

Predicting the Probability of Failure of Central Public Sector Enterprises: A Statistical & Machine Learning Approach¹

BHUSHAN PARDESHI*
PADMALOCHANA BISOYI**
PRANITA BURBURE***

Abstract

The present study is an attempt to identify factors of failure of Heavy, Medium & Light Engineering CPSE, how to predict failure and effective prediction methods. The study is apparent as the escalating number of failures, forcing the management and policy makers to design new strategies and regulation to avoid probable failure. The Principle Component Analysis shows the degree of the factors is responsible for the failure of CPSEs. Further, these variables were tested by using a Statistical and machine learning approach to develop the prediction model. The result of logistic regression has an accuracy of 83.9% in predicting the failure. The prediction accuracy of the Support vector machine is 93.5% whereas Random forest has 96.3% accuracy. The results show that the accuracy of machine learning approach is higher than statistical approach. The failure of the CPSEs may be avoided if indications are timely established and the correct prediction model must be applied.

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Keywords : CPSE, Sector, Bankruptcy, Failure, Regression, Machine Learning, Forecasting, Prediction, India

I. Introduction

DURING THE LAST seven decades, India is ranked high amongst the top industrialized nations in the world, due to the valued contribution from the Central Public Sector Enterprises (CPSEs) towards the Indian economy. So far, the way the public sector in India has grown; it is always a matter of debacles altogether. The performances of many CPSEs have been below the budgeted targets; either these enterprises have failed or are likely to fail due to poor profitability (Mishra, 1986; Venkitachalam, 1988; Sinha, 1988). These inefficient CPSEs are turning to be liabilities to the Government and hence

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* Assistant Professor, S.B.Patil Institute of Management, Pimpri Chinchwad Education Trust's, Sector 26, NigdiPradhikaran, Pune 411044, Maharashtra, INDIA

** Assistant Professor, S.B.Patil Institute of Management, Pimpri Chinchwad Education Trust's, Sector 26, NigdiPradhikaran, Pune 411044, Maharashtra, INDIA

*** Assistant Professor, S.B.Patil Institute of Management, Pimpri Chinchwad Education Trust's, Sector 26, NigdiPradhikaran, Pune 411044, Maharashtra, INDIA

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the factors must be designed and the implementation should be most efficient for reduction in the failure of CPSEs in future. As a result, a technique is valuable for predicting financial failures as an early warning system.

In addition, in this paper to know the prediction accuracy of the models, we applied machine learning method and statistical method on the 10 variables forming five factors. The experimental results of statistical method- Logistic regression show 83.9 % accuracy in predicting the financial failure of CPSEs. On the other hand, the results of machine learning shows that Support Vector Machine have registered 93.5 % accuracy, whereas Random Forest recorded 97.3 % accuracy. Based on the comparison of Sensitivity, Specificity and total error rate, Random forest has registered sensitivity (17.24 %), specificity (82.75 %) and total error rate (1.26%) that's why Random forest is more accurate in predicting the probability of failure. By, comparing the methods on the scale of different metrics, it is clear that machine learning methods are more reliable and accurate than other traditional methods in predictive performance. Particularly, random forest model yielded better results and this method could be more suitable method than any other methods. We propose that the accurate prediction of the financial failure of the CPSEs is crucial from the stakeholders' point of view as to reduce the potential risk. Finally, this study proposes that machine learning method is more beneficial in predicting failure of enterprise over the statistical method and should be considered for predicting the potential financial failure.

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INDIAN INSTITUTE OF FINANCE

45 A Knowledge Park III, Greater Noida 201310, NCR Delhi, INDIA

9999321585-86, 9811971002, 0120-2323683, admission@iif.edu

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