

Is Machine Learning Predicting Bankruptcy Better than Neural Networks and Logistic Regression? Empirical Evidence from Indonesia's Insurance Company

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Abstract:

This research evaluates three bankruptcy prediction models in insurance companies. Bankruptcy prediction enables stakeholders, including the public, to assess risks from the outset and prepare appropriate mitigation measures. A quantitative approach is employed, utilizing secondary data that includes financial indicators (liquidity, solvency, and reliability) and non-financial indicators (corporate governance structure). The company's bankruptcy is proxied by the Altman Z-Score model. Three modelling approaches were compared using RapidMiner Studio, namely Multinomial Logistic Regression (MLR) which is a parametric model with easy-to-interpret logit/softmax functions; Neural Network (NN) is a layered network to capture nonlinearity but is more challenging to interpret; and various Machine Learning (ML) algorithms including decision tree, random forest, SVM, gradient boosting, k-NN, naïve Bayes, to predictive performance-oriented deep learning through feature selection and cross-validation. The results showed that the accuracy of MLR reached 76.17%, while the NN provided the highest overall accuracy at 87.93%. Of the nine ML variants tested, Deep Learning achieved the highest accuracy in the ML group, at 84.74%. These findings indicate that, within the context and data of this study, the NN achieved the highest accuracy values. Thus, ML does not predict bankruptcy better than NN, but it is still better than MLR. Robustness testing with alternative software, more systematic feature selection, cross-period, and cross-country testing are needed to assess external validity and improve model reliability as an early warning system for the insurance industry.

Keywords:

Insurance Company, Bankruptcy Prediction, Machine Learning, Neural Network, Logistic Regression Approaches.