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Using a hybrid evolution approach to forecast financial failures for Taiwan-listed companies

Mu-Yen Chen

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Abstract

Bankruptcy has been an important topic in finance and accounting research for a long time. Recent major bankruptcies have included seemingly robust companies such as Enron, Kmart, Global Crossing, WorldCom, and Lehman Brothers. These cases have become of serious public concern due to the huge influence these companies have on the real economy. This research proposes a hybrid evolution approach to integrate particle swarm optimization (PSO) with the support vector machine (SVM) technique for the purpose of predicting financial failures. The preparation phase collected an initial sample of 68 companies listed by the Taiwan Stock Exchange Corporation (TSEC). The financial datasets were constructed based on 33 financial ratios, four non-financial ratios and one combined macroeconomic index. To select suitable indicators for the input vector, the principle component analysis (PCA) technique was applied to reduce

the data and determine how groupings of indicators measure the same concept. In the swarming phase, PSO was applied to obtain suitable parameters for SVM modeling without reducing the classification accuracy rate. In the modeling phase, the SVM model was used to build a training set that was used to calculate the model's accuracy and fitness value. Finally, these optimized parameters were used in the hybrid PSO–SVM model to evaluate the model's predictive accuracy. This paper provides four critical contributions. (1) Using the PCA technique, the statistical results indicate that the financial prediction performance is mainly affected by financial ratios rather than non-financial and macroeconomic ratios. (2) Even with the input of nearly 70% fewer indicators, our approach is still able to provide highly accurate forecasts of financial bankruptcy. (3) The empirical results show that the PSO–SVM model provides better classification accuracy (i.e. normal vs. bankrupt) than the grid search (Grid–SVM) approach. (4) For six well-known UCI datasets, the PSO–SVM model also provides better prediction accuracy than the Grid–SVM, GA–SVM, SVM, SOM, and SVR–SOM approaches. Therefore, this paper proposes that the PSO–SVM approach is better suited for predicting potential financial distress.

Keywords:

Financial engineering | Evolutionary finance | Network design | Corporate finance

JEL Classification::

C4 | C5 | C45 | C53 | G3

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