and 97% of non-bankrupt companies in the year prior to bankruptcy. Another study was conducted by Grammatikos, T (1984) for attempting the bankruptcy prediction among 29 Greek industries using discriminant and regression method during 1977-81. The study found that the models can successfully predict bankruptcy before 2 or 3 years. Shirata, C (1998) studied bankruptcy prediction with financial ratios of Japanese corporate sector and concluded that the model can predict bankruptcy with more than 86.14% of accuracy as regard to its size. Zhang, et al (1999) investigated bankruptcy among 200 general industries using Artificial Neural Networks (ANN) and suggested that ANN can predict the bankruptcy better than the logistic regression. Nam, J and Jinn, T (2000) investigated bankruptcy prediction of Korean listed companies during the IMF crisis using logit regression and found that bankruptcy can be seen as complementary to the perspective that traced Asian Economic Crisis to the vulnerabilities of corporate governance of Asian Countries. Atiya, F (2001) found that the use of these bankruptcy indicators in addition to traditional financial ratio provide a significant improvement in the prediction accuracy. Their bankruptcy model gave 81.46% to 85.5% accuracy for a three-year-ahead forecast. Shumway, T (2001) forecasted bankruptcy using hazard model and found that market size, past stock returns and idiosyncratic returns were found strongly related to bankruptcy. The model used both accounting ratios and market driven variables to forecast bankruptcy. Hillegeist, et al (2002) investigated bankruptcy prediction using Altman's Z-score and O-score model for 516 companies during 1979 – 1995 and found that accounting measures of bankruptcy risk were inadequate. Chava, S and Jarrow, R (2004) investigated bankruptcy prediction of United States companies during 1962 – 1999 using Shumway's, Altman's and Zmijewski models and found that proposed models can be able to predict bankruptcy successfully. Pongsat, S et al (2004) studied bankruptcy prediction for large and small firms in Thailand using the classical models like Z-Score and O-Score models with 60 bankrupt and non-bankrupt companies during 1998-2003. Kotsiantis, S et al (2005) measured bankruptcy through Machine learning technique of Greek firms and found that the algorithms enabled to predict the bankruptcy with high accuracy level. Martin, E et al (2007) measured the solvency position of European Union country's insurance companies, and presented that the model can predict solvency position in a better way for capital regulation of the countries. Erdogan, B (2008) investigated bankruptcy prediction for Turkish commercial banks using financial ratios model and found that 80% of the banks those failed, in two years prior. John R. Grabski (2008) applied the Z-score to predict corporate performance. Aliakbari, S (2009)

studied bankruptcy prediction of UK manufacturing industries in 2006 and 2007 using Support Vector Machine (SVM) model and logistic regression and concluded that probability and leverage indicators have more power of discriminating bankruptcy prediction. Su, M and Zhang, C (2009) investigated bankruptcy prediction of Japanese listed companies during 1992-2005 using Z-score and O-score models and the authors suggested the use of said model that could give meaningful results for Japanese companies. Lifschuts, S and Jacobi, A (2010) studied bankruptcy prediction for failed public listed companies in Israel between 2000 and 2007 using Altman's Z- score and found that the model can predict 95% accuracy in one year prior and 85% accuracy two years prior to bankruptcy. Pervan, I et al (2011) measured bankruptcy possibility of 78 Croatian companies which were already declared as bankrupt companies. Raiyani and Bhatansa (2011) examined the financial health position in textile industries using Z-score model. The study compared the financial condition of the sample companies, which revealed that most of them were financially sound during the period except two companies. Traczynski (2011) used Bayesian model average approach for predicting the bankruptcy at industry level. Cracium, M et al (2013) investigated bankruptcy prediction for 30 Romanian companies after global financial crisis using basic models between 2005 and 2009. Jouzbarkand, M et al (2013) investigated bankruptcy of Iranian companies using O – score and Shirata models and concluded that these models can predict bankruptcy in better way.

From the above literature review it was found that most of the studies have used basic models like Altman's Z – score, O – score for measuring the bankruptcy of industries around the world. Some of the studies used neural networks and Logistic regression. The above literature indicated that very few have analysed bankruptcy prediction of sophisticated models like Springate, Fulmer and CA score models. Most of the studies have focused private sector companies rather than public sector companies. So this study ventures to predict the financial health / distress of Indian Navratna companies, which are backed by the government and whose financial distress cannot be noticed so easily without an in-depth analysis. The present study investigates in to the financial strength / distress of Indian Navaratna companies using Springate (1978), Fulmer (1984) and CA – Score (1987) during 1995 to 2012.

MATERIALS & METHODS

Objective & Data

The present study attempted an enquiry on to the financial distress of Indian Navratna companies during the period 1995 to 2012. The study has utilized necessary financial ratio which were calculated using the secondary data. The data were collected from Centre for Monitoring Indian Economy (CMIE) data base and administrative reports of the respective companies during the study period.

Bankruptcy Prediction Models

The study has used three sophisticated bankruptcy prediction models, they are Springate (1978), Fulmer (1984) and CA – Score (1987).

Springate (1978)

This model was developed in 1978 at Simon Fraser University by Gordon L.V. Springate, following procedures developed by Altman in the United States data. Springate used step-wise multiple discriminate analysis to identify the most important financial ratios out of 19 popular financial ratios that best distinguished sound business from that of actually failed. The Springate model takes the following form -:

$$Z = 1.03A + 3.07B + 0.66C + 0.4D$$

$$Z < 0.862; \text{ then the firm is classified as "failed"}$$

Where

A = Working Capital/Total Assets

B = Net Profit before Interest and Taxes (NPBIT)/Total Assets

C = Net Profit before Taxes (NPAT)/Current Liabilities
D = Sales/Total Assets

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 83.3%.

Fulmer (1984)

Fulmer (1984) used step wise multiple discriminant analysis to evaluate 40 financial ratios which were applied to a sample of 60 companies. Fulmer found that 30 companies had failed and remaining 30 were successful. The model takes the following form;

$$H = 5.528 (V1) + 0.212 (V2) + 0.073 (V3) + 1.270 (V4) - 0.120 (V5) + 2.335 (V6) + 0.575 (V7) + 1.083 (V8) + 0.894 (V9) - 6.075$$

H < 0; then the firm is called as "failed"

Where

- V1 = Retained earnings / Total assets
- V2 = Sales / Total assets
- V3 = EBT / 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

Based on the Fulmer report 98% of accuracy rate was reported in classifying the test companies one year prior to failure and 81% of accuracy rate more than one year prior to bankruptcy of the organization.

CA – Score (1987)

This model was developed under the direction of Jean Legault of University of Quebec at Montreal, Canada, using step wise multiple discriminant analysis. The model used thirty financial ratios in a sample of 173 Quebec manufacturing business firms. The model takes the following form;

$$CA - Score = 4.5913 A + 4.5080 B + 0.3936 C - 2.7616$$

CA – Score < -0.03; then the firm is called as "failed"

Where,

- A = Shareholders investment / Total assets
- B = Earnings before taxes and extraordinary items + Financial expenses / Total assets
- C = Sales / Total assets

The model reported reliability rate of 83% and found most useful for manufacturing industries.

RESULTS & DISCUSSION

From the Springate values of Indian Navratna companies presented in the table-1 (See Appendix), it was observed that the companies like Bharat Petroleum Corporation limited, Hindustan Petroleum Corporation Limited, NMDC, National Aluminum Corporation, Neyveli Lignite Corporation, Oil India Limited, and Shipping Corporation of India Limited acquired the score of more than 0.862 over the period

of time. Hence it could be safely interpreted that the companies were financially doing better as compared to other Navratna companies as far as Springate model reveals concerned. Power Finance Corporation India Limited was found financially weak in the year 2008, rest of the years operated with all financial soundness. Bharat Electrical Limited was found financially sound only after 2000 but again found in stress in 2011 & 2012. The companies like Mahanagar Telecom Limited and Power Grid Corporation of India were financially weak during 2000, 2003 to 2012. Power Grid Corporation of India Limited was able to cross the minimum score only 4 out of 16 years under study. Rashriya Ispat Nigam Limited were financially weak in more number of years during the study period but showed better financial health during 2003 - 2010. RECL was not doing well in the initial three years but later years showed substantial improvement. The only company Hindustan Aeronautical Limited were found financial weak throughout the study period. On the whole results of Springate model indicate that the companies like Bharat Electrical Limited, Hindustan Aeronautical Limited, Mahanagar Telecom Limited, Power Grid Corporation Limited, Rashriya Ispat Nigam Limited and Rural Electrification Corporation Limited should take serious note of their financial position. These companies unless take serious steps to improve their financial health may become pain on the neck of the government exchequer.

The investigation result on financial health of Indian Navratna companies attempted through Fulmer (1984) Canadian model, which claims to have 92.5% accuracy level have been placed in table 2 (See Appendix). The results shows that Power Finance Corporation of India found financially weak during all the years except 1997 – 1999, where it acquired good score. Whereas Rural Electrification Corporation Limited were found to be financially weak over the period of time, while rest of the companies were found to have their financial positions satisfactory. Fulmer model prescribes the score to be less than zero for firm to be called “failed”. The rest of the firms were found financially strong as per Fulmer model during the period. Without governments financial support the companies who have scored less than zero may any time fall into bankruptcy. However the firms who are having more than zero score in Fulmer model but fail in Springate model should be alert of their position and should try to improve their financial strength.

The values of CA- Score of Indian Navratna companies presented in table- 3 (See Appendix). It can be observed that the companies like Bharat Petroleum Corporation Limited, NMDC, National Aluminum Corporation, Neyveli Lignite Corporation Limited, Oil India Limited and Shipping Corporation of India were found to have satisfactory financial position during the period 1995-2012. Hindustan Petroleum Corporation Limited showed weak financial position in the last three years. i.e. 2010-2012. Mahanagar Telecom Nigam Limited was showed weak financial position over the period of time except during 1999-2009. Rashriya Ispat Nigam Limited was found financially weak during initial two years and for rest of the period it showed good financial position. Bharat Electrical Limited was found to be financially weak over the period of time except from 2005 – 2010. Power Grid Corporation of India was found to be financially sound in the initial years i.e. 1995 – 2001 and later it was seen to be financially weak. The other companies like Hindustan Aeronautical Limited, Power Finance Corporation of India, and Rural Electrification Corporation Limited were found financially weak all through the period of study. The model indicate the above companies should concentrate on their financial position as these companies have failed in showing their financial strength to be able enough to avoid distress as per the CA – Score model.

CONCLUSION

Financial health of a company is a matter of concern for every stakeholder of the organization as financial health indicates the growth prospect of the concern and indirectly it also shows the investment worthiness of the company. If the company is financially sound it leads to better prospect. In this context the present study carried out investigation in to the financial health / distress of Indian Navratna companies with sophisticated models like Springate (1978), Fulmer (1984) and CA- Score (1987), which meticulously probe in to the financial soundness otherwise of the company. These models have not been

used by any Indian studies earlier that to on the public sector companies in terms of their financial strength, or distress which is the uniqueness of their study.

From the results of the study it is revealed that the companies like Bharat Petroleum Corporation Limited, NMDC, National Aluminum Corporation, Neyveli Lignite Corporation, Oil India Limited and Shipping Corporation of India were found financially sound during the study period by all the three models. Thus there is no apprehension about their financial health from any quarter. However the companies like Bharat Electrical Limited, Hindustan Aeronautical Limited, Hindustan Petroleum Corporation Limited, Mahanagar Telecom Limited, Power Finance Corporation of India, Power Grid Corporation of India, Rashriya Ispat Nigam Limited and Rural Electrification Corporation Limited were identified financially weak in two out of three models during the study period. The worst performance was observed in case of Hindustan Aeronautical Limited, Rural Electrification Corporation Limited and Power Finance Corporation of India. Management should take necessary steps to improve the financial status of these companies. These companies may find themselves in distress in absence of distress funding from the government at the time of need. At the same time it may be very stressful for them to raise fund from market, as they may not be regarded as investment worthy in future. Especially the companies like Power Finance Corporation of India, Rural Electrification Corporation Limited and Hindustan Aeronautical Limited must be more concerned as regards to the financial position, because these companies are very nearer to financial distress. Proper action should be taken to improve their financial position for years to come, otherwise their financial distress will create burden on national exchequer which already is stressed with high current account deficit and external obligations. These companies may be suffering because of the administrative pricing policy of the government. But still it should be noted that pricing policy should not be detrimental to the survival of a concern be it be public sector unit.

REFERENCE

- Aliakbari, S. (2009). Prediction of corporate bankruptcy for the UK firms in manufacturing industry. *Unpublished Ph. D thesis*, Brunel University, London, United Kingdom.
- Atiya, A. (2001). Bankruptcy prediction for credit risk using neural networks: A survey and new results. *IEEE Transactions on Neural Networks*, 12(4), 929-935.
- Beaver, W.H. (1966). Financial ratios as predictor of failures. *Journal of Accounting Research*, 4, 71 – 111.
- Brothers, D. (1979). Use of business failure prediction model for evaluating potential and existing credit risk, *Unpublished MBA Research Project*, Simon Fraser University.
- CA – Score. (1987). A Warning system for small business failures, *Bilanas*, 29-31.
- Chava, S., & Jarrow, R. (2004). Bankruptcy prediction with industry effects. *Review of Finance*, 8, 537 – 569.
- Craciun, M., Ratiu, C., Bucerzan, D., & Manolescu, A. (2013). Actuality of bankruptcy prediction models used in decision support system. *International Journal of Computers, Communications & Control*, 8(3), 375-383.
- Altman, E.I. (1968). Financial ratios, discriminant analysis and the prediction of corporate Bankruptcy. *Journal of Finance*, 23(4), 589–609.
- Erdogan, B.E. (2008). Bankruptcy prediction of Turkish commercial banks using financial ratios. *Applied Mathematical Sciences*, 2(60), 2973-2982.
- Fulmer, J.G., Moon, J.E., Gavin, T.A., & Ervin, M.J. (1984). A bankruptcy classification model for small firms. *Journal of commercial Bank Lending*, 25-37.
- Grabski, J.R. (2008). The dynamic Z-score, *Discussion Article*, Clear Momentum, Inc, Rochester, New York, 1-6.
- Grammatikos, T., & Gloupos, G. (1984). Predicting bankruptcy of industrial firms in Greece. *Spoudai Journal of Economics and Business*, 34, 3-4.
- Hillegeist, S.A., Keeting, E. K., Cram, D.P., & Lundstedt, K.G. (2002). Assessing the Probability of Bankruptcy. *Working Paper*, Northwestern University.

- Jones, F.L. (1987). Current techniques in bankruptcy prediction. *Journal of Accounting Literature*, 6, 131-164.
- Jouzbarkand, M., Keivani, F.S., Khodadadi, M., Fahim, S., & Aghajani, V. (2013). The creation of bankruptcy prediction model with using Ohlson and Shirata models. *Journal of Basic Applied Scientific Research*, 3(1), 89-93.
- Kotsiantis, S., Tzelepis, D., Koumanakos, E., & Tampakas, V. (2005). Efficiency of machine learning techniques in bankruptcy prediction. *Paper presented at 2nd International Conference on Enterprise Systems and Accounting (ICESAcc' 05)*, 11-12 July 2005, Thessaloniki, Greece.
- Lifschutz, S., & Jacobi, A. (2010). Predicting bankruptcy: Evidence from Israel. *International Journal of Business and Management*, 5(4), 133-141.
- Martin, E., Schmeiser, H., & Schmit, J. (2007). The Solvency II Process: Overview and Critical Analysis. *Risk Management and Insurance Review*, 10 (1), 69-85.
- Nam, J., & Jinn, J. (2000). Bankruptcy prediction: Evidence from Korean listed companies during the IMF crisis. *Journal of International Financial Management and Accounting*, 11(3), 178-197.
- Pervan, I., Pervan, M., & Vukoja, B. (2011). Prediction of company bankruptcy using statistical techniques. *Croatian Operational Research Review*, 2, 158-167.
- Pongsatit, S., Ramage, J., & Lawrence, H. (2004). Bankruptcy prediction for large and small firms in Asia: A comparison of Ohlson and Altman. *Journal of Accounting and Corporate Governance*, 1(2), 1-13.
- Raiyani, J. R., & Bhatasna, R.B. (2011). A study on financial health of textile industry in India – A Z-score approach. *Indian Journal of Finance*, 12(5), 9-12.
- Sands, E. (1980). Business failure prediction and efficient market hypothesis. *Unpublished MBA Research Project*, Simon Fraser University, Canada
- Shirata, C. (1998). Financial ratios as predictors of bankruptcy in Japan: An empirical research. *The second Asian*, 7, 437-445.
- Shumway, T. (2001). Forecasting bankruptcy more accurately: A simple hazard model. *Journal of Business*, 74, 101-124.
- Springate, G.L.V. (1978). Predicting the possibility of failure in a Canadian Firms. *Unpublished MBA Research Project*, Simon Fraser University, Canada.
- Su, M., & Zhang, C. (2009). Bankruptcy prediction: The case of Japanese listed companies. *Review of Accounting Studies*, 14, 534-558.
- Traczynskily, J. (2011). Firm bankruptcy prediction: A Bayesian model averaging approach. *Department of Economics, University of Hawaii-Manoa*.
- Zhang, G., Hu, M., Patuwo, B., & Indro, D. (1999). Artificial neural networks in bankruptcy prediction: General framework and cross – validation analysis. *European Journal of Operational Research*, 116, 16-32.

TABLE – 1
SPRINGGATE MODEL FOR PREDICTING BANKRUPTCY OF INDIAN
NAVRATNA COMPANIES

| | BEL | BPCL | HAL | HPCL | MTNL | NMDC | NALCO | NLC | OIL | PFCI | PGCI | RINL | RECL | SCI |
|------|------|------|------|------|-------|-------|-------|------|------|------|------|-------|------|------|
| 1995 | 0.53 | 2.60 | 0.80 | 2.48 | 1.05 | 2.18 | 1.92 | 1.27 | 5.02 | 1.95 | 0.73 | -0.02 | 0.42 | 0.96 |
| 1996 | 0.48 | 2.44 | 0.74 | 2.41 | 1.21 | 2.66 | 3.34 | 1.57 | 2.33 | 1.12 | 0.73 | 0.25 | 0.30 | 1.19 |
| 1997 | 0.79 | 1.96 | 0.77 | 2.06 | 0.96 | 2.24 | 2.93 | 1.81 | 1.64 | 2.83 | 0.71 | 0.34 | 0.54 | 1.11 |
| 1998 | 0.81 | 2.16 | 0.59 | 1.93 | 1.14 | 2.63 | 3.05 | 1.70 | 1.94 | 4.50 | 0.76 | 0.31 | 1.70 | 1.06 |
| 1999 | 0.78 | 2.28 | 0.47 | 2.13 | 1.36 | 1.58 | 1.81 | 1.65 | 2.25 | 3.87 | 1.01 | 0.01 | 1.46 | 0.91 |
| 2000 | 0.89 | 2.02 | 0.57 | 1.74 | 0.84 | 2.06 | 2.56 | 1.13 | 2.46 | 3.57 | 1.17 | -0.08 | 1.40 | 0.86 |
| 2001 | 0.97 | 2.04 | 0.51 | 2.14 | 0.98 | 2.54 | 2.22 | 1.53 | 2.48 | 2.42 | 1.27 | 0.24 | 1.23 | 1.37 |
| 2002 | 0.91 | 1.90 | 0.48 | 1.88 | 0.95 | 3.07 | 1.61 | 2.47 | 3.15 | 2.58 | 0.82 | 0.55 | 1.14 | 1.01 |
| 2003 | 1.02 | 1.82 | 0.44 | 2.16 | 0.66 | 2.88 | 1.71 | 3.19 | 4.48 | 2.18 | 0.86 | 1.37 | 1.06 | 0.86 |
| 2004 | 0.99 | 1.96 | 0.37 | 2.28 | 0.65 | 3.57 | 2.39 | 2.52 | 4.30 | 3.01 | 0.66 | 2.64 | 1.09 | 1.45 |
| 2005 | 1.20 | 1.68 | 0.21 | 2.10 | 0.48 | 5.23 | 3.69 | 3.09 | 3.04 | 2.01 | 0.57 | 3.88 | 1.51 | 2.25 |
| 2006 | 1.27 | 1.43 | 0.18 | 1.48 | 0.42 | 9.17 | 4.35 | 1.71 | 3.48 | 1.61 | 0.58 | 3.13 | 1.14 | 1.91 |
| 2007 | 1.24 | 1.80 | 0.26 | 1.60 | 0.44 | 10.86 | 4.70 | 1.03 | 3.31 | 1.02 | 0.56 | 2.79 | 1.21 | 1.75 |
| 2008 | 1.13 | 1.58 | 0.30 | 1.42 | 0.44 | 9.94 | 2.59 | 1.38 | 3.14 | 0.72 | 0.64 | 2.76 | 0.86 | 1.63 |
| 2009 | 0.97 | 1.39 | 0.29 | 1.26 | 0.32 | 10.88 | 1.79 | 0.99 | 3.07 | 1.15 | 0.57 | 1.60 | 0.87 | 1.58 |
| 2010 | 0.94 | 1.32 | 0.38 | 1.21 | -0.52 | 5.17 | 1.18 | 1.01 | 2.79 | 1.27 | 0.45 | 0.96 | 1.19 | 0.97 |
| 2011 | 0.66 | 1.56 | 0.40 | 1.37 | -0.86 | 9.89 | 1.13 | 1.28 | 2.76 | 1.02 | 0.60 | 0.73 | 1.07 | 1.09 |
| 2012 | 0.56 | 1.90 | 0.44 | 1.54 | -1.06 | 8.73 | 1.05 | 1.45 | 3.10 | 0.95 | 0.60 | 0.68 | 1.06 | 0.86 |

Note: Score is < 0.862, then the firm is called "failed"

TABLE - 2
FULMER MODEL FOR PREDICTING BANKRUPTCY OF INDIAN
NAVRATNA COMPANIES

| | BEL | BPCL | HAL | HPCL | MTNL | NMDC | NALCO | NLC | OIL | PFCI | PGCI | RINL | RECL | SCI |
|------|---------|-------|----------|-------|------|--------|--------|------|--------|-------|------|--------|-------|-------|
| 1995 | 133.8 | 889.7 | 119.9 | 729.0 | 71.6 | 1846.3 | 79.4 | 52.6 | 109.4 | -2.45 | 24.9 | 57.90 | -2.64 | 102.7 |
| 1996 | 143.3 | 816.4 | 114.3 | 666.4 | 74.6 | 296.3 | 101.3 | 59.1 | 111.8 | -2.53 | 26.0 | 80.05 | -2.69 | 108.9 |
| 1997 | 151.2 | 703.8 | 117.1 | 542.6 | 60.7 | 154.0 | 105.0 | 62.2 | 101.3 | 0.21 | 24.3 | 127.02 | -2.60 | 116.1 |
| 1998 | 154.5 | 706.2 | 103.1 | 561.1 | 67.8 | 143.2 | 101.0 | 65.9 | 94.7 | 0.46 | 28.6 | 48.61 | -1.36 | 116.3 |
| 1999 | 152.5 | 719.8 | 87.9 | 600.6 | 83.5 | 116.9 | 91.4 | 62.8 | 88.2 | 0.03 | 31.3 | 87.52 | -2.37 | 117.1 |
| 2000 | 171.5 | 725.5 | 78.4 | 559.8 | 80.5 | 112.6 | 112.7 | 55.6 | 109.0 | -0.04 | 32.8 | 96.53 | -1.94 | 122.6 |
| 2001 | 163.9 | 762.9 | 77.7 | 693.1 | 81.4 | 138.3 | 107.4 | 74.7 | 120.5 | -0.29 | 37.1 | 116.55 | -2.34 | 139.2 |
| 2002 | 176.6 | 655.1 | 77.3 | 642.4 | 75.6 | 132.8 | 89.8 | 66.6 | 105.6 | -0.75 | 28.2 | 147.72 | -2.34 | 130.4 |
| 2003 | 234.7 | 606.9 | 77.0 | 673.7 | 66.6 | 114.4 | 100.3 | 70.2 | 133.9 | -0.62 | 25.8 | 194.33 | -2.16 | 113.3 |
| 2004 | 343.2 | 634.4 | 85.6 | 668.3 | 67.1 | 112.1 | 129.8 | 69.5 | 130.9 | -1.12 | 22.9 | 449.24 | -2.23 | 126.3 |
| 2005 | 479.8 | 658.6 | 95.0 | 737.1 | 56.2 | 134.4 | 160.6 | 68.6 | 153.6 | -1.71 | 23.0 | 242.20 | -2.01 | 126.1 |
| 2006 | 1034.6 | 631.7 | 123.8 | 665.3 | 58.7 | 144.9 | 156.7 | 53.3 | 179.8 | -1.80 | 25.1 | 219.85 | -1.93 | 119.3 |
| 2007 | 5979.2 | 667.2 | 11908.6 | 653.2 | 52.1 | 124.6 | 150.8 | 49.6 | 136.8 | -1.31 | 23.5 | 186.68 | -1.42 | 115.9 |
| 2008 | 8070.7 | 601.0 | 26288.2 | 578.8 | 49.3 | 111.6 | 111.0 | 53.9 | 240.6 | -1.45 | 25.5 | 221.40 | -1.41 | 106.0 |
| 2009 | 10719.3 | 642.1 | 26877.7 | 597.3 | 45.0 | 95.4 | 99.5 | 44.2 | 693.9 | -1.34 | 25.6 | 153.29 | -1.51 | 95.5 |
| 2010 | 20368.7 | 514.7 | 272464.7 | 478.6 | 22.1 | 61.6 | 478.4 | 54.0 | 1116.7 | -1.33 | 27.1 | 139.25 | -1.47 | 76.9 |
| 2011 | 43955.7 | 609.6 | 9925.4 | 500.9 | 26.1 | 93.1 | 1149.4 | 56.3 | 168.8 | -1.24 | 27.0 | 133.67 | -1.24 | 63.0 |
| 2012 | 90051.0 | 712.4 | 11998.0 | 562.6 | 23.5 | 76.0 | 98.1 | 59.4 | 2461.8 | -1.29 | 26.6 | 147.19 | -1.20 | 60.5 |

Note: Score < 0, then the firm is called "failed"

TABLE – 3
CA – SCORE MODEL FOR PREDICTING BANKRUPTCY OF INDIAN
NAVRATNA COMPANIES

| | BEL | BPCL | HAL | HPCL | MTNL | NMDC | NALCO | NLC | OIL | PFCI | PGCI | RINL | RECL | SCI |
|------|-------|-------|-------|-------|-------|------|-------|------|------|-------|-------|-------|-------|------|
| 1995 | -1.18 | 1.98 | -0.83 | 1.93 | -0.80 | 1.19 | 0.45 | 0.61 | 2.75 | -0.69 | -0.08 | -0.45 | -1.67 | 0.61 |
| 1996 | -1.23 | 1.86 | -1.04 | 2.07 | -0.62 | 1.27 | 1.67 | 0.86 | 2.25 | -0.69 | -0.06 | -0.37 | -1.70 | 0.38 |
| 1997 | -1.00 | 1.10 | -1.11 | 1.26 | -0.89 | 1.29 | 1.94 | 1.20 | 1.90 | -0.81 | -0.21 | -0.30 | -1.64 | 0.18 |
| 1998 | -0.93 | 1.28 | -1.19 | 1.62 | -0.36 | 1.43 | 1.95 | 1.41 | 1.81 | -0.73 | -0.28 | 0.14 | -1.60 | 0.15 |
| 1999 | -0.95 | 1.33 | -1.34 | 1.71 | 0.33 | 0.94 | 1.52 | 1.16 | 1.72 | -0.78 | -0.26 | 0.07 | -1.42 | 0.12 |
| 2000 | -0.75 | 0.86 | -1.22 | 0.87 | 0.10 | 1.12 | 1.93 | 1.05 | 2.28 | -0.93 | -0.24 | -0.22 | -1.43 | 0.04 |
| 2001 | -0.66 | 0.79 | -1.39 | 1.15 | 0.28 | 1.59 | 1.67 | 1.08 | 2.17 | -1.01 | -0.14 | -0.18 | -1.48 | 0.55 |
| 2002 | -0.68 | 0.54 | -1.47 | 0.83 | 0.07 | 1.83 | 0.57 | 1.08 | 2.35 | -1.07 | -0.54 | 0.13 | -1.53 | 0.32 |
| 2003 | -0.40 | 0.38 | -1.55 | 1.04 | 0.09 | 1.68 | 0.75 | 1.23 | 2.03 | -1.09 | -0.61 | 1.13 | -1.45 | 0.31 |
| 2004 | -0.47 | 0.71 | -1.52 | 1.26 | 0.00 | 1.85 | 1.57 | 1.28 | 2.19 | -1.05 | -0.63 | 2.75 | -1.56 | 0.56 |
| 2005 | -0.07 | 0.34 | -2.17 | 1.22 | -0.09 | 2.59 | 2.75 | 1.38 | 1.64 | -1.40 | -0.72 | 2.48 | -1.65 | 1.40 |
| 2006 | 0.04 | 0.11 | -2.16 | 0.33 | -0.04 | 3.27 | 2.81 | 1.09 | 2.05 | -1.55 | -0.76 | 2.06 | -1.79 | 1.33 |
| 2007 | 0.00 | 0.44 | -2.08 | 0.33 | -0.05 | 3.18 | 3.04 | 0.67 | 1.81 | -1.55 | -0.94 | 1.79 | -1.91 | 1.43 |
| 2008 | -0.05 | 0.07 | -1.96 | -0.14 | -0.05 | 3.01 | 2.26 | 0.61 | 2.21 | -1.58 | -0.85 | 2.00 | -1.83 | 1.32 |
| 2009 | -0.23 | 0.15 | -1.69 | -0.18 | -0.27 | 2.39 | 1.86 | 0.22 | 2.08 | -1.47 | -1.00 | 1.29 | -1.87 | 0.91 |
| 2010 | -0.23 | -0.24 | -1.52 | -0.42 | -1.68 | 1.53 | 1.49 | 0.22 | 2.05 | -1.56 | -1.12 | 1.03 | -1.61 | 0.60 |
| 2011 | -0.76 | -0.09 | -1.61 | -0.53 | -1.78 | 2.07 | 1.40 | 0.54 | 1.91 | -1.65 | -0.96 | 0.99 | -1.68 | 0.30 |
| 2012 | -0.79 | 0.07 | -1.49 | -0.49 | -2.55 | 1.95 | 1.35 | 0.64 | 2.41 | -1.62 | -1.10 | 0.76 | -1.73 | 0.25 |

Note: Score is < -0.3, then the firm is called "failed"