

Predicting going concern opinion with data mining

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Abstract

The auditor is required to evaluate whether substantial doubt exists about the client entity's ability to continue as a going concern. Accounting debacles in recent years have shown the importance of proper and thorough audit analysis. Since the 80s, many studies have applied statistical techniques, mainly logistic regression, as an automated tool to guide the going concern opinion formulation. In this paper, we introduce more advanced data mining techniques, such as support vector machines and rule-based classifiers, and empirically investigate the ongoing discussion concerning the sampling methodology. To provide specific audit guidelines, we infer rules with the state-of-the-art classification technique AntMiner+, which are subsequently converted into a decision table allowing for truly easy and user-friendly consultation in every day audit business practices.

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1. Introduction

Statement on Auditing Standards (SAS) No. 59 [1] requires that on every audit the auditor evaluates whether substantial doubt exists about the client entity's ability to continue as a going concern. In particular, the auditor has to assess the client's going concern status for a reasonable period of time, not to exceed one year beyond the

date of the financial statements being audited. Relevant information with respect to the continuation of an entity as a going concern is generally obtained from the application of auditing procedures that are planned and performed to achieve audit objectives. Examples of conditions and events that cast doubt on the entity's ability to survive include negative financial trends, defaults on loans or similar agreements, and non-financial internal and external matters such as work stoppages or substantial dependence on the success of a particular project. When the identified conditions and events in the aggregate lead to substantial doubt about the continued existence of the entity as a going concern, the auditor should identify and evaluate management's

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plans to mitigate the effects of these adverse conditions or events. If the auditor believes that there exist management plans that overcome this substantial doubt, a going concern audit report is not required. However, if the auditor decides that substantial doubt exists, the audit report should be modified by adding an explanatory paragraph following the opinion paragraph.

Although the assessment of a company's viability is not the main objective of an audit, bankruptcies without a prior going concern report are often viewed by the public as audit reporting failures [35,13,22]. The high frequency of this type of audit reporting failures is indicative of the fact that the auditor's going concern decision is highly complicated and involves a high level of judgment.

The complexity of the going concern decision has prompted the development of numerous models to predict the issuance of a going concern opinion (see, for example, [37,30,17,36,6]). The focus of these studies has been the development of going concern prediction models, proposing a variety of financial and non-financial variables that might be indicative of the auditor's going concern decision.

Most of these prediction models were developed using regression analysis, a technique which is well suited for investigating the determinants of going concern decision-making but less appropriate for developing user-friendly going concern decision models that can be used in everyday auditing. In this paper, we address this gap in the going concern literature by building a comprehensible rule-based classification model which allows for easy consultation by auditors to assess their client's viability. The classification model developed in this study is particularly useful to auditors to screen potential clients or as a decision aid to identify severely distressed clients that might require further consideration. Moreover, auditors may use this model in the final stages of the audit engagement as a quality control device or as a benchmark to represent auditor judgment under similar circumstances.

Furthermore, we will address the appropriateness of the methodology of recent going concern research. In particular, we will evaluate the performance of various data mining techniques including logistic regression and the rule-based classification technique used in this study. In addition, we will examine empirically potential estimation biases induced by the choice-based sampling methodology used in recent going concern research. We compare estimation results from a "complete data" sample with estimation results from choice-based sampling techniques currently used in going concern research. In sum, we contribute to existing going concern research by

(a) developing a practical and user-friendly going concern decision-aid for audit practitioners and (b) critically reviewing the methodology of recent going concern research.

2. Predicting the going concern opinion

In this section, we provide an overview of some relevant prior studies that have investigated the auditor's going concern judgment. Most of these studies investigated the influence of the quantifiable and non-quantifiable factors identified by SAS No. 34 and SAS No.59 on the issuance of a qualified opinion (e.g. [37,17,13,25,5,20]). An overview of related papers is shown in Table 1, where the columns describe the sampling technique and methodology used.

Of the included companies, a distinction is made between companies that received a going concern opinion, and companies that did not receive a going concern opinion. The latter category can be divided further into healthy and distressed companies, where a distressed company is defined as a company fulfilling at least two of the following six conditions [38,13]:

- (1) Negative retained earnings
- (2) Negative operating income
- (3) Negative net income
- (4) Negative working capital
- (5) Negative net worth
- (6) Negative cash flows

Note that some studies (such as [17] and [20]) make a distinction between companies that received a qualified and a clean opinion, which is closely related to the going concern opinion.

The sampling technique is categorized as matched, balanced or other. With a *matched* sample, as many non-going concern companies are chosen as there are companies with a going concern opinion. For each company that was issued a going concern opinion, a non-going concern opinion company is chosen from the set of distressed companies that is as similar as possible (e.g. same sector, opinion being issued in the same year, total assets as close as possible). For a *balanced* sample the number of going concern and non-going concern opinion companies is equal as well, but the non-going concern opinion companies are chosen randomly among all available companies. The final *other* sample encompasses following sampling methodologies:

- A selection of bankrupt companies is made, since these should have been issued a going-concern

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