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AN EMPIRICAL STUDY OF SAS NO. 59 AND BANKRUPTCY PREDICTION MODELS FOR AUDITORS' GOING CONCERN DECISIONS

by
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A DISSERTATION

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy in
the Culverhouse School of Accountancy
in the Graduate School of
The University of Alabama

TUSCALOOSA, ALABAMA
1997

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ACKNOWLEDGMENTS

I would like to thank my wife, Angie, and son, John Stephen, for enduring all of the sacrifices that were necessary in pursuing my goals. Without their love and support, I would have never accomplished my goals. I thank God for helping me persevere to see the end of this process and for blessing us with John Stephen, our first child.

I wish to express my appreciation to Dr. Robert W. Ingram, Dr. Michael T. Dugan, Dr. Thomas A. Lee, Dr. Benton E. Gup, and Dr. James D. Leeper, my dissertation committee. I especially want to recognize Dr. Robert W. Ingram, my dissertation chairperson, for all the effort he expended on my behalf. Each of you contributed to the completion of this dissertation, and I would not be here without your patience, support, and advice.

Finally, I want to thank two individuals who were always willing to answer my questions even though they had no direct interest in this dissertation. For their help a special thanks goes to Dr. Gary K. Taylor and Dr. Richard W. Houston.

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CHAPTER I

INTRODUCTION

In April 1988, the Auditing Standards Board (ASB) issued Statement on Auditing Standards (SAS) No. 59, "The Auditor's Considerations of an Entity's Ability to Continue as a Going Concern." The ASB designed the standard to satisfy public concern about whether companies being audited can continue as going concerns (Ellingson, Pany, and Fagan 1989). The standard's objective was to reconcile the different beliefs between financial statement users and auditors regarding auditors' responsibilities related to the going concern question. SAS No. 59 increased auditors' responsibility for evaluating a company's ability to continue as a going concern (Carcello, Hermanson, and Huss 1995; Raghunandan and Rama 1995; and Bell and Tabor 1991). Specifically, the standard required auditors to take an active role in seeking and evaluating evidence pertinent to the going concern question (Asare 1990).[1]

Though SAS No. 59 increased the auditor's responsibilities, it did not specify audit procedures that auditors could use to evaluate the going concern assumption. However, the standard used analytical procedures as an example of audit procedures that may

[1] Prior to SAS No. 59, the authoritative guidance to help auditors evaluate going concern issues was SAS No. 34, "The Auditor's Consideration When a Question Arises About an Entity's Continued Existence." Under SAS No. 34, the auditor had a passive responsibility in assessing an entity's continued existence. That is, the auditor was required to assess the firm's going concern status only when contrary information was discovered during the audit of the financial statements. If, after assessing a company's going concern status, the auditor had both substantial doubt and questions about the recovery of recorded asset values, then the auditor was required to modify the audit opinion. No modification was required if the auditor had only substantial doubt about the company's ability to continue as a going concern.

identify conditions indicative of possible substantial doubt on the part of auditors about a company's ability to continue as a going concern.[2] Additionally, in April 1988 the ASB issued SAS No. 56, "Analytical Procedures," which formally required auditors to use analytical procedures in all financial audits. SAS No. 56 did not set forth analytical procedures that auditors should use in their evaluation of the going concern issue; however, bankruptcy prediction models have been linked to this evaluation (Hopwood, McKeown, and Mutchler 1994; Blocher and Loebbecke 1993; Altman 1993; Koh 1991; Mckee 1989; and Dugan and Zavgren 1988).

An objective of this study is to evaluate the Zmijewski (1984), Ohlson (1980), and Altman (1968) bankruptcy prediction models as audit tools for evaluating companies' abilities to continue as going concerns.[3] Before these models can be recommended as audit tools, it is useful to evaluate the generalizability of each model to a sample of recent firms from a variety of industries and financial distress situations. Zmijewski, Ohlson, and Altman estimated the coefficients of their models using industrial firms from 1972-1978, 1970-1976, and 1946-1965; consequently, the reliability of these models when applied to current firms from various industries depends on the stationarity of bankruptcy conditions across industries and time. Additionally, though these models were developed using bankrupt companies, it is not clear whether these models are specifically useful for identifying firms that are likely to go bankrupt or whether they are more generally useful for identifying those firms that are financially distressed.

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[2] Pursuant to SAS No. 59, substantial doubt regarding an entity's ability to continue as a going concern on the part of the auditor is reason enough to issue a going concern opinion; however, substantial doubt is not defined in the accounting and auditing literature and is considered a matter of auditor judgment.

[3] Throughout this paper, the Zmijewski (1984), Ohlson (1980), and Altman (1968) models also are referred to as the X-score, Y-score, and Z-score models, respectively.

The current use of the Zmijewski, Ohlson, and Altman models by accounting researchers and practitioners assumes that the models' predictive powers transcend to recent firms from a variety of industries and financial conditions (e.g., Subramanyan and Wild 1996; Dichev 1996; Berger, Ofek, and Swary 1996; Chen and Church 1996; Carcello, Hermanson, and Huss 1995; Chen and Wei 1993; Altman 1993; and Robertson and Mills 1991). However, the generalizability of these models to a large sample of firms from various industries and financial distress situations, as well as from recent time periods, has never been tested. This study tests the generalizability of these models as a necessary first step in evaluating their usefulness as a decision aid for the going concern judgment.

Another objective of this study is to evaluate the impact of SAS No. 59 on auditors' going concern decisions. SAS No. 34, "The Auditor's Considerations When a Question Arises About an Entity's Continued Existence," provided the authoritative guidance to auditors for evaluating the going concern issue prior to SAS No. 59. Though SAS No. 59 superseded SAS No. 34 and increased the auditor's responsibility in assessing the going concern issue, certain parts of the standards are similar. Specifically, the financial characteristics suggested for auditors to identify conditions relevant to the going concern problem are the same in both SAS Nos. 34 and 59.[4] Though the financial characteristics listed in the standards are the same, auditors may use a different process under SAS No. 59 than they used under SAS No. 34 in deciding whether to issue going concern opinions (GCOs) (Chen and Church 1992). This study also evaluates whether SAS No.

[4] SAS Nos. 34 and 59 identify (1) recurring operating losses, (2) working capital deficiencies, (3) negative cash flows from operations, and (4) adverse key financial ratios as conditions that may indicate a going concern problem.

59 had an impact on the degree of reliance auditors place on the financial characteristics in evaluating the going concern question.

Since the ASB sought to create the perception among users and others that SAS No. 59 increased auditors' responsibilities, it is plausible that it increased the costs associated with not issuing GCOs when companies subsequently fail (Raghunandan and Rama 1995). Consequently, auditors may be more conservative in their going-concern evaluations, which would increase the likelihood of auditors issuing GCOs. Additional tests of SAS No. 59's impact evaluate whether the propensity of auditors to issue GCOs to companies that later declared bankruptcy increased after the issuance of SAS No. 59. Also, this study evaluates whether the propensity of auditors to issue GCOs to financially distressed, but not bankrupt, firms increased subsequent to the standard.

The impact of SAS No. 59 on the financial condition and size of firms that receive GCOs also is evaluated in this study. Pre-SAS No. 59 studies suggest that financial condition and size are the most important determinants of whether auditors issue GCOs (Mutchler 1986; McKeown et al. 1991; and Chen and Church 1992). In general, smaller companies and companies in poorer financial conditions are more likely to receive GCOs. As previously mentioned, the increased costs associated with not issuing GCOs to companies that subsequently fail likely increased the level of conservatism exhibited by auditors when assessing the going concern issue. Not only is the auditor's propensity to issue GCOs likely to increase, but also the size and degree of financial health of companies that receive GCOs are likely to change subsequent to SAS No. 59. More specifically, firms that receive GCOs subsequent to the standard may be larger and less financially distressed than those firms that received GCOs in periods prior to the

standard. This study evaluates whether the financial condition and size of firms that received GCOs subsequent to SAS No. 59 are different from those of firms that received GCOs prior to the standard.

A final objective of this study is to assess the usefulness of Zmijewski's, Ohlson's, and Altman's bankruptcy prediction models in identifying companies with financial conditions that warrant GCOs after SAS No. 59. The prediction models may alert auditors to certain problems that are difficult to detect with traditional auditing procedures. If the Zmijewski, Ohlson, and Altman models are useful audit tools for evaluating a firm's going concern potential, then the models should be considered by auditors in making GCO decisions. However, the potential usefulness of the models may have declined subsequent to SAS No. 59 relative to other procedures available to auditors for detecting going concern problems.

The Cohen Commission and pre-SAS No. 59 studies suggest that bankruptcy model predictions are more accurate than auditor opinions in signaling impending failure (Koh 1991; Altman 1982; and Altman and McGough 1974).[5] The auditors' (models') accuracies for signaling impending failure ranged from 40% to 54% (82% to 93%) in pre-SAS No. 59 studies. The ASB increased the auditors' responsibilities for the going concern evaluation in SAS No. 59. Accordingly, auditors may have become more accurate at signaling impending failure after SAS No. 59 was issued. This study evaluates whether the gap between the accuracy rates of auditors and those of bankruptcy prediction models narrowed subsequent to SAS No. 59. Evidence that the

[5] Pre-SAS No. 59 studies refer to studies that used data from periods prior to January 1, 1989, the effective date of the standard.

gap narrowed would suggest that the ASB's efforts to increase the auditors' responsibilities related to the going concern issue have been effective.

CHAPTER II

MOTIVATION

The motivation for this study is based on three general issues: (1) the continued use of bankruptcy prediction models by accounting researchers, practitioners, and educators; (2) the continued interests of the ASB, government, and financial statement users in the effects of SAS No. 59; and (3) the need for reliable audit tools assist auditors in their evaluation of the going concern question.

Current Use of Bankruptcy Prediction Models

The sample periods used by Zmijewski (1984), Ohlson (1980), and Altman (1968) are at least nineteen years old.[6] Altman developed his model using a matched sample of 33 bankrupt and 33 non-bankrupt manufacturing firms from 1946-1965. Zmijewski (Ohlson) developed his model using 40 (105) bankrupt and 800 (2,058) non-bankrupt industrial firms from 1972-1978 (1970-1976).[7] The models exhibited accuracy rates that ranged from 85% to 98% using the estimation samples. Altman and Zmijewski also tested their models using hold-out samples and reported accuracy rates of 95% and 98%. Even though these models exhibited high accuracy rates using estimation and/or hold-out

[6] Altman used multiple discriminant analysis to derive his discriminant function based on five financial ratios. Zmijewski (Ohlson) used probit (logit) analysis to develop his bankruptcy prediction model based on three (nine) predictor variables. These models are discussed in more detail in a later section.

[7] Both Zmijewski's and Ohlson's estimation samples included industrial firms. Zmijewski defined industrial firms as those with industry codes of less than 6000. Ohlson did not define industrial firms but stated that his sample excluded utilities, transportation companies, and financial services companies.

samples, the generalizability of these models to a large sample of firms in various industries and in recent periods has not been tested. Nevertheless, the Zmijewski, Ohlson, and Altman models are still employed in current accounting research to evaluate financial conditions of firms from a variety of industries and time periods (e.g. Subramanyan and Wild 1996; Dichev 1996; Chen and Church 1996; Carcello et al. 1995; Chen and Wei 1993).[8]

Altman's model also continues to be used in a variety of business situations. Commercial banks use the model to make lending decisions.[9] Although the model typically is not used in the original lending decision, it is relied on during the periodic loan review process (Altman 1993). Additionally, the investment banking divisions of banks use the model in security and portfolio analysis. The model also has been employed as an analysis tool in accounting practice. Auditors are required to assess their clients' abilities to continue as going concerns as part of financial audits (AICPA 1988). Altman's model has been used in these assessments (Altman 1983 and Dugan and Zavgren 1988). Altman (1993) identified other cases in which his model has been used as a management decision tool. For example, he reports a case in which a new management team of a financially weak firm implemented a strategy designed to increase

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[8] For example, Subramanyan and Wild (1996) investigated the hypothesis that the informativeness of earnings varies inversely with bankruptcy probabilities. They applied the Z-score model, which was estimated using manufacturing firms from the 1946-1965 period, to a broad sample of 1989 firms. They used the z-scores as independent variables in a regression model to explain firms' unexpected returns for a reporting period. Their results indicated that unexpected returns were significantly and inversely related to the z-scores.

[9] Though the Zmijewski and Ohlson models have been routinely employed by accounting researchers, they have not been implemented by practitioners in any meaningful way (Altman 1993). This study evaluates whether these models are useful audit tools to practitioners for assessing companies' abilities to continue as going concerns.

the company's z-score. Over the course of five years, the company's z-score and financial strength increased.

Bankruptcy prediction models also have been introduced to students through exercises in which the students use the models to make going concern judgments (Paquette and Skender 1996). Paquette and Skender (1996) used Altman's model to illustrate how prediction models can be used as decision aids in auditors' assessment of the going concern issue. Prediction models, particularly Altman's (1968) model, are routinely included in graduate and undergraduate finance textbooks to illustrate the benefits of predicting the possibility of bankruptcy (e.g., Brigham and Gapenski 1993). As previously indicated, the extant literature does not indicate whether the predictive powers of the Zmijewski, Ohlson, and Altman models transcend to industries and time periods other than those used to originally develop the models. Also, it is not clear whether these models are specifically useful for identifying bankrupt firms or more generally useful for identifying firms that are financially distressed. These models and their limitations should be presented to students carefully to avoid inappropriate applications of the models in the future.

Even though the bankruptcy prediction models were developed using samples of industrial firms, they are routinely applied to firms from a variety of industries.[10] Additionally, the coefficients of the models were estimated using firms from the 1946-1978 period, but these coefficients continue to be used to evaluate the financial health of firms in recent periods. The reliability of the models when applied to current firms from

[10] Though models developed using companies from one industry can be used to assess the financial health of companies from that same industry, one should not assume that the models' predictive power can transcend to industries other than those used to develop the models (Robertson and Mills 1991).

various industries depends on the stationarity of bankruptcy conditions across industries and time. Though the variables used in the models were the best discriminating set of variables for the estimation samples, these variables may not be reliable predictors in other periods. Additionally, the relative importance of the variables may change over time, and, consequently, the coefficients may not be stable even if the variables included in the model are accurate predictors.

Evidence of the generalizability of the Zmijewski, Ohlson, and Altman models should interest accounting researchers, practitioners, and educators, all of whom continue to use prediction models to evaluate firms' financial conditions across industries and time. Additionally, testing the generalizability of the models using a broad sample of recent companies is the necessary first step in evaluating these models as auditors' decision aids in the going concern judgment.

Impact of SAS No. 59

SAS No. 59 was one of nine expectation gap standards issued by the ASB to reconcile the different beliefs between financial statement users and auditors regarding auditors' responsibilities. The standard imposed on the auditor a responsibility to evaluate the going concern assumption as part of every audit. By issuing SAS No. 59, the ASB implied that GCOs are important signals of impending failure to financial statement users and that auditors can and should take more responsibility for assessing the ability of their clients to continue as going concerns (Ellingsen, Pany, and Fagan 1989). The ASB and the AICPA's Auditing Standards Division recognized that SAS No. 59 ushered in significant changes in some fundamental and long-standing auditors'

responsibilities; consequently, the ASB and the AICPA have exhibited continued interest in the standard's impact on the profession.

The ASB and the AICPA's Auditing Standards Division held a joint conference in 1992 to evaluate the status of the implementation of SAS No. 59. An objective of the conference was to stimulate research directly related to the more stringent standard. The results of the conference, reported in the Proceedings of the Expectations Gap Roundtable, highlighted the relationship between the going concern status and bankruptcy as one of the most significant issues. Furthermore, the proceedings indicated that the extant research is limited by the fact that most of it was conducted prior to SAS No. 59 (Carmichael and Pany 1993).

The ASB's continued interest in SAS No. 59 and GCOs also is evidenced by the issuance of additional standards. SAS No. 64, "Omnibus Statement on Auditing Standards -- 1990," further tightened the professional standards related to GCOs by prohibiting the use of conditional terminology in GCOs (Carcello, et al. 1995 and AICPA 1990).[11] Subsequent to SAS No. 64, the ASB recognized that auditors often circumvented the purpose of GCOs by using conditional terminology such as, "If the company is unable to obtain refinancing, there may be substantial doubt about the company's ability to continue as a going concern." As a result, in 1995 the ASB set forth additional guidelines with the issuance of SAS No. 77, "Amendments to Statements on Auditing Standards No. 22, Planning and Supervision, No. 59, The Auditor's Consideration of an Entity's Ability to Continue as a Going Concern, and No. 62,

[11] This standard required auditors to include the phase "substantial doubt about the entity's ability to continue as a going concern" in the GCO. The ASB contended that the explanatory paragraph with this phrase should serve adequately to inform the users of the financial statements.

Special Reports." SAS No. 77 prohibited the use of conditional language in the GCO and indicated that auditors must clearly state whether substantial doubt exists.

The impact of SAS No. 59 also should interest the public and government. The ASB's actions related to the going concern issue, evidenced by the issuance of SAS No. 59, were in response to public and legislative expectations. From 1985 to 1993, the U.S. House of Representatives held a series of hearings about the public accounting profession. Congressmen Dingell and Wyden criticized the accounting profession for not using GCOs to provide early warning signals of the subsequent failure of companies. Support for their criticism was reported in prior research that indicated that GCOs precede bankruptcy in only about half of the cases (e.g., Koh 1991; Altman 1982; and Altman and McGough 1974). When companies fail shortly after the issuance of NGCOs, there often is a public perception that the financial statement users should have received an early warning signal from the auditors (Berton 1985; Ellingsen, Pany, and Fagan 1989; AICPA 1989; and Carmichael and Pany 1993). The public clearly views these business failures as audit failures (Berton 1985).

Prediction Models as Audit Tools

The going concern assumption is fundamental to the preparation of financial statements in accordance with generally accepted accounting principles. The postulate states that, in the absence of evidence to the contrary, the firm should be viewed as remaining in operation indefinitely (AICPA 1988). Generally, the auditor does not encounter any unusual audit opinion problems in situations where the going concern assumption is valid. However, when the continued existence of a firm is in question, the

auditor is faced with potentially difficult decisions related to the audit opinion. SAS No. 59 is the current authoritative guidance available to help auditors assess the going concern issue.

SAS No. 59 requires auditors to take an active role in their evaluation of a company's ability to continue as a going concern. Raghunandan and Rama (1995) suggest that the increased responsibilities of auditors also increased the costs associated with issuing NGCOs to companies that subsequently fail.[12] For example, auditors may have greater difficulty defending against lawsuits by investors and creditors when companies fail after receiving NGCOs from auditors.

The auditor's assessment of the going concern issue is a complex process that can benefit from the use of a decision aid (Paquette and Skender 1996). Altman and McGough (1974) suggested that bankruptcy prediction models may help auditors judge companies' abilities to continue as a going concerns by alerting auditors to certain problems that may be difficult to detect using traditional auditing procedures. The Cohen Commission also indicated that statistical failure models might very well be considered by auditors in their overall assessments of companies (Commission 1978). Other evidence that bankruptcy prediction models may be useful to auditors in making going concern judgments was provided by Hopwood et al. (1994), Koh (1991), Levitan and Knoblett (1985), Altman (1982), and Deakin (1977).[13] Additionally, the

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[12] The prevalent costs associated with not modifying opinions of companies that subsequently fail are: (1) litigation by financial statement users and (2) reputational costs (Raghunandan and Rama 1995, Hopwood, McKeown, and Mutchler 1994).

[13] These studies compared the accuracies of prediction models and auditors' opinions at signaling impending failure. In general, bankruptcy prediction models outperformed auditors in providing early warning signals of failure. Relevant details of these studies are presented in later sections.

Proceedings of the Expectations Gap Roundtable called for continued research on the effectiveness of analytical procedures in various contexts, including the going concern evaluation (Blocher and Loebbecke 1993). These proceedings specifically identified the use of bankruptcy prediction models as a potential analytical procedure for evaluating the going concern question.

Though there is support for the use of prediction models in the going concern evaluation, the Zmijewski (1984), Ohlson (1980), and Altman (1968) models have not been evaluated in this context subsequent to SAS No. 59.[14]

[14] Zmijewski's and Ohlson's models have never been evaluated as an audit tool to assist auditors in their going concern assessment. Altman evaluated his model in this context in the Altman and McGough (1974) and Altman (1982) studies. The limitations of these studies are discussed in subsequent sections.

CHAPTER III

CONTRIBUTION

The following sections summarize earlier studies and discuss the related contributions of this study. Though research related to auditors' GCOs is considered an extension of bankruptcy prediction research, this section separately discusses each area of research to demonstrate the current study's contributions.

BANKRUPTCY PREDICTION STUDIES

This section summarizes the Zmijewski (1984), Ohlson (1980), and Altman (1968) and prior studies that developed and tested bankruptcy prediction models. It explains the contributions of the present study to resolving problems identified in earlier studies.

Time and Sample Limitations

Zmijewski (1984) used financial ratios that measured firm performance, leverage, and liquidity to develop his model. The ratios were not selected on a theoretical basis, but rather, on the basis of their performance in prior studies. Zmijewski estimated the model using probit analysis, which weights the log-likelihood function by the ratio of the population frequency rate to the sample frequency rate of the individual groups, bankrupt and nonbankrupt. Zmijewski's probit model based on 40 bankrupt and 800 nonbankrupt industrial firms was

$$X = - 4.3 - 4.5 X_1 + 5.7 X_2 - .004 X_3 \qquad (1)$$

where

X_1 = net income/total assets;
X_2 = total debt/total assets;
X_3 = current assets/current liabilities;
X = overall index.[15]

Zmijewski (1984) developed numerous models using 40 bankrupt and 40 to 800 nonbankrupt firms; however, the model based on the 40:800 proportion of bankrupt to nonbankrupt firms is the model most frequently used by accounting researchers (e.g. Carcello et al. 1995 and Chen and Wei 1993).

Ohlson (1980) indicated that the nine predictors used to develop his model were selected because they appeared to be the ones most frequently mentioned in the literature. He used logistic analysis to derive his bankruptcy prediction model using nine measures of firms' size, leverage, liquidity, and performance. Based on a sample that included 105 bankrupt and 2,058 nonbankrupt industrial firms, his model was

$$Y = -1.3 - .4\,X_1 + 6.0\,X_2 - 1.4\,X_3 + .1\,X_4 - 2.4\,X_5 - 1.8\,X_6 + .3X_7 - 1.7\,X_8 - .5X_9 \quad (2)$$

where

X_1 = log(total assets/GNP price-level index);
X_2 = total liabilities/total assets;
X_3 = working capital/ total assets;
X_4 = current liabilities/current assets;
X_5 = one if total liabilities exceed total assets, zero otherwise;
X_6 = net income/ total assets;
X_7 = funds provided by operations/total liabilities;
X_8 = one if net income was negative for the last two years, zero otherwise;
X_9 = measure of change in net income;[16]
Y = overall index.[17]

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[15] The score is used to determine the probability of membership in the bankrupt group based on a cumulative probability function.

[16] The change in net income was measured as $(NI_t - NI_{t-1})/(|\,NI_t\,| + |\,NI_{t-1}|)$, where NI_t is net income for the most recent period.

To develop the Z-score model, Altman (1968) compiled a list of twenty-two financial ratios and classified each into one of five categories (liquidity, profitability, leverage, solvency, and activity). Again, the ratios were not selected on a theoretical basis, but rather, on the basis of their popularity in the literature and Altman's belief about their potential relevancy to bankruptcy. He estimated the model using multiple discriminant analysis, which attempts to derive a linear combination of variables that best discriminates between bankrupt and non-bankrupt groups. After numerous tests, the linear function that best discriminated between the 33 bankrupt and 33 non-bankrupt manufacturing firms was

$$Z = 1.2\ X_1 + 1.4\ X_2 + 3.3\ X_3 + .6\ X_4 + .999\ X_5 \qquad (3)$$

where

X_1 = working capital/total assets;
X_2 = retained earnings/total assets;
X_3 = earnings before interest and taxes/total assets;
X_4 = market value equity/book value of total debt;
X_5 = sales/total assets;
Z = overall index.[18]

This Z-score model is still cited and used by accounting researchers, practitioners, and educators more than any other bankruptcy prediction model (Altman 1993).

Though the Zmijewski, Ohlson, and Altman models are the only models evaluated in this study, the findings of this study may apply to other models that were derived using a similar methodological process.[19] Scott (1981) provides an overview of this process:

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[17] The score is used to determine the probability of membership in the bankrupt group based on a logistic function.

[18] The lower a company's Z-score, the higher its probability of bankruptcy.

[19] See Jones (1987) and Zavgren (1983) for detailed discussions of other models and techniques used in prior bankruptcy prediction studies.

> Most bankruptcy-prediction models are derived using a paired-sample technique. Part of the sample contains data from firms that eventually failed; the other part contains contemporaneous data from firms that did not fail. A number of plausible and traditional financial ratios are calculated from the financial statements that were published before failure. Next, the researcher searches for a formula based either on a single ratio or a combination of ratios, that best discriminates between firms that eventually failed and firms that remained solvent. A careful researcher also tests the resulting formula both on the original sample and a holdout sample that was not used to derive the formula.

A criticism associated with this process relates to the search bias in the variable selection technique. The lack of a theory of bankruptcy invites the researcher to use untenable methods in selecting the predictor variables. Altman (1968) considered a multitude of variables and then reduced the original variables to the most accurate subset. He reduced the original set of twenty-two variables to the five variables that best discriminated between bankruptcy and non-bankruptcy for the estimation sample firms. Zmijewski (1984) and Ohlson (1980) used a simpler method for variable selection by choosing the variables based on their popularity and performance in prior bankruptcy prediction studies. While the variable sets used in these studies were effective for the estimation and hold-out samples from similar time periods and industries, they may not be effective for the general population of firms over time.

Studies that have developed and tested bankruptcy prediction models include Altman (1968), Deakin (1972), Mensah (1983), and Zavgren (1985).[20] All of these studies used small samples and short windows of time. Deakin (1972) developed a model using 64 industrial firms from the 1964-1970 period and tested the model on an independent

[20] These studies selected estimation and hold-out samples from different time periods. Zmijewski (1984), Gentry, Newbold, and Whitford (1985), and Blum (1974) also developed and tested models; however, they used estimation and hold-out samples drawn from the same time period.

sample consisting of 34 industrial firms from the 1963-64 period. His model correctly classified 97% of the firms in the estimation sample; however, the model's accuracy declined to 82% when tested using the hold-out sample. Mensah (1983) derived his model using 60 manufacturing firms from 1975-1978 and tested it with a hold-out sample of 46 manufacturing firms from 1979-1980. The accuracy rates of his model were 97% for the estimation sample and 63% for the hold-out sample.[21] Altman (1968) applied his Z-score model, developed with 1946-1965 manufacturing firm data, to 91 manufacturing firms from the 1958-1961 period. Subsequently, he applied his model to 61 manufacturing firms and 50 retail firms from the 1969-1975 period (Altman 1983). The accuracy rates of the Z-score model were 95% for the estimation sample and 84% for each of the independent samples.[22] Finally, Zavgren (1985) developed a model using 1972-1978 industrial firm data and tested the model on a hold-out sample consisting of 32 industrial firms from 1979-1981. The accuracy of her model fell from 82% for the estimation sample to 69% for the hold-out sample.

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[21] These results are for Mensah's model estimated based on historical cost amounts. He also tested a model that was estimated using financial ratios adjusted for specific price level changes. This model exhibited 93% and 76% accuracy rates for the estimation and hold-out samples.

[22] Other studies that tested the Z-score model include Begley, Ming, and Watts (1997), Holmen (1988), Zmijewski (1983), Moriarity (1979), and Moyer (1977). Begley et al. (1997) applied the Z-score model to 65 bankrupt and 1,300 nonbankrupt 1980-1989 companies. They reported that the Z-score model correctly classified 78% of the industrial firms as bankrupt and nonbankrupt. Begley et al. also applied Ohlson's (1980) model to the 1,365 industrial companies and reported that the his model exhibited a 98% classification accuracy. Holmen (1988) compared the accuracy rates of the Altman (1968) and Beaver (1966) models using a matched sample of 84 bankrupt and non-bankrupt firms from 1977-1984. The Z-score model accurately classified approximately 70% of the total sample firms and 74% of the manufacturing firms. Zmijewski (1983) compared the bankruptcy probabilities derived from 13 different models, including Altman's (1968) Z-score model, using a sample consisting of 72 bankrupt and 3,573 non-bankrupt firms from 1972 to 1978. Though the accuracy rate for each model is not reported, he reported similar bankruptcy probabilities for the prediction models. Moriarity (1979) applied the Z-score model to eighteen 1974 firms from the discount department store industry. He reported eleven misclassifications using Altman's (1968) model. Moyer (1977) applied the Z-score model to 27 bankrupt and non-bankrupt firms from 1965-1975 and reported a 75% accuracy rate.

The relatively high accuracy rates for these models are not surprising. Estimation sample rates should be high since the firms are classified using a model estimated with individual measurements based on these same firms. The hold-out sample tests represent more rigorous tests of the models' strengths. Though lower than estimation sample rates, the hold-out sample accuracy rates of these models are potentially upwardly biased for three reasons: (1) the estimation and hold-out sample periods are not substantially different, (2) the hold-out sample consisted of firms from the same restricted set of industries as those in the estimation sample,[23] and (3) the hold-out samples were small (the largest sample was 111 firms) and not proportional to actual bankruptcy rates.

For each of these studies, the time span between the estimation sample period and the hold-out sample period was short. Except for Deakin (1972), who selected his hold-out sample from a prior period, the hold-out sample periods began immediately after those of the estimation samples. As such, the accuracy rates for the hold-out samples were potentially biased upward because it is unlikely the economic environment changed substantially between estimation and hold-out sample periods. If hold-out sample tests are to provide evidence of continuing applicability of the model, it is important that the hold-out sample be drawn from recent periods. Tests in the present study evaluate the Zmijewski (1984), Ohlson (1980), and Altman (1968) models in periods that are likely to

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Additionally, he reestimated the Altman's (1968) coefficients using his 1965-1975 sample. Moyer's (1977) reestimated coefficients correctly classified 88% of the sample.

[23] Bias here means that the hold-out sample accuracy rates are higher than the rates users should expect when they apply the models across industries.

exhibit economic differences from the period in which the model was originally developed.[24]

Applying the original coefficients of the Zmijewski, Ohlson, and Altman models to recent samples tests the stationarity of the relation between bankruptcy and financial ratios. This study tests this assumption for the models by reestimating the coefficients using the models' variables and recent firm data. Altman, et al. (1977) provided a similar analysis for the Z-score model using firms from the 1969-1975 period and found their new model exhibited an 88% accuracy rate (compared with the original Z-score model accuracy rate of 95%) for classifying the estimation sample firms. Since Altman, et al. (1977) did not report the coefficients of their new model, a direct comparison of the original Z-score model's coefficients to those of the new model is not possible.[25] Tests in the current study compare both the accuracy rates and estimated coefficients of the original Zmijewski, Ohlson, and Altman models to those derived from recent firm data.

Testing and reestimating the coefficients of models using recent samples evaluate the models in periods that are likely to exhibit economic differences from the periods in

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[24] Examples of external economic factors that are likely to change over time are inflation, interest rates and credit availability. The effect that changing these economic factors had on the accuracy and structure (magnitude and significance of the coefficients) of bankruptcy prediction models was evaluated by Mensah (1984). He developed four models using samples from the 1972-1973, 1974-1975, 1976-1977, and 1978-1980 time periods. He reported that the accuracy and structure of the models changed when developed and tested in the four time periods, each period representing a different economic environment.

[25] Hamer (1983) tested the variable sets of Altman (1968), Deakin (1972), Blum (1974), and Ohlson (1980) using 44 bankrupt and 44 non-bankrupt firms from the 1966-1975 period. The purpose of her study was to test the sensitivity of error rates to statistical methods and variable sets. She developed numerous models and reported error rates, ranging from 17% to 40% using logit, linear discriminant, and quadratic discriminant models for each variable set. Her discriminant model using the Altman (1968) variable set exhibited an overall error rate of 21.3%. Her logit model using the Ohlson (1980) variable set exhibited an overall error of 24%. Hamer did not report the coefficients of the models. Begley et al. (1997) reestimated Altman's (Ohlson's) model using 100 bankrupt and 100 (2000) nonbankrupt companies from 1980-1989. They reported that the reestimated Altman (1968) and

which the models were developed. Platt and Platt (1990) indicated that differences in the economic environment may change the (1) relationships between the dependent (e.g., bankruptcy) and independent variables (e.g., financial ratios), (2) average range of the independent variables and, (3) relationships among the independent variables.[26] Consequently, the models' predictive powers should decline using hold-out samples unless the economic environments for the estimation and hold-out sample periods are the same.

The above discussion leads to the following testable hypotheses for the models:

Hypothesis 1: The classification accuracies of the bankruptcy prediction models in recent periods differ from those of the periods in which the models were originally developed.

Hypothesis 2: The models' structures (magnitude and significance of the coefficients) change when reestimated using data from time periods that differ from the periods in which the models were originally developed.

The hold-out sample tests in prior studies also were potentially biased upward (with respect to a sample of firms from a cross-section of industries) since the hold-out samples consisted of firms from the same industries as those in the estimation sample. Deakin's (1972) estimation and hold-out samples included only companies listed in Moody's Industrial Manual. Zavgren (1985), Mensah (1983), and Altman (1968) developed and tested their models using manufacturing firms. The only exception to these procedures is the 50 retail firms tested with the Z-score model (Altman 1983).

Ohlson (1980) models' exhibited overall classification accuracies of 78% and 99%; however, the coefficients of both models changed when reestimated using 1980s data.

[26] Platt and Platt (1990) suggested that these changes are attributable to: (1) changes in the business cycle, (2) changes in corporate strategy, (3) changes in competitive nature of the market and, (4) technological changes.

These hold-out sample tests do not provide evidence as to the models' predictive-ability across industries. Tests in the current study evaluate Zmijewski's (1984), Ohlson's (1980), and Altman's (1968) models in industries other than those used to derive the original model. These findings are relevant to accounting researchers and practitioners who apply bankruptcy prediction models to firms from various industries. Recent examples include Subramanyan and Wild (1996), Dichev (1996), Chen and Church (1996), Carcello et al. (1995), and Chen and Wei (1993). Each of these studies assumed the bankruptcy prediction models were generalizable across industries and time periods other than those used to develop the model.

Robertson and Mills (1991) indicated that it is not valid for models derived for one industry group to be used to evaluate the financial conditions of other industry groups; consequently, the predictive powers of the X, Y, and Z-score models should decline using industries different from those used to originally develop the models. The testable hypothesis for the models is stated as follows:

Hypothesis 3: The bankruptcy prediction models' classification accuracies decrease relative to those for industries used to develop the models.

Proportionality and Error Costs

Another limitation of the hold-out samples of prior studies is that the samples were small. Deakin (1972), Mensah (1983), and Zavgren (1985) tested their models using hold-out samples consisting of 34 (11 failed and 23 nonfailed), 46 (11 bankrupt and 35 non-bankrupt), and 32 (16 bankrupt and 16 non-bankrupt) firms, respectively. Altman (1968) tested his model on two different independent samples consisting of 91 (25 bankrupt and 66 non-bankrupt) and 111 (53 bankrupt and 58 non-bankrupt) firms. Also,

the hold-out samples were not proportionately representative of the population of bankrupt and non-bankrupt firms. The average business failure rate is less than 1%, while the proportion of bankrupt firms included in these hold-out samples ranges from 24% to 50%.[27]

Biases resulting from oversampling distressed firms include misstatement of Type I and Type II errors. Altman et al. (1977) reported classification accuracy under assumptions of equal prior probabilities as well as under different probabilities. The overall accuracy rate (92%) of their model was not affected when prior probabilities more representative of the average business failure rate were incorporated. However, the number of bankrupt (non-bankrupt) firms misclassified increased (decreased) under the more representative prior probabilities.[28] Zmijewski (1984) also tested the effect of disproportionate sampling in bankruptcy prediction studies and reported similar results. He used 40 bankrupt and 800 nonbankrupt firms to develop models using various proportions of bankrupt and nonbankrupt firms (e.g., 40:40, 40:800). His findings indicated that failure to consider prior probabilities may not affect the overall accuracy of the model, but affects Type I and Type II errors.

Of the models evaluated in this study, Altman's (1968) model is the one most affected by the biases resulting from the oversampling of distressed firms. Altman used an equal number of bankrupt and non-bankrupt companies for his estimation sample;

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[27] The average business failure rate between 1970 and 1991 ranged from .038% to 1.19% (Gentry, Newbold, and Whitford 1985 and Altman 1993).

[28] Altman et al. (1977) adjusted the model's cutoff score to simulate the effect of using unequal prior probabilities. The adjustment factor was calculated as the $\ln(p_1/p_2)$, where p_1 and p_2 represent the prior probabilities of the bankrupt and nonbankrupt groups. It should be noted that if their sample violated the assumptions of equal variance-covariance matrices between the groups and multivariate normality, then this adjustment factor may be inappropriate. Though Altman et al. did not report information

consequently, his model understates Type I errors and overstates Type II errors. Zmijewski (1984) and Ohlson (1980) used estimation samples that were more proportionately representative of the population in terms of bankrupt and nonbankrupt firms than that used by Altman. Thus, the samples used by Zmijewski and Ohlson to develop their models reduced the biases resulting from the oversampling of distressed firms.

The economic consequences of Type I and Type II errors vary among users of the models. For example, auditors may use the models as tools to help evaluate an entity's ability to continue as a going concern. Type I errors occur when auditors issue NGCOs to companies that subsequently fail. The costs of Type I errors include those costs associated with litigation by financial statement users and the loss of the auditor's reputation (Raghunandan and Rama 1995 and Kennedy and Shaw 1991). Type II errors occur when auditors issue GCOs to companies that continue as going concerns. The costs associated with Type II errors include reputational costs as well as the loss of clients (Raghunandan and Rama 1995 and Chen and Church 1992). [29]

Though the use of the models by auditors is the focus of this study, the findings should interest other users such as loan officers and investors. Loan officers may use the models as tools to help minimize loan losses. The costs of Type I errors include the losses arising from loan defaults by firms predicted to survive but that subsequently fail.

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related to these assumptions, prior research suggests the assumptions typically are violated for the estimation samples used to develop bankruptcy prediction models (Jones 1987).

[29]Kida's (1980) behavioral study employed 27 audit partners, each of whom analyzed 40 firms comprising 20 problem and 20 nonproblem firms matched on industry and size. The subjects analyzed the firms using both financial ratios and perceived outcomes of issuing GCOs and NGCOs. The results supported the notion that the auditors' opinion decisions are influenced by the perceived consequences. Kida reported that auditors may be quick to issue GCOs, fearing lawsuits by investors and creditors if

The costs of Type II errors include the opportunity costs from failing to make loans to companies that would have made timely payments. Investors may use the model in their assessments of potential investments. The cost of Type I errors for investors is estimated by the loss in equity value of investments in firms that subsequently fail. The opportunity costs associated with foregoing potentially sound investments represent investors' Type II error costs.

This study demonstrates the effect of proportionate samples on Type I and Type II errors using the Zmijewski (1984), Ohlson (1980), and Altman (1968) bankruptcy prediction models.[30] Though prior studies indicated that models developed using disproportionate samples misstate Type I and Type II errors, the frequencies of these errors using Altman's, Ohlson's, and Zmijewski's models on large proportionate samples from recent periods have not been measured. The testable hypothesis related to the effects of proportionate samples is as follows:

Hypothesis 4: Bankruptcy prediction models developed using disproportionate samples (e.g., Altman 1968) generate lower (higher) quantities of Type I (Type II) errors than those resulting from proportionate samples (e.g., Zmijewski 1984 and Ohlson 1980).

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the GCOs are not issued and companies subsequently fail. Alternatively, auditors may be reluctant to issue GCOs fearing the loss of clients should companies continue as going concerns.

[30] The magnitudes of Type I and Type II error costs remain an empirical question that is beyond the scope of this study. Even though the costs of Type I and Type II errors are difficult to measure with precision, prior research suggests that Type I error costs are the greater of the two (Altman et al. 1977, Mensah 1983, Frydman, Altman, and Kao 1985, Hsieh 1993). The only prior studies that attempted to measure Type I and II error costs are Altman et al. (1977) and Grice and Ingram (1997). Altman et al. measured the error costs associated with the commercial bank loan function and reported the Type I error costs to be approximately 70% of the loan value. The Type II error costs were the differences in returns of high and low risk loans, or approximately 2-4%. Grice and Ingram (1997) used market returns to measure the error costs associated with investment decisions based on Altman's (1968) model predictions. They reported that the decline in equity value of firms predicted to survive but that subsequently failed, Type I error costs, ranged from -16.5% to -66.5%. Also, they reported that the opportunity costs of forgoing investments in firms predicted to fail but that subsequently survived, Type II error costs, ranged from -10.7% to 63.1%. These results suggest that, from the creditors' and investors' perspectives, Type I and II error costs are not equal, as assumed by Zmijewski (1984), Ohlson (1980), and Altman (1968). Models that fail to incorporate the difference in error costs may understate the effects of Type I errors and overstate the effects of Type II errors.

This study also evaluates the models' Type I and II errors within the context of auditors' opinion decisions. Further discussion of the models' errors based on companies' audit opinions is presented in later sections.

Bankruptcy or Financial Distress?

Even though the Zmijewski (1984), Ohlson (1980), and Altman (1968) models were developed to predict the event of bankruptcy, this event is only one of several indicators of financial distress. It is not clear whether these models are specifically useful for identifying firms that are likely to go bankrupt or whether they are more generally a model for identifying firms experiencing financial distress. While firms that experience financial distress are more likely to declare bankruptcy than other firms, most financially distressed firms are not likely to declare bankruptcy.[31] Bankruptcy usually is a joint result of financial stress and other events that precipitate legal action.

Additional analyses included in this study relate to the models' abilities to assess financial distress in a variety of situations as identified by codings on the Compustat Database. Compustat maintains codes for bankruptcy, liquidation, reorganization, S&P ratings for bonds vulnerable to default, and S&P ratings for stocks, all of which may identify firms that are financially distressed. If Altman's, Ohlson's, and Zmijewski's models are better suited for predicting bankruptcy than for predicting other outcomes of

[31] Gilbert, Menon, and Schwartz (1990) suggest that financial dimensions that set apart bankrupt and healthy firms are different from those that separate bankrupt and distressed firms. They developed prediction models using both bankrupt/healthy and bankrupt/distressed estimation samples. The model developed using the bankrupt/healthy estimation sample was unable to distinguish failed firms from distressed firms.

financial distress, they may not be appropriate for some of the applications for which they have been used. Alternatively, if the models predict financial distress rather than just bankruptcy, care should be used in employing the models to identify bankrupt firms because most distressed firms will not declare bankruptcy.

A limitation of the Zmijewski, Ohlson, and Altman models is that the variable sets do not incorporate proxies for non-financial events that precipitate bankruptcy. For example, a bank's refusal to extend credit, lawsuits, and union problems are three factors associated with bankruptcies. Arguably, a bank's refusal to extend credit is typically attributable to firms' poor financial performances or high debt levels, both of which should be included in the variable set. However, union problems and lawsuits could result in firms filing bankruptcy as a result of strategic management decisions. That is, management may deem it necessary to file bankruptcy to secure a favorable outcome in negotiations or court proceedings, even though the firm is not experiencing serious financial problems. The lack of homogeneity in the motivation for bankruptcy filings complicates the modeling effort, and users should recognize these models do not capture all events that may cause, or precede, bankruptcy.

The above discussion leads to the following testable hypothesis for the X, Y, and Z-score models:

Hypothesis 5: Bankruptcy prediction models are more generally useful for identifying financially distressed companies rather than just bankruptcies.

Hypotheses 1-5 focus on the general usefulness of the X, Y, and Z-score models to auditors. The following sections discuss auditors' opinion decisions and the use of the models in the opinion decision context. Hypotheses 5-11 are set forth to evaluate the

impact of SAS No. 59 on auditors' opinion decisions. Since SAS No. 59 ushered in significant changes in auditors' responsibilities for evaluating going concern questions, it is likely that auditors' GCO decisions changed after the issuance of the standard. Hypotheses 12-13 are set forth to evaluate whether auditors' opinion decisions are more consistent with the models' predictions for post-SAS No. 59 companies. Prior studies, discussed later, suggested that bankruptcy prediction models routinely outperformed auditors at signaling impending failures prior to SAS No. 59. However, the correlation between auditors' opinions and the models' predictions likely changed after the issuance of SAS No. 59.

AUDIT OPINION STUDIES

This section discusses prior studies from the audit opinion literature that are relevant to the research proposed for this study. These studies can be categorized into three distinct categories: (1) studies that evaluated the ability of financial ratios to foreshadow auditors' GCOs, (2) studies that evaluated the propensity of auditors to issue GCOs to both bankrupt and other financially distressed companies, and (3) studies that evaluated the usefulness of bankruptcy prediction models in auditors' evaluations of the going concern question. This section summarizes the prior studies and explains the related contributions of this study.

Usefulness of Financial Ratios to Predict GCOs

SAS No. 34 provided the auditors' authoritative guidance related to the going concern issue before the issuance of SAS No. 59.[32] Though SAS No. 59 increased auditors' responsibilities in assessing the going concern issue, certain sections of the standards were unchanged. Specifically, both standards identified (1) recurring operating losses, (2) working capital deficiencies, (3) negative cash flows from operations, and (4) adverse key financial ratios as financial characteristics auditors should investigate for negative trends to identify firms with going concern problems. The remainder of this section summarizes prior studies that modeled the auditor's GCO decision using financial ratios.

Levitan and Knoblett (1985) compiled a list of twenty-six variables and classified each into one of the four categories identified in SAS No. 59 (and No. 34). They developed a model that discriminated between 32 companies that received GCOs from 32 companies that received NGCOs in the 1980-1981 period. Using stepwise discriminant analysis, the set of variables that best discriminated between the GCO and NGCO firms was: (1) net worth to total debt, (2) a dummy integer representing how many of the previous three years' cash flows were negative, (3) slope of the trend line of the three years' current ratios, (4) dummy integer representing how many of the previous three years reported negative net income, and (5) total debt to total assets. Their model correctly classified 93.6% of the companies as those that received GCOs and those that received NGCOs. Since the sample used by Levitan and Knoblett (1985) terminated at

[32] SAS No. 34 was issued March 1981.

the point that SAS No. 34 was issued, their study was directed toward those financial factors which foreshadowed GCOs prior to 1982 (Levitan and Knoblett 1985).[33]

Mutchler's (1985) study was designed to test the extent to which auditors' GCO decisions could be predicted using publicly available information. Her sample consisted of 119 companies that received GCOs and 119 companies that received NGCOs during the 1981-1982 period. She developed a multiple discriminant analysis model that discriminated between GCO and NGCO companies using financial ratios identified by auditors as useful cues in evaluating whether to issue GCOs.[34] Specifically, the variables were: (1) cash flow to total liabilities, (2) current assets to current liabilities, (3) net worth to total liabilities, (4) total long-term liabilities to total assets, (5) earnings before interest and taxes to net sales.

Mutchler tested her model using two samples: (1) the entire sample of 119 GCO and 119 NGCO firms and, (2) a subset of the entire sample that included 42 firms that received GCOs for the first time and 42 NGCO companies. Since she was interested solely in the predictive power of the variable set, she reported only the model's classification accuracies for both samples (83%).[35] Consequently, her results have limited

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[33] Levitan and Knoblett (1985) also constructed a discriminant bankruptcy prediction model using 35 bankrupt and 35 non-bankrupt firms from 1980-1981 and the list of twenty-six variables mentioned above. Their model correctly classified 95% of the firms as bankrupt and nonbankrupt. They presumed that by contrasting the models, an inference could be made about whether auditors use bankruptcy prediction variables in assessing going concern issues. They reported that the dummy integer representing how many of the previous three years reported negative cash flow was significant in both models.

[34] The variables were identified through an interview and questionnaire process using two auditors from each of the Big Eight firms.

[35] Mutchler also developed a model that included a control variable for companies' prior year opinions because she suspected that auditors find it easier not to remove GCOs until companies are clearly out of trouble. Additionally, the auditor subjects indicated that although a company may look bad on the surface, its performance may have improved over the previous year and it may not receive the qualification. Thus, she also developed a model that included an improvement variable which indicated whether a firm's performance had improved over the previous years. The classification accuracies for

use in evaluating the ratios' abilities to foreshadow GCOs since she did not disclose the coefficients and significance levels for the variables in the model. Other limitations of Mutchler's study relative to the research proposed in this paper are (1) the sample included firms from periods in which SAS Nos. 34 and 59 were not effective and (2) the ratios used in the model did not include any of the trend variables specifically identified in the auditing standards.

Menon and Schwartz (1987) continued the inquiry into whether financial ratios have the ability to predict GCOs. Their sample included 89 bankrupt firms, 37 of which received GCOs, from the 1974-1980 period. By restricting their sample to only bankrupt companies, they provided insights into the financial characteristics of failing companies that received GCOs and those that received NGCOs.[36] They developed a logit model using seven predictor variables: (1) current ratio, (2) change in current ratio, (3) retained earnings to total assets, (4) debt to total assets, (5) income to total assets, (6) recurring operating losses, (7) cash flow from operations to total liabilities.

Menon and Schwartz validated their model using samples of bankrupt and nonbankrupt companies. The bankrupt sample included 39 firms, 14 of which received GCOs, that filed bankruptcy during the 1981-1983 period. The nonbankrupt sample included 46 nonbankrupt firms, 11 of which received GCOs, that reported net losses and negative retained earnings in 1981. For both samples, the model exhibited a 78%

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the models that included these control variables ranged from 80.7% to 89.9% using the two sample sets described above. She concluded that while GCOs do not appear to have additional information content for the majority of companies, there are specific cases (the model errors) in which the GCO has marginal information content.

[36] The Mutchler (1985) and Levitan and Knoblett (1985) studies selected their estimation samples based on whether firms received GCOs, not whether firms filed bankruptcy.

accuracy for classifying companies as those that received GCOs and those that received NGCOs.

Menon and Schwartz reported that the change in current ratio and recurring operating losses were statistically significant in the model; however, these findings cannot be interpreted within the context of auditors' opinion decisions pursuant to the provisions of SAS Nos. 34 and 59. As was the case in the Mutchler (1985) and Levitan and Knoblett (1985) studies, the model was estimated using a sample selected from periods before SAS Nos. 34 and 59 were issued. Additionally, except for the two significant variables identified above, Menon and Schwartz did not evaluate the financial characteristics identified in the standards.

Chen and Church (1992) developed a logit model to predict GCOs using 127 (127) firms that received (did not receive) GCOs during the 1983 to 1986 period. The primary objective of their study was to evaluate the usefulness of companies' default status in predicting GCOs. The variables used to develop their model were (1) cash flows from operations to total liabilities, (2) current assets to current liabilities, (3) long-term debt to total assets, (4) earnings before interest and taxes to sales, (5) one year change in current ratio, (6) log of total assets, (7) a dummy variable of 1 if the company experienced two consecutive years of operating losses, and (8) default status. The results of their logit model indicated that current assets to current liabilities, long-term debt to total assets, log of total assets, and default status were useful to auditors in the going concern decision.

Though Chen and Church used a sample selected from a period in which SAS No. 34 was effective, the results are still dated (Chen and Church 1992). Under SAS No. 59,

auditors are required to consider the prospects that a company will be unable to continue as a going concern as part of every engagement; as such, it is possible that under the new standard auditors may use a different process than was used previously in deciding whether to issue GCOs. Also, as was the case with the other studies previously discussed, Chen and Church failed to consider ratio trends.

For the most part, the financial characteristics listed in SAS No. 59 (and 34) have been ignored in prior research.[37] If auditors are to use them in assessing the going concern question, it is necessary to evaluate the abilities of the characteristics to foreshadow GCOs. Also, prior studies used models for auditors' opinion decisions developed with data from pre-SAS No. 34 periods; consequently, it is not clear how to interpret their findings under the current provisions of the auditing standards. Tests in the current study evaluate the financial characteristics' usefulness in auditors' going concern evaluations performed under SAS No. 59. The testable hypothesis can be set forth as follows:

Hypothesis 6: The financial characteristics listed in SAS No. 59 (and 34) are useful to auditors when evaluating the going concern assumption for post-SAS No. 59 companies.

As previously indicated, the ASB did not amend the list of financial characteristics that may signal companies with going concern problems when the board issued SAS No. 59. However, since SAS No. 59 significantly increased auditors' responsibilities related to the going concern question, it is plausible that auditors' reliance on the characteristics

[37] The studies discussed in this section were those that specifically evaluated auditors' GCOs. Other studies used similar methods to evaluate audit opinion qualifications in general (e.g. Bell and Tabor 1991, Hopwood, Mckeown, and Mutchler 1989, and Dopuch, Holthausen and Leftwich 1987). The audit opinions investigated in these include those qualified due to litigation, consistency, contingent

increased in post-SAS No. 59 periods. Tests in the current study evaluate auditors' reliance on the financial characteristics listed in the standards using pre and post-SAS No. 59 companies. Specifically, the tests evaluate whether the auditors' reliance on the characteristics increased with their responsibilities in post-SAS No. 59 periods. The testable hypothesis is stated as follows:

Hypothesis 7: When evaluating the going concern assumption, auditors' decisions are more consistent with financial characteristics identified by SAS No. 59 (and 34) after the ASB issued SAS No. 59 than before.

Auditors' Propensities to Issue GCOs

Carcello et al. (1995), Johnson and Khurana (1995), and Raghunandan and Rama (1995) investigated whether the proportion of firms that received GCOs prior to bankruptcy increased after SAS No. 59 became effective.[38] The latter two studies reported that auditors were more likely to issue GCOs prior to bankruptcy after SAS No. 59 was implemented. Raghunandan and Rama (Johnson and Khurana) used samples of 82 (78) and 93 (107) bankrupt companies from periods before and after the standard's effective date.[39] The proportion of bankrupt companies that received GCOs prior to bankruptcy for the pre (post) SAS No. 59 samples ranged from 39% to 46% (57% to 62%). Both studies reported that their logistic regression results that used audit opinions

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liabilities, asset realization, multiple uncertainties, as well as going concern. The sample periods used in these studies range from 1973 to 1985.

[38] These three empirical studies are the only ones found in the literature that investigated the effect of SAS No. 59 using samples from periods in which the standard's provisions were in effect; consequently, the only issues that have been investigated using samples from the post-SAS No. 59 period relate to the auditors' propensities to issue GCOs to bankrupt and other financially distressed companies.

[39] Raghunandan and Rama (1995) used 1987-1988 (1990-1991) as the pre (post) SAS No. 59 sample period. Johnson and Khurana (1995) used 1986-1988 (1989-1992) as the pre (post) SAS No. 59 sample period.

as the dependent variables indicated that time (pre or post SAS No. 59) was significant.[40] The findings of the studies were interpreted as evidence that auditors were more likely to provide early warning disclosures for bankrupt companies after SAS No. 59 became effective.

The results of the Carcello et al. (1995) study were inconsistent with those of the Johnson and Khurana (1995) and Raghunandan and Rama (1995) studies discussed above. Their sample included 211 (119) bankrupt companies from the pre (post) SAS No. 59 period.[41] They reported that the proportions of firms that received GCOs prior to bankruptcy were not significantly different before (51.7%) and after (54.6%) the issuance of SAS No. 59. Additionally, their logistic regression results that used audit opinions as the dependent variables indicated that time (pre or post SAS No. 59) was not significant.[42] Carcello et al. (1995) concluded that even though the ASB issued the new standard in response to a going concern expectations gap, it does not appear that the gap between audit firm reporting and users' expectations has been reduced. That is, the audit opinions were not more likely to signal early warnings of potential failure subsequent to SAS No. 59.

Raghunandan and Rama (1995) is the only study that examined effects of SAS No. 59 on auditors' propensities to issue GCOs to financially distressed companies other than

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[40]The control variables included in the Raghunandan and Rama (1995) model were: (1) Size measured by ln(sales), (2) current ratio, (3) decline in current ratio, (4) total liabilities/total assets, (5) dummy variable of 1 if net income was negative for past two years, 0 otherwise, (6) cash flow from operations/total liabilities and, (7) dummy variable for time, 0 (1) if pre (post) SAS No. 59. The control variables used by Johnson and Khurana (1995) were: (1) size measured by ln(sales) and, (2) financial distress as determined by the McKeown et al. (1991) bankruptcy prediction model.

[41] Carcello et al. used 1982-1988 (1990-1992) as the pre (post) SAS No. 59 sample periods.

[42] The control variables used in their model were: (1) dummy variable for SAS No. 34 period, (2) dummy variable for SAS No. 59 period, (3) financial distress as determined by the Zmijewski (1984)

bankruptcies.[43] They hypothesized that auditors were more likely to issue GCOs after SAS No. 59 became effective. Their sample included 174 and 188 nonbankrupt, but financially stressed, companies from periods before and after SAS No. 59's effective date. They reported that 22% (35%) of the pre (post) SAS No. 59 companies received GCOs. Their logistic regression results using audit opinions as the dependent variables indicated that time (pre or post SAS No. 59) was significant. They interpreted their findings as evidence that auditors are more likely to issue GCOs to financially distressed companies subsequent to the issuance of SAS No. 59; furthermore, they contended that their results were consistent with the position that the efforts of the ASB, in issuing SAS No. 59 as an expectation gap standard, were successful.

Given the level of interest expressed by the ASB, financial statement users, and government in the going concern standards, the extant research subsequent to SAS No. 59 is sparse. Furthermore, the studies do not provide consistent evidence about the standard's effect on auditor GCOs. Only two of three studies reported that audit opinions were more likely to provide early warning signals of impending bankruptcy after SAS No. 59 became effective. Raghunandan and Rama (1995) is the only study that considered the standard's impact on audit opinions for financially distressed companies other than bankruptcies. They reported that companies in financial distress were more likely to receive GCOs subsequent to SAS No. 59.

In general, the studies discussed above indicated that the expectations gap narrowed based on the higher proportions of GCO firms after the standard became effective;

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bankruptcy prediction model, (4) audit lag (number of days between financial statement and audit report date) as a measure of audit effort and, (5) dummy variable for default status.

however, additional research is warranted to add credence to these findings. A potential problem with two of the studies discussed above relates to their use of bankruptcy prediction models. Carcello et al. (1995) and Johnson and Khurana (1995) used model predictions to control for the financial condition of firms.[44] To the extent these models do not accurately measure the financial stress of firms in time periods and industries different from those used to develop the model, the results of these studies may be open to question. As previously discussed, this study evaluates the generalizability of bankruptcy prediction models when used in this context. Also, this study provides additional evidence related to the propensity of auditors to issue GCOs before and after the effective date of SAS No. 59 using bankrupt and other financially distressed companies. The testable hypotheses related to the propensity of auditors to issue GCOs are set forth as follows:

Hypothesis 8: Auditors are more likely to issue GCOs to firms that go bankrupt in post-SAS No. 59 periods than in pre-SAS No. 59 periods.

Hypothesis 9: Auditors are more likely to issue GCOs to financially distressed companies other than bankruptcies in post-SAS No. 59 periods than in pre-SAS No. 59 periods.

Financial Condition and Size

Prior research suggests that financial condition and size are the most important determinants in whether auditors issue GCOs (Carcello et al. 1995, Raghunandan and Rama 1995, Johnson and Khurana 1995, Chen and Church 1992, Mckeown et al. 1991,

[43] Companies were deemed financially distressed if they met any one of the following criteria: (1) negative working capital, (2) negative cash flow from operations or, (3) negative net income.
[44] Zmijewski's (1984) model was used in the Carcello et al. (1995) study. As previously discussed, Zmijewski's model is one of three models evaluated in this study.

and Mutchler 1986). In general, studies have reported that relatively smaller companies and companies in poorer financial conditions are more likely to receive GCOs. Post-SAS No. 59 studies that evaluated auditors' GCOs included control variables in their logistic models to ensure that the observed differences in the proportion of GCOs before and after SAS No. 59 were attributable to the standard, not the financial condition and size of firms (e.g., Carcello et al. 1995, Raghunandan and Rama 1995, and Johnson and Khurana 1995). However, these studies did not assess whether the financial condition and size of firms receiving GCOs changed subsequent to SAS No. 59.

As previously discussed, the ASB sought to create the perception among users and others that SAS No. 59 increased auditors' responsibilities for evaluating the going concern question. Raghunandan and Rama (1995) and Hopwood et al. (1994) suggest that, subsequent to the standard, higher costs are associated with not issuing GCOs to companies that subsequently fail; consequently, the level of conservatism exhibited by auditors in going concern evaluations likely increased. As indicated in the Carcello et al. (1995), Raghunandan and Rama (1995), and Johnson and Khurana (1995) studies, it is plausible to posit that the propensity of auditors to issue GCOs increased subsequent to SAS No. 59; however, it is just as plausible to suggest that auditors may issue GCOs to companies from broader ranges of financial conditions and sizes subsequent to the standard.

This study evaluates the financial condition and size of firms that received GCOs before and after the issuance of SAS No. 59. Since no evidence exists to suggest that the ASB intended to broaden the range of firms that receive GCOs, it is necessary to

evaluate whether the standard had this effect on the going concern decision. The above discussion leads to the following testable hypotheses:

Hypothesis 10: Companies that received GCOs in post-SAS No. 59 periods were financially stronger than those that received GCOs in pre-SAS No. 59 periods.

Hypothesis 11: Companies that received GCOs in post-SAS No. 59 periods were larger than those that received GCOs in pre-SAS No. 59 periods.

Prediction Models as Audit Tools

Altman and McGough (1974) provided a link between bankruptcy prediction models and auditors' opinion decisions by comparing the accuracy of Altman's (1968) bankruptcy prediction model to auditors' opinions prior to the bankruptcy event. They analyzed the model's predictions and auditors' opinions for 34 firms that filed bankruptcy during the 1970-1973 period. The results indicated that the Z-score model correctly signaled impending failure prior to bankruptcy in 82% of the cases. They reported that auditors' opinions signaled impending failure in only 46% of the cases.[45]

Altman (1982) extended the evaluation of Altman's (1968) model in the auditors' opinion context using two additional samples: (1) 37 bankrupt firms from 1974-1978 and (2) 44 bankrupt firms from 1978-1982. The Z-score model correctly signaled impending failure for 81.1% (93%) of the 1974-1978 (1978-1982) companies; additionally, he reported that auditors issued GCOs to 59.5% (40%) of the 1974-1978 (1978-1982) companies. Combining the results of the Altman and McGough (1974) and Altman (1982) studies, the Z-score model (auditors) provided early warning signals of subsequent failure in 86.2% (48.1%) of the cases.

These results are somewhat dated since the samples used to evaluate the model were selected from the pre-SAS No. 59 period.[46] The ASB argued that, at one extreme, all research performed prior to the issuance of SAS No. 59 is of only historical interest since the standard significantly changed (Carmichael and Pany 1993).[47] Even so, both studies concluded that Altman's (1968) model was a useful tool for auditors' going concern evaluations. Additionally, the results supported the notion that bankruptcy prediction models are better than auditors at signaling the future prospects of companies.[48]

Carmichael and Pany (1993) indicated that auditors' failures to issue GCOs to bankrupt companies were at the heart of the expectations gap between auditors and financial statement users. SAS No. 59 charged the auditor with an affirmative responsibility for investigating the going concern status of a firm; consequently, it is questionable whether auditors' opinions continue to be inferior to bankruptcy prediction models at providing early warning signals of impending bankruptcies after the more stringent standard was issued. This study evaluates whether the gap between the models' and auditors' accuracies for signaling impending failure narrowed subsequent to SAS No. 59. Finding that the gap has narrowed would suggest that the ASB's efforts to

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[45] The auditors' opinions correctly signaled impending failures when GCOs were issued to bankrupt companies prior to bankruptcy.

[46] Prior studies have not evaluated the use of bankruptcy prediction models as audit tools for assessing the going concern issue using data from periods subsequent to the issuance of SAS No. 59.

[47] It should be noted that only three studies have evaluated auditors' GCOs using samples from periods subsequent to SAS No. 59. Carcello et al. (1995), Raghunandan and Rama (1995), and Johnson and Khurana (1995) used post-SAS No. 59 samples to evaluate the propensity of auditors to issue GCOs before and after the standard.

[48] Zmijewski's (1984) and Ohlson's (1980) models have never been evaluated as decision aids to auditors in the going concern judgment. Studies that developed bankruptcy prediction models and evaluated the models in the context of auditors' GCOs include Deakin (1977), Levitan and Knoblett (1985), Koh (1991), and Hopwood, Mckeown, and Mutchler (1994). These studies used 1970-1981 firms to evaluate the models' and auditors' accuracies at signaling impending failure. They reported models' (auditors') accuracies ranging from 13% (15%) to 89% (66%). Additionally, Koh (1991) and

increase auditors' responsibilities in the going concern evaluation have been effective. The testable hypothesis is set forth as follows:

Hypothesis 12: Auditors' GCO decisions are more consistent with the models' predictions for bankrupt companies after the issuance of SAS No. 59.

Prior studies used restricted samples, that included only bankrupt companies, to evaluate bankruptcy prediction models in the auditors' opinion context (e.g., Hopwood, Mckeown, and Mutchler 1994, Koh 1991, Levitan and Knoblett 1985, Altman 1982, Deakin 1977, and Altman and McGough 1974). Arguably, firms that declare bankruptcy should have received GCOs; however, firms that receive GCOs do not always file for bankruptcy. Auditors are confronted with decisions of whether to issue GCOs to firms from a variety of financial distress situations, not just bankruptcies. This study evaluates the ability of the Zmijewski, Ohlson, and Altman bankruptcy prediction models to foreshadow GCOs for financially distressed companies other than bankruptcies. For the models, the testable hypothesis can be stated as follows:

Hypothesis 13: Auditors' GCO decisions are more consistent with the models' predictions for financially distressed companies, other than bankruptcies, after the issuance of SAS No. 59.

Levitan and Knoblett (1985) reported that both auditors and models correctly classified 100% of the nonbankrupt companies.

CHAPTER IV

RESEARCH DESIGN

As previously indicated, the overall objectives of this study are to (1) evaluate the Zmijewski, Ohlson, and Altman models as audit tools for the going concern judgment and (2) evaluate the impact of SAS No. 59 on auditors' GCO decisions. This section describes the samples and tests used to evaluate hypotheses related to objectives of the proposed research. Specifically, this section describes the selection criteria used to identify the distressed and nondistressed sample companies. Also, it explains the methodology employed to evaluate the usefulness of the models as audit tools in going concern assessments as well as that used to evaluate the effects of SAS No. 59 on auditors' opinion decisions.

Sample

The analyses in this study used a 1985-1987 estimation sample and a 1988-1991 prediction sample, with each sample including distressed and nondistressed firms.[49] Distressed companies were defined as those reported by Compustat as meeting one or more of the following conditions:[50]

[49] This study used S&P ratings for stocks and bonds from Compustat's Industrial Annual Research File (CIAR) and Industrial Annual File (CIA) to identify the firms used in this study. CIAR and CIA did not report these ratings prior to 1985. CIAR contains firms that were deleted from CIA for various reasons, including bankruptcy and liquidation. Since the number of bankrupt and liquidated firms identified on CIAR subsequent to 1991 was minimal, the final year in the prediction sample was 1991. The results reported in this study did not change when the prediction sample was extended to include companies from 1992 and 1993.

[50] The Compustat codes used in this study to identify bankruptcies and liquidations were used in prior studies that evaluated bankrupt and liquidated companies (e. g., Barth, Beaver, and Landsman 1996).

- Chapter 11 Bankruptcy: Compustat's Industrial Annual Research File (CIAR) contains companies that were deleted from the Industrial Annual File (CIA) because of bankruptcy. CIAR identifies bankrupt firms with an 02 code for footnote 35.[51]
- Chapter 7 Liquidation: CIAR also contains companies that were deleted from CIA because of liquidation. CIAR identifies liquidated firms with an 03 code for footnote 35.
- Bonds vulnerable to default: Both CIAR and CIA report bond ratings for companies evaluated by S&P. Companies with bonds rated CCC or below were included in the distress sample. These companies were identified by codes 19-24 for data item 280.
- Low stock rating: CIAR and CIA also report stock ratings for companies evaluated by S&P. Companies whose stock was rated as "lower B" and below were included in the distressed sample. These companies were identified by codes 18-22 for data item 282.

The nondistressed firms were selected randomly from the population of firms that were evaluated by S&P but did not receive poor S&P stock or bond ratings.[52] That is, companies that maintained codes for data item 280 (282) that were less than 19 (18) were included in the nondistressed population.[53]

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[51] CIAR and CIA also identified firms in bankruptcy or liquidation using code TL for footnote 27; however, the footnote did not distinguish between bankruptcy and liquidation. Approximately 82% of the firms from CIAR that were coded TL for footnote 27 also were coded 02 for footnote 35. Thus, firms coded TL for footnote 27 were included as bankruptcies. The results reported in this study did not change when bankruptcies included firms coded 02 or 03 for footnote 35.

[52] A random number generator was used to select the companies for the nondistressed group. The method used to select the companies was one that: (1) closely equated the number of nondistressed firms in the 1985-1987 and 1988-1991 samples; and (2) minimized the probability of selecting the same firm for multiple years since each sample year included many of the same nondistressed companies.

[53] Firms not rated by S&P were excluded from the nondistressed population because it was not reasonable to assume firms were nondistressed just because they were not rated by S&P.

The final 1985-1987 samples for the X, Y, and Z-score models included 1,022 companies (181 distressed and 887 nondistressed), 1059 companies (153 distressed and 906 nondistressed), and 972 companies (148 distressed and 824 nondistressed). These samples were used to reestimate Zmijewski's (1984), Ohlson's (1980), and Altman's (1968) original coefficients shown in equations (1), (2), and (3). The final 1988-1991 samples for the X, Y, and Z-score models included 1,024 (183 distressed and 841 nondistressed), 1,043 (154 distressed and 889 nondistressed), and 1,002 (148 distressed and 854 nondistressed) companies. These samples were used to evaluate the predictive accuracies of the original and reestimated (1985-1987) X, Y, and Z-score models. The financial ratios described in equations (1), (2), and (3) were calculated for each firm in both samples with data from CIAR and CIA.

Two subsets of the 1988-1991 sample were used in analyses for this study. A subset of the distressed and nondistressed firms from the industries used by Zmijewski, Ohlson, and Altman to develop their models was used to evaluate the sensitivity of the models to industry classifications. A subset of distressed firms with code 02 for footnote 35 or code TL for footnote 27 was used to evaluate the sensitivity of the models to bankruptcy as opposed to other financial distress situations.

Table 1 reports descriptive statistics, by distressed and nondistressed groups, for the 1985-1987 samples used to reestimate the X, Y, and Z-score models' coefficients. A comparison of the 1985-1987 distressed and nondistressed variable means for the Zmijewski sample indicated that the ratios deteriorated in the distressed group. For example, net income to total assets was lower for the distressed (-3.0791) than for the nondistressed group (.0451). Also, the total debt to total assets and current assets to

current liabilities ratios were higher for the distressed than for the nondistressed group. The p-values for the test of mean differences between distressed and nondistressed companies were significant for the net income to total assets, total debt to total assets, and current assets to current liabilities variables. Zmijewski (1984) did not indicate whether the variable means for his estimation sample were significantly different between the distressed and nondistressed groups.

A comparison of the 1985-1987 distressed and nondistressed variable means for the Ohlson sample also indicated that each variable deteriorated in the distressed group. For example, total liabilities to total assets was higher for the distressed (.8981) than for the nondistessed group (.5541). Also, the performance measure, return on assets, was lower for the distressed (-.2492) than the nondistressed group (.0431). The p-values for the test of mean differences between distressed and nondistressed companies were significant for each of the variables except for the measure of change in net income. The descriptive statistics for Ohlson's variables using the 1985-1987 sample were similar to those reported by Ohlson (1980). Ohlson indicated that all the variable means were significantly different between the distressed and nondistressed groups at a .05 level.

A comparison of the 1985-1987 distressed and nondistressed variable means for the Altman sample indicated that working capital to total assets, retained earnings to total assets, and earnings before interest and taxes to total assets deteriorated in the distressed group. For example, the liquidity measure, working capital to total assets, was lower for the distressed (.0921) than for the nondistressed group (.2292). The p-values for the test of mean differences between distressed and nondistressed companies were significant for each of these variables. These results indicate that the working capital to total assets,

retained earnings to total assets, and earnings before interest and taxes to total assets variables discriminate between 1985-1987 distressed and nondistressed firms. The means for market value of equity to book value of total debt and sales to total assets were not significantly different between the distressed and nondistressed groups. The descriptive statistics for Altman's (1968) variables using the 1985-1987 sample were similar to those reported by Altman (1968) for his estimation sample except for market value of equity to book value of total debt. The mean for market value of equity to book value of total debt was significantly different between his bankrupt and nonbankrupt samples.

The descriptive statistics for the 1988-1991 prediction samples also are reported in Table 1. For each sample, these statistics were similar to those of the 1985-1987 sample except for the measure of change in net income (Ohlson sample) and sales to total assets (Altman sample). The means of these ratios were (were not) significantly different between the distressed and nondistressed firms in the 1988-1991 (1985-1987) sample; however, since sales to total assets is a capital turnover ratio that measures the sales generating ability of the firm's assets, it was expected to be lower for the distressed companies than for the nondistressed.

The Zmijewski, Ohlson, and Altman models used financial ratios that discriminated among industrial firms. This study evaluated the predictive accuracy and reestimated the coefficients of the models using both industrial and non-industrial companies. Consequently, the financial data necessary to calculate the models' ratios were not on

CIAR and CIA for some non-industrial companies.[54] Companies were deleted from the sample if CIAR and CIA did not report the necessary financial data. Table 2 reports the distribution for companies, by industrial and non-industrial classifications, in the 1985-1987 and 1988-1991 samples. Both samples included approximately the same number of industrial and non-industrial firms in the distressed and nondistressed groups. The equal distribution of the industrial and non-industrial firms within each sample was necessary to clearly demonstrate the sensitivity of the X, Y, and Z-score models to industry classifications as discussed later in this section.

The 1985-1987 and 1988-1991 sample distributions for the distressed and nondistressed companies are reported by year in Table 3. Since analyses in this study evaluated the predictive accuracy and reestimated the coefficients of X, Y, and Z-score models using only bankruptcies from the samples, the distributions for the distressed firms were partitioned into two categories: (1) those identified as distressed because of bankruptcy; (2) those identified as distressed for reasons other than bankruptcy. The 1985-1987 (1988-1991) samples included 70 to 98 (88 to 121) bankrupt companies and 72 to 83 (54 to 64) companies that were identified as financially distressed because of reasons other than bankruptcy. The mix of financially distressed companies attributable to bankruptcy and those attributable to factors other than bankruptcy was used to evaluate the sensitivity of the models to various financial conditions as discussed later in this section.

The distressed companies' audit opinions were needed for this study's analyses related to the impact of SAS No. 59 on auditors' going concern decisions. Codes for

[54] CIAR and CIA do not report current assets or current liabilities for financial institutions, life

auditors' opinions reported on CIAR and CIA were used to identify whether the distressed companies received GCOs or NGCOs. Companies with GCOs were defined as those reported by Compustat as meeting one of the following conditions:[55]

- Unqualified opinion with explanatory language: Both CIAR and CIA code data item 149 as 4 when auditors expressed an unqualified opinion regarding the financial statements by adding explanatory language to the standard report.[56]
- Disclaimer: Both CIAR and CIA code data item 149 as 3 when auditors refused to express opinions regarding companies' abilities to sustain operations as going concerns.[57]

Table 4 reports the distribution of the GCOs by year and type. Pursuant to SAS No. 59, when auditors have substantial doubt about companies' abilities to continue as going concerns, they are required to issue either unqualified with an explanatory paragraph or disclaimer opinions. However, virtually no authoritative guidance or published research exists that auditors could use for determining which type of opinion to issue (LaSalle and Anandarajan 1996). Furthermore, LaSalle and Anandarajan (1996) indicated that no evidence exists to suggest that the differences in auditors' reporting decisions related to going concern decisions are systematic; consequently, this study included both unqualified with an explanatory paragraph and disclaimer opinions as GCOs. However,

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insurance, or property and casualty companies.

[55] The companies with NGCOs were defined as those not meeting any of the conditions.

[56] Prior to 1988, data item 149 was coded 2 on CIAR and CIA when auditors modified their opinion because of uncertainties regarding companies' ability to continue as going concerns.

[57] Prior to 1988, data item 149 was coded 3 on CIAR and CIA when auditors refused to express an opinion regarding companies' abilities to sustain operations as going concerns.

Table 4 shows that substantially all of the GCOs used in this study were unqualified opinions with explanatory paragraphs.

The remainder of this section discusses the tests used in this study to evaluate the X, Y, and Z-score models as audit tools in the going concern judgment, as well as those used to evaluate the impact of SAS No. 59 on auditors' going concern decisions. Table 5 provides a brief summary of the method, objective, and related hypothesis for each test.

Classification Accuracy

Tests 1-3 listed in Table 5 evaluated the classification accuracies of the X, Y, and Z-score models using: (1) the full 1988-1991 sample, (2) a subset of the sample containing only bankrupt firms in the distressed group, and (3) a subset of the sample containing only industrial firms in both distressed and nondistressed groups. The x, y, and z-scores were derived for each of these samples using the coefficients shown in equations (1), (2), and (3), respectively. Companies were predicted to be distressed or nondistressed based on these scores.[58] The accuracies of the X, Y, and Z-score models were calculated by dividing the number of firms correctly predicted by the total number of firms in the sample.

The classification accuracies using the full 1988-1991 sample, as well as the industrial and bankruptcy subsets of the sample, were used to evaluate the stationarity of the X, Y,

[58] The x and y-scores were converted to bankruptcy probabilities using the calculations previously described in footnotes 15 and 17. Companies were classified as distressed if their bankruptcy probabilities were > 50% (Zmijewski 1984 and Ohlson 1980). Firms were classified as distressed if their z-score was < 2.675 (Altman 1968). Firms with a 2.675 z-score had approximately a 50% chance of being classified as distressed in Altman's study.

and Z-score models across time. As previously discussed, the models' coefficients were originally estimated using 1946-1978 firms; however, these coefficients continue to be used to evaluate the financial health of firms in recent periods. Test 1 used a statistical test for comparing two binomial proportions to test the significance of differences between the model's accuracies reported in the Zmijewski (1984), Ohlson (1980), and Altman (1968) studies and those reported in the current study using the 1988-1991 sample.[59]

The X, Y, and Z-score models' classification accuracies using a subset of the 1988-1991 sample containing only industrial firms were used to evaluate the sensitivity of the models to non-industrial companies. Though Zmijewski, Ohlson, and Altman developed their models using industrial firms, the models are routinely applied to non-industrial companies. Test 2 used binomial tests to compare the models' classification accuracies using the full 1988-1991 sample, which contained both industrial and non-industrial firms, to those using the industrial subset of the sample. A significant difference between these accuracies would indicate that the model was sensitive to industry classifications.

The classification accuracies of the X, Y, and Z-score models using a subset of the 1988-1991 sample containing only bankrupt firms was used to evaluate the models' abilities to assess financial distress other than bankruptcy. The models were developed specifically as bankruptcy prediction models; however, they are often more generally used to assess financial distress. Test 3 used binomial tests to compare the models' classification accuracies using the full 1988-1991 sample, which contained firms from

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[59] The binomial test used in this study is from Ott (1993). Define π_1 and π_2 as the proportion of successes (correct predictions) for two samples, n_1 and n_2. The test statistic was calculated as (π_1 -

various financial distress situations, to those using the bankruptcy subset of the sample. A significant difference between these accuracies would indicate the models were sensitive to financial distress situations other than bankruptcy.

Model Reestimations

For Tests 4 and 5 listed in Table 5, the X, Y, and Z-score models' coefficients were reestimated using the 1985-1987 estimation sample. The coefficients were reestimated using the methodology originally employed to derive the models. Zmijewski and Ohlson used probit and logit analysis to derive the models shown in equations (1) and (2), respectively. Altman (1968) used discriminant analysis (DA) to estimate the linear discriminant function shown in equation (3). Arguably, DA is no longer the prevalent statistical methodology used by bankruptcy prediction researchers to develop prediction models.[60] The use of DA was necessary in this study so direct comparisons could be made between the coefficients in the original and reestimated Z-score models.[61]

The statistical methodologies discussed above were used to reestimate the X, Y, and Z-score models' coefficients. For each model, the coefficients were reestimated using (1) the full 1985-1987 sample, (2) a subset of the sample containing only bankrupt firms

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$\pi 2)/\sigma$ $\pi 1 - \pi 2$. The binomial test is appropriate if $ni\pi i$ and $ni(1 - \pi i)$ are greater than 5.

[60] The prevalent statistical methodologies used by bankruptcy prediction researchers are conditional probability models such as the logit and probit models used by Zmijewski (1984) and Ohlson (1980). See Jones (1987) for detailed discussions of DA, logit, probit, and other statistical methodologies used in bankruptcy prediction research.

[61] Linear models, such as equation (3) derived using DA, assume the variance-covariance matrices of the distressed and nondistressed groups are equal. Unequal variance-covariance matrices for the groups suggest that a quadratic discriminant function may be more suitable for the sample. Altman's (1968) study does not report information related to this assumption. However, prior research suggests that the samples used to derived bankruptcy prediction models typically violate the equal variance-covariance matrix assumption (Jones 1987). Consequently, bankruptcy prediction researchers began using

in the distressed group, and (3) a subset of the sample containing only industrial firms in both distressed and nondistressed groups. Subsequent discussion refers to these models as (1) the 1985-1987 X, Y, and Z-score models, (2) the bankruptcy-only X, Y, and Z-score models, and (3) the industrial-only X, Y, and Z-score models.

Test 4 compared the magnitude and significance of the coefficients for the industrial-only and bankruptcy-only X, Y, and Z-score models to those for the 1985-1987 X, Y, and Z-score models, respectively, to evaluate whether reestimations of the models were sensitive to industry classifications or financial conditions. As discussed above, the samples used to reestimate these models differed in terms of industry or financial conditions. As such, differences in the coefficients of the models would indicate a sensitivity to industry or financial distress situations. Test 5 compared the coefficients of the 1985-1987 X, Y, and Z-score models to those shown in equations (1), (2), and (3), respectively, to provide further evidence about the stationarity of the models. If the models are stationary, then the coefficients reported in equations (1), (2), and (3) should equal those of the reestimated models.

The classification accuracies also were evaluated for the 1985-1987, bankruptcy-only, and industrial-only (X, Y, and Z-score) models using the 1988-1991 prediction sample. Test 6 used binomial tests to compare the accuracies of the reestimated models to those using the original Zmijewski (1984), Ohlson (1980), and Altman (1968) models. These tests provided evidence about whether the discriminating ability of the X, Y, and Z-score models' coefficients was affected when they were reestimated using a recent sample.

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conditional probability models, such as logit and probit models, because these models are not limited by the stringent assumptions of DA (Jones 1987).

Also, this test demonstrates the effect of using proportionate samples to develop bankruptcy prediction models on their Type I and Type II errors.

Predictive-Ability of Financial Characteristics

The financial characteristics listed in SAS No. 59 (and 34) to assist auditors in their going concern evaluations are the following trends: (1) recurring operating losses, (2) working capital deficiencies, (3) negative cash flows from operations, and (4) adverse key financial ratios. Test 7 evaluated the whether auditors' use of these financial characteristics changed after the issuance of SAS No. 59 using the following samples:

- Pre-full sample: The 1985-1987 distressed sample.
- Post-full sample: The 1988-1991 distressed sample.[62]

The combined (pre-full and post-full) sample was partitioned into two groups: (1) those companies that received GCOs and, (2) those companies that received NGCOs. A logistic regression model was developed using audit opinions (GCO and NGCO) as dependent variables and measures of the financial characteristics set forth in the auditing standards as the independent variables.

As previously indicated, SAS No. 59 increased auditors' responsibilities for evaluating the going concern question; however, the financial characteristics set forth by the ASB as conditions that may alert auditors to companies with going concern problems

[62] The 1985-1987 (1988-1991) distressed samples represent the pre (post) SAS No. 59 periods. SAS No. 59 was effective for audit reports issued after January 1, 1989; however, the ASB heavily encouraged early implementation of SAS No. 59 when it issued the standard in February 1988. Analyses in this study were performed with and without 1988 firms in the post-SAS No. 59 samples. The results of tests excluding 1988 companies did not change the findings reported in this study except where indicated.

are the same for SAS Nos. 34 and 59. This test evaluated whether auditors' use of these characteristics in going concern evaluations increased after the ASB issued SAS No. 59.

For test 7, the following logistic regression model for auditors' opinion decisions was developed:

$$GC = B_0 + B_1 TIME + B_2 NOI + B_3 NOI*TIME + B_4 CR + B_5 CR*TIME + B_6 NOCF + B_7 NOCF*TIME + B_8 DTA + B_9 DTA*TIME + B_{10} SIZE + B_{11} SIZE*TIME + \varepsilon \quad (4)$$

where

GC = 1 for GCO, 0 otherwise;
TIME = 1 for post-SAS No. 59, 0 otherwise;
NOI = number of the previous three years with negative operating income;
CR = change in the current ratio measured as $(CR_t - CR_{t-2}) / CR_{t-2}$;
NOCF = number of the previous three years with negative operating cash flows;
DTA = change in the debt to total assets ratio measured as $(DTA_t - DTA_{t-2}) / DTA_{t-2}$;[63]
SIZE = natural log of total assets$_t$;[64]
ε = error term.

For test 7, the variables of interest in equation (4) are those that measure the interactions between financial ratios and TIME (pre and post-SAS No. 59). If the logistic regression results indicate that the interaction variables are significant, then the evidence suggests that auditors' reliance on the financial characteristics listed in the standards changed after the issuance of SAS No. 59.[65] Also, the significance of individual coefficients from equation (4) was used to evaluate the usefulness of the

[63] The results reported by Levitan and Knoblett (1985) indicated that auditors tend to rely heavily on the degree of financial leverage when making opinion decisions. They reported that auditors seem to emphasize debt to total assets in their GCO decisions; thus, debt to total assets was included as an adverse key financial ratio in the auditors' opinion decision model.

[64] As previously indicated, prior studies suggest that size is an important determinant in whether auditors issue GCOs. However, the financial characteristics listed in SAS Nos. 34 and 59 do not include measures of company size; consequently, SIZE was included in the model as a control variable.

[65] The design of this study is such that auditors' reliance on the financial characteristics in going concern evaluations, before and after SAS No. 59, cannot be measured directly (e.g., interviews or questionnaires). However, the results of test 7 can be interpreted as being consistent, or inconsistent, with auditors' reliance.

financial characteristics in auditors' going concern judgments under the provisions of SAS No. 59.[66]

Propensity of Auditors to Issue GCOs

Tests 8 and 9 evaluate the propensity of auditors to issue GCOs before and after the issuance of SAS No. 59. The proportions of companies that received GCOs were measured using the following samples:

- Pre-bankruptcy sample (pre-B): Subset of the 1985-1987 distressed sample containing only bankrupt companies.
- Post-bankruptcy sample (post-B): Subset of the 1988-1991 distressed sample containing only bankrupt companies.
- Pre-financial distress sample (pre-FD): Subset of the 1985-1987 distressed sample containing only financially distressed companies other than bankruptcies.
- Post-financial distress sample (post-FD): Subset of the 1988-1991 distressed sample containing only financially distressed companies other than bankruptcies.

For each sample, the proportion of firms that received GCOs was calculated by dividing the number of firms that received GCOs by the total number of firms in the sample.

Test 8 used the proportions of bankrupt firms that received GCOs from the pre-bankruptcy and post-bankruptcy samples to evaluate whether the likelihood of auditors to issue GCOs to bankrupt companies changed under the provisions of SAS No. 59. As previously discussed, SAS No. 59 requires auditors to actively investigate the going

[66] For example, the sum of the NOI and NOE*TIME coefficients provide evidence as to the usefulness of

concern question for all financial statement audits. Arguably, the auditors' increased responsibilities also increased the cost of issuing NGCOs to companies that subsequently fail; consequently, auditors are more likely to issue GCOs to bankrupt companies after the issuance of SAS No. 59. For test 8, binomial tests were used to compare the proportion of GCO companies in the pre-B sample to that of GCO companies in the post-B sample. A significant increase in the proportion of GCO companies in the post-B sample would suggest that auditors are more likely to provide early warning signals for bankrupt companies after the issuance of SAS No. 59.

Test 9 used the proportions of GCO companies in the pre-financial distress and post-financial distress samples to evaluate whether the likelihood of auditors to issue GCOs to financially distressed companies, other than bankruptcies, changed under the provisions of SAS No. 59. Since SAS No. 59 increased auditors' responsibilities related to the going concern issue, it is plausible that they are more conservative in their evaluations of the going concern question. As a result, auditors are more likely to issue GCOs to financially distressed companies, other than bankruptcies, under SAS No. 59 than they were before the issuance of the standard. For test 9, binomial tests were used to compare the proportion of GCO firms in the pre-FD sample to that of GCO firms in the post-FD sample. A significant increase in the proportion of GCO companies in the post-FD sample would suggest that auditors are more likely to issue GCOs to financially distressed companies, other than bankruptcies, after the issuance of SAS No. 59.

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the NOI variable in auditors' going concern decisions for the post-SAS No. 59 period (1988-1991).

Financial Condition and Size of GCO Companies

Tests 10 and 11 evaluated whether the financial condition and size of companies that received GCOs prior to the issuance of SAS No. 59 were different from those that received GCOs subsequent to the standard. As previously discussed, prior studies indicated that the most important determinants in whether auditors issued GCOs were companies' financial health and size. Though the post-SAS No. 59 studies controlled for these factors, they did not evaluate whether GCO companies' financial condition and size changed after the issuance of SAS No. 59. Tests 10 and 11 evaluated GCO companies' financial health and size using the pre-full and post-full samples.[67]

The analyses for Tests 10 and 11 required the following financial measures: (1) leverage--debt to total assets, (2) liquidity--cash flow from operations to total assets, (3) solvency--current assets to current liabilities, (4) performance--net income to total assets and, (5) size--natural log of total assets.[68] Testing procedures for comparing two population means were used to evaluate the financial condition (e.g., ratios) and size of GCO companies before and after the issuance of SAS No. 59.[69] Evidence that GCO firms in the post-full sample are financially stronger, or larger, than those in the pre-full sample would suggest that auditors' GCO decisions are more conservative after the

[67] The variables used to control for financial condition and size in post-SAS No. 59 studies were evaluated to identify the financial measures used in this analysis. Since the prior studies often used bankruptcy probabilities, as opposed to individual ratios, as a control variable for financial condition, the analysis described in this section was also performed using bankruptcy probabilities. The bankruptcy prediction model used to derive the probabilities was determined based on this study's tests of the generalizability of the X, Y, and Z-score models. Since Zmijewski's (1984) model exhibited the highest classification accuracy, it was used to derive the bankruptcy probabilities.

[68] The financial ratios for the entire pre-full and post-full samples were used as a comparison group for the analyses in Tests 10 and 11. The samples' ratios were used to standardize the GCO firms' ratios (e.g., mean of debt to total $assets_{gco}$ / mean of debt to total $assets_{total}$) to control for economic factors that may have affected the financial health and size of firms in general.

issuance of SAS No. 59. That is, they issue GCOs to both larger and financially stronger companies under the provisions of SAS No. 59.

Prediction Models in the Going Concern Judgment

Tests 12 and 13 listed in Table 5 evaluated the correlation between the X, Y, and Z-score models' predictions and auditors' opinions before and after the issuance of SAS No. 59. The correlation between the models' predictions and auditors' opinions was evaluated using the following samples:[70] (1) pre-bankruptcy, (2) post-bankruptcy, (3) pre-financial distress and, (4) post-financial distress.

Each sample was partitioned into two groups: (1) those companies that received GCOs and were predicted as bankrupt (GCO/bankrupt group) and, (2) those that received NGCOs and were predicted as nonbankrupt (NGCO/nonbankrupt group). The auditors' opinions were correlated with the models' predictions when the auditors issued GCOs (NGCOs) and the models predicted companies as bankrupt (nonbankrupt).

Test 12 used the pre-B and post-B samples to evaluate the correlation between the X, Y, and Z-score models' predictions and auditors' opinions for bankrupt companies. Pre SAS No. 59 studies indicated that models routinely outperformed auditors at signaling impending failures. For example, Altman (1982) indicated the Z-score model (auditors) provided early warning signals of subsequent failure in 86.2% (48.1%) of the bankrupt companies in his sample. However, Chen and Church (1992) suggested that, under the

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[69] This test assumes that: (1) the samples are independent, (2) the samples are drawn from normal populations and, (3) the two population variances are equal.

[70] Nondistressed samples were not included in these analyses since prior studies have shown that models and auditors rarely issued GCOs to healthy firms. For example, both Levitan and Knoblett (1985) and

provisions of SAS No. 59, auditors may use a different process than was used previously in deciding whether to issue GCOs. Binomial tests were used to compare the GCO/bankrupt and NGCO/nonbankrupt groups using the pre-B sample to those using the post-B sample. This test evaluated whether auditors' decisions in going concern evaluations for bankrupt companies were more consistent with the models' predictions after the issuance of SAS No. 59.

Test 13 used the pre-FD and post-FD samples to evaluate the correlation between the X, Y, and Z-score models' predictions and auditors' opinions for financially distressed companies other than bankruptcies. As previously indicated, prior studies limited their samples to include only bankrupt companies; however, auditors must decide whether to issue GCOs to firms from a variety of financial distress situations, not just possible bankruptcies. Binomial tests were used to compare the GCO/bankrupt and NGCO/nonbankrupt groups using the pre-FD sample to those using the post-FD sample. This test evaluated whether auditors' decisions in going concern evaluations for companies from various financial distress situations were more consistent with the models' predictions after the issuance of SAS No. 59.

Koh (1991) reported that the models and auditors correctly classified 100% of the nonbankrupt firms as NGCO companies.

CHAPTER V

RESULTS AND DISCUSSION

This section reports the findings of the tests used to evaluate the generalizability of the X, Y, and Z-score models. The classification accuracies of the models using the 1988-1991 prediction samples and the stability of their coefficients when reestimated using the 1985-1987 estimation samples are discussed. Evidence related to the models' sensitivity to non-industrial firms and financial conditions, as well as the Type I and Type II errors associated with their predictions, are reported. This section also reports the findings of tests used to evaluate the impact of SAS No. 59 on auditors' opinion decisions. The predictive ability of the financial characteristics listed in SAS No. 59 (and 34) are discussed. Also, the propensity of auditors to issue GCOs, as well as the financial health and size of GCO companies before and after SAS No. 59, are presented. Finally, the consistency between the X, Y, and Z-score models' predictions and auditors' opinions is reported.

Reduced Classification Accuracy for the X, Y, and Z-score Models

As reported in Table 6, the X, Y, and Z-score models correctly classified 81.3%, 39.8%, and 57.8% of the firms in the 1988-1991 samples. The binomial test for Test 1 indicated that these accuracy rates were significantly lower than the models' 98.2%, 96.4%, and 83.5% rates, using 1958-1976 samples, reported by Zmijewski (1984), Ohlson (1980), and Altman (1968). Separate classification accuracy rates for the 1988-

1991 sample's distressed and nondistressed groups also are reported in Table 6. Zmijewski's model correctly classified 58.7% and 86.1% of the distressed and nondistressed companies from the 1988-1991 sample. Zmijewski's study reported accuracy rates of 70.7% and 99.5% for his bankrupt and nonbankrupt groups. The separate accuracy rates for the 1988-1991 distressed and nondistressed groups were significantly lower than those reported by Zmijewski.

Ohlson's model correctly classified 95.4% and 30.1% of the distressed and nondistressed companies from the 1988-1991 sample. Ohlson's study reported accuracy rates of 32.4% and 99.4% for his bankrupt and nonbankrupt groups.[71] The separate accuracy rate for the 1988-1991 distressed (nondistressed) group was significantly higher (lower) than that reported by Ohlson. Altman's model correctly classified 70.9% and 55.5% of the distressed and nondistressed firms from the 1988-1991 sample. Altman's (1968) study reported accuracy rates of 96% and 78.8% for his bankrupt and nonbankrupt groups. The separate accuracy rates for distressed and nondistressed companies in the 1988-1991 sample also were significantly lower than those reported by Altman.[72]

For each model, the binomial tests reported in Table 6 showed that these results did not change when subsets of the 1988-1991 sample containing only industrial or bankrupt firms were used. Further discussions of the results using the industrial and bankruptcy subsets are presented in the next two sections.

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[71] The separate accuracy rates reported for Ohlson's model were based on a .50 cutoff probability.

[72] Altman (1983) reported accuracy rates for his Z-score model using a 1969-1975 sample. The rates were 87%, 83%, and 85% for the bankrupt, nonbankrupt, and combined samples. The rates reported in the current study also were significantly lower than those reported by Altman (1983).

The findings of Test 1 support hypothesis 1 for the X, Y, and Z-score models. The overall accuracies of the models were reduced when used on large, proportionate samples from periods different from those used by Zmijewski, Ohlson, and Altman to develop the models.[73] This result suggest that the X, Y, and Z-score models are not stationary across time periods, and, consequently, continued application of the original models is problematic. Additional evidence related to the stationarity of the models was provided by Test 5 discussed later.

Industrial Sample

Test 2 analyzed the sensitivity of the X, Y, and Z-score models to industry classifications to assess whether the models provide more accurate classifications for industrial firms than for non-industrial firms.[74] Subsets of the 1988-1991 sample containing only industrial firms were used for these analyses. The results in Table 6 for Zmijewski's (1984) model indicate that his model's accuracy was not sensitive to industry classifications. The overall accuracy of the model was 80.5% when applied to industrial firms in 1988-1991. The binomial test indicated that this rate was not significantly different than the 81.3% reported for the entire 1988-1991 sample, which included all industries. Also, Zmijewski's model correctly classified 55.1% and 86.4% of the distressed and nondistressed 1988-1991 industrial firms. The results of binomial tests showed that the accuracy rates for the distressed and nondistressed group were not

[73] In tests not reported in this study, the overall classification accuracies of the Zmijewski (1984), Ohlson (1980), and Altman (1968) models were compared. The results of binomial test indicated that the Zmijewski model's classification accuracy was significantly higher than those of the Ohlson and Altman models using 1988-1991 companies.

significantly different between the full 1988-1991 sample and the subset of the sample containing only industrial firms.

Table 6 also reports results for the Ohlson and Altman models. The overall accuracy for Ohlson's (1980) model was 47.4% when applied to industrial firms in 1988-1991. The binomial test indicated that this rate was significantly greater than the 39.8% reported for the entire 1988-1991 sample, which included all industries. The overall accuracy of Altman's (1968) model was 69.1% when applied to industrial firms in 1988-1991. The binomial test indicated that this rate was significantly greater than the 57.8% reported for the entire 1988-1991 sample, which included all industries. This finding indicates that both the Ohlson (1980) and Altman (1968) models were more reliable when used to predict financial distress for industrial companies than when used to predict financial distress for non-industrial companies.

Table 6 also reports that Ohlson's (1980) model correctly classified 94% and 40% of the distressed and nondistressed industrial firms in the 1988-1991 sample. For the entire 1988-1991 sample containing all industries, Ohlson's model correctly classified 95.4% and 30.1% of the distressed and nondistressed groups. Altman's (1968) model correctly classified 69% of both the distressed and nondistressed industrial companies in the 1988-1991 sample. For the entire 1988-1991 sample containing all industries, Altman's (1968) model correctly classified 71% and 56% of the distressed and nondistressed groups. For both the Ohlson and Altman models, the results of binomial tests showed that only the accuracy rates for the nondistressed group were significantly different between the full 1988-1991 sample and the subset of the sample containing only

[74] For the Zmijewski and Ohlson models, the industrial firms included firms with SICs less than 4000

industrial firms. Thus, Ohlson's (1980) and Altman's (1968) models were sensitive to industries for the nondistressed group, but not for the distressed group.

In sum, the findings of Test 2 support hypothesis 3 using the Ohlson (1980) and Altman (1968) models. The results indicated that the use of Ohlson's and Altman's models to predict financial distress for non-industrial companies is questionable; consequently, studies that apply these models to non-industrial companies should be viewed cautiously. Hypothesis 3 was not supported using Zmijewski's (1984) model. That is, the accuracy of Zmijewski's model was not sensitive to industry classifications.[75]

Bankruptcy Sample

Test 3 evaluated whether the X, Y, and Z-score models were more generally useful for identifying financial distress as opposed to bankruptcy. Subset of the 1988-1991 samples containing only bankrupt firms were used in these analyses. Table 6 reports the accuracies of the models when applied to the sets of bankrupt firms. Zmijewski's (Altman's) model correctly predicted 59.8% (68.2%), 86.1% (54.9%), and 82.9% (56.1%) of the distressed, nondistressed, and combined (distressed and nondistressed) firms. Ohlson's model correctly predicted 96.1%, 30.2%, and 37% of the distressed, nondistressed, and combined firms. For the X, Y, and Z-score models, binomial tests indicated that the accuracy rates using the 1988-1991 bankruptcy samples were not significantly different from those using the entire 1988-1991 samples that included

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and 5000-5999. For Altman's model, the industrial firms included firms with SICs 2000-3999.

[75] Zmijewski (1984), Ohlson (1980), and Altman (1968) used only bankrupt industrial firms, as opposed to distressed firms, to develop their models. In tests not reported in this paper, the subsets of industrial firms from the prediction samples were further reduced to include only bankrupt firms. The results discussed in this section did not change when using the bankrupt industrial subsets.

financially distressed firms. Though Zmijewski, Ohlson, and Altman developed their models for the purpose of predicting bankruptcy, the models are more correctly financial distress prediction models than bankruptcy prediction models.

The findings of Test 3 support hypothesis 5 for the X, Y, and Z-score models. Thus, researchers who use the models to identify bankrupt companies should do so with caution. As previously discussed, though all bankrupt companies may be financially distressed, not all financially distressed companies declare bankruptcy.

Unstable Coefficients

Additional evidence related to the stationarity of the X, Y, and Z-score models was evaluated by reestimating the models' coefficients using the 1985-1987 samples. If the models are stationary, then the coefficients of the original models should be similar to those derived from the 1985-1987 samples. As previously discussed, the full 1985-1987 sample, a subset of the sample containing only bankrupt firms in the distressed group, and a subset of the sample containing only industrial firms in both distressed and nondistressed groups were used to reestimate three models: (1) the 1985-1987 X, Y, and Z-score models, (2) the bankruptcy-only X, Y, and Z-score models, and (3) the industrial-only X, Y, and Z-score models. Test 4 used these three samples to evaluate whether Zmijewski's (1984), Ohlson's (1980), and Altman's (1968) models were sensitive to industry classifications or financial condition.

The results of Test 4 reported in Table 7 indicated similar coefficients for the entire 1985-1987, bankruptcy-only, and industrial-only X-score models. This finding does not support hypotheses 3 and 5 since Zmijewski's model was not sensitive to various distress

situations and industry classifications. For Test 5, the coefficients that were significant in both the original and 1985-1987 X-score models were lower in the 1985-1987 model than they were in the original model. These variables include net income to total assets and total debt to total assets. Also, the current assets to current liabilities variable was significant in the 1985-1987 X-score model but not in the original model. Thus, the results of Test 5 support hypothesis 2 since the coefficients of the original X-score model are not stable across time periods.

The results for Test 4 reported in Table 8 indicated similar coefficients for the variables that were significant in both the 1985-1987 and bankruptcy-only Y-score models. These variables included log of total assets to price-level index,[76] total liabilities to total assets, and funds provided by operations to total liabilities. Again, these results provide further support for hypothesis 5 in that the model was not sensitive to various distress situations even though Ohlson used only bankrupt firms to develop the original model. The coefficients for total liabilities to total assets, funds provided by operations to total liabilities, and dummy variable for negative net income for the industrial-only Y-score model were lower than those for the 1985-1987 Y-score model. Additionally, the coefficient for the net income to total assets variable was significant in the industrial-only Y-score model but not in the 1985-1987 Y-score model. This finding provides further support for hypothesis 3 since it suggests that Ohlson's model is sensitive to industry classifications. Since the 1985-1987, bankruptcy-only, and industrial-only Y-score models reported in Table 8 were similar relative to the original Y-score model, the

[76] The price-level index ranged from 99.7 (102.3) to 102.3 (116) for the 1985-1987 (1988-1991) period.

following comparisons for Ohlson's model (for Test 5) refer only to the 1985-1987 model.

The coefficients that were significant in both the original and 1985-1987 Y-score models were higher in the original than they were in the 1985-1987 Y-score model. These variables include log of total assets to price-level index, total liabilities to total assets, and funds provided by operations to total liabilities. Additionally, the dummy variable for negative net income was (was not) significant in the 1985-1987 (original) Y-score model. Ohlson also reported that the coefficients for the dummy variable for total liabilities greater than total assets and the measure of change in net income were significant in the original Y-score model; however, these coefficients were not significant in 1985-1987 Y-score model. The findings of Test 5 related to Ohlson's model support hypothesis 2. That is, the findings provide further evidence that the original Y-score model's coefficients are not stationary across time. The differing coefficients and related significance of the Ohlson (1980) and 1985-1987 models indicate that the relationships from period to period between Ohlson's ratios and financial distress change.

The results of Test 4 reported in Table 9 indicated similar coefficients for the entire 1985-1987 and bankruptcy-only Z-score models.[77] This result provides further support for hypothesis 5 since the Z-score model was not sensitive to various distress situations even though Altman used only bankrupt firms to develop the original model. The retained earnings to total assets (earnings before interest and taxes to total assets) variable coefficient for the industrial-only Z-score model was higher (lower) than that for

[77] Zmijewski (1984), Ohlson (1980), and Altman (1968) used bankrupt industrial companies to develop their original models. The industrial samples were further reduced to include only bankrupt industrial

the 1985-1987 Z-score model.[78] This finding provide further support for hypothesis 3 in that the Z-score model is sensitive to industry classifications. Since the 1985-1987, bankruptcy-only, and industrial-only Z-score models reported in Table 9 were similar relative to the original Z-score model, the following comparisons for Test 5 refer only to the 1985-1987 Z-score model.

The differences between the univariate F statistic for the Altman (1968) and 1985-1987 Z-score models indicate stationarity problems. These differences, reported in Table 9, suggest that the importance of Altman's variables in predicting financial distress has changed since his 1968 study.[79] The retained earnings to total assets and earnings before interest and taxes to total assets variables exhibit higher significance levels in the 1985-1987 Z-score model than in Altman's original model. The market value of equity to book value of total debt variable has a higher significance level in the original model, and the working capital to total assets and sales to total assets variables maintained about the same level of significance. The magnitudes and signs of the coefficients also differ between models. The magnitudes of the working capital to total assets, earnings before interest and taxes to total assets, market value of equity to book value of debt, and sales to total assets coefficients are lower in the 1985-1987 Z-score model. Additionally, the signs of the market value of equity to book value of total debt and sales to total assets

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companies in the distressed group. The results discussed in this section did not change when the coefficients were reestimated using only the bankrupt industrial companies in the distressed group.

[78] The univariate significance level for the earnings before interest and taxes to total assets variable coefficient was lower for the industrial-only model than for the 1985-1987 model. The univariate F statistic for the retained earnings to total assets variable coefficient was lower in the industrial-only model than in the 1985-1987 model.

[79] In results not reported, the multivariate significance tests of the coefficients support the univariate results. Only the retained earnings to total assets and earnings before interest and taxes to total assets coefficients have significant p-values for the 1985-1987 model. Altman did not report the multivariate

coefficients in the 1985-1987 Z-score model are different from those reported by Altman model.

The findings of Test 5 (for Altman's model) support hypothesis 2 since the original Z-score model's coefficients are not stationary across time. Again, the differing coefficients and related significance of the original and 1985-1987 Z-score models indicate that the relationships from period to period between Altman's ratios and financial distress change.

Classification Accuracy for Reestimated Models

Table 10 reports the predictive accuracies for the distressed and nondistressed groups for the 1985-1987, bankruptcy-only, and industrial-only X, Y, and Z-score models using the 1988-1991 sample. The overall accuracies for the X, Y, and Z-score models range from 85.7% to 86.1%, 88.1% to 88.7%, and 86.4% to 88.1%. The results of binomial tests indicate that the overall predictive accuracies for Zmijewski's (81.3%), Ohlson's (39.8%), and Altman's (57.8%) models when applied to the 1988-1991 samples were significantly less than those for the 1985-1987, bankruptcy-only, and industrial-only X, Y, and Z-score models.[80] Thus, these results suggest that those who employ the models using recent data should reestimate the models' coefficients to obtain more accurate results.

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significance for the financial ratios; however, he indicated that each ratio provided significant information in the original Z-score model.

[80] The 1985-1987 X, Y, and Z-score models also were estimated after outliers were excluded from the samples. Outliers were defined as the upper and lower 1% of the companies based on Zmijewski's, Ohlson's, and Altman's ratios. The results reported in Table 10 did not change when the accuracies of the reestimated models based on the reduced samples were used.

Type I and Type II Errors

The binomial tests for Test 6 reported in Table 10 indicated that the Altman (1968) model was significantly more (less) accurate in predicting distressed (nondistressed) firms than the 1985-1987, bankruptcy-only, and industrial-only Z-score models. Additionally, the difference between the accuracies of the Altman (1968) model for distressed and nondistressed firms (15.4%) was small relative to those of the three reestimated models (ranging from 36.7% to 46.3%).

The evidence related to the Altman model's accuracy rates for the distressed and nondistressed groups provides support for hypothesis 4. That is, the rates demonstrate the effect of using proportionate samples of distressed and nondistressed companies to develop the models. Altman (1968) used a matched sample of 33 bankrupt and 33 nonbankrupt firms and, as such, ignored the prior probabilities of group membership. The 1985-1987, bankruptcy-only, and industrial-only Z-score models were developed using proportionate, or more representative, samples of distressed and nondistressed companies. As a result, the Type I (Type II) errors for the Altman (1968) model were lower (higher) than those for the three reestimated models.

Hypothesis 4 was also supported when the accuracy rates of the Altman (1968) and Zmijewski (1984) models were compared. Altman's (1968) model was significantly more (less) accurate than Zmijewski's (1984) model at predicting the distressed (nondistressed) companies.[81] Again, Altman developed his model using a matched sample of bankrupt and nonbankrupt companies; consequently, his model understates

[81] The binomial test statistics comparing the rates of Altman's (1968) and Zmijewski's (1984) models were not reported in Table 10. The test statistics (z) comparing the Altman and Zmijewski models' rates for the distressed and nondistressed firms were 2.44 and 12.67 (both significant at level .05).

(overstates) Type I (Type II) errors. Zmijewski developed his model using a proportionate sample of bankrupt and nonbankrupt companies; thus, his model exhibited a higher (lower) Type I (Type II) error rate.

The results of binomial tests comparing the accuracy rates for the distressed and nondistressed groups using Altman's (1968) model to those using Ohlson's (1980) model did not support hypothesis 4.[82] Though Ohlson developed his model using a proportionate sample of bankrupt and nonbankrupt companies, his model did not exhibit a higher (lower) Type I (Type II) error rate. It seems that Ohlson's (1980) model failed to demonstrate the effects of proportional samples because the relationships between financial distress and financial ratios are not stable. For example, as reported in Table 8, the coefficient for the total liabilities to total assets variable for Ohlson's (1980) model (6.03) was higher than that for the reestimated 1985-1987 Y-score model (3.22).[83] Further analysis indicated that the classification accuracy of the original Y-score model demonstrated the effects of proportional samples when the coefficient for total liabilities to total assets was reduced.

These results have implications for all who choose to use these bankruptcy prediction models to evaluate the financial health of companies. For example, investors who use the Altman's Z-score (Zmijewski's X-score) model for investment decisions would be less (more) likely to invest in companies that were predicted as nondistressed but that

[82] The binomial test statistics (z) comparing the rates of Altman's (1968) and Ohlson's (1980) models for the distressed and nondistressed firms were 4.69 and 10.09 (both significant at level .05). However, Ohlson's model exhibited a lower (higher) Type I (Type II) error rate than did Altman's model. These tests were not reported in Table 10.

[83] Prior research suggests that there was an increasing acceptance of high corporate debt levels during 1980s. As such, a given level of debt in the 1980s may not be associated with the same likelihood of bankruptcy as it was in pre-1980 periods (Begley et al. 1997).

were actually distressed than to invest in companies that were predicted as nondistressed and that were actually nondistressed. However, they would be more (less) likely to forego investments in companies that were predicted as distressed but that were actually nondistressed than to forgo investments in companies that were predicted as distressed and that were actually distressed.

Financial Characteristics

Test 7 evaluated an auditors' opinion decision model developed using the financial characteristics listed in SAS Nos. 34 and 59. Table 11 reports the univariate results for the financial characteristics used to develop the auditors' opinion decision model shown in equation (4). The univariate results indicated that the 1985-1991 GCO firms were significantly different from the 1985-1991 NGCO firms for two characteristics: (1) the number of previous three years with negative operating income and (2) the number of the previous three years with negative operating cash flows. The number of previous three years with negative operating income and cash flows was greater for the GCO companies than for the NGCO companies.[84]

Test 7 evaluated whether the financial characteristics listed in SAS No. 59 (34) were useful to auditors when evaluating the going concern assumption for post-SAS No. 59 companies. Table 12 reports the logit results for the auditors' opinion decisions model shown in equation (4). The p-values for the F-statistics reported in Table 12 indicated that the change in debt to total assets variable was useful to auditors in their going

[84] The size variable is not one of the financial characteristics listed in SAS No. 59; however, as previously discussed, prior research suggests that size is an important determinant in whether auditors

concern evaluations under the provisions of SAS No. 59. However, the number of the previous three years with negative operating income, change in the current ratio, and number of the previous three years with negative operating cash flows variables were not significant in the post-SAS No. 59 period.[85]

Test 7 also evaluated whether the auditors' reliance on financial characteristics listed in SAS Nos. 59 (and 34) changed after the issuance of SAS No. 59. The variables of interest were those that measure the interactions between financial ratios and TIME (pre and post-SAS No. 59). Table 12 reports that the change in debt to total assets measure was the only variable that exhibited a significant interaction with TIME.[86] This suggests that auditors' reliance on the debt to total assets variable in going concern evaluations changed after the issuance of SAS No. 59. The variables for the number of previous three years with negative operating income, the number of previous three years with negative operating cash flows, and the change in the current ratio did not exhibit significant interactions with TIME. That is, the auditors' reliance on these financial characteristics was not affected by the issuance of SAS No. 59.

The results reported in Table 12 generally failed to support hypotheses 6 and 7.[87] Though the ASB identified negative trends for operating income, working capital,

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issue GCOs. Table 11 reports that the size of GCO companies was significantly different from that of the NGCO companies.

[85] The results reported in Table 12 also indicated that the size variable was useful to auditors in their post-SAS No. 59 GCO decisions.

[86] The p-value for the variable representing the interaction between the change in debt to total assets measure and TIME increased from .069 to .175 when 1988 companies were excluded from the post-SAS No. 59 sample.

[87] The tests discussed in this section also were evaluated after excluding the upper and lower 1% (i.e., outliers based on the variables shown in Table 11) of the companies. When outliers were excluded, the change in the debt to total assets (interaction between change in debt to total assets and TIME) variable reported in Table 11 (Table 12) was (was not) significant; however, the general findings reported in this section did not change. That is, hypothesis 6 and 7 were not supported.

operating cash flows, and key financial ratios (i.e. leverage ratios) as signals of companies with going concern problems, only the number of previous three years with negative operating cash flows (change in debt to total assets) was significant to auditors' opinion decisions in the pre (post) SAS No. 59 period. The financial characteristics evaluated in equation (4) are those listed in both SAS Nos. 34 and 59. As previously indicated, SAS No. 59 increased auditors' responsibilities for evaluating the going concern question; however, auditors' reliance on the financial characteristics in going concern evaluations was unchanged except for the change in debt to total assets measure. These findings suggest that SAS No. 59 had a modest effect on the auditors' reliance on the financial characteristics listed in the standards. A possible explanation is that the ASB simply codified existing practice with the issuance of SAS No. 59.

Propensity of Going Concern Opinions

Tests 8 evaluated the propensity of auditors to issue GCOs to bankrupt companies in the pre and post-SAS No. 59 periods. The results reported in Table 13 indicated that the proportion of bankrupt companies with GCOs in the post-SAS No. 59 period (53.7%) was significantly higher than that in the pre-SAS No. 59 period (39.8%). The significant increase in the proportion of bankruptcies with GCOs in the post-SAS No. 59 period provides support for hypothesis 8. That is, auditors were more likely to issue GCOs to companies that subsequently declared bankruptcy under the provisions of SAS No. 59.[88] This result supports the notion that the increased responsibilities imposed on auditors by

[88] GCOs generally were issued during the twelve months prior to bankruptcy for the companies used in this study.

SAS No. 59 also increased the costs associated with not issuing GCOs when companies that subsequently fail; consequently, auditors were forced to be more conservative in their going-concern evaluations.

Test 9 evaluated the propensity of auditors to issue GCOs to financially distressed companies other than bankruptcies, before and after the issuance of SAS No. 59. The results in Table 13 indicated that the proportion of other distressed companies with GCOs in the post-SAS No. 59 period (49%) was higher than that in the pre-SAS No. 59 period (40%). The higher proportion of other distressed companies with GCOs in the post-SAS No. 59 period is consistent with hypothesis 9; however, the binomial test indicated that the proportions of other distressed companies with GCOs were not significantly different between the pre and post-SAS No. 59 periods.[89] Though auditors were more conservative in their going concern evaluations for bankruptcies under the provisions of SAS No. 59, the standard did not significantly alter their GCO decisions for financially distressed firms other than bankruptcies.

Financial Condition and Size of GCO Firms Under SAS No. 59

Tests 10 and 11 evaluated the financial condition and size of companies that received GCOs before and after the issuance of SAS No. 59. Financial health was measured using financial ratios that proxy for firms' leverage, liquidity, solvency, and performance. The results reported in Table 14 indicated that the total liabilities to total assets (leverage) variable for companies that received GCOs in the post-SAS No. 59 period was

[89] The proportion of post-SAS No. 59 distressed companies, other than bankruptcies, with GCOs increased from 49% to 69% when 1988 companies were excluded. Excluding 1988 companies, the

significantly higher than that for companies that received GCOs in the pre-SAS No. 59 period. However, the operating cash flows to total assets (liquidity), current assets to current liabilities (solvency), and net income to total assets (performance) variables were not significantly different for the GCO companies between the pre and post-SAS No. 59 periods. Also, the results reported in Table 14 indicated that the size of companies that received GCOs before and after the issuance of SAS No. 59 was not significantly different.

The findings of Tests 10 and 11 did not provide support for hypotheses 10 and 11.[90] Overall, the financial condition and size of GCO firms in the post-SAS No. 59 period were similar to those of GCO firms in the pre-SAS No. 59 periods. As previously discussed, prior research suggests that financial condition and size are the most important determinants in whether auditors issued GCOs to problem companies. Though SAS No. 59 likely increased the level of conservatism exhibited by auditors in their going concern evaluations, it did not result in auditors issuing GCOs to firms that were financially stronger and larger than those prior to the issuance of the standard.[91]

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proportion of other distressed companies with GCOs in the post-SAS No. 59 period (69%) was significantly higher (z-statistic: 2.703) than that in the pre-SAS No. 59 period (40%).

[90] As previously indicated, the analysis described in this section also was performed using bankruptcy probabilities from Zmijewski's (1984) model, as opposed to individual financial ratios. The bankruptcy probabilities for companies that received GCOs in the post-SAS No. 59 period were not significantly different from those for companies that received GCOs in the pre-SAS No. 59 period.

[91] The results reported in this section did not change when the upper and lower 1% of the firms (i.e., outliers based on the measures for financial condition and size) were excluded. Additionally, the total liabilities to total assets (current assets to current liabilities) variable for companies that received GCOs in the post-SAS No 59 period was not (was) significantly different than that for companies that received GCOs in the pre-SAS No. 59 period when nonparametric procedures (i.e., Wilcoxin rank-sum test and Kruskal-Wallis) were used; however, the general conclusions discussed in this section did not change.

Consistency Between Models' Predictions and Auditors' Opinions

Tests 12 and 13 evaluated the correlation between the X, Y, and Z-score models' predictions and auditors' opinions before and after the issuance of SAS No. 59. Table 15 reports the proportion of bankrupt companies that were predicted as bankruptcies and that also received GCOs (GCO/bankrupt firms). Using Altman's (Zmijewski's) model, 56.3% (54.3%) of the post-SAS No. 59 and 53.1% (52.8%) of the pre-SAS No. 59 bankrupt companies were GCO/bankrupt firms. The results of binomial tests indicated that the proportions of GCO/bankrupt companies were not significantly different between the pre and post-SAS No. 59 periods for both the Altman and Zmijewski models. Using Ohlson's model, the proportion of post-SAS No. 59 bankrupt companies that were GCO/bankrupt firms (53.8%) was significantly higher than that of pre-SAS No. 59 bankrupt companies that were GCO/bankrupt firms (41.6%). In sum, the findings suggest that the models' predictions and auditors' opinions were more consistent after the issuance of SAS No. 59 only for the Ohlson model's predictions.[92]

Table 15 also reports the consistency between the models' predictions and auditors' opinions using financially distressed firms other than bankruptcies (other distressed in Table 15). Using the X, Y, and Z-score models, 58.8%, 52.1%, and 65.8% of the post-SAS No. 59 other distressed companies were GCO/bankrupt firms. For the pre-SAS No. 59 other distressed companies, 46.5%, 42%, and 52.6% of the firms were

[92] In tests not reported in this study, the consistency between auditors' opinions and the 1985-1987 X, Y, and Z-score models was evaluated for post-SAS No. 59 companies. Using the reestimated X, Y, and Z-score models, the proportions of post-SAS No. 59 bankrupt companies that were GCO/bankrupt firms were 64%, 55%, and 55%. The proportions of post-SAS No. 59 financially distressed companies other than bankruptcies that were GCO/bankrupt firms were 47%, 57%, and 61%. The results of binomial tests reported in this section did not change when the predictions from the reestimated models were used.

GCO/bankrupt firms. Though the post-SAS No. 59 proportions of GCO/bankrupt firms were higher than those of the pre-SAS No. 59 samples, binomial tests indicated that the proportions were not significantly different between the pre and post-SAS No. 59 samples. That is, SAS No. 59 did not affect the consistency between models' predictions and auditors' opinions using financially distressed companies other than bankruptcies.

Table 15 also reports the proportions of bankrupt companies predicted as nonbankruptcies that received NGCOs (NGCO/nonbankrupt firms). For the Altman and Zmijewski models, the proportions of post-SAS No. 59 bankrupt firms that were NGCO/nonbankrupt firms (63% and 52.1%) were significantly lower than those (82.4% and 76.5%) of the pre-SAS No. 59 bankrupt companies. Using Zmijewski's model, the proportion of post-SAS No. 59 other distressed companies that were NGCO/nonbankrupt firms (62.1%) also was significantly lower than that (85%) of the pre-SAS No. 59 other distressed firms.

The findings related to the proportions of NGCO/bankrupt firms were consistent with those for GCO/bankrupt firms discussed above. Though the changes in the proportions of GCO/bankrupt firms were not significant for all models (for the both bankruptcies and other distressed companies), the proportions of post-SAS No. 59 GCO/bankrupt firms were always higher than those of pre-SAS No. 59 GCO/bankrupt firms; consequently, the proportions of post-SAS No. 59 NGCO/nonbankrupt firms were always lower than those of pre-SAS No. 59 NGCO/nonbankrupt firms.

The results reported in Table 15 did (did not) support hypothesis 12 using Ohlson's (Altman's or Zmijewski's) model. That is, auditors' opinions and the models'

predictions were more consistent after the issuance of SAS No. 59 only for the Ohlson model's predictions. As previously discussed, prior studies indicated that prediction models routinely outperform auditors at signaling impending failure in pre-SAS No. 59 periods. Though SAS No. 59 increased auditors responsibilities related to the going concern question, the consistency between auditors' opinions and models' predictions did not change. Also, hypothesis 13 was not supported using the X, Y, and Z-score models. That is, auditors' GCO decisions were not more consistent with the models' predictions for financially distressed companies, other than bankruptcies, after the issuance of SAS No. 59.

CHAPTER VI

SUMMARY

This study evaluated the generalizability of Zmijewski's (1984), Ohlson's (1980), and Altman's (1968) bankruptcy prediction models to proportionate samples of distressed and nondistressed companies from time periods, industries, and financial conditions other than those used to developed their models. The findings indicated that the accuracy of the models declined when applied to alternative samples. Zmijewski (1984), Ohlson (1980), and Altman (1968) reported 98.2%, 96.4%, and 83.5% overall accuracies for their models using samples from 1958-1976. The overall accuracies for the 1988-1991 sample used in this study ranged from 40% to 81%. It should be noted that Zmijewski's model was significantly more accurate at classifying the 1988-1991 companies than were Ohlson's and Altman's models. Additionally, the coefficients of the X, Y, and Z-score models changed dramatically when reestimated using 1985-1987 samples. Thus, it appears the relation between financial ratios and financial distress changes over time. The relative importance of the various ratios in predicting distress conditions was not constant.

Ohlson's (1980) and Altman's (1968) models were sensitive to industry classifications based on the 1988-1991 samples used in this study. The overall accuracy of Ohlson's and Altman's models using industrial firms were 47.4% and 69.1%. These rates were significantly higher than those for the entire 1988-1991 samples (Ohlson--39.8%, Altman--57.8%) that included all industry classifications. Zmijewski's, Ohlson's,

and Altman's models were not sensitive to the various financial distress situations present in the 1988-1991 samples. The overall accuracies of the models for bankrupt companies (ranging from 37% to 83%) in the 1988-1991 sample were not significantly different from those of the entire samples (ranging from 40% to 81%) that included all financial distress situations. Thus, the models were more generally useful for identifying firms that were financially distressed, as opposed to the more limited condition of bankruptcy.

The Type I (Type II) error rate for Zmijewski's (1984) model was significantly higher (lower) than that of Altman's (1968) model using recent companies. Additionally, when Altman's coefficients were reestimated using the 1985-1987 sample, the number of Type I error (Type II error) firms increased (decreased) using the 1985-1987 Z-score model, which was estimated using a proportionate sample of distressed and nondistressed companies. These findings indicate that the use of disproportionate samples to develop bankruptcy prediction models generates lower (higher) quantities of Type I (Type II) errors.

The results of this study suggest that current, broad application of the Zmijewski, Ohlson and Altman models is questionable. Though each model was capable of identifying various forms of financial distress, the effectiveness of the Ohlson and Altman models was limited to the industrial companies. Additionally, the X, Y, and Z-score model's accuracies using the industrial or bankrupt companies from the 1988-1991 samples as well as the entire 1988-1991 samples were significantly lower than those reported in Zmijewski's (1984), Ohlson's (1980) and Altman's (1968) studies. Other evidence in this study suggests that those who employ the X, Y, and Z-score models

using recent data should reestimate the models' coefficients. When the models' coefficients were reestimated using 1985-1987 data, their predictive accuracies were significantly higher than those of Zmijewski's (1984), Ohlson's (1980), and Altman's (1968) original models when applied to data for 1988-1991.

This study also evaluated an auditors' opinion decision model developed using the financial characteristics listed in SAS No. 59 (and 34). The results indicated that the change in debt to total assets variable was useful to auditors in going concern evaluations under the provisions of SAS No. 59. However, the number of the previous three years with negative operating income, change in the current ratio, and number of the previous three years with negative operating cash flows variables were not significant in post-SAS No. 59 going concern evaluations. Variables that measured the interaction between the financial characteristics and time (pre and post-SAS No. 59) also were included in the model. The change in debt to total assets measure was the only financial characteristic that exhibited a significant interaction with time. That is, the issuance of SAS No. 59 generally did not affect auditors' reliance on the financial characteristics even though the standard increased auditors' responsibilities related to going concern evaluations.

The proportion of post-SAS No. 59 bankruptcies that received GCOs was significantly higher than that of pre-SAS No. 59 bankruptcies that received GCOs. Thus, auditors were more likely to issue GCOs to bankrupt firms for audits performed after the issuance of SAS No. 59. The proportion of post-SAS No. 59 financially distressed firms other than bankruptcies that received GCOs was higher than that of pre-SAS No. 59 financially distressed other than bankruptcies that received GCOs; however, these proportions were not significantly different between the pre and post-SAS No. 59

periods. Additionally, post-SAS No. 59 GCO companies were not significantly different than pre-SAS No. 59 GCO companies in terms of financial health and size.

The consistency between the X, Y, and Z-score models' predictions and auditors' opinions before and after the issuance of SAS No. 59 also was evaluated. Pre-SAS No. 59 studies indicated that prediction models routinely outperformed auditors at signaling impending failures. Additionally, prior research suggests that, under the provisions of SAS No. 59, auditors may use a different process than was used previously since the standard increased auditors' responsibilities for going concern evaluations. Though SAS No. 59 likely increased auditors' costs of issuing NGCOs to firms that failed, the overall results of this study indicated that the consistency between the Zmijewski, Ohlson, and Altman models' predictions and auditors' opinions was unchanged after the standard was issued.

In sum, the findings of this study suggest that SAS No. 59 had a modest impact on auditors' going concern decisions. Though auditors were more likely to issue GCOs to bankrupt companies after the issuance of SAS No. 59 than before, the post-SAS No. 59 GCO companies were not financially stronger or larger than pre-SAS No. 59 GCO companies. Additionally, except for the change in debt to total assets measure, auditors' reliance on the financial characteristics listed in SAS No. 59 (and 34) did not change under the provisions of SAS No. 59. It seems that the ASB simply codified existing practice when they issued the more stringent standard.

Also, the results of this study suggest that the effect of samples proportionately representative of bankrupt and nonbankrupt firms should be considered by researchers when prediction models are developed or applied. The findings indicated that models

developed with disproportionate samples generate lower (higher) quantities of Type I (Type II) errors. This study also indicated that the Zmijewski, Ohlson, and Altman (Ohlson and Altman) models were not generalizable to periods (industries) other than those used to originally develop the models. Thus, researchers should be cautious in assuming that the models' predictive powers can transcend to periods and industries other than those used to develop the models.

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Table 1

Profile Analysis for 1985-1987 and 1988-1991 Samples

Variat.		Group	Statistic	X1	X2	X3	X4	X5	X6	X7	X8	X9
Zmijev	kl	Nondistressed (z)	Mean	0.0451	0.5465	2.2547						
(1985-1	7 Sample)	n=887	Std. Deviation	(0.084)	(0.193)	(2 173)						
			min	-0 936	0 027	0 383						
			max	0 426	1 941	35 947						
		Distressed (z)	Mean	-3.0791	0 9495	1.3969						
		n=181	Std. Deviation	(0 916)	(0.846)	(2.441)						
			min	-10 648	0.056	0 006						
			max	0 354	8 555	19 347						
			p-value (1)	*0 000*	*0 000*	*0 030*						
(1988-1	1 Sample)	Nondistressed (z)	Mean	0.0376	0.5637	2.1789						
		n=841	Std. Deviation	(0.122)	(0.231)	(2.380)						
			min	-2 280	0 016	0.144						
			max	0 825	3 375	49 612						
		Distressed (z)	Mean	-0.1745	0 8696	3.1177						
		n=163	Std. Deviation	(0.375)	(0.846)	(14 329)						
			min	-2 447	0.002	0 080						
			max	0 877	5 818	184 104						
			p-value (1)	*0 000*	*0 000*	*0 056*						
Ohlso.		Nondistressed (z)	Mean	1.6858	0.5541	0 2159	0.6534	0.0099	0.0431	0.2208	0.0496	0.0145
(1985-1	7 Sample)	n=888	Std. Deviation	(1.845)	(0.177)	(0 201)	(0.561)	(0.098)	(0.073)	(0.239)	(0.217)	(0.481)
			min	-3 059	0 032	-1.001	0.056	0 000	-0 611	-0.533	0.000	-1.000
			max	9 814	1 849	0 841	13 324	1 000	0 326	2 705	1 000	1 000
		Distressed (z)	Mean	-0.9913	0.8981	0.0671	1.3931	0 2026	-0 2492	-0.1167	0.5359	-0 0659
		n=163	Std. Deviation	2.021	(0.803)	(0.481)	(2.457)	(0.403)	(0.474)	(0.515)	(0.501)	(0.864)
			min	-5.136	0.055	-3 041	0 051	0 000	-3 056	-4.623	0.000	-1.000
			max	5 833	8 555	0 841	18 509	1.000	0 354	1 818	1.000	1 000
			p-value (1)	*0 000*	*0 000*	*0 000*	*0 000*	*0 000*	*0 000*	*0 000*	*0 000*	*0 189*
(1988-1	1 Sample)	Nondistressed (z)	Mean	1.5224	0.5779	0.2059	0.7031	0.0359	0.0352	0.2264	0.0731	-0.0369
		n=888	Std. Deviation	(1.842)	(0.248)	(0 229)	(0 574)	(0.186)	(0.138)	(0.343)	(0.261)	(0.487)
			min	-4 015	0.045	-2.493	0 047	0 000	-2 299	-1.881	0 000	-1.000
			max	9 335	3 375	0 914	8 023	1 000	0 825	4 817	1 000	1 000
		Distressed (z)	Mean	-0.8146	0.8649	0.0446	1.2669	0.2468	-0.1789	-0.0871	0.4741	-0.1646
		n=164	Std. Deviation	(2.036)	(0.514)	(0.505)	(1.788)	(0.432)	(0.361)	(0.573)	(0.501)	(0.681)
			min	-4.874	0.084	-3 441	0 097	0 000	-2.447	-4.201	0 000	-1.000
			max	4 099	4 026	0 861	12 455	1 000	0 877	2 466	1 000	1 000
			p-value (1)	*0 000*	*0 000*	*0 000*	*0 000*	*0 000*	*0 000*	*0 000*	*0 000*	*0 000*
Altma.		Nondistressed (z)	Mean	0.2292	0.2834	0.1068	2.2636	1.2348				
(1985-1	7 Sample)	n=824	Std. Deviation	(0.189)	(0.241)	(0 081)	(3.156)	(0 812)				
			min	-0 288	-1.880	-0 406	0 040	0 033				
			max	0 858	1 384	0 508	28 705	7 283				
		Distressed (z)	Mean	0 0921	-0 5646	-0 1758	3.1656	1.2129				
		n=148	Std. Deviation	(0.369)	(1.058)	(0 409)	(13 992)	(0 968)				
			min	-2.410	-6 203	-2 042	0.014	0.000				
			max	0 841	0 550	0 038	161 918	8 563				
			p-value (1)	*0 000*	*0 000*	*0 000*	*0 436*	*0 799*				
(1988-1	1 Sample)	Nondistressed (z)	Mean	0.2004	0.1816	0.0901	2.2669	1 2387				
		n=864	Std. Deviation	(0.208)	(1.784)	(0 110)	(4.058)	(0.780)				
			min	-0.684	-2.427	-1 722	0 361	0 002				
			max	0 843	1 077	0 351	58 890	5 284				
		Distressed (z)	Mean	0.0607	-0.7725	-0.1217	2.268	1.6219				
		n=148	Std. Deviation	(0.500)	(2.152)	(0 349)	(9 158)	(1.173)				
			min	-3.442	-19 023	-2 446	0 003	0 001				
			max	0 861	0 663	0 301	101 802	8 633				
			p-value (1)	0 000	0 000	0 000	0 998	0 000				

(1) *p-va* one-tailed t-test of differences in variable means between the distressed and nondistressed groups.

(2) The d rressed group includes companies that experienced bankruptcy or liquidation as well as those that received low S&P ratings for their bonds or stock. The nondistressed group includes mpanies that were rated by S&P and did not receive low bond or stock ratings.

Gideon variables: X1 = log(total assets/GNP price-level index); X2 = total liabilities/total assets; X3 = working capital/total assets; X4 = current liabilities/current assets; X5 = one if total liabilities ceed total assets, zero otherwise; X6 = net income/total assets; X7 = funds provided by operations/total liabilities; X8 = one if net income was negative for the last two years, zero oth rwise; X9 = measure of change in net income.

Altman variables: X1 = working capital/total assets; X2 = retained earnings/total assets; X3 = earnings before interest and taxes/total assets; X4 = market value of equity/total assets; X5 = sal otal assets

Zmijew e variables. X1 = net income/total assets; X2 = total liabilities/total assets; X3 = current assets/current liabilities

Table 2
Sample Distibution by Industry Classification

	Sample	Classification	Distressed (1)	Nondistressed (2)
Zmijewski	1985-1987	Non-industrial	26	256
		Industrial (3)	155	631
		Total	*181*	*887*
	1988-1991	Non-industrial	39	246
		Industrial (3)	144	595
		Total	183	841
Ohlson	1985-1987	Non-industrial	23	241
		Industrial (3)	130	665
		Total	*153*	*906*
	1988-1991	Non-industrial	34	270
		Industrial (3)	120	619
		Total	154	889
Altman	1985-1987	Non-industrial	69	389
		Industrial (3)	79	435
		Total	*148*	*824*
	1988-1991	Non-industrial	70	402
		Industrial (3)	78	452
		Total	148	854

(1) The distressed group includes companies that experienced bankruptcy or liquidation as well as those that received low S&P ratings for their bonds or stock.

(2) The nondistressed group includes companies that were rated by S&P and did not receive low bond or stock ratings.

(3) The industrial classification includes SIC codes less than 4000 and 5000-5999 for the Zmijewski and Ohlson samples. The industrial classification includes SIC codes 2000-3999 for Altman's sample.

Table 3
Sample Distibutions by Year

Sample		Description	1985	1986	1987		Total
1985-1987	Zmijewski	bankruptcy	38	21	39		98
		other distressed	15	47	21		83
		nondistressed	290	285	312		887
	Ohlson	bankruptcy (1)	30	12	28		70
		other distressed (2)	17	47	19		83
		nondistressed (3)	296	311	299		906
	Altman	bankruptcy	27	22	27		76
		other distressed	17	37	18		72
		nondistressed	259	277	288		824
			1988	1989	1990	1991	Total
1988-1991	Zmijewski	bankruptcy	63	33	17	8	121
		other distressed	14	17	23	8	62
		nondistressed	223	205	214	199	841
	Ohlson	bankruptcy	48	25	7	8	88
		other distressed	12	16	30	8	66
		nondistressed	224	220	234	211	889
	Altman	bankruptcy	48	27	11	8	94
		other distressed	12	12	24	6	54
		nondistressed	213	211	209	221	854

(1) Includes companies identified as financially distressed due to bankruptcy.

(2) Includes companies identified as financially distressed due to reasons other than bankruptcy, such as low S&P ratings for their stocks or bonds.

(3) Includes companies that were rated by S&P but that did not receive low ratings for their stocks or bonds.

Table 4
Going Concern Opinions by Year and Type

Period	Year	Explanatory Paragraph (1)	Disclaimer (2)	Total
Pre-SAS No. 59	1985	23	2	25
	1986	17	1	18
	1987	17	1	18
				61
Post-SAS No. 59	1988	23	0	23
	1989	11	2	13
	1990	13	0	13
	1991	7	0	7
				56

(1) Auditors expressed an unqualified opinion regarding the financial statements by adding explanatory language to the standard report.
(2) Auditors refused to express opinions regarding companies' abilities to continue as going concerns.

Table 5
Summary of Tests for Proposed Research

Test	Hypothesis Tested	Method	Objective
Usefulness of Bankru		**cy Models for Predicting Firm Failure**	
1	1	Con are classification accuracies of X, Y, and Z-score models using the full 88-1991 prediction sample, the manufacturing subset of the sample, and e bankruptcy subset of the sample to those reported by Zmijewski, Ohl n, and Altman, respectively.	Evaluate the stationarity of the X, Y, and Z-score models using a broad sample of recent firms.
2	3	Con are classification accuracies of the X, Y, and Z-score models using the l 1988-1991 prediction sample to those of the models using a sut t of the sample containing only industrial companies.	Evaluate the sensitivity of the X, Y, and Z-score models to non-industrial companies.
3	5	Con are classification accuracies of the X, Y, and Z-score models using the l 1988-1991 prediction sample to those of the models using a sub t of the sample containing only bankrupt companies.	Evaluate the sensitivity of the X, Y, and Z-score models to various financial distress situations.
4	3, 5	Ree imate the X, Y, and Z-score models' coefficients using the 198 1987 estimation sample, the industrial subset of the sample, and e bankruptcy subset of the sample. For each model, analyze the mag itudes and significance of the coefficients across these three ree: mated models.	Evaluate the sensitivity of current reestimations of the X, Y, and Z-score models' coefficients to non-industrial companies and various financial conditions.
5	2	Ana ze the magnitudes and significance of the coefficients between the estimated X, Y, and Z-score models using the full 1985-1987 esti ation sample (from test 4) and the original X, Y, and Z-score models sho in equations (1), (2), and (3).	Evaluate the stability of the X, Y, and Z-score models' coefficients over time.
6	4	Con are the accuracies of the reestimated X, Y, and Z-score models from test to those of the original X, Y, and Z-score models using the 198 1991 prediction sample.	(1) Demonstrate the effect of using proportionate samples to to reestimate the X, Y, and Z-score models' coefficients on their Type I and Type II errors. (2) Evaluate the effect of reestimating the X, Y, and Z-score models' coefficients using current firms on their ability to classify firms as distressed or nondistressed.
Impact of SAS No. 59		**n Auditors' Opinion Decisions**	
7	6, 7	Dev op a logistic regression model using the combined pre-B, pre-FD, pos.), and post-FD samples. The dependent variables are the opinion typ (GCOs or NGCOs) and the independent variables are: (1) the fina ial characteristics listed in SAS Nos. 34 and 59 and, (2) interaction vari les between the financial characteristics and time (pre or post SAS No 9).	(1) Evaluate whether auditors' reliance on financial characteristics listed in SAS No. 59 (and 34) increased after the ASB issued SAS No. 59. (2) Evaluate whether the financial characteristics listed in SAS No.59 (and 34) are useful to auditors when evaluating the going concern assumption for post-SAS No. 59 companies.

See bottom of next page for upplemental information.

--- Table 5 Continued ---

Table 5 (Continued)
Summary of Tests for Proposed Research

Test	Hypothesis		Method	Objective
Impact of SAS No. 59 on Auditors' Opinion Decisions -Continued-				
8	8	Cor.	are the proportion of firms that received GCOs in the pre-B sample to t	t of firms that received GCOs in the post-B sample.	Evaluate whether auditors are more likely to issue GCOs to bankrupt companies in post-SAS No. 59 periods than they were in pre-SAS No. 59 periods.
9	9	Cor	are the proportion of financially distressed firms, other than ban	uptcies, that received GCOs in the pre-FD sample to that of those that	ceived GCOs in the post-FD sample.	Evaluate whether auditors are more likely to issue GCOs to financially distressed firms, other than bankruptcies, in post-SAS No. 59 periods than they were in pre-SAS No. 59 periods.
10, 11	10, 11	Use	st of means to compare the financial conditions and sizes of GCO firm	n the pre-B and pre-FD samples to those of GCO firms in the post-B and	ost-FD samples.	Evaluate whether GCO firms are financially stronger or larger in the post-SAS No. 59 period.
Consistency Between Auditors' Opinions and the Models' Predictions				
12	12	Cor	are the X, Y, and Z-score models' predictions and auditors' opinions usi	the pre-B sample to those using the post-B sample.	Evaluate whether auditors' opinions are more consistent with models' predictions for bankrupt companies after the issuance of SAS No. 59.
13	13	Cor	are the X, Y, and Z-score models' predictions and auditors' opinions usi	the pre-FD sample to that using the post-FD sample.	Evaluate whether auditors' opinions are more consistent with models' predictions for financially distressed companies, other than bankruptcies, after the issuance of SAS No. 59.

Supplemental information:

Binomial tests were used for c parisons of classification accuracies and proportions.

X, Y and Z-score models refer the Zmijewski (1984), Ohlson (1980), and Altman (1968) original models shown in equations (1), (2), and (3), respectively.

Pre-B sample: Subset of the 1 5-1987 distressed sample containing only bankruptcies.

Pre-FD sample: Subset of the 85-1987 distressed sample containing only financially distressed companies, other than bankruptcies.

Post-B sample: Subset of the 88-1991 distressed sample containing only bankruptcies.

Post-FD sample: Subset of the 988-1991 distressed sample containing only financially distressed companies, other than bankruptcies.

Table 6

Comparisons of the Classification Accuracy of Prediction Samples Using Coefficients from Zmijewski's (1984), Ohlson's (1980), and Altman's (1968) Models

Model	Sample	Statistic	Overall	Distressed Group (7)	Nondistressed Group (7)
Zmijewski (X)	Zmijewski (1984) sample (3)	accuracy (6)	98.2%	70.7%	99.5%
		n	841	41	800
	1988-1991 sample (4)	accuracy (6)	81.3%	58.7%	86.1%
		n	1046	184	862
		test statistic (2)	21.809*	1.726*	79.534*
	1988-1991 Industrial sample (5)	accuracy (6)	80.5%	55.1%	86.4%
		n	770	145	625
		test statistic (1)	0.401	0.644	0.231
		test statistic (2)	21.184*	1.283	71.437*
	1988-1991 Bankruptcy sample (5)	accuracy (6)	82.9%	59.8%	86.1%
		n	981	118	863
		test statistic (1)	0.919	0.254	0.059
		test statistic (2)	19.363*	1.808*	79.535*
Ohlson (Y)	Ohlson (1980) sample (3)	accuracy (6)	96.4%	32.4%	99.4%
		n	2,163	105	2,058
	1988-1991 sample (4)	accuracy (6)	39.8%	95.4%	30.1%
		n	1046	154	892
		test statistic (2)	80.641*	10.650*	218.274*
	1988-1991 Industrial sample (5)	accuracy (6)	47.4%	94.0%	39.7%
		n	593	84	509
		test statistic (1)	3.027*	0.497	3.786*
		test statistic (2)	56.707*	9.003*	152.175*
	1988-1991 Bankruptcy sample (5)	accuracy (6)	37.0%	96.1%	30.2%
		n	995	103	892
		test statistic (1)	1.285	0.249	0.052
		test statistic (2)	83.184*	9.822*	217.921*
Altman (Z)	Altman (1968) sample (3)	accuracy (6)	83.5%	96.0%	78.8%
		n	91	25	66
	1988-1991 sample (4)	accuracy (6)	57.8%	70.9%	55.5%
		n	979	148	831
		test statistic (2)	4.748*	2.552*	3.668*
	1988-1991 Industrial sample (5)	accuracy (6)	69.1%	69.2%	69.1%
		n	547	78	469
		test statistic (1)	4.283*	0.27	4.741*
		test statistic (2)	2.755*	2.524*	1.597
	1988-1991 Bankruptcy sample (5)	accuracy (6)	56.1%	68.2%	54.9%
		n	972	85	887
		test statistic (1)	0.779	0.439	0.238
		test statistic (2)	5.045*	2.621*	3.762*

(1) z-statistic for binomial tests comparing the accuracy rates to those in the 1988-1991sample.

(2) z-statistic for binomial tests comparing the accuracy rates to those in the Zmijewski, Ohlson, or Altman sample.

(3) The Ohlson, Altman, and Zmijewski samples include bankrupt and nonbankrupt industrial firms from the 1958-1978 period.

(4) Sample includes firms from various industries and financial distress situations from 1988-1991

(5)The industrial and bankruptcy samples are subsets of the 1988-1991 sample.

(6) Rates represent correct classifications using the Zmijewski, Ohlson, and Altman models in equations (1), (2), and (3).

(7) The distressed group includes companies that experienced bankruptcy or liquidation as well as those that received low S&P ratings for their bonds or stock. The nondistressed group includes companies that were rated by S&P but did not receive low bond or stock ratings.

* the null hypothesis of equal accuracy rates is rejected at .05 level.

Table 7
Coefficients for Zmijewski's (1984) and Reestimated Models

Statistic	Zmijewski's (1984) Model (1)	1985-1987 Model (2)	Bankruptcy-only Model (3)	Industrial-only Model (4)
net income/total assets	-3.599	-4.341	-4.076	-4.325
(p-value)	*(< .05)**	*(0.000)**	*(0.000)**	*(0.000)**
total debt/total assets	5.406	2.106	1.921	2.194
(p-value)	*(< .05)**	*(0.000)**	*(0.000)**	*(0.000)**
current assets/current liabilities	-0.100	0.092	0.991	0.077
(p-value)	*(> .05)*	*(0.024)**	*(0.003)**	(0.116)

(1) These are the coefficients and significance levels reported in Zmijewski's (1984) study.
N=840 (40 bankrupt and 800 nonbankrupt firms).
(2) Coefficients estimated using the full 1985-1987 sample containing all industry classifications and financially distressed companies. N=1,048 (181 distressed and 867 nondistressed companies)
(3) Coefficients estimated using a subset of the 1985-1987 sample that only includes bankrupt companies in the distressed group. N=990 (123 distressed and 867 nondistressed firms).
(4) Coefficients estimated using a subset of the 1985-1987 sample that only includes industrial companies. N=791 (155 distressed and 636 nondistressed firms).
X1 = net income/total assets; X2 = total debt/total assets; X3 = current assets/current liabilities.
(p-value)-- Represents the multivariate significance of the coefficient in the full model.
*indicates significance at .05 level.

Table 8
Coefficients for Ohlson's (1980) and Reestimated Models

Statistic	Ohlson's (1980) Model (1)	1985-1987 Model (2)	Bankruptcy-only Model (3)	Industrial-only Model (4)
log(total assets/price-level index)	-0.407	-0.777	-0.881	-0.706
(p-value)	*(< .05)**	*(0.000)**	*(0.000)**	*(0.000)**
total liabilities/total assets	6.030	3.224	3.931	2.204
(p-value)	*(< .05)**	*(0.000)**	*(0.000)**	*(0.003)**
working capital/total assets	-1.430	-0.323	0.054	-1.250
(p-value)	*(>.05)*	*(0.323)*	*(0.962)*	*(0.075)*
current liabilities/current assets	0.076	0.589	0.166	0.455
(p-value)	*(>.05)*	*(0.199)*	*(0.657)*	*(0.300)*
1 if total liabilites exceed total assets, 0 otherwise	-1.720	0.041	0.645	0.553
(p-value)	*(< .05)**	*(0.761)*	*(0.493)*	*(0.552)*
net income/ total assets	-2.370	-2.810	-0.548	-3.790
(p-value)	*(>.05)*	*(0.158)*	*(0.729)*	*(0.106)**
funds provided by operations/liabilities	-1.83	-2.854	-2.886	-4.591
(p-value)	*(< .05)**	*(0.003)**	*(0.007)**	*(0.000)**
1 if net income negative past 2 years, 0 otherwise	0.285	0.372	0.656	0.157
(p-value)	*(>.05)*	*(0.003)**	*(0.151)*	*(0.003)**
measure of change in net income	-0.521	0.206	-0.300	0.309
(p-value)	*(< .05)**	*(0.354)*	*(0.278)*	*(0.250)*

(1) These are the coefficients and significance levels reported in Ohlson's (1980) study.
N=2,163 (105 bankrupt and 2,058 nonbankrupt firms).
(2) Coefficients estimated using the full 1985-1987 sample containing all industry classifications and financially distressed companies. N=1,004 (153 distressed and 851 nondistressed companies)
(3) Coefficients estimated using a subset of the 1985-1987 sample that only includes bankrupt companies in the distressed group. N=953 (102 distressed and 851 nondistressed firms).
(4) Coefficients estimated using a subset of the 1985-1987 sample that only includes industrial companies. N=752 (130 distressed and 620 nondistressed firms).
X1 = log(total assets/GNP price-level index); X2 = total liabilities/total assets; X3 = working capital/total assets; X4 = current liabilities/current assets; X5 = one if total liabilities exceed total assets, zero otherwise; X6 = net income/total assets; X7 = funds provided by operations/total liabilities; X8 = one if net income was negative for the last two years,zero otherwise; X9 = measure of change in net income.
(p-value)-- Represents the multivariate significance of the coefficient in the full model.
*Indicates significance at .05 level.

Table 9
Coefficients for Altman's (1968) and Reestimated Models

Statistic	Altman's (1968) Model (1)	1985-1987 Model (2)	Bankruptcy-only Model (3)	Industrial-only Model (4)
working capital/total assets	1.200	0.058	-0.301	-0.386
(Univariate F)	(32.66)*	(39.67)*	(19.573)*	(9.67)*
retained earnings/total assets	1.400	1.504	1.599	2.067
(Univariate F)	(58.86)*	(387.37)*	(369.01)*	(278.84)*
earnings before interst and taxes/total assets	3.300	2.073	2.627	1.385
(Univariate F)	(26.56)*	(289.23)*	(309.12)*	(186.33)*
market value equity/book value of debt	0.600	-0.014	-0.033	-0.005
(Univariate F)	(33.26)*	(3.025)	(11.41)*	(2.815)
sales/total assets	0.990	-0.058	-0.157	-0.069
(Univariate F)	(2.840)	(0.261)	(1.050)	(0.249)

(1) These are the coefficients and significance levels reported in Altman's (1968) study.
N=66 (33 bankrupt and 33 nonbankrupt firms).
(2) Coefficients estimated using the full 1985-1987 sample containing all industry classifications and financially distressed companies. N=972 (148 distressed and 824 nondistressed companies)
(3) Coefficients estimated using a subset of the 1985-1987 sample that only includes bankrupt companies in the distressed group. N=910 (86 distressed and 824 nondistressed firms).
(4) Coefficients estimated using a subset of the 1985-1987 sample that only includes industrial companies. N=555 (79 distressed and 476 nondistressed firms).
X1=working capital/total assets; X2=retained earnings/total assets; X3=earnings before interest and taxes/total assets; X4=market value equity/book value of total debt; x5=sales/total assets.
(univariate F)– Represents the individual discriminating ability of each ratio. Altman(1968) only reported univariate significance.
*indicates significance at .05 level.

Table 10

Comparisons of the Classification Accuracy of the 1988-1991 Prediction Sample Using Zmijewski's, Ohlson's, and Altman's Coefficients and Those from the 1985-1987 Models

	Model	Statistic	Overall	Distressed Group	Nondistressed Group
Zmijewski (X)	Zmijewski (1984) (1)	accuracy (5)	81.3%	58.7%	86.1%
	1985-1987 (2)	accuracy (5)	85.7%	36.4%	96.3%
		test statistic (6)	2.577*	4.341*	6.171*
	1985-1987 Bankruptcy-only (3)	accuracy (5)	86.1%	33.2%	97.3%
		test statistic (6)	2.801*	4.979*	6.793*
	1985-1987 Industrial-only (4)	accuracy (5)	86.1%	41.3%	95.6%
		test statistic (6)	2.801*	3.387*	5.477*
Ohlson (Y)	Ohlson (1980) (1)	accuracy (5)	39.8%	95.4%	30.1%
	1985-1987 (2)	accuracy (5)	88.7%	59.1%	93.7%
		test statistic (6)	22.827*	15.319*	29.332*
	1985-1987 Bankruptcy-only (3)	accuracy (5)	88.5%	51.9%	94.8%
		test statistic (6)	22.648*	18.327*	14.356*
	1985-1987 Industrial-only (4)	accuracy (5)	88.1%	62.9%	92.9%
		test statistic (6)	22.603*	13.677*	28.971*
Altman (Z)	Altman (1968) (1)	accuracy (5)	57.8%	70.9%	55.5%
	1985-1987 (2)	accuracy (5)	88.1%	54.7%	93.8%
		test statistic (6)	13.657*	3.702*	15.871*
	1985-1987 Bankruptcy-only (3)	accuracy (5)	87.6%	48.6%	94.9%
		test statistic (6)	13.243*	4.225*	15.989*
	1985-1987 Industrial-only (4)	accuracy (5)	86.4%	55.4%	92.1%
		test statistic (6)	12.681*	2.945*	14.871*

(1) Zmijewski's (1984), Ohlson's (1980), and Altman's (1968) models are represented in equations (1), (2), and (3).

(2) Model estimated using the full 1985-1987 sample containing all industry classifications and financially distressed firms. See coefficients in Tables 7-9.

(3) Model estimated using a subset of the 1985-1987 sample that only includes the bankrupt firms from the distressed group. See coefficients in Tables 7-9.

(4) Model estimated using a subset of the 1985-1987 sample that only includes industrial firms. See coefficients in Tables 7-9.

(5) Accuracy rates represent the correct classifications for each model using the 1988-1991 samples.

(6) z-statistic comparing the reestimated model's accuracy rates to those of Zmijewski's, Ohlson's, or Altman's original model.

* the null hypothesis of equal accuracy rates is rejected at .05 level.

Table 11
Univariate Results for Variables Used in Equation (4)

Group	Statistic	NOI	CR	NOCF	DTA	SIZE
GCO (1)	Mean	1.761	0.108	1.547	0.495	4.275
N=117	*Std. dev.*	*(1.179)*	*(1.327)*	*(1.178)*	*(1.042)*	*(2.272)*
	Min	*0*	*-0.966*	*0*	*-0.791*	*-0.357*
	Max	*3*	*7.459*	*3*	*8.581*	*8.791*
NGCO (1)	Mean	1.421	0.276	1.138	0.400	3.476
N=195	*Std. dev.*	*(1.187)*	*(1.778)*	*(1.097)*	*(1.573)*	*(1.781)*
	Min	*0*	*-0.979*	*0*	*-0.851*	*-0.529*
	Max	3	16.597	3	19.598	10.445
	t-statistic	2.456*	0.958	3.098*	0.636	3.252*

(1) Going concern opinions (GCOs) include both unqualified with explanatory paragraphs and disclaimor opinions. Other opinion types were considered non-going concern opinions (NGCOs).

NOI = number of the previous three years with negative operating income.

CR = change in the current ratio measured as $(CR_t - CR_{t-2})/CR_{t-2}$.

NOCF = number of the previous three years with negative operating cash flows.

DTA = change in the debt to total assets ratio measured as $(DTA_t - DTA_{t-2})/DTA_{t-2}$.

SIZE = natural log of total assets.

*significant at the .05 level.

Table 12
Logit Results for Auditors' Opinion Decisions Model
See Equation (4) for Model

Statistic	TIME	NOI	NOI*TIME	CR	CR*TIME	NOCF	NOCF*TIME	DTA	DTA*TIME	SIZE	SIZE*TIME
Parameter	-0.9142	0.1365	0.0398	-0.112	0.1949	0.5048	-0.3917	-0.0872	0.4772	0.2331	0.1836
Wald Statistic	0.939	0.293	0.013	0.667	0.832	3.748	0.495	0.521	5.204	5.765	0.191
p-value **(1)**	*0.351*	*0.588*	*0.915*	*0.414*	*0.357*	*0.052***	*0.315*	*0.471*	*0.069***	*0.016**	*0.163*
F-statistic		0.627		0.175		0.279		3.375		20.755	
p-value **(2)**		*0.429*		*0.676*		*0.597*		*0.067***		*0.000**	

(1) p-value for the Wald statistic

(2) p-value for the F-stastic which indicates the significance of the variable for the post-SAS No. 59 period (1988-1991).

Sample includes 117 (195) companies with (without) going concern opinions from the 1985-1991 period.

GC = 1 for going concern opinion, 0 otherwise.

TIME = 1for post SAS No. 59, 0 otherwise.

NOI = number of the previous three years with negative operating income.

CR = change in the current ratio measured as $(CR_t - CR_{t-2})/CR_{t-2}$.

NOCF = number of the previous three years with negative operating cash flows.

DTA = change in the debt to total assets ratio measured as $(DTA_t - DTA_{t-2})/DTA_{t-2}$.

SIZE = natural log of total assets.

*significant at the .05 level.

**significant at the .10 level.

Table 13
Propensity of Going Concern Opinions

Group	Period (3)	N	Proportion with GCO (4)	z-statistic (5)
Bankruptcies (1)	Pre-SAS No. 59	103	39.8%	
	Post-SAS No. 59	108	53.7%	-2.062*
Other Distressed (2)	Pre-SAS No. 59	50	40.0%	
	Post-SAS No. 59	53	49.1%	-0.938

(1) Includes companies identified as financially distressed due to bankruptcy.
(2) Includes companies identified as financially distressed due to reasons other than bankruptcy, such as low S&P ratings for their stocks and bonds.
(3) The pre (post) periods include 1985-1987 (1988-1991).
(4) Going Concern opinions include both unqualified with explanatory paragraphs and disclaimer opinions.
(5) Test statistic for comparing the proportion of GCO companies in the pre-SAS No. 59 sample to that in the post-SAS No. 59 sample.
*the null hypothesis of equal proportions is rejected at .05 level.

Table 14
Tests of Differences in Financial Condition and Size Between Pre and Post-SAS No. 59 Companies with Going Concern Opinions (2)

Period (1)	Statistic	TLTA	CFO	CACL	NITA	SIZE
Pre-SAS No. 59	Mean	0.9903	-0.1854	1.3119	-0.3857	3.9276
	Std. Dev.	0.427	0.417	1.341	0.549	2.287
	Min	0.313	-2.138	0.079	-2.449	-0.357
	Max	2.902	0.101	7.346	0.058	8.612
	N	61	61	61	61	61
Post-SAS No. 59	Mean	1.0046	-0.0962	1.4783	-0.2525	4.6136
	Std. Dev.	0.627	0.265	1.614	0.375	2.257
	Min	0.218	-1.542	0.035	-1.939	0.098
	Max	4.026	0.144	8.859	0.239	8.791
	N	56	56	56	56	56
	t-statistic	-2.009	-0.096	-1.351	-0.383	-0.650
	p-value (3)	(0.047)*	(0.924)	(0.180)	(0.703)	(0.517)

(1) The pre (post) period includes 1985-1987 (1988-1991).

(2) Going Concern opinons includes both unqualified with explanatory paragraphs and disclaimors.

(3) p-value represents the significance level for the test of differences in means between the pre and post-SAS No. 59 GCO firms' ratios. The GCO firms' ratios were standardized using the total sample's (both GCO and NGCO companies) ratios to control for economic factors that may have affected the financial health and size of firms in general.

TLTA = total liabilities divided by total assets.

CFO = cash flows from operations divided by total assets.

CACL = current assets divided by current liabilities.

NITA = net income divided by total assets.

SIZE = log of total assets.

*significant at .05 level.

Table 15
Consistency Between Auditors' Opinions and Models' Predictions

Group	Period (3)	Model (4)	Bankruptcy Predictions (5)	Proportion with GCOs (6)	*z-statistic (7)*	Nonbankruptcy Predictions (5)	Proportion with NGCOs (6)	z-statistic (7)
Bankruptcies (1)	Pre-SAS No. 59	Altman	64	53.1%	*-0.192*	34	82.4%	1.973*
		Ohlson	101	41.6%	*-1.714**	1	100.0%	na
		Zmijewski	72	52.8%	*-0.179*	51	76.5%	2.859*
	Post-SAS No. 59	Altman	71	56.3%		27	63.0%	
		Ohlson	99	53.5%		4	75.0%	
		Zmijewski	70	54.3%		48	52.1%	
Other distressed (2)	Pre-SAS No. 59	Altman	43	46.5%	*-1.076*	7	100.0%	na
		Ohlson	50	42.0%	*-1.011*	1	100.0%	na
		Zmijewski	38	52.6%	*-1.149*	20	85.0%	2.209*
	Post-SAS No. 59	Altman	34	58.8%		12	75.0%	
		Ohlson	48	52.1%		3	100.0%	
		Zmijewski	38	65.8%		29	62.1%	

(1) Includes companies identified as financially distressed due to bankruptcy.

(2) Includes companies identified as financially distressed due to reasons other than bankruptcy, such as low S&P ratings on their stocks and bonds.

(3) The pre (post) period includes 1985-1987 (1988-1991).

(4) The Zmijewski, Ohlson, and Altman models are shown in equations (1), (2), and (3).

(5) Companies with bankruptcy probabilities > 50% (< 50%) were predicted as bankruptcies (nonbankruptcies).

(6) Going concern opinions (GCOs) include both unqualified with explanatory paragraphs and disclaimer opinions. Other opinion types were considered non-GCOs.

(7) Test statistic for comparing the proportion with GCOs (and NGCOs) in the the pre-SAS No. 59 period to that in the post-SAS No. 59 period.

na-sample size not appropriate for the binomial test.

*The null hypothesis of equal proportions is rejected at .05 level.