

Building a Model for Detecting Accounting Fraud in Tokyo Stock Exchange Listed Companies Using Machine Learning Method

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Abstract

Accounting fraud greatly undermines the credibility of accounting information and carries an immeasurable impact on the market and economy. Many researchers have conducted theoretical studies to clarify the mechanism of accounting fraud and its economic impact. Furthermore, based on theoretical research, empirical studies are being conducted to detect companies that engage in accounting fraud (e.g., Beneish, 1999; Dechow et al., 2011; Perols, 2011; Purda and Skillicorn, 2014). In addition, Shuto et al. (2016) and Ushuki et al. (2019) study the detection model of accounting fraud for Japanese firms.

Dechow et al. (2011) conducted a representative study that developed a detection model of accounting fraud. Dechow et al. (2011) summarized the characteristics of accounting fraud firms based on the previous practices of accounting fraud. They then identified five factors that influence the occurrence of accounting fraud and reflect the characteristics. Finally, 28 variables corresponding to the five factors were developed, and a detection model was attempted to be constructed using the variables. As a result, they concluded that the F-score obtained from the detection model is effective in detecting accounting fraud. The study by Shuto et al. (2016) aimed to detect accounting fraud in Japanese firms. They added the variables 1) real activities manipulation, 2) conservatism, and 3) general business corporation shareholding to the detection model of Dechow et al. (2011). The results of the analysis confirmed that the additional variables are effective in discriminating the accounting fraud practices prevalent in Japanese firms.

However, the limitation of these studies is that the variables considered are limited to those set up based on theoretical studies. In recent years, it is said that companies have diversified the purposes of accounting fraud (Suda et al., 2007). For example, an accounting fraud was carried out for maintaining or inflating stock prices and winning public works orders. If the purpose of accounting fraud is diversified, the methods and timing of accounting manipulation may also be diversified. Accounting researchers are required to contribute to this situation by converting a huge amount of corporate information data into variables and finding useful variables to improve the detection accuracy.

This study aims to develop a detection model of accounting fraud based on the diversified purposes of accounting fraud. To do so, we use machine learning method. The reason for this is that technical problems have emerged in the logit models that were conducted in previous studies, especially when the company information is variable as much as possible and the search for specific variables is effective in improving the detection accuracy. This is also because it may exhibit aspects that go beyond the nonlinearity assumed by the logit model.

A machine learning based accounting fraud detection model was constructed for companies listed on the Tokyo Stock Exchange from 2008–2018. During this period, we observed 330 fraudulent and 17,194 non-accounting fraud firms. As a result, the detection accuracy of our study's accounting fraud detection model was higher than that of Shuto et al. (2016).

Keywords

Accounting fraud, Detection model, Machine learning method, Tokyo Stock Exchange listed companies

Biographies

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Hirohisa Hirai is a Professor of Department of Industrial Engineering and Management at Kanagawa University, Japan. He earned his Ph.D. in Engineering at Osaka University respectively. His research is an empirical study in the areas of management accounting, firm analysis and applied statistics, especially, firm valuation. He has received paper awards at several academic societies in the areas of accounting and management.