THE FLORIDA STATE UNIVERSITY

COLLEGE OF BUSINESS

MEASURES OF FIRM PERFORMANCE, EARNINGS CHANGES, AND THE PREDICTION OF STOCK RETURNS

By

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A Dissertation submitted to the
Department of Accounting
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

Degree Awarded:
Fall Semester, 1995

UMI Number: 9605038

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ACKNOWLEDGMENTS

I wish to thank my dissertation committee members who provided valuable comments: Kenneth S. Lorek, Pamela P. Peterson, Stephen P. Baginski, and Susan G. Pourciau. I am especially indebted to my committee chairman, Kenneth S. Lorek. His guidance, support, and insight on this study are greatly appreciated. Even more appreciated is his guidance and support throughout my doctoral studies. I would also like to thank my family and friends for their support and encouragement.

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ABSTRACT

This study extends the existing research on the use of financial statement variables to predict one-year-ahead earnings changes. It also provides additional evidence on the extent to which this information is fully reflected in stock prices. A structured approach to the financial statement variables was undertaken in an attempt to examine the relationships between the measures of firm performance identified by traditional financial statement analysis and one-year-ahead earnings changes. The study finds that most profitability measures are negatively related to one-year-ahead earnings changes. Several other variables were also found to be systematically related to one-year-ahead earnings changes. For example, changes in dividends per share were found to be negatively related to one-year-ahead earnings changes.

A principal component analysis was conducted on 61 financial statement variables in an attempt to describe the dimensionality of the variables and facilitate the development of parsimonious earnings prediction models. This study finds that the 61 variables embody a much richer array of information than suggested by previous research. The variabies could not be described by a small number of principal components. Consequently, using principal component analysis to develop parsimonious earnings prediction models was impaired.

The effect on the predictive ability of different earnings prediction model specifications was assessed by examining 36 different models which were estimated over two non-overlapping periods. The predictive ability tests led to four main findings. First, models using a dichotomous earnings change variable as the dependent variable performed as well as models using a trichotomous earnings change variable. Second, models with a one-year drift term achieved greater predictive ability than similar models using a four-year drift term. Third, models with the strongest fit in the estimation period did not necessarily dominate in the predictive ability tests. Fourth, the accuracy of the predictions of many of the models in this study was greater than the results obtained in the Ou and Penman [1989a] study.

This study also provides additional evidence on the extent to which the information regarding one-year-ahead earnings contained in current financial statements is fully reflected in stock prices. It was found that a simulated trading strategy did not perform well in the period subsequent to 1983. Thus, the Ou and Penman [1989a] results are not as robust as initially believed. Evidence is also provided that the trading strategy generates abnormal returns in periods extending beyond 36 months. This provides further support that the probabilistic measure of one-year-ahead earnings changes (*Pr*) is proxying for differences in expected returns rather than exploiting the underutilized information contained in financial statements.

Lastly, three stratifications of the sample firms were conducted to determine whether the effectiveness of the trading strategy could be increased. It was found that stratifying firms on the basis of predisclosure earnings information (proxied for by the market value of equity) and taking portfolio positions based on industry-specific models did not increase the performance of the trading strategy on a consistent basis. Although limiting trading strategy positions to stocks that experienced an extreme change in current earnings did increase the effectiveness of the strategy, it is likely it did so by further sorting firms according to determinants of expected returns.

CHAPTER 1

INTRODUCTION

Research by Ou and Penman [1989a] has documented that financial statements contain a wide array of variables that are useful in predicting one-year-ahead earnings changes. Using multivariate logit models, they derived a summary measure (denoted *Pr*) that is an indicator of the direction of future earnings and "has the character of a 'future earning power' attribute referred to by traditional fundamental analysts" (Ou and Penman [1989a, p. 299]). In addition to the development of an earnings prediction model, they find that the information contained in *Pr* is not fully reflected in stock prices. Trading strategies based on *Pr* were shown to earn abnormal returns over the 36-month period following implementation of the strategy. This evidence is inconsistent with the notion that the stock market is efficient with respect to all publicly available information. Ou and Penman [1989a, p. 327] conclude that *Pr* "captures equity values that are not reflected in stock prices." Bernard [1989, p. 90] has interpreted the results as evidence that "fundamental analysis works."

A contrasting view is that Ou and Penman have merely developed a trading strategy and little, if any, knowledge of financial statement analysis has been documented. Consistent with this is the viewpoint that *Pr* is simply a summary indicator of future earnings changes. Thus, it provides little insight on the relationships between specific operating characteristics, or measures of firm performance, and future earnings generating ability. The motivation for this study is to provide such insights by using a more structured approach to the financial statement information. It is hoped that this will help document empirical regularities that facilitate the prediction of earnings changes. Bernard [1989, p. 91] believes that such efforts "could ultimately establish a set of 'building blocks' of financial statement analysis that could be useful for students, analysts, and auditors."

It can be said that Ou and Penman used a mechanical approach when conducting their financial statement analysis.[1] Pooled cross-sectional and time-series data was used to estimate two earnings prediction models over non-overlapping periods (1965 - 1972 and 1973 - 1977). When estimating these models, Ou and Penman were not concerned about what specific signals regarding future earnings are embedded in the financial statements. In fact, Ou and Penman [1989a, p.300] conjecture that their results could have been improved had they "thought a little" about the selection of the financial statement variables. Unfortunately, their approach impairs the interpretability of the prediction models and reduces the insights gained from their analysis. Indeed, Larcker [1989, p. 148] states that the models are "essentially a black box" and that "in the present state of development, it is difficult to understand the economic meaning of the composite variable that is simply referred to as the *Pr* index."

Several features of the Ou and Penman models lead to this "black box" characterization and provide the motivation for the methodology used in this study. For

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[1]See Chapter 2 for a discussion of the specific procedures used by Ou and Penman.

example, the two models contain 16 and 18 variables, respectively, but have substantive differences as only six variables are common to both. Ou and Penman [1989a, p. 306] reconcile such differences by stating "that many of the descriptors capture similar operating characteristics." However, this assertion is potentially troublesome since some operating characteristics are not represented in both models. For example, three liquidity ratios are contained in one model whereas none is contained in the other. Thus, the implications of changes in liquidity on future earnings cannot be ascertained from this result.

Although certain operating characteristics are excluded from the models, other characteristics are over-represented. Unfortunately, the use of similar, highly correlated independent variables not only provides redundant information but also impairs the interpretability of the models. For example, seven of the independent variables can be regarded as return on investment (ROI) ratios. Previous research has concluded that one ratio from the ROI category could convey most of the information contained in all seven ratios.[2] The inclusion of similar ratios in the models leads to multicollinearity which results in unstable and often misleading coefficient estimates. This appears to have had an effect on the Ou and Penman models. Of the seven variables in the ROI category, three have positive coefficients, three have negative coefficients, and one changes signs between the two estimation periods.[3] Needless to

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[2]See Chapter 2 for a review of the research assessing the empirical similarities among financial ratios.

[3]Ou and Penman may attribute this result to the stepwise procedures which they state impair the ability to interpret the signs of the estimated coefficients.

say, it is difficult to draw any conclusions about the relationship between ROI ratios and future earnings generating ability from this result.

Additionally, some findings that appear to have implications for financial statement analysis were not discussed by Ou and Penman. For example, changes in dividends per share were found to be negatively related to earnings changes in the subsequent year. This result is counter to the "dividend information hypothesis" which suggests that dividends convey managers' private information about future earnings.[4] The dividend information hypothesis suggests that dividend increases (decreases) can be interpreted as a signal that management anticipates higher (lower) future earnings. This implies a positive relationship between dividend changes and subsequent earnings changes. The Ou and Penman finding, although counter to the result suggested by the dividend information hypothesis, could be useful in establishing an empirical regularity between dividend changes and future earnings changes. In contrast to Ou and Penman, who did not discuss the relationships between financial statement variables and future earnings changes, this study will explicitly consider these relationships in an attempt to identify empirical regularities.

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[4]This idea has been formalized in the dividend signalling models of Bhattacharya [1979], John and Williams [1985], and Miller and Rock [1985]. Early empirical studies (see Watts [1973] and Gonedes [1978]) did not support the dividend information hypothesis. However, recent research by Healy and Palepu [1988] indicates that firms initiating dividends have positive subsequent earnings changes while those omitting dividend payments have negative subsequent earnings changes.

Purpose and Contribution of the Study

One purpose of this study is to provide insight on the conflicting viewpoints regarding the Ou and Penman findings. Specifically, the study will examine the relationships between the measures of firm performance identified by traditional financial statement analysis (as embodied by the 68 variables used by Ou and Penman) and future earnings changes in an attempt to document empirical regularities. As noted previously, the relationships between the measures of firm performance and future earnings changes are obscured in the Ou and Penman study by the use of pooled cross-sectional and time-series data in the estimation of model parameters. This limitation will be overcome by estimating univariate logit models on an annual basis. The objective of the yearly analysis is to document which variables, hence which measures of firm performance, provide consistent signals regarding future earnings changes.

From a practical standpoint such knowledge may prove beneficial to the process of financial statement analysis. For example, changes in firm liquidity may not provide any information about future earnings. Therefore, an analyst would not need to examine such changes when attempting to forecast earnings changes. Conversely, changes in asset turnover ratios may be consistently related to future earnings generating ability and changes in these ratios may provide useful information for the analyst. Additionally, these empirical insights may prove useful in the development of theories relating the measures of firm performance and future earnings changes.

In addition to categorizing the 68 variables according to traditional financial statement analysis, a principal component analysis will be conducted to determine an empirical classification scheme. If the 68 variables are highly interrelated the benefits of the principal component analysis will be twofold. First, it will allow the variables to be grouped empirically according to the measures of firm performance. This will provide additional evidence on the relationships between the measures of firm performance and future earnings changes. Second, it will facilitate the development of parsimonious earnings prediction models. This will be accomplished by selecting one variable to represent each unique aspect of firm performance. By design, the selected variables will exhibit very low correlations between one another so that parsimonious prediction models can be developed. The models will also be interpretable because the problem of multicollinearity arising from the use of redundant variables will be avoided. Thus, the marginal contribution of each variable toward the prediction of earnings changes can be assessed.

Although the principal component analysis may facilitate the development of parsimonious prediction models, it is desirable to compare the predictive ability of these models to models developed on a purely statistical basis (e.g., through stepwise procedures). Such comparisons are necessitated because the use of principal component analysis to guide variable selection will result in a loss of information contained in the original 68 variables.[5] Comparing the predictive ability of the parsimonious models

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[5]The objective of the principal component analysis is to select a subset of variables without losing a significant amount of information contained in the original 68 variables. However, it is possible that the selected variables will under-represent some

to "benchmark" statistical models will also give some insight on the amount of information that was lost in the variable selection process. Three benchmark models will be used in this study: the two Ou and Penman models and a model estimated using stepwise procedures.

In addition to the documentation of empirical regularities, this study will make several contributions to the accounting literature. First, this study will examine whether the specification of the earnings prediction model affects predictive ability. Three different specifications will be used: (1) a multivariate logit model with a binary dependent variable, (2) a multivariate logit model with a trichotomized dependent variable, and (3) a multivariate ordinary least squares regression model with the standardized change in one-year-ahead earnings as the dependent variable. The first specification is that used by Ou and Penman. The motivation for the latter two specifications is to utilize the information in the dependent variable more fully in the estimation of model parameters.

Second, this study will determine whether earnings prediction models that are similar to those used by Ou and Penman can earn abnormal returns using a simulated trading strategy. If the models used in this study achieve predictive ability results comparable to the Ou and Penman models, it appears reasonable to expect that these models will generate comparable abnormal returns too. If abnormal returns can be earned, then additional evidence of market underreaction to financial statement

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of the dimensions of firm performance and that a significant amount of information may be lost.

information will be provided. Conversely, if the models cannot be used to produce abnormal returns, the following question remains unanswered: What information about future earnings, that is not reflected in stock prices, are the Ou and Penman models capturing?

Third, insight on the conflict as to how long the abnormal returns persist will be provided. Although Ou and Penman found that abnormal returns could be generated for a 36-month period, Stober [1990] documented abnormal returns over a 60-month period.[6] Additional evidence on this conflict is important to the interpretation of the abnormal returns generated by the trading strategy. Although *Pr* is a probabilistic measure of one-year-ahead earnings changes, Ou and Penman [1989b] found that *Pr* has some ability to classify correctly earnings changes three years ahead. This is consistent with abnormal returns persisting for 36 months. In contrast, the documentation of abnormal returns over a 60-month period would suggest that *Pr* may be systematically related to some asset pricing misspecification problem.

Fourth, an attempt to detect greater discrepancies between fundamental values and stock prices will be undertaken by using information in addition to *Pr* to stratify sample firms. This will be accomplished by stratifying sample firms on the basis of one additional information variable. Three different stratifications will be conducted based on the following variables: (1) the amount of predisclosure information, as

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[6]Stober [1990] used the same models as Ou and Penman and examined abnormal returns over the same time period.

proxied for by the market value of equity, (2) the magnitude of the change in current earnings, and (3) the basis of industry membership.

Lastly, the time period covered by the trading strategy will extend six years beyond that examined by Ou and Penman. This study will use returns through 1992 whereas Ou and Penman used returns through 1986. This will provide evidence on whether the profitability of the trading strategy is unique to the time period studied by Ou and Penman.

It is important to note that several studies extending Ou and Penman [1989a] have been published since this study was initially proposed. Although their focus is primarily on the trading strategy aspect of Ou and Penman, they have, nonetheless, had an impact on the incremental contribution of this study. These studies are reviewed in Chapter 4 and their impact on the contribution of this study is assessed (see pages 110 - 120). Additionally, Chapter 5 provides a summary of the incremental contribution of this study in light of these other studies (see pages 138 and 139).

Organization of the Study

The remainder of this study is organized as follows. Chapter 2 is a review of the accounting literature which provides the background for this study. Chapter 3 provides a description of the data sources and the methodologies used in conducting the empirical analyses. Chapter 4 presents the results of the empirical analyses. Lastly, Chapter 5 contains a summary of the results, provides an assessment of the contribution of the study, and makes some suggestions for future research.

CHAPTER 2

LITERATURE REVIEW

Four aspects of the accounting literature which provide the background for this study are reviewed in this chapter. The four aspects are: (1) studies on the role of accounting information in security valuation, (2) studies on the prediction of annual accounting earnings based on different information sets, (3) studies on the incremental information content of nonearnings accounting numbers, and (4) studies on the empirical similarities among financial ratios.

The Role of Accounting Information in Security Valuation

The role of accounting information, particularly earnings, in security valuation has been a widely researched topic since the seminal papers of Ball and Brown [1968] and Beaver [1968]. One criticism of such efforts, however, is that the empirical hypotheses tested have not been based on formal security valuation models linking accounting variables to security prices [Ohlson, 1990]. More recent research has overcome this objection by discussing a valuation model prior to the empirical analyses.[7] Unfortunately, there is little consistency among these studies with regard

[7]For example, Beaver, Lambert and Morse [1980], Beaver, Lambert and Ryan [1987], Collins and Kothari [1989], Easton [1985], Easton and Zmijewski [1989], Hopwood and Schaefer [1988], and Kormendi and Lipe [1986].

to the valued attribute of common stock ownership. The studies have used either cash flows, earnings, or dividends as the valued attribute of stock ownership.

Recently, Ohlson [1990] has demonstrated that only expected future dividends can serve as the valued attribute of a security. This finding is consistent with the *informational perspective* on accounting data. Under this perspective, the role of accounting data in security valuation is to alter investors' expectations of future dividends. It is this relationship between accounting data and expectations of a firm's future dividend-paying ability that gives accounting information valuation implications.[8] The informational perspective on accounting data has been developed within a framework linking accounting data to security prices.[9] The framework consists of three parts: (1) A valuation link between expected future dividends and current security price. This is established via a dividend discounting valuation model. (2) An information link between expected future accounting variables and expected future dividends. This is generally couched in terms of the relationship between expected earnings and dividends in a particular year via the dividend payout ratio. (3) A predictive link between all available information about the firm and expected future

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[8]It is often suggested that accounting variables have valuation implications through their ability to predict the systematic risk (beta) of a security (see Foster [1986] for a review of this literature). As in Ou and Penman [1989a] this study will seek to identify variables related to future earnings and hence the future dividend-paying ability of the firm.

[9]This conceptual framework is presented formally in Ohlson [1979] and Garman and Ohlson [1980] and is discussed in a less formal setting by Beaver [1989].

accounting variables. As in the information link, future accounting earnings are generally the accounting variable of interest.

The importance of future accounting earnings in this framework stems from its ability to alter expectations of the future dividend-paying ability of the firm. This view is held in fundamental security analysis as well. For example, *Graham and Dodd's Security Analysis* states:

> Future earnings, however, are generally perceived as the long-term determinant of a company's ability to pay future dividends. This link between earnings and dividends allows a view of value as a function of future earning power (Cottle, Murray and Block [1988, p. 557]).

The importance of earnings in assessing the dividend-paying ability of the firm is also reflected by the Financial Accounting Standards Board (FASB) in its *Statement of Financial Accounting Concepts No. 1* [1978], which states:

> Financial reporting should provide information that is useful to present and potential investors and creditors and other users in assessing the amounts, timing, and uncertainty of prospective cash receipts...Since investors' and creditors' cash flows are related to enterprise cash flows, financial reporting should provide information to help investors, creditors, and others assess the amounts, timing, and uncertainty of prospective net cash inflows to the related enterprise (page viii).

Although investors' cash flows (i.e., dividends) are related to the firm's cash flows, the FASB suggests that earnings provide a better indicator of this future dividend-paying ability than cash flows:

> Information about enterprise earnings based on accrual accounting generally provides a better indication of enterprise's present and continuing ability to generate cash flows than information limited to the financial aspects of cash receipts and payments (page ix).

Consistent with this discussion, the informational perspective on earnings will be used in this study.

The Prediction of Annual Accounting Earnings

The prediction of accounting earnings is the third link in the informational perspective on accounting. As future earnings are perceived to be a measure of a firm's future dividend-paying ability, a substantial amount of research has focused on the prediction of accounting earnings. The studies discussed in this section are limited to those making one-year-ahead predictions of annual earnings and are divided into two groups: (1) those based on time-series modeling of annual earnings, and (2) those based on an information set broader than current and past earnings.[10]

Predictions Based on Past Earnings

The time-series properties of annual accounting earnings have been studied extensively during the past two decades. Early studies concentrated on drawing inferences based on cross-sectional means and/or medians. These studies focused on growth in earnings per share (EPS) and generally concluded that past growth rates in EPS are not useful in predicting future growth rates in EPS (e.g., Little [1962] and Brealey [1969]).

Ball and Watts [1972] were among the first to examine the time-series properties of earnings. They concluded that annual EPS changes can be characterized as a

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[10]For a thorough discussion of the accounting earnings prediction literature (both annual and quarterly earnings) see Brown [1993].

submartingale or a random walk with drift.[11] However, Brooks and Buckmaster [1976, 1980] argued that the submartingale may be an appropriate characterization for the average firm, but the use of mean/median statistics may mask the processes for certain subsets of these firms. By stratifying the sample of firms based on the magnitude of earnings change in the prior year, Brooks and Buckmaster identified that extreme changes in earnings seemed to signify the starting of a mean-reverting process that lasts for several periods before reverting to a submartingale.

The time-series properties of deflated earnings (i.e., earnings divided by net worth) have also been examined in a cross-sectional context. Both Beaver [1970] and Lookabill [1976] found that the deflated earnings series can be characterized as a moving-average process in which mean reversion takes several years to complete.

The studies employing mean/median statistics in a cross-sectional context identified the time-series process generating earnings for an "average" firm. Thus, the potential exists that a specific firm's earnings process may differ from a submartingale. This led researchers to use univariate Box-Jenkins techniques to analyze the time-series behavior of earnings for individual firms.[12] Both Watts and Leftwich [1977] and Albrecht, Lookabill and McKeown [1977] compared the predictive accuracy of the

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[11]The terms "submartingale" and "random walk with drift" as well as "martingale" and "random walk" will be used interchangeably in this discussion. The random walk and random walk with drift models are considered martingales and submartingales processes, respectively, with the additional assumption that the error terms are independent and identically distributed. See Lorek, Kee and Vass [1981] for a further discussion of these processes.

[12]See Box and Jenkins [1976] for a detailed description of univariate Box-Jenkins forecasting techniques.

firm-specific Box-Jenkins models, the random walk model and the random walk with drift model. No significant differences between the predictive accuracy of the firm-specific Box-Jenkins models and the random walk with drift model were found when using nondeflated earnings. Additionally, firm-specific models estimated on deflated earnings were unable to outpredict the random walk model.

The results of these studies have been taken as evidence that firm-specific Box-Jenkins models cannot outpredict the random walk models. However, as noted by Lorek, Kee and Vass [1981], this inability may be due to the methodological problems encountered when using Box-Jenkins models on annual earnings data.[13] Thus, the findings of these stuαies should not be construed as strong evidence supportive of the "random walk hypothesis." Nonetheless, by the end of the 1970s it was believed that annual earnings follow a random walk with drift for the majority of firms (i.e., except for those firms experiencing an extreme change in earnings). In contrast, recent research has found that the random walk with drift model is not descriptive of the annual earnings series of many firms. Specifically, Kendall and Zarowin [1990], and Ramakrishnan and Thomas [1993] show that, for many firms, annual earnings are best described as a first-order autoregressive process on earnings levels. Additionally, Ramakrishnan and Thomas [1993] show that the autoregressive behavior has increased

[13]The methodological problems arise from the numbe: of observations used to estimate the firm-specific Box-Jenkins models. It is likely that the stationarity assumption is violated when a sufficient number of observations (50 or more) are used. In contrast, the stationarity assumption may be met when using a smaller number of observations; however, the resulting parameter estimates are subject to a high degree of sampling error. Either of these problems may reduce the predictive accuracy of the firm-specific Box-Jenkins models.

over time. They attribute the change in the process underlying annual earnings (i.e., from a random walk with drift model to a first-order autoregressive model) to the decrease in earnings persistence.[14]

Predictions Based on Expanded Information Sets

When discussing the prediction of annual earnings, the specification of the information set is crucial. Although past earnings may not aid in the prediction of future earnings, once the conditioning information set is expanded beyond the earnings history of a firm, the prediction of future earnings may be facilitated. That is, when expectations are conditioned upon data other than prior earnings, expected earnings may differ from that derived from a random walk with drift model or a first-order autoregressive model. Two aspects of this literature are relevant to this study. The first examines the prediction of annual earnings by expanding the information set to include additional accounting variables beyond current and past earnings. The second examines the prediction of annual earnings based on all available information or a "global" information set.[15]

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[14]Thomas [1993] offers two possible explanations for the decrease in earnings persistence. First, many firms now produce products with shorter life cycles. Thus, a new product innovation will only generate earnings for a short period of time. Second, accounting rules have changed in ways that reduce the persistence of reported earnings (e.g., marking assets and liabilities to market).

[15]This literature is also discussed in Brown [1993]; however, much of his discussion focuses on the prediction of quarterly earnings. In contrast, the literature review contained in this study is primarily restricted to studies examining the prediction of annual earnings.

Freeman, Ohlson and Penman [1982] were the first to examine the predictive ability of annual nonearnings accounting variables. They found that the direction of future earnings changes could be predicted weakly by simply expanding the conditioning information set from current and past earnings to include one additional accounting variable: the common equity of the firm. Specifically, they hypothesized that the book rate-of-return (defined as annual earnings divided by common equity at the beginning of the period) could predict the probability of observing an increase, or decrease, in the subsequent year's earnings. They found that a relatively low rate-of-return implies a higher probability of an earnings increase in the next year, and vice versa.[16]

This result served as the impetus for two more recent studies which assessed the predictive ability of additional nonearnings accounting variables. Both Ou and Penman [1989a] and Ou [1990] examined the ability of a wide array of nonearnings financial variables to predict one-year-ahead earnings changes (minus drift).[17] Sixty-eight and 61 accounting variables were used in the Ou and Penman and Ou studies, respectively. The majority of the variables were financial ratios and the percentage change in the ratios from the previous year. Both studies used a similar approach to develop earnings

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[16]This result was anticipated based on the finding of Beaver [1970] who showed that the book rate-of-return is mean-reverting. A relatively low rate-of-return suggests that current earnings contain a negative transitory element and that earnings should increase in the subsequent period. A relatively high rate-of-return indicates current earnings contain a positive transitory element and will decrease in the subsequent period.

[17]The adjustment for the drift is implied in all future references to "earnings changes."

prediction models.[18] Three steps were undertaken to develop the final models: (1) Simple (i.e., univariate) logit earnings prediction models were estimated for each of the accounting variables. That is, each of the sixty-plus variables was the sole explanatory variable of the sign of one-year-ahead earnings changes. (2) All variables that were statistically significant at the .10 level from the univariate models were then used simultaneously in a multivariate logit model. (3) The variables that were significant at the .10 level in the multivariate model were then examined in a step-wise manner. Variables that were significant at the .10 level were retained in the final prediction models. These procedures were followed over two estimation periods in Ou and Penman and resulted in models with 16 and 18 variables, respectively. Ou's procedures resulted in eight variables being included in her final model.

The dependent variable of the multivariate logit models is a probabilistic measure of one-year-ahead earnings changes and is denoted as *Pr*. The value of *Pr* is interpreted as the probability a firm will experience an earnings increase in year $t+1$ based on the values of the financial statement variables as of year t. In contrast, (1-*Pr*) denotes the probability of observing either no change in earnings or an earnings decrease in year $t+1$.[19] The ability of the models to predict correctly the sign of one-year-ahead earnings changes was virtually identical across the Ou and Penman and Ou studies. When all observations were categorized as either an earnings increase or an

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[18]The procedure described is that followed by Ou and Penman [1989a]. Ou's [1990] procedures were basically the first two steps.

[19]In all future references to "earnings decreases" it is implied that this term also includes "no changes" in earnings.

earnings decrease (i.e., a *Pr* cutoff of .5) the models were correct 61% of the time. When vague earnings change predictions were excluded (i.e., observations where *Pr* was between .4 and .6) the predictive increased to 67%. These results indicate clearly that when the information set is expanded to include additional nonearnings accounting variables that the prediction of annual earnings is facilitated. In other words, based on this conditioning information set, expected annual earnings are inconsistent with a random walk with drift.[20]

The notion that expectations (i.e., predictions) of future earnings should be based on all available information is consistent with Muth's [1961] theory of rational expectations. Two areas of research have examined the predictive ability of forecasts made on this "global" information set: (1) forecasts made by financial analysts and (2) forecasts made by security price-based models.

Financial analysts' forecasts (FAF) of one-year-ahead earnings have been found to be more accurate than forecasts from univariate time-series models. The superiority of FAF relative to time-series models has been attributed to a contemporaneous information advantage and a timing advantage. The contemporaneous information advantage arises from the ability of financial analysts to incorporate all publicly available information, in addition to past earnings, into their forecasts. The timing advantage is due to the use of FAF made subsequent to the announcement of annual

[20]If annual earnings follow a random walk with drift, then the probability of observing an increase (or decrease) in the subsequent years' earnings, after adjustment for the drift, is 50 percent. In this situation a random-guess strategy would be used when predicting earnings changes.

earnings. Forecasts from time-series models can be made as soon as earnings are announced. However, FAF made subsequent to the earnings announcement date allow financial analysts to incorporate information from the intervening period into their forecasts.[21] Fried and Givoly [1982] found only the contemporaneous information advantage was significant. In contrast Brown, Griffin, Hagerman and Zmijewski [1987] found both the timing advantage and the contemporaneous information advantage to be significant when forecasting quarterly earnings.

In a study similar to Ou and Penman [1989a], Stober [1990] evaluated the predictive ability of the sign of the change in one-year-ahead financial analysts' forecasts. Using consensus forecasts made four months after the fiscal year-end, Stober found correct predictions were made approximately 70% of the time. These results compare favorably with the results of Ou and Penman [1989a] and Ou [1990] and suggest that financial analysts use an information set broader than the financial statement variables analyzed in the Ou and Penman [1989a] study.

Other studies have attempted to identify the information utilized by analysts to achieve their forecasting advantage relative to time-series models. For example, Kross, Ro and Schroeder [1990] investigated whether analysts' forecasting superiority is associated with certain firm characteristics. They found that the analyst advantage is positively related to the variability in the firm's earnings time series and the amount of

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[21]When comparing the predictive ability of FAF and time-series forecasts it is desirable to minimize the timing advantage by using FAF made as soon after the earnings announcement as possible. In this situation, the superiority of the FAF can be better attributed to the contemporaneous information advantage.

coverage in *The Wall Street Journal.* In another study, Kim and Schroeder [1990] found evidence of analysts' anticipation of discretionary accruals for firms with earnings-based bonus plans. Brown [1993] concludes that analysts' forecasting advantage relative to time-series models is analysts' ability to distinguish between permanent, transitory and price-irrelevant earnings shocks.

Beaver, Lambert and Morse [1980] were the first to suggest that security prices could be used as a surrogate for the "global" information set used to form expectations of future earnings. If expected future earnings are relevant in equity valuation, then the theory of rational expectations implies that the price of a firm's stock should reflect earnings expectations based on all available information. Therefore, in a rational security market, stock prices can be viewed as summarizing all relevant information about future earnings. This suggests that current stock prices reflect information about future earnings before that information is reflected in current earnings. Consequently, Beaver, Lambert and Morse [1980] hypothesized that security price-based models can be used to predict future earnings.[22] In addition to Beaver, Lambert and Morse [1980], several other studies have examined this hypothesis (Beaver, Lambert and Ryan [1987], Collins, Kothari and Rayburn [1987], and Freeman [1987]). The conclusion

[22]To allow prices to have predictive ability, Beaver, Lambert and Morse [1980] characterized the earnings generating process as a mixture of two processes. The first process reflects the effects of events on earnings that have an impact on security prices. This is generally called the permanent component of earnings. The second process reflects the effects of events on earnings that have no impact on security prices. This is generally called the temporary or transitory component of earnings. The reported earnings number is viewed as a "garbling" of these two processes. It is this garbling process that contributes to reported earnings following a random walk with drift.

of this research is that price-based models are more accurate than the random walk with drift model in predicting one-year-ahead earnings. Additionally, the superiority of the price-based models has been shown to be positively related to firm size (see Collins, Kothari and Rayburn [1987] and Freeman [1987]). This result has been viewed as being consistent with the implications of the differential information hypothesis developed by Atiase [1980]. However, Brown [1993] states that the random walk model is a weak benchmark for predicting annual earnings and the performance of the price-based models should be reexamined against stronger time-series benchmarks.

The Information Content of Nonearnings Accounting Numbers

In the past decade a number of studies have assessed the incremental information content of various accounting disclosures.[23] The most widely researched areas have been the incremental information content of inflation-adjusted data, cash flow and accrual data, and reserve recognition accounting disclosures in the oil and gas industry. A review of this literature can be found in Bernard [1989] who summarizes the findings of this research by stating:

> The recurring lesson from this research is that bottom-line historical cost earnings is not only "hard to beat," but that it is difficult to demonstrate convincingly that other data convey any information beyond that reflected in earnings. That is, once one knows the bottom-line historical cost earnings, it is not clear one can achieve much improvement in the ability to explain stock returns by using inflation-adjusted earnings, cash flow data, or disclosures of the present value of oil and gas reserves [p. 92].

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[23]The focus of these studies has been to determine if these disclosures contain information beyond that contained in the earnings disclosure. Thus, the term incremental information content is generally used.

However, it appears that this lack of information content does not apply when one considers a large number of financial statement variables simultaneously. Ou and Penman [1989a], Ou [1990] and Hopwood and Schaefer [1988] have all documented that a wide array of annual nonearnings accounting numbers, do possess incremental information content.[24]

As noted in the previous section, Ou and Penman [1989a] and Ou [1990] found that annual nonearnings accounting numbers are useful in predicting the sign of one-year-ahead earnings changes. This indicates that nonearnings accounting numbers contain information about future earnings that is not available from past earnings alone. Consistent with the notion that stock prices reflect information regarding future earnings, these studies also examined the extent to which this information is impounded in security prices. Both Ou and Penman [1989a] and Ou [1990] demonstrate that stock returns over the annual report dissemination period (defined as the three-month period subsequent to the fiscal year-end) are consistent with the predictions of one-year-ahead earnings changes. That is, firms with predicted earnings increases (decreases) generally had positive (negative) cumulative abnormal returns during this period. Thus, stock prices behave as if investors revise their expectations of future earnings based on annual nonearnings accounting numbers.

Although this suggests that the stock market impounds some of the information in *Pr* when it is published, Ou and Penman [1989a] show that the market does not fully

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[24]Earlier studies examined the incremental information content of a limited set of nonearnings variables. Both Gonedes [1974] and O'Connor [1973] concluded that the nonearnings variables did not possess significant incremental information content.

impound all of the information about future earnings that is contained in *Pr*. Ou and Penman use a trading strategy that involved taking long positions in stocks with *Pr* values greater than .6 and offsetting short positions in stocks with *Pr* values less than .4. This strategy requires zero net investment and is denoted as the *Pr* strategy.[25] Stocks were held for 24 months and mean return differences to the long and short positions were observed. The *Pr* strategy resulted in a 24-month return of 14.53% which was shown to be 55% of the return earned by a trading strategy employing perfect foreknowledge of year $t+1$ earnings changes (i.e., the Ball and Brown [1968] hypothetical strategy).[26]

It is also interesting to note that the cumulative returns to the perfect foresight strategy do not increase much beyond month 12, at which time earnings are publicly known. In contrast, the cumulative returns to the *Pr* strategy increase through month 36. Ou and Penman [1989a] suggest that *Pr* may be capturing "value attributes" that extend for three years and that this delayed response to the disclosure of annual nonearnings numbers is evidence that fundamental analysis works. Their results may also be construed as evidence of market inefficiency as the information used to

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[25]In a securities market that is semistrong efficient, stock prices will fully reflect all publicly available information and trading strategies based on this information set should not lead to abnormal returns. Therefore, in a semistrong efficient market we would expect a return of zero to the *Pr* strategy.

[26]This return was based on firms with different fiscal year-ends and therefore is not an implementable strategy. When the sample was restricted to December fiscal year-end firms (an implementable strategy), the 24-month return was 12.56%. The use of size-adjusted returns resulted in 24-month returns of 9.08% (all firms) and 7.02% (December fiscal year-end firms).

construct *Pr* is publicly available at the time the trading strategy is implemented.[27] Another explanation of their results is that *Pr* may be distinguishing firms on risk characteristics so that the "abnormal returns" are nothing more than fair compensation for bearing risk. However, Ou and Penman conduct several tests that show that *Pr* is not proxying for risk, as measured by conventional risk proxies (e.g., beta). Nonetheless, there is still the possibility that *Pr* is proxying for an unidentified risk factor that is priced by the market.

Hopwood and Schaefer [1988] examined the incremental information content of earnings and nonearnings-based financial ratios. Previous research has examined the empirical relationships among financial ratios and has found that financial ratios can be represented by a seven-factor classification system (see the next section for a discussion of this literature). Each factor (or ratio category) in this classification system represents a unique dimension of firm performance that is uncorrelated with the other factors. Using principal component analysis, Hopwood and Schaefer examined the correlations between the unexpected component score for each of the seven dimensions of firm performance and unexpected security returns. Their findings provide additional evidence that annual nonearnings numbers are used in security valuation as five of the seven dimensions were correlated significantly with unexpected security returns.

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[27]Some would argue that this apparent underreaction of prices to publicly available information does not provide evidence of market inefficiency. For example, Ball [1989] states that many of the stock market anomalies documented over the last decade can be attributed to data limitations and our "meager understanding" of asset pricing.

Empirical Similarities Among Financial Ratios

Financial ratios and related financial data have been used extensively to predict various business events. Researchers have attempted to predict corporate bond ratings (Horrigan [1966], Pinches and Mingo [1970] and West [1970]), takeover targets (Belkaoui [1978] and Palepu [1986]), business failure (Altman [1968], Beaver [1966] and Ohlson [1980]) and one-year-ahead earnings changes (Ou [1990] and Ou and Penman [1989a]).[28] A common feature underlying this research is the lack of a theoretical basis to facilitate independent variable selection. Subsequently, these studies have used numerous variables to aid in the prediction of the event under consideration. Indeed, Chen and Shimerda [1981] document that over 100 financial variables have been used in various studies to predict business failure.

This situation has made comparisons across studies difficult as the variables found to be significant predictors of the criterion event have often varied from study to study. However, it is likely that many of these variables may be proxies for the same characteristic or dimension of firm performance. In an attempt to address this issue, several studies have examined the empirical relationships that exist among financial ratios.[29] The main purpose of this literature is to provide insight on the

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[28]This listing is not meant to be exhaustive with regard to either the object of prediction or the studies conducted within a specific area.

[29]A substantial amount of research has examined other aspects of ratios as well. For example, the cross-sectional distributional properties of financial ratios have been studied. The general conclusion of this research is that most financial ratios are not normally distributed (Deakin [1976]). However, Frecka and Hopwood [1983] have shown that non-normality for most of the ratios is caused by a few outliers and that normality, or approximate normality, can be achieved for most of the ratios by deleting the outliers.

extent to which common information is provided by various ratios. The rest of this section summarizes the findings of these studies.

Pinches, Mingo and Carruthers (PMC) [1973] were the first to examine the empirical relationships that exist among financial ratios. Using factor analysis, PMC examined 48 ratios from 221 industrial firms for the years 1951, 1957, 1963 and 1969. Seven factors or classifications of financial ratios occurred in each of the four years studied and the composition of the financial ratio groups was reasonably stable over the nineteen-year period. The seven factors obtained by PMC were: return on investment, capital intensiveness, inventory intensiveness, financial leverage, receivables intensiveness, short-term liquidity and cash position.

Pinches, Eubank, Mingo and Carruthers (PEMC) [1975] examined the short-term stability of the seven empirically based financial ratio groups identified in the PMC [1973] study. Using the same ratios and firms as PMC, PEMC found that the seven categories were stable over the 1966-1969 time period. PEMC also conducted a higher-order factor analysis to identify the interrelationships among the seven first-order classifications. They documented that a hierarchical classification of financial ratios can be constructed as the seven first-order classifications were found to be related to three higher-order classifications.

Johnson [1979] extended the two previous studies by including more ratios (61) and examining the classifications of manufacturers and retailers separately. Using principal component analysis on data from 1972 and 1974, Johnson identified eight financial ratio groups: the seven identified by PMC [1973] and a category for decomposition measures.[30] Johnson's results provide additional evidence on the existence of the seven groups identified by PMC [1973] and on their short-term stability. Additionally, the composition of each ratio group and the importance of a ratio to a particular group were found to be stable across the two industry categories studied.

Chen and Shimerda [1981] reconciled the ratio categories documented in five studies that assessed the empirical similarities among financial ratios.[31] The authors found that the diversity of ratio categories identified in these studies was due to nomenclature and that the seven categories identified by PMC [1973] constitute the principal dimensions of firm performance. Chen and Shimerda also document that the 34 ratios that have been found to be useful (i.e., statistically significant) in the prediction of business failure can be grouped into these seven categories. This led Chen and Shimerda to state that in most cases one ratio from each category could be selected which would account for the majority of the information provided by all the ratios in a category. Additionally, the inclusion of more than one ratio from each category leads to multicollinearity which results in unstable and often misleading parameter estimates associated with the collinear variables.

Gombola and Ketz [1983] addressed the impact of alternative cash flow measures on the classification of financial ratios. The studies discussed previously have

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[30]Financial decomposition measures reflect changes in the composition of balance sheet and income statement items over time. See Theil [1969] and Lev [1973] for a discussion of the use of decomposition measures in financial analysis.

[31]The PMC [1973] and PEMC [1975] studies were included among the five studies.

generally defined cash flows as net income plus depreciation and amortization. Ratios involving this measure of cash flow have been grouped under the return on investment category. However, this result may be due to the high correlation between the cash flow measure and net income. By using a more refined definition of cash flow, Gombola and Ketz found that cash flow ratios form a distinct factor. This finding is consistent with recent research that has shown that the time-series properties of quarterly operating cash flows are markedly different from the time-series properties of quarterly earnings. For example, Lorek, Schaefer and Willinger [1993] found that the quarterly operating cash flow series can be described by purely seasonal time-series models. These cash flow models differ from the three "premier" models used to describe quarterly earnings. Hopwood and McKeown [1992] also found that the time-series properties of cash flows differ from those of earnings. The other ratios studied by Gombola and Ketz grouped under the seven categories identified by PMC [1973].

The overall conclusion from this literature is that meaningful, empirically-based classifications of financial ratios can be identified and that these classifications are stable over time. To some extent, however, the number of dimensions identified in a particular study is affected by the particular group of ratios examined. Nonetheless, the implication of these findings is that researchers using financial ratios in predictive studies can choose a single ratio from each dimension of financial performance thereby avoiding the use of redundant ratios.

CHAPTER 3

DATA SOURCES AND METHODOLOGY

Four separate empirical analyses will be performed in this study. First, the empirical relationships between the measures of firm performance identified by traditional financial statement analysis and one-year-ahead earnings changes will be examined. Second, a principal component analysis will be conducted in an attempt to reduce the dimensionality of the 68 variables used in the Ou and Penman study (see Appendix A for a list of these variables). By selecting one variable to represent each dimension of firm performance, parsimonious earnings prediction models will be developed. Third, the predictive ability of these models will be examined vis-a-vis "benchmark" statistical models. Fourth, a simulated trading strategy will be used to determine whether stock prices fully reflect the information about future earnings that is contained in the prediction models. Additionally, three alternative trading strategies, will be developed in an attempt to determine whether the effectiveness of the strategy can be increased by using information in addition to *Pr* when constructing the hedge portfolios. Specifically, sample firms will be stratified on (1) the amount of predisclosure earnings information, (2) the magnitude of current earnings change, and (3) industry membership.

The 68 annual financial statement variables will be obtained from the 1990 COMPUSTAT Annual Primary, Supplementary and Tertiary File and will be merged with the 1990 COMPUSTAT Research File. This will result in 20 years of annual financial statement date (1971 through 1990). Monthly security returns will be obtained from the Monthly Returns Tape of the Center for Research in Security Prices (CRSP) for NYSE firms and will be calculated from the Daily Returns Tape for AMEX firms.

The sampling filters used in this study will closely parallel those used by Ou and Penman. Subject to data availability, all industrial firms listed on the NYSE and AMEX will be included with the exception of utilities (SIC code 49) and banks, financial, and real estate companies (SIC codes 60-69). Ou and Penman found that these firms generally do not possess the dimensions of firm performance reflected by the 68 accounting variables. One difference in this study will be the restriction to December fiscal year-end firms only. This restriction is imposed so that the simulated trading strategy will better represent an implementable strategy.[32]

The remainder of this chapter discusses the motivation for, and the specific details of, the analyses to be conducted within each of the four areas.

Measures of Firm Performance and One-Year-Ahead Earnings Changes

To provide insight on the relationships between the measures of firm performance and one-year-ahead earnings changes, the 68 variables were categorized according to measures of firm performance identified frequently by traditional financial

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[32]See the section entitled "Simulated Trading Strategy" in this chapter for a further discussion of the trading strategy to be used in this study.

statement analysis. This categorization is shown in Appendix B. Seven categories were used; the first four are consistent with the coverage in most financial statement analysis textbooks.[33] The first category contains liquidity measures. These measures reflect a company's ability to meet its short-term obligations as they come due. The second category consists of financial leverage and debt-coverage measures. The financial leverage ratios show the extent to which nonequity capital is used to finance the assets of the company. The debt-coverage ratios measure the extent to which a company's debt-related fixed charges are exceeded by its earnings. Profitability ratios, the third category, generally relate the company's level of profits to various measures such as sales, assets, and equity. The higher each of these ratios, the more profitable the firm is in a relative sense. The fourth category contains asset utilization, or intensity, ratios. These ratios provide insight on how efficiently a company uses its assets. Generally, these ratios compare sales to various balance sheet accounts. This category has been further subdivided into four parts: (1) measures of capital intensity, (2) measures of inventory intensity, (3) measures of accounts receivable intensity, and (4) other measures of asset intensity.

Categories five through seven were added to reflect the fact that the 68 variables used by Ou and Penman are much broader than the ratios often discussed in traditional financial statement analysis texts. That is, the four categories identified in most financial statement analysis texts do not fully encompass the 68 variables. The fifth

[33]A number of texts were consulted to determine the categories. Although there is some variation in nomenclature, the categories are generally consistent among sources.

category contains discretionary types of expenses such as advertising, research and development, and capital expenditures.[34] The sixth category contains growth measures. These measures reflect the percentage change in balance sheet or income statement accounts from the previous year to the current year. The last category contains miscellaneous items that were difficult to classify elsewhere. As such, it consists of a variety of different variables that may be useful in predicting one-year-ahead earnings.

Within each of the seven categories, the variables are split between those representing the level of a given variable versus the percentage change in the level (e.g., the level of the current ratio in year *t* versus the percentage change in the current ratio from year *t*-1 to year *t*).[35]

The relationships between the measures of firm performance and future earnings changes will be examined by estimating univariate logit models yearly from 1975 through 1989.[36] The categorization of the 68 variables along the various dimensions of firm performance will provide a framework for assessing the degree to which a measure can be used to predict one-year-ahead earnings changes. For instance, it may be found that an increase in an asset utilization measure (i.e., a "good" signal) in one

[34]This category is not discussed in most financial statement analysis texts; however, it is discussed in Bernstein [1990].

[35]This is the case for all of the categories except categories five and six in which all variables are measured as the percentage change over the prior year.

[36]See the section entitled "Multivariate Earnings Prediction Models" in this chapter for a discussion of the logit model.

year provides a signal of increased earnings in the subsequent period. This example is the type of empirical regularity this analysis seeks to identify. However, this will be done without developing "stories" in an attempt to develop expectations regarding coefficient signs. Thus, no specific hypothesis relating the measures of firm performance and one-year-ahead earnings changes will be tested. However, not conducting tests of any hypotheses or theories does not lessen the contribution of this analysis. Indeed, Jensen [1982, p. 243] states that some "relations are interesting to know even though they do not provide tests of any currently known or interesting theory." It could also be said that much of the market-based research in accounting and finance has been concerned with documenting empirical regularities. For example, the extensive literature on stock market anomalies has outpaced the development of theories to explain the anomalies. Nonetheless, it is hoped that the results of this analysis may prove useful in the development of theoretical connections between the measures of firm performance and future earnings changes.

The yearly logit estimations will also facilitate the assessment of the intertemporal stability of the relationships between the measures of firm performance and one-year-ahead earnings changes. *A priori*, there is no reason to expect the relationships to vary dramatically over time. It is expected, however, that the relationships will have consistent signs over time. That is, changes in the measures of firm performance should provide the same signal regarding future earnings changes. If the coefficient signs "flip" from year-to-year then a measure does not provide a clear signal regarding one-year-ahead earnings changes. The occurrence of coefficient sign inconsistencies, as well as statistically insignificant coefficients, works against the notion that useful empirical regularities can be documented.

In the above discussion, the ability to document empirical regularities is based on the assumption that the relationships between the measures of firm performance and future earnings changes are constant across time. However, there are two factors that may work against this assumption. First, Lee and Chen [1990] provide evidence on the pervasiveness of structural changes that affect the quarterly earnings series of utilities.[37] It is likely that structural changes affect all industries, and therefore, the sample firms in this study will have experienced structural change that will impact their earnings series too. In turn, it is possible that these structural changes may alter the relationships between the measures of firm performance and future earnings changes.

Second, it could be argued that changes in measures of firm performance need not signal the same information regarding future earnings. For example, the interpretation of an increase in liquidity ratios is contextual, conveying either good or bad news. In the case where a firm has a low liquidity position, an increase may be good news as the firm may be in a better position to meet its upcoming cash obligations and avoid heavy financing charges. In contrast, an increase in an already high liquidity position may indicate "too much" liquidity in the sense that the firm does not have

[37]Lee and Chen [1990] define structural change as nonsystematic exogenous random shocks (e.g., changes in government regulation, changes in competition, labor strikes, etc.) that transform the earnings time series of firms. They categorize structural changes based on the length of time the shock will affect the earnings series. A temporary structural change affects the earnings series for one period. A short-run structural change affects several periods but the impact decreases over time. Lastly, a long-run structural change permanently transforms the earnings series.

attractive investment opportunities. It is hoped that these two factors will not be pervasive enough to have a significant impact on the estimated coefficient signs.

Principal Component Analysis

A principal component analysis (PCA) will be conducted on the 68 variables to determine an empirical classification scheme. The empirical relationships among many of the 68 variables have not been examined so the number of unique dimensions of firm performance conveyed by the variables is unknown.[38] The empirical classification scheme may also provide additional insights on the relationships between the measures of firm performance and one-year-ahead earnings changes.

However, the main objective of the PCA in this study is to facilitate the development of parsimonious earnings prediction models. PCA is a technique that can be used to reduce the dimensionality of a data set in which there are a large number of interrelated variables. This is achieved by finding an orthogonal transformation of the original variables to a new set of uncorrelated variables, called principal components (PCs). These PCs are linear combinations of the original variables. If the variables are interrelated, most of the information contained in the original data can be represented by several PCs. The PCs can then be used instead of the full data set in

[38]It is interesting to note that the prior studies examining the empirical relationships among financial ratios have generally used ratios that map directly into the measures of firm performance identified by traditional financial statement analysis. As the ratios in the same category are very closely related (e.g., current ratio and quick ratio) they are highly correlated. When additional variables have been analyzed they generally formed *a priori* groups as well. For example, decomposition measures and cash flow ratios have been examined and have been found to form two distinct measures of firm performance.

subsequent analyses. However, all of the variables are still needed to calculate the PCs, since each PC is a linear combination of all the original variables.

Instead of using the PCs themselves, they can be used to facilitate the choice of a subset of variables that will account for most of the variation in the original data. For example, if most of the variation in the original data can be explained by five PCs, then one variable from each PC can be selected that will contain most of the information contained in that PC.[39] Thus, the motivation for using PCA is to facilitate the development of parsimonious earnings prediction models that may include just one variable representing each underlying dimension of firm performance. Using the PCs in this manner will reduce the data set to the number of selected variables. This method will be used in this study.

Before selecting a subset of variables, a decision on how many PCs should be retained must be made. There are several rules that can be used, all of which are *ad hoc* rules-of-thumb. The three most popular rules will be used in this study. In the first rule, a specified cumulative percentage of the total variation in the original data that the retained PCs should explain is chosen. Generally, 80 to 90 percent of the variation in the data should be accounted for by the retained PCs. The second rule is based on the size of the eigenvalues of the PCs. Kaiser [1960] suggests retaining PCs

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[39]This will be the case when there are distinct groups of variables that possess high within group correlations but have very low correlations with variables outside the group. It is anticipated that many of the 68 variables will form such groups. Additionally, a variable that is uncorrelated with all the other variables (i.e., provides unique information) will be represented by its own principal component so that it need not be deleted in subsequent analyses.

with eigenvalues greater than or equal to one. However, in simulation studies, Jolliffe [1972] showed that Kaiser's cutoff often results in discarding too much information and suggests that a cutoff of .70 is more appropriate. Cattell [1966] proposed the third method and it involves the use of a "scree" graph. Preparing a scree graph involves plotting the eigenvalues against the PC number and connecting adjacent points with a straight line. The number of retained PCs (say *k*) is then chosen by finding where the line is "steep" to the left of *k* and "not steep" to the right of *k*.

As these three rules are all arbitrary they can lead to substantial differences in the number of retained PCs. For instance, dropping the eigenvalue cutoff from one to .7 may result in a doubling in the number of retained PCs. The same result may occur when the percentage of variation retained is increased from 80 to 90 percent. Clearly, there is a tradeoff between retaining enough of the information contained in the original data and the development of parsimonious prediction models. However, the objective of this analysis is to develop parsimonious earnings prediction models. Consequently, all three rules will be used in this study. The extent to which each of the rules results in a parsimonious set of PCs will then be assessed. Any method that does not result in a parsimonious set of PCs will be dropped from further analysis.

Once the number of retained PCs has been selected there are two main principal-component based techniques that can be used to select a subset of variables (see Jolliffe [1986] for a further discussion). The first technique selects the variable that has the highest correlation with a given PC, provided it has not already been chosen to represent a higher variance PC. The second technique involves the discarded, rather than the retained, PCs and involves eliminating variables. Specifically, the variable with the highest correlation with a discarded PC is eliminated from the data set. The reasoning behind this method is that the discarded PCs do not contain a significant amount of information. Correspondingly, the variable most highly correlated with these PCs does not contain much information either. Although these approaches are somewhat complementary, they may result in the selection of different variables. Thus, both methods will be used in this study to determine if the subset of variables chosen is sensitive to the technique used.

The PCA and the subsequent variable selection procedures will be performed using data from 1980. The selected variables will then serve as the independent variables in the parsimonious earnings prediction models discussed in the next section.

Multivariate Earnings Prediction Models

Although the PCA may facilitate the development of parsimonious prediction models, it is possible that these models may exclude a significant amount of information contained in the original 68 variables. This is likely to occur if the first seven or eight PCs do not account for most of the variation in the original variables.[40] To identify the amount of information lost in the variable selection process, the predictive ability of the parsimonious models will be compared to that of models developed on a purely statistical basis (e.g., through stepwise procedures).

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[40]As a general rule, 80 to 90 percent of the variation in the data should be accounted for by the retained PCs.

Although parsimonious models may be desirable in a descriptive sense, the objective is to predict one-year-ahead earnings changes as accurately as possible. From this perspective, a non-parsimonious model may achieve a greater degree of predictive ability and would be preferred. Specifically, in addition to the parsimonious models, three additional models will also be estimated: the two Ou and Penman models and a model derived using stepwise procedures.[41]

For each of these models, the specification of the dependent variable wiil take three different forms to assess the impact on predictive ability by using the information in the dependent variable more fully. The first model estimated to construct a probabilistic measure of one-year-ahead earnings changes will be a multivariate logit model with a binary dependent variable.[42] This logit model takes the following form:

$$Pr_{it} = (1 + exp(-\mathbf{\Theta}'\mathbf{X}_{it}))^{-1},$$

where $\mathbf{X}_{it}$ denotes a vector of firm *i*'s accounting variables in year *t* (i.e., the independent variables), and $\mathbf{\Theta}$ is a vector of estimated parameters. The estimated probability of observing an earnings increase in year $t+1$ for firm *i* is given by Pr_{it}, or *Pr* for short. Earnings changes for firm *i* in year $t+1$ are defined as the change in earnings per share before extraordinary items (EPS) minus a drift term.[43] That is,

$$\Delta EPS_{it+1} = EPS_{it+1} - EPS_{it} - drift_{it}.$$

[41]Recall that the Ou and Penman models were estimated in a sequential manner. However, they did not use stepwise procedures per se.

[42]This model is the same as that used by Ou and Penman [1989a].

[43]All earnings variables are adjusted for stock dividends and stock splits.

As annual earnings have been shown to follow a submartingale process, a drift term is subtracted to reflect earnings changes more accurately.

In the logit model, the null hypothesis is $\mathbf{\Theta} = \mathbf{0}$, which means that the probability of observing an earnings increase (or decrease) in year $t+1$ is independent of the accounting variables in $\mathbf{X}_{it}$. The alternative hypothesis is $\mathbf{\Theta} \neq \mathbf{0}$, which means that a firm's one-year-ahead earnings changes are likely to be predicted given the accounting variables in $\mathbf{X}_{it}$.

When estimating this model, a binary dependent variable representing earnings changes in year $t+1$ will be used. The motivation for the binary specification is that a continuous dependent variable (e.g., magnitude of earnings change) may contain outliers which could have a dramatic effect on the estimated model parameters. In turn, this could impair the predictive ability of the model. However, the binary specification ignores information which is useful in the estimation of model parameters. In an attempt to utilize this information, yet avoid the estimation bias caused by outliers, two additional model specifications will be developed.

First, a multinomial logit model, with a trichotomized dependent variable, will be estimated. The use of such a model can be motivated by noting that with a binary specification, small changes in EPS are given as much weight in the estimation of model parameters as are large EPS changes. However, these small changes may not provide an equal amount of information regarding the future earnings of the firm. This view is consistent with the methodology used by Ou and Penman when conducting predictive ability tests and developing their simulated trading strategy. *Pr* values between .4 and .6 were deleted because they represented "relatively vague predictions" of future earnings changes.[44] Analogously, actual small earnings changes represent "vague" earnings changes and should therefore be treated differently in the estimation of model parameters. The trichotomization will be accomplished by examining the cross-sectional distribution of earnings changes to determine what constitutes a "small" or "large" earnings change. The top and bottom third of the distribution will be classified as a large increase in EPS and a large decrease in EPS, respectively. The middle third, which should be made up of both increases and decreases in EPS, will be classified as a small change in EPS.

The second alternative specification will be an ordinary least squares (OLS) regression model with the standardized change in earnings as the dependent variable. EPS changes will be standardized by the standard deviation of the firm's EPS changes over the five previous years. This measure is similar to that used by Brooks and Buckmaster [1976, 1980] and is appealing because it captures the extent to which an earnings change deviates from the firm's "normal" performance. Additionally, the standardization should reduce the potential for outliers which can have undue influence in the estimation of model parameters.

The drift term will be measured two ways for each of the three dependent variable specifications. First, it will be measured as firm i's mean change in earnings per share during the previous four years. Second, the drift term will be firm i's most

[44]Ou and Penman found that *Pr* predicts the magnitude, as well as the sign, of one-year-ahead earnings changes. Thus, *Pr* values between .4 and .6 correspond to "small" earnings changes in year $t+1$.

recent change in earnings. Thus, in total, six different dependent variable specifications will be used. Each of these will be combined with the different sets of independent variables.[45] These models will then be estimated using data pooled over two time periods: 1975 through 1979 and 1980 through 1984.[46]

Predictive Ability Tests

The predictive ability of the different model specifications will be assessed against a random-guess prediction (as implied by the random walk hypothesis) in a 2x2 contingency table setting. This test is used to assess whether predicted earnings changes and actual earnings changes are independent. The null hypothesis is that the two variables are independent; the alternative is that they are not. However, the χ^2 statistic from this test is nondirectional in that it does not distinguish between "better" or "worse" than random-guess predictions. Rather, it merely distinguishes differences from random-guess predictions. Thus, the percentage of correct predictions will also be presented.

To conduct this test, the output from the earnings prediction models must be transformed to a dichotomous prediction of either an earnings increase or an earnings decrease. A number of probability cutoff schemes can be used to achieve this transformation. With the dichotomous logit specification, the most basic scheme

[45]The total number of independent variable sets will depend on the results of the PCA.

[46]Earnings data from 1971 through 1975 will be used to estimate the drift term used in the prediction models and to calculate the standard deviation of firms' earnings changes needed for the OLS model.

classifies predicted earnings increases as cases where *Pr* is greater than .5 and predicted earnings decreases are cases where *Pr* is less than or equal to .5. Using this scheme, no observations are deleted as all earnings changes are categorized as either increases or decreases. Additional cutoff schemes can be developed that exclude some observations by focusing on more extreme predicted probabilities. The motivation for this is to drop vague earnings change predictions from further analysis. An additional cutoff scheme examined in this study will be to exclude observations where *Pr* is between .4 and .6. Thus, predicted earnings increases (decreases) will be cases where *Pr* is greater than .6 (less than or equal to .4). This cutoff scheme will facilitate comparisons to the predictive ability results achieved in the Ou and Penman [1989a] study.

Similar probability cutoff schemes must be developed for the trichotomous logit model and the OLS model. It is important to note that the cutoff schemes for these models were chosen ex post in an attempt to exclude approximately the same number of observations as excluded by the dichotomous cutoffs. This facilitates comparisons of the predictive ability of the different model specifications used in this study. Predictions from the trichotomous logit specification will be the probability that the earnings change will fall into one of the three categories: large increase, large decrease, or small change in one-year-ahead earnings. The first trichotomous cutoff defines predicted earnings increases (decreases) as cases where the predicted probability of observing a large increase (large decrease) is greater than .33. The second trichotomous cutoff scheme focuses on more extreme probabilities by defining predicted earnings increases (decreases) as cases where the predicted probability exceeds .40. Although both trichotomous cutoffs excluded some observations, it was found that the .33 cutoff excluded few firms whereas the .40 cutoff excluded approximately the same number as the (.4,.6) dichotomous cutoff.

For the OLS model, the predicted earnings change will not be expressed as a probability. Rather, it is a prediction of the standardized change in one-year-ahead EPS. For example, a value of 1.5 is a prediction that one-year-ahead earnings will be 1.5 standard deviations above the firm's normal earnings level. These predictions of the standardized change in one-year-ahead EPS must be transformed to a dichotomous prediction of earnings changes. The first OLS cutoff scheme defines earnings increases (decreases) as predictions where the standardized change in EPS is greater than (less than or equal to) 0. As with the (.5,.5) dichotomous cutoff, this cutoff scheme does not exclude any observations. The second cutoff defines earnings increases (decreases) as predictions where the standardized change in EPS is greater than (less than or equal to) .5 (-.5).

Predictive ability tests will be conducted over the six years subsequent to model estimation. That is, the predictive ability of models estimated from 1975 to 1979 will be assessed from 1980 through 1985. Models with an estimation period of 1980 to 1984 will be tested from 1985 to 1990.

Simulated Trading Strategy

A simulated trading strategy similar to that used by Ou and Penman will be implemented to see whether abnormal returns can be generated using the prediction models developed in this study. Although the predictive ability of all the models will be evaluated, earnings predictions from only two models will be used to enter into the trading strategy. The first will be the model exhibiting the highest degree of predictive ability. The choice of this model is consistent with the informational perspective on accounting data. Recall that under this perspective the role of accounting data in security valuation is to alter investors' expectations of future dividends. The importance of future accounting earnings in this framework stems from its ability to alter expectations of the future dividend-paying ability of the firm. Thus, the model achieving the greatest predictive ability provides the most information regarding future earnings, and hence the future dividends of the firm.

Although the model achieving the greatest predictive accuracy may provide the most information regarding future earnings, it does not necessarily follow that this model will also exhibit the highest association with abnormal security returns during the simulated trading strategy period. This conclusion is based on research that examined the relationship between various proxies for market expectations of earnings and abnormal security returns.[47] The focus of these studies was to take a dual approach when evaluating the market expectation proxies. Specifically, both the predictive ability

[47]The proxies for market expectations were generally forecasts from univariate time-series models and financial analysts' forecasts.

(i.e., accuracy) and the contemporaneous association with abnormal security returns were examined. Foster [1977] was the first to use the dual approach to evaluate earnings forecasts. He found that the quarterly univariate time-series model that achieved the highest predictive ability was not the most highly correlated with contemporaneous abnormal security returns. Other studies (e.g., Hughes and Ricks [1987] and O'Brien [1988]) corroborate Foster's [1977] findings. In contrast, other studies have shown that the model with the greatest predictive ability is also most highly correlated with abnormal security returns (for example, see Fried and Givoly [1982] and Bathke and Lorek [1984]).

Although the findings of this research have been mixed, we can conclude that the earnings prediction model achieving the highest degree of predictive ability may not be the most highly correlated with contemporaneous abnormal returns. Consequently, as a basis for comparison, the second model used to enter into the trading strategy will be the parsimonious model developed from the PCA. It is anticipated that the parsimonious model will not achieve the greatest predictive ability because it is likely that it will exclude some information contained in the statistical models. However, this does not imply that the returns to the trading strategy will be diminished from its use.

The trading strategy involves zero net investment (at the portfolio formation date) as the dollar amount invested in the "long" position equals the dollar amount received from the "short" position.[48] The return to the zero investment (or "hedge") portfolio is calculated as the difference between the returns to the long and short sides.

[48]The trading strategy assumes no transactions costs or margin requirements.

If the offsetting positions have equal risk, then the expected return to this hedge is zero and a nonzero expected return is inconsistent with the implications of market efficiency.

Three procedures that parallel Ou and Penman will be followed to implement the strategy: (1) For each year from 1980 through 1990 stocks will be assigned to investment positions at the end of the third month following fiscal year-end.[49] (2) Stocks with *Pr* greater than .6 will be assigned to a long position and stocks with *Pr* less than or equal to .4 will be assigned to a short position. (3) Mean return differences between the long and short positions will be observed at 12-month intervals over the 60-months subsequent to portfolio formation.

The motivation for calculating returns over a 60-month period is to provide additional evidence on the conflicting findings of Ou and Penman and Stober [1990]. Ou and Penman found that the positive abnormal returns to the hedge portfolio did not extend much beyond 36 months. In contrast, Stober, who used the identical Ou and Penman models, found that abnormal returns were generated for the two-year period following month 36 (i.e., through month 60). Consequently, portfolio returns will be evaluated over this longer period when possible.

Ou and Penman calculated portfolio abnormal returns for two different portfolios: (1) a portfolio consisting of all firms in their sample, regardless of fiscal year-end, and (2) a portfolio consisting of December fiscal year-end firms. Only the

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[49]This date is used to initiate investment positions because it is assumed that the financial statement information needed to compute *Pr* will be publicly available at this time. Thus, this date will avoid a look-ahead bias which would occur if portfolio positions were taken using information that was not yet available to investors.

latter represents an implementable trading strategy and is appropriate for testing market efficiency.[50] To provide further insight on the efficiency of the market with respect to the annual financial statement data this study will construct portfolios using December fiscal year-end firms only.

Ou and Penman used two market-adjusted return metrics in their trading strategy. The first metric is the cumulative average market-adjusted return (CAR). Abnormal returns to the long and short positions are calculated by averaging monthly abnormal returns across firms to obtain the mean monthly return on an equally-weighted portfolio. These average monthly returns are then summed over longer periods of time (e.g., a year) to produce the CARs. Thus, the calculation of the CAR is as follows:

$$CAR_m = \sum_{t=1}^{m} \sum_{i=1}^{N_m} \frac{1}{N_m} AR_{imt},$$

where a firm's monthly abnormal security return is defined as the firm's raw return minus the corresponding return on an equally-weighted index of NYSE and AMEX stocks. Thus, AR_{imt} is the abnormal return for stock i in month m and CAR_m is the cumulative abnormal return from the first month ($t=1$) through month m. N_m represents the number of stocks in the position in month m.

A drawback of the CAR metric is that it implies monthly rebalancing of portfolios which would give rise to substantial transactions costs. An alternative

[50]The use of all firms in the trading strategy results in a non-implementable trading strategy because portfolio positions are entered into at different times in a given year. Therefore, to form zero investment portfolios, the weights on securities are determined ex post (Ou and Penman [1989a, p. 310]).

market-adjusted return metric that does not involve monthly rebalancing is the buy-and-hold return (BHR). The calculation of BHRs involves compounding an individual firm's abnormal return over a given number of months (*m*), and then averaging over all securities in the position at month *m* (N_m) to arrive at an equally-weighted mean return. This calculation can be shown as follows:

$$BHR_m = \frac{1}{N_m} \sum_{i=1}^{N_m} \left[\prod_{t=1}^{m} (1+AR_{imt}) - 1 \right].$$

Although this metric does not involve monthly rebalancing of portfolios and would involve lower transactions costs, Ou and Penman were critical of it because it relies on information that is not available at the time portfolio positions are taken. Specifically, BHRs at month *m* will reflect only the returns of stocks that are still trading at month *m*. Although, the BHR at month *m* excludes stocks that are not trading, the decision to exclude them from the portfolio is made at month $t=0$, the initiation date. However, this criticism is usually overcome by assuming that the proceeds of the sale of stocks that stopped trading are reinvested in a market portfolio or a risk-free security.

Although Ou an Penman used both market-adjusted return metrics in their study, BHRs were only disclosed in the text. All tables reflected CARs. Additionally, Ou and Penman's results were qualitatively similar between metrics.[51] Consequently, to facilitate comparisons to Ou and Penman, CARs will be used in this study.

[51]The two return metrics have led to qualitatively similar results in other studies too. For example, see Foster, Olsen and Shevlin [1984], and Bernard and Thomas [1989].

In addition to CARs, cumulative average size-adjusted returns (SARs) will be calculated using a size control portfolio approach. The motivation for this metric is to control for the firm "size effect" which can confound analyses performed using market-adjusted and market-model returns (see Kothari and Wasley [1989] for a further discussion).[52] Based on the ranking of market value of equity, all NYSE and AMEX stocks will be assigned to one of ten portfolios (each containing an equal number of firms).[53] The firms involved in the trading strategy will then be assigned to the appropriate size-based portfolio. Abnormal returns will be calculated as the firm's raw return minus the corresponding return on the equally-weighted portfolio return in which the firm is a member. The computation of SARs is identical to the computation of CARs except that a size-adjusted measure of abnormal returns is used.

Stratification of Sample Firms

As the simulated trading strategy discussed above is based solely on the information contained in *Pr*, it may be possible to increase the effectiveness of the strategy by using additional information when constructing the hedge portfolios. To examine this possibility, the sample firms will be stratified on the basis of one additional information variable. Once stratified, long and short positions will be entered into based on *Pr* as done previously. For comparison with the results from the

[52]Additionally, small firms have been shown to have more prediction error associated with their returns than do large firms. Consequently, using SARs can be viewed as an adjustment for the predictability of returns.

[53]To parallel the procedures used by Ou and Penman, firms will be assigned to size control portfolios at the inception of the trading strategy (i.e., at $t=0$).

previous section, the same time periods will be examined. The following subsections discuss the motivation for the three stratification schemes to be used.

Predisclosure Information Stratification

The differential information hypothesis (DIH) developed by Atiase [1980] suggests that predisclosure earnings information production and dissemination by private parties for the purpose of identifying mispriced securities is an increasing function of firm size (market capitalization).[54] An implication of the DIH is that earnings announcements of large firms are less informative than are earnings announcements of small firms. A number of studies (e.g., Atiase [1985, 1987], Freeman [1987], and Ro [1988, 1989]) provide empirical support for the DIH by examining the cross-sectional differences in the information content of earnings announcements between large and small firms.[55]

One source of predisclosure earnings information is the information about future earnings contained in *Pr*. An implication of the DIH is that fewer individuals would be exploiting the information contained in *Pr* for small firms. This suggests that the

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[54]As noted by Atiase, Bamber and Tse [1989] the DIH is often referred to as a "size effect" and is an "information hypothesis." In contrast, the "size effect" documented in the finance literature is related to differential risk-adjusted returns between large and small firms and can be considered a "returns hypothesis."

[55]Several recent studies (e.g., Carvell and Strebel [1987], Dempsey [1989], Lobo and Mahmoud [1989], and Shores [1990]) have used other measures, in addition to firm size, as proxies for the level of predisclosure information. A common finding is that the number of financial analysts following a firm provides explanatory power beyond that associated with firm size alone. Thus, it appears that analyst following and firm size provide different measures of firms' predisclosure information environments.

degree of security "mispricing" may be greater on small firms' stocks and that abnormal returns to the hedge portfolio may be larger if positions are limited to small stocks. To examine this conjecture, the simulated trading strategy will be conducted on samples stratified to reflect different amounts of predisclosure information.

Procedurally, firms will be assigned to one of five portfolios based on the ranking of market value of equity as of the beginning of the year.[56] To compare the effect of different information environments on security mispricing, the trading strategy will be separately implemented for the largest and smallest size-based portfolios. As the two hedge portfolios will consist of relatively large or small firms, market-adjusted returns (CARs) are not appropriate and only size-adjusted returns (SARs) will be used.

Magnitude of Current Earnings Changes Stratification

Although Ou and Penman document that *Pr* identifies earnings reversals, this finding is based on the average earnings changes of firms in the extreme *Pr* deciles. However, it is possible that all firms will not experience earnings reversals and that the performance of the trading strategy may be enhanced by limiting positions to stocks that have a higher probability of experiencing a reversal. The rationale for this is the "overreaction hypothesis" formulated by DeBondt and Thaler [1985, 1987]. The overreaction hypothesis says that investors overemphasize extreme earnings changes and disregard the mean reversion inherent in extreme earnings (Brooks and Buckmaster

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[56]Market value of equity is chosen to proxy for the amount of predisclosure earnings information because it is available for all firms in the sample. Using analyst following as a proxy was rejected because analyst data bases, such as IBES, would exclude many of the firms in the sample.

[1976, 1980] find that firms having a large change in current earnings will likely experience an earnings change in the opposite direction in the next period).

Consequently, we are more likely to see an earnings reversal for firms experiencing an extreme change in current earnings. The probability of observing an earnings reversal should be further increased when *Pr* provides an additional signal that the one-year-ahead earnings change will be in the opposite direction of the current earnings change. Thus, the effectiveness of the trading strategy may be increased by limiting positions to firms that are very likely to experience an earnings reversal. To examine this conjecture, the sample of firms will be stratified into quintiles using a normalized first difference stratification rule similar to that developed by Brooks and Buckmaster [1976, 1980]. This metric is the same as the standardized change in current earnings used in the OLS prediction models. The measure is appealing because it captures the extent which a firm's earnings change deviates from its "normal" performance. The hedge portfolios will then be formed by taking long positions in stocks in the lowest quintile (i.e., largest decreases in current standardized earnings) that have *Pr* values greater than .6. Short positions will be taken in stocks in the highest quintile (i.e., largest increase in current standardized earnings) that have *Pr* values less than or equal to .4.

Industry Stratification

The earnings prediction models developed in this study will be based on pooled cross-sectional data. As noted by Ou and Penman [1989a, p. 299], if different operating characteristics generate future earnings in different ways for different firms, the results of the trading strategy may be weakened. As firms in the same industry face similar operating environments it appears reasonable to assume that the measures of firm performance will provide the same signals regarding future earnings. The increased homogeneity of firms within a particular industry may result in more accurate prediction models which, in turn, could increase the returns to the trading strategy.

This conjecture will be examined by estimating industry-specific models. Two digit SIC codes will be used to identify firms within homogeneous industries. To obtain adequate sample sizes for model estimation, each industry will be required to have at least 10 firms. Earnings prediction models will be estimated over the same non-overlapping periods (1975-1979 and 1980-1984) as done previously. The trading strategy will then be entered into from 1980 through 1989.

CHAPTER 4

EMPIRICAL RESULTS

Measures of Firm Performance and One-Year-Ahead Earnings Changes

Univariate logit models were estimated yearly from 1975 through 1989 for each of the variables in the seven categories identified by traditional financial statement analysis (see Appendix B). Initially, to be included in a given year's sample, a firm had to meet the criteria discussed in Chapter 3 (see page 31) and had to have all the data items necessary to compute the 68 accounting variables and the one-year-ahead earnings change variable.[57] However, due to a considerable number of missing observations for four data items, seven of the accounting variables were deleted.[58] Specifically, the absence of advertising expense (COMPUSTAT data item 45) and research and development expense (COMPUSTAT data item 46) resulted in the elimination of accounting variables 49 through 52. The impact of this was to leave only two variables in Group 5: Discretionary Costs. The issuance of *Statement of Financial Accounting Standards No. 95* in 1987 by the Financial Accounting Standards

[57]Although there is some variability in how the accounting variables may be computed (e.g., using average assets versus year-end assets), all variables were computed identically to Ou and Penman [1989a] to facilitate comparisons. I would like to thank Stephen Penman for supplying me with this information.

[58]These variables will be dropped from subsequent analyses as well.

Board required the statement of cash flows. This resulted in the elimination of the funds variables (COMPUSTAT data items 112 and 116) which resulted in the deletion of accounting variables 59, 60, and 64.[59] It should be noted that none of the seven deleted variables was included in Ou and Penman's final earnings prediction models.

Two additional screens were imposed before a firm was included in a specific year's sample. First, a firm was dropped if the computation of any variable resulted in division by zero. Approximately 90 firms were deleted each year due to this requirement. Second, a screen for illogical variable values was imposed. For example, days sales in accounts receivable (variable 5) must be greater than or equal to zero. Very few firms were deleted due to illogical variable values.[60] The final sample sizes in each of the 15 years are shown in Table 1. The sample sizes ranged from 801 in 1975 to 456 in 1989.

Tables 2a, 2b, and 2c provide descriptive statistics for the 61 variables over the five-year subperiods 1975 - 1979, 1980 - 1984, and 1985 - 1989, respectively. The Kolmogorov-Smirnov test rejected the hypothesis that the accounting variables are normally distributed at the .01 significance level for all 61 variables in each of the three

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[59]These seven variables were missing to a great extent in the Ou and Penman [1989a] study too. From Table 2 of their study it can be noted that these seven variables could be calculated between 657 and 2,338 times. In contrast, the remaining 61 variables were calculated approximately 15,000 times.

[60]Ou and Penman do not address whether a screen for illogical variable values was used in their study. It does not appear that it was.

subperiods. This lack of normality is consistent with previous research regarding the distributions of accounting variables.[61]

As can be seen in Tables 2a, 2b, and 2c, some of the 61 accounting variables have extreme maximum and minimum values. Generally, the cause of the extreme values was the denominator of the variable approaching zero. Recall that firms with zero denominators were deleted from the sample. However, this does not preclude "near-zero" denominators which would result in extreme values for variables measured as ratios. These extreme values were analyzed on a case-by-case basis to determine whether they were outliers that should be eliminated from the sample or whether they represent an extreme state of the underlying distribution and therefore should be retained. All but five of the extreme values were retained on the grounds that they represent an extreme state of the underlying distribution (see Foster [1986] for a discussion of how to deal with extreme observations in data analysis). Additionally, retaining these observations is consistent with the approach used by Ou and Penman [1989a].

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[61]Although previous research (e.g., Frecka and Hopwood [1983]) has shown that approximate normality can be achieved by deleting outliers, this finding is not applicable to the original distribution of the variables. For example, Frecka and Hopwood found that 10 of the 11 variables studied departed from normality in a "highly significant fashion." Additionally, this inference is based on results from chi-square tests in which 20 class intervals were used. Stronger inferences could have been made by applying the Kolmogorov-Smirnov test. Approximate normality was achieved only after applying square-root transformations to all variables (note that for ratios with negative values, this required shifting the entire distribution to the right to make each value positive before the transformation was applied) and deleting outliers.

Of the 61 variables examined here, 31 are "levels" variables, 28 are the percentage change in the levels, and two represent the change from the previous year. Consequently, the following discussion will address these sets of variables separately.

Virtually all empirical studies examining the distributional properties of financial variables have focused on levels variables. For example, the focus has been on the debt-to-equity ratio rather than on the percentage change in the debt-to-equity ratio from one year to the next. Consistent with this research, this study found that the 30 levels variables were not normally distributed. Indeed, many of these variables have technical limits that prevent them from being normally distributed. For example, some of the variables have a lower limit of zero but are unbounded on the positive side. Therefore, the distribution of these variables is skewed to the right (i.e., exhibit positive skewness). For example, the current ratio (variable 1) reflects such a distribution. As can be seen in Table 2a, the median current ratio is 2.071 and the middle 50 percent of the observations lie within 1.561 and 2.700 (the interquartile range). The minimum value lies 1.7 standard deviations below the median. In contrast, the maximum value lies approximately 10.5 standard deviations above the median. A test for skewness also indicates that the distribution is skewed to the right, as it does for many of the levels variables.[62]

The distributions of some of the levels variables appear to be fairly stable over the three subperiods examined. For example, comparing results of the current ratio

[62]This test compares the difference between the upper quartile and the median with the difference between the median and the lower quartile. Positive skewness is present if the first difference exceeds the second difference.

(variable 1) across Tables 2a, 2b, and 2c shows this variable to be stable over time. In contrast, there are some trends in the mean and median values for some of these variables. For example, the debt-equity ratio (variable 21) increases over the three subperiods. This is consistent with assets being increasingly financed by debt rather than equity. Another interesting observation is the drift in the mean and median values for variables involving inventory. An upward drift is noticed for inventory turnover (variable 7) and sales-to-inventory (variable 43). A downward drift is seen in inventory/total assets (variable 9). These results are consistent with the lower inventory levels associated with just-in-time inventory techniques.

As previously noted, the distributional properties of the percentage change variables have not been widely studied. Nonetheless, some preliminary observations can be made about these variables. These variables can be broken into two groups. First, those variables that represent the percentage change in a financial ratio from one year to the next (for example, the current ratio). The mean and median of these variables are generally close to zero. This is consistent with many of the levels ratios being fairly stable or having slight trends over time. However, these variables appear to be positively skewed. The minimum value for these variables is -1 (which would represent a 100 percent reduction in the levels variable). In contrast, they can assume relatively large positive values (this would occur when the levels variable went from being close to zero in year t to a "large" value in year $t+1$).

The second group represents the percentage change in balance sheet or income statement accounts and can be considered growth measures. For example, the median percentage change in sales (variable 12) within the three subperiods was 14.9%, 7.9%, and 7.2%. As with the other percentage change variables, these variables have a minimum value of -1 but can take on fairly large values, especially in the presence of structural change from events such as acquisitions or divestitures. Consequently, these variables are also positively skewed.

The last two variables are those measured as the change from the previous year. The interquartile range of changes in dividends per share (variable 14) indicates that most firms follow a policy of keeping dividends at a constant or modestly increasing level from year to year. The fact that this variable is positively skewed is consistent with firms' reluctance to cut dividends. The other variable is the change in return on opening equity (variable 18). This variable is merely the change in variable 17 (return on opening equity) from the preceding period. For all three subperiods, this variable had mean and median values that were close to zero. This suggests that the average firm's return on equity does not change dramatically from year to year.

Results of Annual Univariate Logit Model Estimations

The details of the annual logit model estimations are shown in Appendix C and are summarized in Table 3. The coefficients were estimated using the SAS Logistic procedure and are obtained by the method of maximum likelihood. As maximum likelihood estimators are distributed asymptotically normal, it follows that the parameter estimates of the logit models have large-sample normal distributions. Thus, the appropriate test to evaluate the significance of the coefficient is a t-test. As no directional effects have been hypothesized, a two-tailed t-test is needed. That is, the following hypothesis is being tested:

$$H_O: \beta = 0$$

$$H_A: \beta \neq 0.$$

In the case of a single parameter estimate, as is the case here, the chi-square statistic (χ^2) reported by the SAS procedure is the square of the t-ratio and the statistical results are identical to a two-tailed t-test.[63]

The objective of estimating univariate logit models on an annual basis is to determine the degree to which a measure of firm performance can predict one-year-ahead earnings changes. A variable is considered useful in predicting one-year-ahead earnings changes if two criteria are met. First, the variable should have the same coefficient sign over most of the years in the 15-year period examined. Second, the coefficients should be statistically significant in the majority of the years.

It is important that both criteria be met in order to establish a linkage between the measures of firm performance and one-year-ahead earnings changes. For example, a variable may have the same coefficient sign over the 15-year period and therefore meet the first criteria. However, if the coefficients are not statistically significant then they are not discernable from zero (i.e., the null hypothesis is not rejected). Consequently, the interpretation of insignificant coefficients is misleading. Conversely, the second criteria may be met in that the coefficients are statistically significant in most

[63]The equivalence can be shown by noting that a t distribution converges to a normal distribution with mean equal to zero and variance equal to one. Further, the square of this normal distribution is distributed χ^2 with one degree of freedom.

of the years. If, however, the coefficient signs flip from year-to-year then the measure does not provide a consistent signal regarding one-year-ahead earnings changes. Either one of these situations works against the notion that useful empirical regularities can be documented.[64] In contrast, if both of these criteria are met by most of the accounting variables within a group then an empirical relationship between the measure of firm performance and one-year-ahead earnings changes has been established.

Appendix C shows the parameter estimate (β), the χ^2 statistic and the associated probability of observing this statistic (i.e., the p-value). Summary results are presented in Table 3. Specifically, Table 3 shows the breakdown between positive and negative coefficients over the 15-year period for each variable, and the number of times the coefficients were statistically significant at the .10 level.[65]

Generally, the results are mixed with respect to the notion that empirical regularities can be established for the seven categories of variables. In several of the categories the results indicate that the variables are not consistent predictors of one-year-ahead earnings changes. The results of these categories are discussed next, followed by a discussion of the categories that do provide stronger evidence regarding the measures of firm performance and one-year-ahead earnings changes.

The accounting variables in Group 1 (Short-Term Liquidity), Group 2 (Financial Leverage and Debt-Coverage), Group 4 (Asset Utilization) and Group 5 (Discretionary

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[64]Of course, neither criteria may be met by some variables. That is, some variables may have inconsistent coefficient signs that are statistically insignificant.

[65]The .10 significance level was used to facilitate comparison to the Ou and Penman [1989a] study.

Costs) were not consistent predictors of one-year-ahead earnings changes. The short-term liquidity measures have negative coefficients in about two-thirds of the years; however, few of these are statistically significant at the .10 level.[66] The results in Group 2 depend on whether the variables are financial leverage measures (variables 21, 22, 23, and 24) or debt-coverage ratios (variables 27 and 28). The financial leverage measures are positively related to future earnings increases; however, only variable 22 (% Δ in Debt-Equity Ratio) is statistically significant at a rate higher than expected by chance.[67] In contrast, the debt-coverage ratios are generally negatively related to future earnings changes and are statistically significant one-third of the time. Although the results on the debt-coverage variables are fairly consistent, I do not believe they are strong enough to establish an empirical link between them and one-year-ahead earnings changes.

Many of the asset utilization measures (Groups 4a, 4b, 4c, and 4d) have inconsistent signs as well as statistically insignificant parameter estimates. However, variable 30 (% Δ in Sales/Total Assets) in Group 4a did meet the dual criteria of sign consistency and statistical significance. It appears that increases in Sales/Total Assets from year t-1 to year t provide a consistent signal that earnings will increase in year t+1. Nonetheless, the results are not strong enough across all variables within the

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[66]Positive (negative) coefficients are positively (negatively) correlated with the chance of observing an earnings increase in the subsequent year. That is, an increase in an accounting variable with a positive (negative) coefficient increases (decreases) the probability of observing an earnings increase in the following year.

[67]Using a .10 significance level we would expect statistical significance to occur one in ten times due to chance alone.

subcategories to establish any empirical regularities. A similar statement may be made with respect to the two variables in Group 5. Although the coefficient signs are negative in more than two-thirds of the years, they are not statistically significant often enough to support an empirical linkage.

Stronger evidence regarding the measures of firm performance and one-year-ahead earnings changes is provided by the accounting variables in Group 3 (Profitability) and Group 6 (Growth Measures) as well as several of the variables in Group 7 (Miscellaneous). Generally, these variables met the dual criteria of sign consistency and statistical significance. In Group 3, nine of the 15 variables are measured as levels versus the percentage change in the level from the preceding year. These nine variables are consistently negatively related to one-year-ahead earnings increases and are statistically significant in most, if not all, of the 15 years. The only exception is variable 33 (Gross Margin Ratio) which has a negative coefficient in two-thirds of the years and is statistically significant in only four of these years. The lack of consistency in this variable, relative to the other eight profitability measures, may be attributable to the use of gross margin (i.e., sales minus cost of goods sold) as a measure of profitability. A firm may have an adequate gross margin but may not show favorable "bottom line" earnings because of excessive operating expenses. In contrast, the other eight variables all use an earnings number more reflective of the earnings variable used as the dependent variable in the logit model.[68]

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[68]The dependent variable is defined as the change in earnings per share before extraordinary items minus a drift term.

The strong results for these profitability variables are consistent with the findings of Freeman, Ohlson, and Penman [1982] who found that variable 17 (Return on Opening Equity or ROE) was negatively related to one-year-ahead earnings changes due to the transitory component of current earnings. A relatively low (high) ROE suggests that current earnings contain a negative (positive) transitory element and that earnings should increase (decrease) in the subsequent period. That is, ROE has been shown to exhibit mean-reverting behavior. Although this relationship has been documented for ROE, it appears reasonable that this explanation is valid for the other variables also as they are highly correlated with ROE (see Table 4 for the correlations among these variables).

In contrast to the levels specification, the six profitability variables measured as the percentage change from the previous year did not show the same degree of sign consistency or statistical significance.[69] For example, three of the variables (34, 36, and 58) were about equally split with regard to coefficient signs and were generally not statistically significant. This result may be due to "mixed" information within these variables regarding future earnings. For instance, an increase in a relatively low ROE from period t-1 to period t may be consistent with an increase in period $t+1$ earnings as mean reversion has been shown to take several periods to complete. Such a situation would be consistent with a positive coefficient. Conversely, an increase in a relatively high ROE may signal the beginning of the mean-reverting process and would be

[69]Note that variable 18 (Δ in Return on Opening Equity) is measured as the change from the previous year, not the percentage change.

consistent with an earnings decrease in year $t+1$. A negative coefficient would be consistent with this scenario. The other three variables (18, 38, and 40) have negative coefficients in most of the years with statistically significant coefficients in about half of the these cases.

In summary, the evidence presented here extends the findings of Freeman, Ohlson, and Penman [1982] by showing that a wide range of current profitability measures is useful in predicting one-year-ahead earnings changes. Additionally, the linkage is stronger for variables measured as levels versus the percentage change in the levels.

The seven growth measures in Group 6 were negatively related to the probability of observing an earnings increase in the subsequent period. However, only two (variables 14 and 53) were statistically significant in most of the years. As discussed in Chapter 1, the negative coefficient on variable 14 (Δ in Dividends Per Share) is counter to the dividend information hypothesis which suggests that dividend increases (decreases) can be interpreted as a signal that management anticipates higher (lower) future earnings. The result on this variable corroborates the Ou and Penman [1989a] finding.

The negative coefficient on variable 53 (% Δ in Total Assets) indicates that increases in asset size do not lead to increases in the probability of an increase in one-year-ahead earnings. Two rationales may partially explain this finding. First, firms that grow through merger or acquisition have been shown to have relatively weaker earnings in subsequent years (see Meeks [1977]). Second, conglomerates that downsize their operations through a sell-off of assets or a spin-off of a subsidiary generally have stronger subsequent earnings due to the simplification of operations within the firm (see Schipper and Smith [1983]). Although the cited empirical evidence is consistent with the negative coefficient, the number of firms in each yearly sample that experienced a merger or divestiture is probably not large enough to be driving the results.

As Group 7 (Miscellaneous) contains a variety of variables that were difficult to classify in the other six categories, it is not anticipated that the variables will provide similar signals regarding one-year-ahead earnings changes. For most of these variables, the results do not support the notion that empirical regularities can be established. Specifically, eight of the 14 variables have inconsistent coefficient signs that are not statistically significant in most of the years. Three other variables have the same sign in two-thirds of the years but only variable 48 (% Δ in Production) has coefficients that are statistically significant in the majority of the years. Only variables 15 and 16 (Depreciation/Plant Assets and % Δ in Depreciation/Plant Assets, respectively) have consistent signs that are statistically significant in most of the years. The positive coefficients on these variables are consistent with the income effects of using accelerated depreciation. Specifically, a large depreciation charge in year t will be followed by a smaller charge in year $t+1$ and subsequently higher earnings in year $t+1$, assuming all other things are held constant.

The overall conclusion of this section is that some of the variables do appear useful in predicting one-year-ahead earnings changes. The profitability measures (Group 3) were found to be negatively related to one-year-ahead earnings changes. No other group of variables was as strongly related to future earnings changes. However, several individual variables do appear to be systematically related to future earnings changes. Specifically, variables 14 (Δ in Dividends Per Share) and 53 (% Δ in Total Assets) were found to be negatively related to one-year-ahead earnings changes. Variables 15 (Depreciation/Plant Assets) and 16 (% Δ in Depreciation/Plant Assets) were found to be positively related to future earnings changes. Collectively, these variables may provide information that is useful in the prediction of future earnings.

Although some of the variables may provide consistent signals regarding future earnings changes, many of the 61 variables have no consistent relationship to one-year-ahead earnings changes. This can be seen by noting the number of variables with inconsistent coefficient signs and/or statistically insignificant coefficients. This finding may be consistent with one's intuition regarding the relationship between the accounting variables and one-year-ahead earnings changes. That is, there is no *a priori* reason to think that many of these variables would provide a signal regarding future earnings. For example, an increase in liquidity ratios may convey good news in the sense that the firm is in a better position to meet its upcoming cash obligations. However, it provides little information regarding future earnings per se.

Lastly, the inconsistent results may be partially attributable to structural changes that affected sample firms' earnings series. Such structural changes may alter the relationships between the measures of firm performance and future earnings changes thereby working against the possibility of documenting empirical regularities.

Principal Component Analysis

Before conducting the principal component analysis (PCA) on the 61 accounting variables, the Spearman rank-order correlations among the variables within the seven categories identified by traditional financial statement analysis were assessed.[70] Data from 1980 was employed to obtain the sample used for the correlation analysis and the PCA. The resulting sample was 723 firms. This sample contains 20 more firms than the 1980 sample used in the previous section because the screen for missing earnings variables was not needed.

The Spearman correlations are shown in Table 4. As anticipated, most of the variables within a group are highly correlated. The correlations between most of the variables are statistically significant at the .0001 level. Three items regarding the correlations are relevant to the PCA. First, although many of the variables are statistically significant, the absolute magnitude of the correlation coefficients varies dramatically. Variables that are computationally similar have very high correlations. For example, in Group 3, return on opening equity and return on closing equity (variables 17 and 32, respectively) have a correlation coefficient of .96727. It is likely that such variables will group under the same principal component (PC). In contrast, the correlation between the percentage change in depreciation and the change in dividends per share (variables 13 and 14 in Group 6, respectively) is statistically

[70]Pearson product-moment correlations assume that the two variables are bivariate normally distributed. The Spearman rank-order correlation is the nonparametric equivalent of the Pearson correlation but does not assume any specific distribution for the two variables. As the distributions of the 61 accounting variables were shown to be non-normal, reliance on the Spearman correlation is warranted.

significant at the .0001 level; however, the correlation coefficient is only .09085. While statistically significant, it is unlikely that such variables will group under the same PC.

Second, within each category, the correlations are stronger when both variables are measured as levels or as the percentage change from the previous year. For example, in Group 1, the current and quick ratios (variables 1 and 3, respectively) have a correlation coefficient of .81247. Similarly, the percentage change in these variables (variables 2 and 4) have a correlation coefficient of .86792. In contrast, the four pairs of correlations between a levels variable and a percentage change variable range from .23569 to .30250. Based on the correlations, it is likely that the levels variables will form one PC and the percentage change variables will form another.

Third, the correlations reveal that some groups of variables are more homogeneous than others. For example, the correlations among the variables within Groups 1, 2, 3, and 5 are all significant at the .0001 level. In contrast, the correlations are not as consistently significant in Groups 4, 6, and 7. For Group 4, the correlations between all of the asset utilization measures are shown. Within each of the four subgroups (i.e., 4a, 4b, 4c, and 4d) the correlations are statistically significant at the .10 level. However, correlations across subgroups (for example, 4a and 4b) are not significant at the .10 level in approximately 25% of the cases. This indicates that different measures of asset utilization provide different information. Similarly, approximately one-third of the correlations in Group 7 (Miscellaneous) are not significant at the .10 level. This result is not surprising as many of the variables appear to be unrelated. For example, there is no *a priori* reason to expect that variable 63 (Purchase of Treasury Stock as % of Stock) would be highly correlated with any of the other variables in Group 7. Given the diversity of the variables in Group 7, it is unlikely that all of the information conveyed by these variables can be summarized into one or two PCs.

The motivation for using PCA is to reduce the dimensionality of the 61 variables so that parsimonious earnings prediction models may be developed. Unfortunately, the 61 variables appear to represent a much broader information set than that represented in previous studies assessing the empirical similarities among financial ratios. Recall that previous studies were able to account for approximately 90% of the variation in the data with seven or eight principal components. It was hoped that similar results would be achieved with the 61 variables used in this study. However, the 61 variables cannot be described by a parsimonious set of PCs. Table 5 shows the proportion of the variation explained by the first 28 PCs and the cumulative percentage of variation explained.[71] Most of the PCs explain between one and five percent of the variation in the original data. Only one PC explains more than ten percent of the variation. Consequently, to explain an amount of variation comparable to previous studies would entail retaining more than 20 PCs.

The disparity between the results of previous studies and the results of this study may be attributed to two factors. First, the previous studies used ratios that formed *a*

[71]Note that all 61 PCs are needed to account for all of the variation in the 61 accounting variables.

priori groups. That is, ratios that are grouped together per traditional financial statement analysis (e.g., liquidity or return on investment ratios) and are computationally very similar. As shown in the correlation analysis, such variables will be very highly correlated (e.g., the current and quick ratios). Thus, it is not surprising that these ratios grouped under the same PC. They measure the same aspect of firm performance and are slight variations of the other variables in the group. In contrast, many of the 61 variables analyzed in this study do not fit into such groups. For example, recall that Group 7 consists of variables that were difficult to classify in the six variable groups frequently identified in traditional financial statement analysis. The result is that many of the variables in Group 7 are not highly correlated with the other variables in the group and therefore provide unique information. When a PCA is conducted, it is likely these variables will be represented by their own PC.

Second, approximately half of the 61 variables are measured as the percentage change in the variable from the previous year. In contrast, all previous studies have restricted their analysis to levels variables. As shown in the correlation analysis, two similar levels variables will be more highly correlated than will a levels and a percentage change variable. Therefore, more PCs will be needed to account for a specified percent of the variation in the data.

Two of the three methods used to determine the number of PCs to retain do not result in a parsimonious set of PCs. Specifically, the Kaiser criterion of retaining PCs with eigenvalues greater than one results in the retention of 21 PCs. When the eigenvalue cutoff is lowered to .70 as suggested by Jolliffe [1972], 28 PCs are retained.

The identical number of PCs are retained when the decision is based on a specified cumulative percentage of the total variation in the original data. Specifically, accounting for 80 (90) percent of the variation results in retaining 21 (28) PCs.

The third method involves a "scree" graph and is more subjective than the two previous methods. The number of retained PCs is determined by identifying the point that separates "large" differences in eigenvalues from "small" differences.[72] Based on the scree graph shown in Figure 1, it appears that only four PCs should be retained. The difference between the third and fourth eigenvalues is 1.08 whereas the difference between the fourth and fifth is only .30. Thus, the line connecting the eigenvalues is "steep" to the left of the fourth PC and "not steep" to the right of it. Although this is a parsimonious set, it is unlikely that the four PCs adequately reflect all of the information in the original 61 variables as they account for only 33% of the variation in the original data.

The result of this broader information set is that a parsimonious set of variables cannot be selected that will adequately reflect the information contained in all 61 variables. As noted, two of the models developed via the PCA will contain 21 or 28 variables depending on the cutoff used. To develop models with approximately the same number of variables as the Ou and Penman [1989a] study, 21 PCs will be used as a basis for variable selection.[73] Although 21 variables does not constitute a

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[72]The subjectivity arises in the specification of what constitutes a large and a small difference in eigenvalues.

[73]The two Ou and Penman models contained 16 and 18 variables.

parsimonious set of variables, it is nonetheless a different set of variables than that used by Ou and Penman. As the scree graph method resulted in the retention of four PCs, a parsimonious model with only four variables will also be developed for comparative purposes.

Once the number of PCs to retain is established, a variable must be chosen to represent each PC. As discussed in Chapter 3, two methods will be used in this study to select variables. First, the variable with the highest correlation (often referred to as the "component loading") with a given PC is selected to represent the PC. Table 6 shows the accounting variables that grouped under the first 21 PCs after a varimax rotation has been applied to the PCs.[74] Consistent with previous research, a variable was grouped under a specific PC if its component loading with the PC was greater than .70. Out of the 61 variables, a total of 44 grouped under the 21 PCs.

The variables that grouped under a PC were generally consistent with the classification of variables according to traditional financial statement analysis in that the variables were from the same financial variable category. However, the pattern of component loadings also shows the extent to which the 61 variables provide unique information. Of the 21 retained PCs, nine had only two variables with loadings greater than .70. In five of these, the variables were from the same category and were statistically significantly correlated at the .0001 level. Although the other two PCs (numbers 11 and 12) contained variables that were not grouped in the same category

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[74]Rotations are applied to increase the interpretability of the PCs. The varimax rotation results in variables with very high (close to plus or minus one) or very low (close to zero) correlations with the PCs.

per traditional financial statement analysis, the variables were computationally similar and were correlated at the .0001 level as well. Seven PCs had only one variable with a component loading greater than .70. This indicates that these variables provide unique information since they formed their own PC.

The second method used to select variables involves eliminating the variable that has the highest component loading with one of the 40 discarded PCs. Table 7 shows the variables that were deleted. The 21 variables not deleted are the variables retained in the earnings prediction model.

Table 8 compares the variables retained under the two methods according to the categories identified by traditional financial statement analysis. The first method (selecting one variable associated with each of the 21 retained PCs) resulted in at least one variable from each category being retained. The second method (deleting a variable associated with each of the 40 discarded PCs) resulted in variables representing all categories except for Group 5. The results for both models were similar in that four variables from the profitability measures (Group 3) were selected. Additionally, both methods retained two levels variables and two percentage change variables. From an empirical standpoint, it appears that the information conveyed by the profitability measures cannot be fully described by one variable alone. Similarly, the miscellaneous category (Group 7) was represented by the most variables. In total, eight variables were selected from this category. This is consistent with the correlation analysis that showed many of these variables were not highly correlated with one another and thus provide unique information.

The method that selects variables with the highest component loading on a PC was used to select the four variables as dictated by the scree graph method. From Table 6 it can be seen that variables 37, 23, 48, and 1 are retained. The method that eliminates variables associated with discarded PCs was not used because discarding 57 PCs (i.e., retaining only four) is undoubtedly discarding some PCs that contain a significant amount of information. However, the reasoning behind this method is to only discard PCs (and an associated variable) that do not contain a significant amount of information.

Model Estimation Results

A total of 72 earnings prediction models were estimated. Six different sets of independent variables were used: three from the PCA and three benchmark models used for comparison purposes. The comparison models are the two Ou and Penman models and a model derived from stepwise procedures. Each of these sets of independent variables was then estimated with six different dependent variable specifications: dichotomous earnings changes using either a four-year or a one-year drift term, trichotomous earnings changes using either a four-year or a one-year drift term, and standardized earnings changes using either a four-year or a one-year drift term. These 36 models were then estimated over two non-overlapping time periods: 1975 through 1979 and 1980 through 1984. A summary of these models is shown in Table 9. The labels given to the 36 models in Table 9 will be referenced throughout the discussion of the model estimation and predictive ability results. For example, Model 2d is the model where the independent variables were chosen by discarding principal components and the dependent variable is a trichotomized earnings change measure utilizing a one-year drift term.

The number and percentage breakdown of actual earnings increases and decreases using the two alternative drift-term specifications (i.e., four-year and one-year) are provided in Table 10. For both specifications, the breakdown of earnings changes varies dramatically over the 16-year period. In some years earnings increases outnumber decreases by almost a two-to-one margin (e.g., 1975 and 1983). In other years the reverse situation is true (e.g., 1979, 1981, 1984, 1989, and 1990). However, when the yearly results are pooled, the number of earnings increases and decreases is approximately equal. For example, for the 16-year period 1975 through 1990, 48.85% (51.15%) of earnings changes were increases (decreases) when using a four-year drift adjustment.

The samples used to estimate the models were the same as those used in the annual univariate logit analysis (see Table 1). There were three reasons for using the same samples. First, the estimation of the stepwise models required all 61 accounting variables. Thus, the same samples were needed to estimate these models. Second, although the models using the other five sets of independent variables could have been estimated with data bases containing only the variables used by the models, these data bases would not be significantly larger than the 61-variable samples. Third, using the same sample firms to estimate all models facilitates comparisons across models.

The dichotomous and trichotomous dependent variable specification models were estimated using logistic regression with the SAS LOGISTIC procedure. Both of these dependent variable specifications involve an ordinal response as a discrete measurement of an underlying continuous variable. That is, the dependent variable is continuous (measured as the change in EPS before extraordinary items minus a drift term) but is transformed into a categorical variable. To operationalize the dichotomous specification, this continuous variable is classified as either an increase in earnings (i.e., earnings change minus drift greater than zero) or a decrease in earnings (earnings change minus drift less than or equal to zero). The trichotomous dependent variable specification was operationalized by splitting the cross-sectional distribution of earnings changes into thirds. The top third was considered large earnings increases, the bottom third was considered large earnings decreases, and the middle third was considered small earnings changes. This latter category consisted of both increases and decreases in earnings. Thus, the trichotimization resulted in three equal-sized ordered categories.[75] The appropriate logit model to use in this situation is one that does not

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[75]Note that dividing the earnings change variable into increases and decreases for the dichotomous specification used an objective cutoff point (zero) and did not result in equal-sized categories. In contrast, splitting the earnings change variable into thirds for the trichotomous specification required different cutoff points each year. For example, the cutoff between a large and a small earnings increase may have been $.40 in the first year and $.50 in the second. Consequently, an earnings change of $.45 would have been classified as a large change in the first year but classified as a small change in the second year. Clearly, splitting the dependent variable into thirds is an arbitrary choice. An alternative, perhaps better, way to operationalize the trichotomous dependent variable would have been to determine set cutoff points that classified earnings changes into the three categories. This would have resulted in three ordered categories but they would not have been of equal size. Nonetheless, the choice of the set cutoff points would still have been arbitrary.

make any assumptions about the differences between categories on an interval scale. Such a model is often referred to as the *proportional odds model* and is based on cumulative probabilities (see Hosmer and Lemeshow [1989] for a thorough discussion of this model). The models using the standardized change in earnings were estimated using ordinary least squares (OLS) regression with the SAS REG procedure.

The results of the model estimations are shown in Tables 11 through 28. For each model, a measure of the goodness of fit is reported. The measure for the logit models (i.e., the dichotomous and trichotomous dependent variable specifications) is the model chi-square (χ^2) statistic. For the OLS models (i.e., the standardized earnings change dependent variable specification), the F statistic is the analogous statistic.[76] These statistics test the null hypothesis that all parameters in the model are zero. This hypothesis is rejected for virtually all of the logit models as the models are statistically significant at the .001 level. Although most of the OLS models are also significant at the .001 level, several are statistically significant but at lower levels. Only Model 3, when estimated using OLS, is not statistically significant in all cases (see Table 19). However, this result is consistent with expectations as Model 3 contains only four independent variables. It is also interesting to note that the logit models estimated using the one-year drift term had larger χ^2 statistics (i.e., a better fit) than the models using the four-year drift term. In contrast, the four-year drift term provided a better fit in for the OLS models. There is no apparent explanation for this result.

[76]The R^2 and adjusted R^2 are also shown for the OLS models.

For the logit models, the association between realized subsequent earnings changes and the estimated probability of an earnings increase (*Pr*) is assessed by the percentage of concordant pairs and the rank correlation between the two. Under the null hypothesis of no association, the percentage of concordant pairs is expected to be 50 percent and the rank correlation is expected to be zero. Once again, all logit model specifications are significant at the .001 level except for Model 3 (see Tables 17 and 18).

The significance of individual model coefficients is assessed using the χ^2 statistic for the logit models and the t statistic for the OLS models. Tables 11 through 28 show the parameter estimates (denoted θ in the logit models and β in the OLS models), the corresponding test statistic (χ^2 or t, respectively) and the two-tailed probability of observing this statistic (i.e., the p-value).[77] An important point to note when analyzing the results of Models 1 through 5 (see Tables 11 through 25) is that all of the independent variables are not statistically significant in the models.[78] This is especially true when the independent variables were chosen by the PCA (i.e., Models 1, 2, and 3). Recall that these variables were chosen without regard to the variables' ability to predict one-year-ahead earnings changes.

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[77]As no directional effects have been hypothesized for the individual coefficients two-tailed tests are appropriate.

[78]In contrast, the criterion for entrance into the stepwise models (Model 6) was that the independent variables had to be significant at the .10 level (see Tables 26, 27, and 28). Thus, all variables in the stepwise models are statistically significant.

Table 29 summarizes the number of times the independent variables were significant at the .10 level in Models 1 through 5. As can be seen, choosing variables by retaining or by deleting principal components (Models 1 and 2, respectively) led to between three and 12 variables (out of 21) being statistically significant. On average, less than half of the variables were found to be significant in any given model. Additionally, some of the variables were not significant in any of the model estimations or were rarely significant. For example, both models had three variables that were never significant (variables 1, 7, and 65 in Model 1 and variables 6, 44, and 65 in Model 2).

Choosing variables via the scree graph (Model 3) led to a lower percentage of statistically significant variables. All four of the variables were never significant in any of the 12 estimations. In fact, no variables were significant in two of the OLS models (see Table 19) and only one variable was found to be significant in five other estimations.

Models 4 and 5 used the variables from the Ou and Penman [1989a] study. These models had a higher percentage of significant variables than the models that used the PCA to select the variables (i.e., Models 1 through 3). This result was to be expected because Ou and Penman only used variables that were significant in univariate logit models at the .10 level. Thus, these variables had been shown to be useful in predicting one-year-ahead earnings changes. Virtually all of these variables were significant in at least one of the estimations. On average, over half the variables were significant in any given model.

The independent variables in Model 6 were determined using stepwise procedures (see Tables 26, 27, and 28). To be included in any given model, the variable had to be significant at the .10 level.[79] The number of variables contained in the 12 stepwise models ranged from seven to 23, with an average of more than 14. A wide range of variables was significant at least once. Fifty-two of the 61 variables were significant in at least one of the 12 estimations. Thus, only nine variables were never significant.[80] None of these variables was found to be consistent predictors of one-year-ahead earnings changes in the univariate estimations discussed earlier. In fact, most had coefficient signs that changed from year-to-year and were not statistically significant. A similar statement can be made for the eight variables that were found to be significant in only one of the 12 models. It is interesting to note that none of the nine nonsignificant variables was contained in either of the Ou and Penman models; however, three of the eight variables that were significant only once were contained in these models.

Ten different variables were significant in five or more of the stepwise models.[81] These variables were all found to be consistent predictors of one-year-ahead

[79]The .10 percent significance level was used to facilitate comparison to the Ou and Penman [1989a] study.

[80]The following nine variables were never significant: 7, 24, 42, 44, 47, 56, 65, 67, and 68.

[81]Variables 10, 14, 17, 34, and 35 were significant in five models; variable 18 was significant in six models; variables 20 and 57 were significant in seven models; and variables 31 and 66 were significant in eight models. Eight of the ten variables were included in Ou and Penman's models; only variables 34 and 35 were not included.

earnings changes in the annual univariate logit estimations. Additionally, the coefficient signs were generally consistent across the stepwise models and agreed with the signs obtained in the annual univariate logit estimations. The few disagreements that did occur can probably be attributed to multicollinearity. This can be seen by noting that six of the ten variables were from the profitability category (Group 3). In fact, the eight stepwise logit models contained between three and nine profitability measures, with an average of six. The four stepwise OLS models (see Table 28) contained between one and four, with an average of three. This result is consistent with the findings of the PCA in that the profitability variables did not all group under the same principal component. Even though these variables did not group under the same principal component, they were nonetheless highly correlated and could cause multicollinearity when contained in the same model (see Table 4 for the Spearman correlations among these variables).

Some models contained several variables from the same principal component. For example, the first principal component contained six profitability variables (see Table 6). From Table 26 it can be seen that the 1980 - 1984 estimation of the dichotomous logit model, using a four-year drift contains five of these variables. In the annual univariate logit estimations all of these variables were negatively related to one-year-ahead earnings changes. However, only two of the five have negative signs in the multivariate model. A similar finding is documented for variable 57 (% Δ in Operating Income/Total Assets). It entered the stepwise models seven times; each time with a positive coefficient. In contrast, it had a negative coefficient in each of the 15 annual univariate models.

In summary, the following observations can be made regarding the model estimations. First, virtually all of the models were statistically significant at the .001 level; however, the stepwise models achieved the highest significance levels. Second, most of the coefficient signs in the multivariate models agreed with the results of the univariate logit estimations. It appears that the few sign disagreements that did occur can be attributed to multicollinearity. Lastly, the trichotomous logit models generally had the most significant coefficients within a given model while the OLS models had the least. Consequently, the overall significance levels of the trichotomous models exceeded that of either the dichotomous or the OLS models.

Predictive Ability Tests

The predictive ability of the 72 models was assessed over the six years subsequent to model estimation. Thus, the 36 models estimated from 1975 to 1979 (1980 to 1984) were examined over the period 1980 thorough 1985 (1985 through 1990). Note that none of the data used to estimate a model was subsequently used to assess the model's predictive ability. Although all 61 variables are not required for each separate model, the large number of different models made it easier to conduct the predictive ability tests on the samples used in model estimation. Additionally, using the same samples facilitates comparisons across models.

A discussion on how the predictive ability tests are conducted is undertaken before discussing the results from these tests. First, the output from each prediction model must be transformed to a dichotomous prediction of either an earnings increase or an earnings decrease (see pages 43-45 for a detailed discussion of how this was accomplished). Once this has been achieved, the predictive ability of the models is assessed in a 2x2 contingency table setting. The following numerical example illustrates this:

Predicted Earnings Change

		Decrease	Increase	
Actual Earnings Change	Decrease	136 Correct	156	292
	Increase	64	446 Correct	510
		200	602	802

In this example there are 802 earnings changes. The rows represent the actual earnings changes (292 are decreases and 510 are increases) and the model predictions are the columns (200 are decreases and 602 are increases). The correct predictions are the main diagonal cells and are indicated in the table. The χ^2 statistic tests the null hypothesis that actual and predicted earnings changes are independent. If independent, the percentage of correct predictions should be 50 percent and the resulting χ^2 statistic would be close to zero. The null hypothesis is rejected when this percentage deviates significantly from 50 percent. However, the χ^2 statistic is nondirectional in that it does not distinguish between "better" or "worse" than random-guess predictions. For example, a model with a 20 percent correct prediction rate would have a statistically significant χ^2 statistic; however, it clearly performed worse than a random-guess strategy as it had a 80 percent error rate. Consequently, in addition to the χ^2 statistic, the percentage of correct predictions must be calculated to determine whether a model provides better than random predictions. In this example, 46.56% (136 ÷ 292) of the earnings decreases were predicted correctly and 87.45% (446 ÷ 510) of the earnings increases were predicted correctly. This resulted in an overall correct prediction rate of 72.56% ((136+446)÷802). The associated χ^2 statistic is 114.83 and is statistically significant at the .001 level (a χ^2 statistic with one degree of freedom of 10.83 is significant at the .001 level).

The discussion of the results will first present an overall assessment of the predictive ability of the models. Then comparisons of model performance will be made to address four specific questions. First, does a four-year or a one-year drift term result in higher predictive ability? Second, for a given a set of independent variables (i.e., one of the six independent variable sets) which estimation technique achieves the highest predictive ability? Third, which set of independent variables results in the most accurate prediction models? Lastly, how does the predictive ability of these models compare to the results obtained by Ou and Penman [1989a]?

The results of the predictive ability tests are shown in Tables 30 through 35. The tables are laid out as follows:

Table	Model/Estimation Period	Predictive Ability Period
30	Dichotomous Logit (1975 - 1979)	1980 - 1985
31	Trichotomous Logit (1975 - 1979)	1980 - 1985
32	Ordinary Least Squares (1975 - 1979)	1980 - 1985
33	Dichotomous Logit (1980-1984)	1985 - 1990
34	Trichotomous Logit (1980 - 1984)	1985 - 1990
35	Ordinary Least Squares (1980 - 1984)	1985 - 1990

The predictive ability of each model is assessed using the definition of earnings changes that is consistent with that used in model estimation. That is, models estimated with a four-year (one-year) drift term are used to predict earnings changes similarly defined (see Table 10 for the distribution of actual earnings changes using the two drift terms). Each page within a given table compares the predictive ability of the same model, except for the definition of the drift term. For example, the first page of Table 30 compares the predictive ability of the dichotomous logit specification of the two models that used independent variables selected by retaining principal components (i.e., Models 1a and 1b from Table 9). The only difference between these models is the definition of the drift term used to define earnings changes. On each page the top panel is the four-year drift model and the bottom panel is the one-year drift panel. Presenting the results in this format facilitates an analysis of the efficacy of the two drift terms.

Within each table there are 144 predictive ability tests conducted (12 models, using two probability cutoff schemes, evaluated over six years). Most of the dichotomous and trichotomous logit models had χ^2 statistics that were statistically significant at the .001 level and had overall correct prediction percentages in excess of

50 percent (see Tables 30, 31, 33, and 34). Only a few of the models were not significant at the .01 level; these are summarized below:

Table	Model/Estimation Period	Predictive Ability Period	# Not Sig. at .01 Level
30	Dichotomous Logit (1975 - 79)	1980 - 1985	17
31	Trichotomous Logit (1975 - 79)	1980 - 1985	8
33	Dichotomous Logit (1980 - 84)	1985 - 1990	5
34	Trichotomous Logit (1980 - 84)	1985 - 1990	7

All of the nonsignificant results in the 1980 - 1985 period occurred in either 1981 or 1984. The poor results in these years may be attributed to a large percentage of actual earnings decreases. From Table 10 it can be noted that in 1981 (1984) decreases outnumbered increases by a three-to-one (two-to-one) margin, regardless of the drift term used. Additionally, approximately half of the nonsignificant tests were from Model 3. Recall that Model 3 had only four independent variables.

In contrast to the strong results produced with the logit models, the OLS models had many nonsignificant results (see Tables 32 and 35). This is especially true for the models that used a one-year drift term. Virtually none of the tests is significant at the .01 level. The one-year drift models generally predicted almost all earnings increases or all earnings decreases. For example, in Panel B of Table 32 (Model 1f), over 90 percent of earnings increases were predicted correctly. In contrast, less than 10 percent of earnings decreases were predicted correctly. This results from the models predicting virtually all of the earnings changes as increases. In Panel F of the same table (Model 3f) the reverse situation occurred. Almost 100 percent of the decreases were predicted correctly because the model predicted almost all decreases. In essence, these predictions are nothing more than random guesses. That is, if earnings changes are random, you might as well choose 100 percent increases or 100 percent decreases. Even though you may achieve a favorable overall prediction rate in a given year, the χ^2 statistic does not reward you for random guesses. For example, in 1981 Model 3f (Table 32, Panel F) achieved an overall accuracy rate of 65.50 percent due to a large percentage of actual earnings decreases (70.27%) combined with the model predicting virtually all earnings changes as decreases. However, the χ^2 statistic is not significant. Essentially, the better-than-average correct decrease percentage is offset by the worse-than-average correct increase percentage. A possible explanation for the poor results of the OLS models is that extreme observations may have dominated the estimation of model parameters. Consequently, the OLS models performed poorly when predictive ability tests were conducted in a subsequent period.

The predictive ability results are also consistent with the model estimation results in that the OLS models using a one-year drift achieved lower overall model significance levels than did the OLS models using a four-year drift. It should also be noted that while the four-year drift models achieved much better predictive ability results than the one-year drift models, they nonetheless were not as strong as the results achieved by either of the two logit model specifications. Given the relatively poor results of the OLS models vis-a-vis the logit models, the remaining discussion will focus on the results from the two logit specifications only.

The superiority of drift terms can be assessed by comparing the predictive ability of models that differed only in terms of the drift term. This question can be answered by comparing the two panels on each page of the tables.[82] The results indicate that the one-year drift models achieve higher predictive ability. In the vast majority of years the χ^2 statistic and the percentage of correct predictions for the one-year models exceed those of the four-year models.[83] Additionally, it appears that the one-year drift models achieved more success in correctly predicting both earnings increases and decreases. For example, in Panel A of Table 30 (i.e., the four-year drift model) it can be noted that earnings increases are predicted much more successfully than are earnings decreases. In contrast, the one-year drift model shown in Panel B is much more successful in predicting earnings decreases. This trend can be seen in many of the comparisons between the models. Structural change may be a possible explanation for the superiority of the one-year drift models relative to the four-year drift models. Specifically, to the extent that structural change has altered the earnings series of firms, the four-year drift may contain measurement error that adversely affects the models ability to predict future earnings changes.

The second comparison is determining which estimation technique (dichotomous logit or trichotomous logit) achieves the greater predictive ability for a given set of independent variables. This can be addressed by comparing the same panels between two tables. Specifically, the panels in Table 30 (33) should be compared to the

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[82]The top panel on each page within Tables 30 through 35 is the four-year drift model and the bottom panel is the one-year drift model.

[83]Although most of the models using the four-year drift were significant at the .001 level, the comparable one-year drift models had larger (i.e, more significant) χ^2 statistics.

corresponding panels in Table 31 (34). When making such comparisons it should be noted that the probability cutoff schemes used do not result in the same number of firms being excluded from the tests so that the results are not directly comparable. The dichotomous models use two cutoff schemes. In the first one, predicted earnings increases (decreases) are cases where *Pr* is greater than (less than or equal to) .5. Thus, no observations are deleted. The second cutoff scheme focused on more extreme probabilities by excluding observations where *Pr* is between .4 and .6. In contrast, both cutoff schemes used for the trichotomous models excluded some observations. In the first trichotomous cutoff earnings increases (decreases) were defined as observations where the predicted probability of observing a large increase (large decrease) was greater than .33. The second trichotomous cutoff increased the predicted probability from .33 to .40 and therefore excluded more observations.[84] However, if the trichotomous cutoffs exclude more observations than the dichotomous cutoffs than we would expect a higher degree of predictive ability from the trichotomous models because more extreme earnings changes have been shown to be easier to predict (Ou and Penman [1989a]).

Overall, the results from the two estimation techniques are similar. Although several patterns appear in the results, they are not consistent either within, or across, the two time periods examined. For example, during the 1980 - 1985 time period, the

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[84]The trichotomous cutoffs were chosen ex post in an attempt to exclude approximately the same number of observations as the dichotomous cutoffs. That is, the .33 cutoff generally excluded few firms and the .40 cutoff excluded approximately the same number as (.4,.6) dichotomous cutoff.

.4 trichotomous cutoff excludes fewer observations than the (.6,.4) dichotomous cutoff. Based on this observation, we would expect to see the dichotomous models achieve a greater degree of predictive ability. However, this is only the case for the one-year drift models. The trichotomous models using a four-year drift achieve higher χ^2 statistics and a larger percentage of correct predictions. This situation does not hold during the 1985 - 1990 time period, however, as the trichotomous cutoff generally excludes more observations than the dichotomous cutoff and the results are very similar across models. In conclusion, it appears that neither method dominates the other on a consistent basis. Thus, there does not appear to be a significant benefit in trichotomizing the earnings change variable in terms of increasing the predictive performance of the models.

The third comparison assesses which set of independent variables leads to the most accurate prediction models. The results are somewhat surprising in that one would suspect that the models with the strongest overall fit in the estimation period would also dominate in the predictive ability tests. This was generally not the case, however. Tables 36 and 37 provide the pooled overall correct prediction rates for the two logit model specifications. From Table 36 (pooled results from 1980 through 1985) it can be noted that Model 3 using a four-year drift achieved the lowest overall predictive ability when using the (.5,.5) cutoff but the highest when using the (.6,.4) cutoff. It is surprising that a model that used only four independent variables could achieve predictive ability results comparable to models using far more variables. Additionally, recall that several of the Model 3 estimations were not significant at the

.01 level. On average, we can conclude that Model 3 produced comparable results to the other models. It is also interesting to note that the stepwise models (Model 6) did not dominate the other models even though all variables in these models are statistically significant at the .10 level and therefore the models achieved the highest overall fit in the estimation period.

Although puzzling at first, these findings are consistent with the results of the annual univariate logit estimations. Recall that many variables were not consistent predictors of earnings changes. That is, a variable would be statistically significant in one year and not in the next. Thus, the variables that provided a strong fit in the estimation period may not be good predictors in the prediction period. This is sometimes referred to as the descriptive/predictive paradox or the "regression fallacy."[85]

Lastly, the issue of how the predictive ability of these models compares to the results obtained by Ou and Penman [1989a] needs to be addressed. Ou and Penman examined two predictive ability periods and achieved overall correct prediction rates of 60 and 62 percent for the (.5,.5) cutoff and 67 percent for (.6,.4) cutoff (for both periods).[86] An analysis of the results in Tables 36 and 37 shows that many of the models used in this study achieved superior predictive ability. This is especially true

[85]A time-series example of the descriptive/predictive paradox was shown in Watts and Leftwich [1977]. They fit firm-specific univariate time-series models to 32 firms and found that 17 models differed significantly from the random walk model. However, in predictive ability tests, these models performed worse relative to the models that did not reject the random walk hypothesis.

[86]Ou and Penman [1989a] pooled their results from 1973 - 1977 and 1978 - 1983.

for the models estimated with a one-year drift term. For example, in the 1985 - 1990 period, Model 6 estimated with a one-year drift achieved a 72.56 percent (.5,.5 cutoff) and a 76.12 percent (.6,.4 cutoff) correct prediction rate (see Table 37, Panel A). Many of the trichotomous models have superior results, even though a larger percentage of observations is deleted.

Simulated Trading Strategy

Based on the results of the predictive ability tests, two models were chosen to enter into the simulated trading strategy. First, the model that achieved the highest predictive ability was selected. Although many of the models achieved similar results, the dichotomous stepwise logit model using a one-year drift term was selected (i.e., Model 6). From Tables 36 and 37 it can be noted that this model achieved strong results when using the (.6,.4) cutoff scheme.[87] In the 1980 - 1985 test period, it had the second highest overall correct prediction rate of all the dichotomous models and was higher than any of the trichotomous logit models. In the 1985 - 1990 test period, it had the highest rate of all the dichotomous models. Although three trichotomous models achieved higher overall correct prediction rates in this test period, they were only marginally superior. Additionally, using a dichotomous model facilitates comparisons with the Ou and Penman study [1989a].

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[87]Recall that the (.6,.4) cutoff scheme is used to take portfolio positions. Long positions are taken in stocks with *Pr* greater than .6 and stocks with *Pr* less than or equal to .4 are assigned short positions.

The second model chosen was the one that selected variables based on the results of the PCA. Although Model 3 (specifically the dichotomous logit model using a one-year drift term that chose variables via the scree graph), did not achieve the highest predictive ability results of the three PCA-based models, it was chosen for two reasons. First, the model achieved predictive ability results comparable to the other two models. Second, and perhaps more important, the model contains only four variables (the other two PCA-based models each contain 21 variables) and is therefore the only parsimonious model examined in this study. Recall that one motivation of this study was to determine whether a parsimonious model could achieve results comparable to models containing many more variables. The predictive ability tests indicate that a parsimonious model can achieve overall prediction rates comparable to models containing more variables. An extension of this finding is to assess whether this same model will perform as well as a non-parsimonious model in the simulated trading strategy. Additionally, as noted in Chapter 3, the model achieving the greatest predictive ability may not exhibit the highest association with abnormal security returns during the simulated trading strategy.

Note that both models selected for the trading strategy utilize a one-year drift term. In addition to achieving higher overall correct prediction rates relative to the identical four-year drift models, the one-year specification also achieved greater success at correctly predicting both earnings increases and earnings decreases.

Table 38 summarizes the years covered by the trading strategy. The procedures used to implement the strategy were as follows: (1) For each year from 1980 through

1989 stocks were assigned to investment positions at the end of the third month following fiscal year-end. Thus, the trading strategy was implemented separately each year, for a ten-year period. As all firms in this study have December year-ends, investment positions were entered into on the first trading day of April in the following year.[88] (2) Stocks with *Pr* greater than 0.6 were assigned to a long position and stocks with *Pr* less than or equal to 0.4 a short position. (3) Mean return differences between the long and short positions were observed at 12-month intervals over a 60-month period.

Where possible, holding-period returns were calculated over a 60-month period. However, this study used monthly returns through December 1992 so that the holding period for the last three years was less than 60 months. In these years, returns were calculated for the longest 12-month period available. For example, returns for the last year could have been calculated for 33 months (April 1990 through December 1992); however, to facilitate comparisons with the other years, returns were calculated for a 24-month period. See Table 38 for a description of the holding-period lengths used for the last three years.

The sample sizes used in the trading strategy are shown in Table 39. The samples used are the same as those used in previous analyses (see Table 1) except that the firms must be listed on the CRSP as of the first month of the trading strategy (i.e.,

[88]Recall that the earnings prediction models were used to calculate the probability of an earnings increase in the subsequent year. For example, the predictive ability test for 1980 used accounting variables from financial statements dated 12/31/80 (assumed to be publicly available by 3/31/81) to predict the probability of an earnings increase for the year ending 12/31/81.

as of the first trading day of the following April). As can be seen, this requirement had a nominal effect on the sample sizes.

The results of the trading strategy are contained in the following tables and figures. Tables 40 through 49 show the results from the strategy as implemented on a yearly basis. Tables 50 and 51 show the average results over the five-year subperiods, 1980 - 1984 and 1985 - 1989, respectively. Table 52 shows the average results over the entire ten-year period (1980 - 1989) examined by this study. Lastly, Figures 2 through 9 graphically depict the 24-month returns for the two five-year subperiods.

Two points should be noted when interpreting the trading strategy results. First, when the trading strategy performs as expected, the long side will generate positive returns and the short side will generate negative returns. The hedge return is the long position return minus the short position return. Consequently, from a hedge return perspective, negative returns on the short position are viewed as positive returns. Second, Tables 50 through 52 show the average of the yearly means. For example, in Table 50, the 24-month market-adjusted hedge return of 3.77% for Model 6 is the average of the five individual year hedge returns shown in Tables 40 through 44. Consequently, the reported holding-period results are means of returns to the strategy over the five years and therefore reflect the average profitability for the strategy on an annual basis.[89]

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[89]This approach to calculating the average return is in contrast to using equally-weighted pooled observations. When equally-weighted pooled observations are used, each firm-year observation is assigned to the long (short) portfolio. After all

The discussion of the trading strategy results will address four main issues. First, an overall assessment of the effectiveness of the trading strategy will be provided. This will include comparisons between the results of this study and the Ou and Penman [1989a] findings. Second, comparisons between the parsimonious model (Model 3) and the non-parsimonious model (Model 6) will be made to determine whether the parsimonious model generated abnormal returns as well as the non-parsimonious model did. Third, a comparison of market-adjusted versus size-adjusted returns will be undertaken. Lastly, the extent to which hedge returns are earned over the entire 60-month holding period will be examined.

Overall, the hedge returns do not indicate that the trading strategy is successful in every year implemented. In the first five-year subperiod (1980 - 1984) the strategy worked "well" in only 1980 and 1981. In these years, the long position had positive returns and the short position had negative returns (see Tables 40 and 41). Both models generated 24-month market-adjusted (size-adjusted) returns in excess of 20% (10%).[90] In contrast, both models had large negative 24-month hedge returns in 1983 and 1984 (see Tables 43 and 44). This was due to the negative returns for the long position. For example, in 1983, the long position for Model 6 had 24-month market-adjusted returns

observations in the five-year period have been assigned to a portfolio, the mean returns are calculated using all the observations contained in the portfolio. Such an approach is not implementable because the total number of observations (i.e., the portfolio weights) are not known until all observations have been assigned to the portfolios.

[90]To facilitate comparisons across the years examined in this study and with Ou and Penman [1989a], most of the comments in this discussion are restricted to 24-month returns.

of -24.47%. In 1982, the hedge return was positive, but not as large as in 1980 and 1981 (24-month market-adjusted and size-adjusted returns of approximately 5%). The long position generated positive returns; however, positive returns on the short position reduced the hedge return (see Table 42).

As noted, within the first five-year subperiod, the strategy performed well in two years (1980 and 1981) and poorly in two years (1983 and 1984). When averaged, the five-year subperiod returns are very close to zero as the two negative years offset the two positive years. For example, the five-year average 24-month size-adjusted returns are 1.29% for Model 3 and 0.75% for Model 6 (see Table 50 or Figures 4 and 5). In this situation, averaging returns over several years masked the profitability of the trading strategy on a year-by-year basis.

The trading strategy did not perform well in the second five-year subperiod (1985 - 1989). The strategy did perform modestly well in 1985 and 1986 with 24-month market-adjusted hedge returns between 10% and 15% (see Tables 45 and 46). These are the only years in this five-year subperiod where the strategy performed as "expected" (i.e., positive returns on the long side and negative returns on the short side). However, the positive 24-month hedge returns were driven primarily from the short side. In 1987, 1988, and 1989, the 24-month hedge returns were either negative or very close to zero (see Tables 47, 48, and 49). In these years, the short position performed reasonably well; however, the modest performance of the hedge is attributable to the long position which had negative 24-month market-adjusted returns. For example, in 1987 Model 3 had negative returns on the short side of -6.77%.

However, the long side had negative 24-month of -9.72% which resulted in a hedge return of -2.95%. A similar situation was encountered in 1988.

As in the first five-year subperiod, the average 24-month returns over the second five-year subperiod were only modestly positive (see Table 51). Lastly, as can be seen in Table 52, the average 24-month returns over the entire ten-year period are close to zero. This result is due to "good" and "bad" years offsetting each other in some years as well as several years where the trading strategy generated 24-month returns that were close to zero.

The potential for the trading strategy to generate positive hedge returns derives from the following logic: The earnings prediction models correctly predict the sign of one-year-ahead earnings changes approximately two-thirds of the time. Taking positions based on this foreknowledge allows the strategy to exploit the fact that there is a positive correlation between earnings changes and contemporaneous stock price movements (see Ball and Brown [1968]). The hypothesis, therefore, is that there is an unexploited link between financial statement variables and abnormal returns due to the implications the variables have for predicting future earnings. Consequently, the hedge portfolio, in theory, should earn positive returns as the long position earns positive returns and the short position earns negative returns.

Empirically, however, this study finds that the hedge portfolio earns large positive returns in only two years (1980 and 1981) and modest positive returns in three other years (1982, 1985, and 1986). In the other five years the strategy performed poorly as 24-month hedge portfolio returns were either negative or close to zero. In these years, the poor performance can be attributed mainly to the long side of the portfolio. In these years the long position had large negative returns after 24 months. The short position was responsible for poor performance too. Although the short position generally earned negative returns, they were generally close to zero. Additionally, the short position had positive 24-month returns in one or two years (depending on the model and the return metric used).

The overall conclusion of this portion of the study is that the trading strategy is not successful in five of the ten years implemented. This is in contrast to Ou and Penman [1989a] who found large positive 24-month market-adjusted hedge returns in eight of the 11 years examined (1973 - 1983). In two years, negative 24-month hedge returns were found (due to the long side of the hedge) and in the other year, 24-month hedge returns were very close to zero. Therefore, on a pooled basis, the Ou and Penman results indicate the strategy performs well. In contrast, the pooled results of this study indicate that the strategy does not perform well. Indeed, ten-year average 24-month hedge returns are close to zero. For example, from Table 52 it can be seen that the ten-year average 24-month hedge returns range from 1.02% to 3.74%, depending on the model and return metric used. Consequently, based on the results of this study, it does not appear that the Ou and Penman trading strategy is as robust as initially believed.

It is interesting to note, however, that this study obtained results that are qualitatively similar to the Ou and Penman study in the four years covered by both studies (1980 - 1983).[91] Table 53 compares the results for these four years.[92] When making comparisons, it should be noted that the results of the two studies should not be expected to be the same, due to three reasons. First, the studies used different earnings prediction models to generate *Pr*. Second, this study restricted the sample to firms with December fiscal year-ends whereas the Ou and Penman did not impose this restriction. Third, this study further restricted the sample to firms that had the required variables to estimate all of the earnings prediction models estimated in this study. Due to these reasons, the samples differed considerably between the studies. Nonetheless, the pattern of returns is similar. For instance, in 1980 and 1981 the strategy worked well, whereas in 1983 it did not. Given the qualitatively similar results over the common period, it is possible that, similar to this study, the Ou and Penman models would perform poorly in the period subsequent to 1983 too.

The poor performance of the trading strategy over the entire ten-year period may lessen the importance of an in-depth discussion of the relative performance of the two models within these years. Nonetheless, the two following observations are worth noting. First, in most years, the results were qualitatively similar between models. The stepwise model (Model 6) did not dominate the parsimonious model (Model 3) on

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[91]Ou and Penman initiated trading strategy positions over an 11-year period from 1973 through 1983. This study initiated trading strategy positions over a ten-year period, from 1980 through 1989. Thus, the two studies have the four years 1980 through 1983 in common.

[92]Ou and Penman only disclose 24-month portfolio returns on a yearly basis in figures, rather than in tables. Consequently, the returns shown in Table 53 are estimates based on these figures (see figures 1 and 2 in Ou and Penman [1989a]).

a consistent basis. This can be seen by comparing the results between models, as shown in Tables 40 through 52 and in Figures 2 through 9. Second, although the stepwise model out-performed the parsimonious model in a couple of "good" years, it performed worse in a couple of "bad" years. For example, in two good years (1980 and 1981), Model 6 generated larger 24-month hedge returns than Model 3. Similarly, in two bad years (1983 and 1984), Model 6 performed more poorly than Model 3. Overall, this evidence appears to support the notion that a parsimonious model can perform almost as well as a model that contains many more variables. This result is consistent with the findings of the predictive ability tests conducted.

In addition to market-adjusted returns, size-adjusted returns were also calculated in this study. The motivation for using size-adjusted returns is the recognition that size (as measured by market capitalization) helps explain the cross-sectional differences in realized stock returns (for example, see Banz [1981]). To control for the size effect, all NYSE and AMEX stocks were assigned to one of ten equal-sized portfolios, based on a ranking of market value of equity.[93] The sample firms were then classified into the portfolio they belong to. Abnormal returns were calculated as the sample firm's raw return minus the return on the equally-weighted portfolio return in which the firm is a member.

A comparison of market-adjusted and size-adjusted returns supports the finding that expected returns are related to the size of the firm. From Tables 40 through 52

[93]In contrast, Ou and Penman [1989a] developed size portfolios using their sample firms only. Given the smaller sample sizes of this study, it was believed that using all NYSE and AMEX firms would provide a better control for the size effect.

it can be seen that the size-adjusted returns are consistently smaller than market-adjusted returns. However, there is some variation in the extent to which size-adjusted returns are smaller. For example, in 1985, the 24-month market-adjusted hedge returns for Models 3 and 6 are 10.71% and 11.86%, respectively. The 24-month size-adjusted hedge returns for the two models are 3.27% and 1.46%, respectively. Thus, the performance of the trading strategy in this year is almost totally eliminated by adjusting for differences in expected returns due to size. In contrast, the trading strategy performed poorly in 1984, regardless of return metric used. The 24-month market-adjusted hedge returns are -15.18% and -20.43% for Models 3 and 6, respectively. The use of size-adjusted returns did not reduce the loss on the hedge portfolio dramatically: Twenty-four month size-adjusted returns were -14.78% and -17.02% for Models 3 and 6, respectively. Overall, the decrease in hedge returns due to the size adjustment further erodes the performance of the trading strategy over the ten-year period, especially in the 1985 - 1989 subperiod. This can be seen in Panel B of Figures 4, 5, 8, and 9.

The final analysis with respect to the trading strategy is the extent to which abnormal hedge returns are generated for a period longer than three years. Although the earnings prediction models were developed to predict one-year-ahead earnings changes, Ou and Penman [1989b, table 2, p.121] document that their models have some success in predicting the sign of earnings changes over a three-year period. Therefore, the occurrence of abnormal returns over a three-year period may be consistent with the hypothesis that the market does not fully impound the future earnings implications of current accounting variables into stock prices. Such a finding, however, is inconsistent with stock market efficiency. In an efficient market, prices should respond quickly and unbiasedly to the release of new information. Clearly, an efficient market would not take three years to impound fully the future earnings information embedded in financial statements.[94]

Another view of such a finding is that the research design has not controlled fully for risk. This view stems from the fact that all studies of market efficiency involve a joint test of capital market efficiency and a particular model of expected returns. Therefore, we cannot, with assurance, attribute the results of such studies to market inefficiency because the findings may be driven by flaws in the model of expected returns.[95]

As discussed above, there may be some disagreement regarding the interpretation of the "abnormal returns" within the first three-year period. In contrast, abnormal returns extending beyond a three-year period can be unequivocally attributed to a failure to control fully for risk. This is because the earnings prediction models have shown no ability to predict earnings for a period greater than three years. Indeed, the models were designed to predict one-year-ahead earnings changes. Consequently, there is no reason to expect the hedge portfolio would generate abnormal returns during

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[94]It may be argued that the profitability of the Ou and Penman trading strategy results from ignoring transaction costs and that factoring these costs into the strategy will eliminate its apparent profitability. However, Ball [1992, p.333] states that the Ou and Penman return "is comfortably in excess of reasonable transaction cost estimates."

[95]This is discussed more fully in the following section.

this period. Such a finding suggests that *Pr* may be proxying for differences in expected returns. Ball [1978] was the first to note that variables (such as price-earnings ratios) may be proxying for some omitted risk factor. If this risk factor were included in the calculation of expected returns, the apparent abnormal returns would disappear.[96]

In this study, the issue of abnormal hedge returns extending beyond a three-year period is clouded somewhat by the fact that the trading strategy did not perform well in most of the ten years examined. Therefore, to determine whether positive hedge returns are generated over the entire 60-month period, two separate analyses are conducted. First, a pooled approach is used. Table 52 shows the hedge returns over the entire ten-year period examined by this study. Using this information, the incremental 12-month hedge returns are calculated and shown in Panel A of Table 54. As can be seen, the hedge returns increase in every 12-month period, regardless of the earnings prediction model or return metric used. Additionally, returns are the largest in the last two 12-month periods (i.e., months 37 through 48 and 49 through 60). This too, is consistent across models and return metrics. Based on the pattern of pooled returns, we would conclude that abnormal returns are generated beyond the first 36 months. This evidence supports the idea that *Pr* is proxying for differences in expected returns.

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[96]It is important to note that the omitted risk factor is unknown so that including it into the expected return model is impossible. Consequently, Ball's [1978] hypothesis is untestable.

The second analysis examines hedge returns as a function of the success of the trading strategy. The analysis is limited to the seven years where 60-month returns were calculated (i.e., 1980 through 1986).[97] These seven years were categorized on the basis of their 24-month hedge returns. Specifically, 1980 and 1981 were considered "good" years; 1982, 1985, and 1986 were considered "moderate" years; and 1983 and 1984 were considered "poor" years. Partitioning the years on their 24-month performance is consistent with the previous discussion in this section and also allows us to discern whether the pattern of returns differs depending on the success of the trading strategy. Such insights are not available with a pooled approach.

The partitioned analysis leads to the same basic conclusion: positive hedge returns are generated beyond 36 months. However, there is some variation in the results depending on how well the strategy performed in a given year. Panel B of Table 54 shows the average incremental 12-month returns in the two "good" years (1980 and 1981). In these years, the largest 12-month returns are generated in months 13 through 24. The returns generated in this 12-month period were, in most cases, twice as large as in any of the other 12-month periods. This result is counter to the pooled results. Additionally, Panel B clearly shows that positive hedge returns are generated in months 37 through 60.

The average incremental 12-month returns in the three "moderate" years (1982, 1985, and 1986) are shown in Panel C of Table 54. When assessing the returns in

[97]This study used returns through December 1992; therefore, 60-month returns were not calculated for the latter years (i.e., 1987 through 1990).

these years it is important to note that significant hedge returns were not generated in most of the 12-month periods, especially when size-adjusted returns were used. For example, Model 6 in 1985 earned positive returns in each of the 12-month periods; however, these returns were less than one percent in each period. As in the good years, the largest returns were generated in months 13 through 24. These returns were generally twice as large as the returns generated in any other 12-month period. For example, average Model 6 market-adjusted returns were 6.05% in months 13 through 24, whereas they ranged 1.61% to 3.54% in the other 12-month periods. Even though the magnitude of returns is not that large in any 12-month period, the overall pattern of returns indicates that abnormal hedge returns are earned in the last two 12-month periods. Once again, this is consistent across models and return metrics.

Lastly, the average incremental 12-month returns for the two "poor" years (1983 and 1984) are shown in Panel D of Table 54. It can be noted that the hedge returns are negative in four of the five 12-month periods, irrespective of the model or return metric used. Only in months 25 through 36 are positive hedge returns generated, and they are very close to zero in this 12-month period. One item not discernable from Table 54, but discussed previously, is that the poor performance of the trading strategy is driven by negative returns on the long side of the hedge. Both long and short positions generated negative returns in most of the 12-month periods (see Tables 43 and 44). Consequently, the negative hedge return increased over the entire 60-month period. The increasing negative returns beyond month 36 on the short side are consistent with the previous results. The increasing negative returns on the long side of the hedge is inconsistent with the previous results; however, it is consistent with *Pr* sorting firms according to expected returns.

The overall conclusion from the above analyses is that abnormal returns are generated in periods extending beyond 36 months. In most of the years examined, the long position earned positive returns and the short position earned negative returns in months 37 through 60. As discussed more fully below, this suggests that *Pr* may be systematically sorting firms according to determinants of expected returns. Consequently, the "abnormal" returns generated by the trading strategy may be nothing more than compensation for bearing risk.

Impact of Recent Research on Trading Strategy Findings

Perhaps the most significant result contained in Ou and Penman [1989a] was the finding that the market does not fully impound into stock prices the future earnings implications contained in current accounting variables. Consequently, their simulated trading strategy earned abnormal returns. The study was significant enough to win the 1991 AAA/AICPA Notable Contribution to Accounting Literature Award. It also motivated Bernard [1989, p. 90] to assert that it is "the recent capital markets research most likely to have the greatest impact on future work." Given the accolades bestowed upon the Ou and Penman study it is not surprising that other researchers have sought to corroborate and extend their findings. Indeed, the motivation of this study was to extend their findings.

Although some researchers sought to corroborate and extend the Ou and Penman study, it is possible that other researchers were skeptical of the findings. Specifically, some researchers may have believed that Ou and Penman did not provide evidence of market inefficiency. Rather, they believed that the trading strategy results were driven by a failure to control fully for risk. The skepticism of some toward the Ou and Penman findings is not uncommon in market efficiency studies. As discussed previously, any study of market efficiency is a joint test of capital market efficiency and a particular model of expected returns. Consequently, the apparent market inefficiency may be attributable to the incorrect specification of expected returns.

A good example of how documenting apparent market inefficiencies will stimulate subsequent research is the study by DeBondt and Thaler [1985]. DeBondt and Thaler analyzed the 36-month stock performance over non-overlapping periods from 1926 through 1982.[98] Based on this, they took the top 50 and bottom 50 performers and formed portfolios. The top performing portfolio was designated as "winners" while the bottom portfolio was labeled "losers." DeBondt and Thaler then examined the return behavior of the portfolios over the subsequent 36 months. They found that the loser portfolio outperformed the winner portfolio by almost 25 percent (the loser and winner portfolios had 36-month market-adjusted returns of 19.6 percent and -5 percent, respectively). This finding has been called the "winner-loser effect." The DeBondt and Thaler [1985] study provided evidence of long-term stock price reversals. The

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[98]DeBondt and Thaler [1985] used three different return metrics to measure performance. As their results were qualitatively similar across metrics they focused their discussion on cumulative market-adjusted returns.

authors also found that earnings reversals accompanied the stock price reversals. That is, firms with poor prior stock price performance also had poor prior earnings performance. It was found that most of these firms would have earnings increases in the subsequent period. Conversely, firms with good prior stock price performance also had good prior earnings performance. Generally, these firms were found to have earnings decreases in the subsequent period. The contemporaneous earnings and stock price reversals led DeBondt and Thaler to hypothesize that the stock price reversals could be attributed to investor overreaction to current earnings information. This has been called the "overreaction hypothesis."

The overreaction hypothesis is based on experimental psychology research that has shown individuals tend to overweight recent information and underweight prior information (see Kahneman and Tversky [1982]). Consequently, investors will overemphasize extreme earnings changes and disregard the mean reversion inherent in extreme earnings changes (see Chapter 2 of this study for a discussion of this literature). For example, a firm may have an extremely good (bad) year due to the transitory component of earnings. The market, however, will interpret the earnings change as permanent, and will overreact to the announcement by bidding the stock price up (down) too high (low). In later periods, earnings will revert to their mean and the stock price will adjust downward (upward) as the market realizes its mistake.

As the winner and loser portfolios in DeBondt and Thaler [1985] were formed on the basis of prior stock prices, the study provided apparent evidence of weak form market inefficiency. This result led several other researchers to re-examine the

DeBondt and Thaler [1985] study. Indeed, the authors themselves conducted a second study (DeBondt and Thaler [1987]) in which they paid attention to three unresolved issues from the first study. First, almost all of the price "corrections" occurred in the month of January. Indeed, 84 percent of the return difference was generated in the three Januaries contained in the 36-month period. This finding may indicate that the winner-loser effect is merely the January effect.[99] Second, the characteristics of firms in the winner and loser portfolios were not fully described in their previous study. Thus, if there were significant differences in size between the portfolios, the winner-loser effect may be nothing more than the size effect.[100] Lastly, the interpretation of their results (i.e., investor overreaction) was disputed. Some researchers believed the results were due to time-varying expected rates of return rather than investor overreaction to earnings.

After conducting additional analysis, DeBondt and Thaler [1987] concluded that the winner-loser effect is not explained by the January effect, the size effect, or by time-varying rates of return. Other researchers, however, have not reached the same conclusion. Chan [1988] conducted more sophisticated tests than DeBondt and Thaler and concluded that his risk-adjustment procedure is successful in explaining most of the return difference to the DeBondt and Thaler investment strategy because it is able to

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[99]The January effect refers to the finding that differential risk-adjusted returns are concentrated primarily in the month of January. See Thaler [1987] for a further discussion of the January effect.

[100]The size effect is the empirical anomaly that small firms earn higher returns than predicted by the capital asset pricing model. See Schwert [1983] for a summary of the size effect.

capture the correlation between the time-varying betas and the market risk premium. Zarowin [1989] found when winners and losers were matched by size there was little difference in return behavior, except in January. Zarowin [1990] further examined whether the January returns were due to initial month investor overreaction or to the January effect. He concluded that the January effect is the cause. Based on the findings of Chan [1988] and Zarowin [1989, 1990], the winner-loser effect documented by DeBondt and Thaler [1985, 1987] is no longer regarded as strong evidence of market inefficiency.

The Ou and Penman [1989a] study was conducted at approximately the same time as the follow-up studies to DeBondt and Thaler [1985, 1987]. Thus, they were aware that the winner-loser effect had been criticized as being nothing more than "repackaged" size and January effects. Additionally, there is a significant similarity between the *Pr* measure developed by Ou and Penman and the winner-loser studies: *Pr* identifies both earnings and stock price reversals.[101] Consequently, Ou and Penman took measures to try and assure that the abnormal returns documented in their study were not attributable to the size effect, the January effect, or to time-varying rates of return. Ou and Penman also assessed whether *Pr* is systematically related to other variables that may proxy for risk (e.g., price-earnings ratios). Based on extensive analysis, Ou and Penman [1989a, p. 327] concluded that "although we cannot be absolutely sure that this measure (*Pr*) is not solely a risk attribute, the analysis indicates

[101]It is possible that others thought the *Pr* strategy was nothing more than a variation of the winner-loser effect.

that this is not so. It appears that this fundamental measure captures equity values that are not reflected in stock prices."[102]

The DeBondt and Thaler [1985, 1987] studies and the Ou and Penman [1989a] study are similar in that they both provided evidence of market inefficiency while trying to control for other factors that could be driving their results. The studies are also similar in that they motivated other researchers to examine more closely the research methods used. Based on this additional research, the DeBondt and Thaler [1985, 1987] studies are no longer viewed as strong evidence of market inefficiency due to investor overreaction. Similarly, the three studies discussed below lead to the conclusion that the Ou and Penman [1989a] results are probably not due to the ability of *Pr* to identify equity values that are not reflected in stock prices. Rather, the results appear to be due to accounting variables proxying for stocks' expected returns (Ball [1992, p. 319]). Below, I will provide a summary of the main findings of the three studies that led to this conclusion. I will then discuss the implications of these studies on the results of this study.

Recall from Chapter 1 of this study that the main finding of Stober [1990] was that abnormal returns persist for a 60-month period. This finding is consistent with a failure of the *Pr* trading strategy to control fully for risk. In the published version

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[102]Ou and Penman [1989a] also distinguish the results of their study from DeBondt and Thaler [1985, 1987] along three lines. First, they note that their abnormal returns are still generated even after controlling for differences in size. Second, the abnormal returns are essentially the same after dropping January returns from the holding period. Third, the DeBondt and Thaler results were primarily due to the "loser" portfolio. In contrast, the Ou and Penman results are driven primarily by the "winner" portfolio.

(Stober [1992]), he documents that the abnormal returns persist for 72 months. This provides even stronger evidence that *Pr* is systematically sorting firms along unidentified measures of risk that are, nonetheless, priced by the market.

The main finding of Greig [1992] is that the abnormal returns earned by the Ou and Penman trading strategy are due to differences in expected returns rather than the market underreaction to future earnings information embedded in *Pr*. First, Greig replicates the Ou and Penman study (he used the same logit models and covered the same years) and finds qualitatively similar results. One difference is that Greig finds size-adjusted hedge returns are driven by returns on the long side. In contrast, Ou and Penman find the hedge return is driven primarily by returns on the short side. Greig offers no explanation for the difference in the relative contribution of the long and short positions. Recall that Ou and Penman distinguished their study from DeBondt and Thaler [1985, 1987] by noting that their returns were primarily from the short side whereas DeBondt and Thaler's were from the long side. Greig's findings suggest that this distinction may not be valid.

After replicating the Ou and Penman study, Greig then attempts to explain the abnormal returns via determinants of expected returns. The motivation for suspecting that the hedge return is due to differences in expected returns is twofold. First, Stober's [1992] finding that the positive hedge return persists for 72 months is consistent with differences in expected returns rather than underutilizing the earnings-relevant information contained in financial statements. Second, Ou and Penman ([1989a] Table 7, p. 317) document that *Pr* is correlated with firm size, prior stock price performance, and current changes in earnings. Consequently, forming portfolios on the basis of *Pr* is equivalent to forming portfolios on these variables. Each of these variables have, in turn, been shown to be correlated with changes in expected returns.

Greig first controls for differences in beta between the long and short position by using the approach used by DeBondt and Thaler [1987] and Zarowin [1989].[103] He finds that this approach to control for risk eliminates some, but not all, of the positive return to the hedge portfolio. Specifically, differences in risk between the long and short position account for about one-sixth of the hedge return. Based on another analysis, Greig finds that *Pr* is a proxy for beta and even more so for extreme *Pr* firms that are small. Consequently, he implements a more precise control for firm size. Once this is done, the *Pr* strategy loses its ability to predict abnormal returns. Therefore, he concludes that it is important to control for size and risk differences simultaneously. Greig summarizes his findings by stating that the Ou and Penman result "is another manifestation of the size effect rather than new evidence of market inefficiency" [1992, p. 441].

Holthausen and Larcker [1992] extend the Ou and Penman study by examining five years not covered by the Ou and Penman study (1984 through 1988) and by including over-the-counter firms. They estimate new earnings prediction models (in

[103]This approach regresses the monthly return for the hedge portfolio against the market risk premium. The intercept is the Jensen performance index and the slope coefficient is an estimate of the CAPM beta for the hedge portfolio. The hedge portfolio beta is interpreted as the difference in CAPM-betas between the long and short portfolios. If the long and short positions have equal risk, the beta estimate for the hedge portfolio will not be significantly different from zero.

contrast to both Stober [1992] and Greig [1992] who used the models estimated by Ou and Penman). Although their models achieve predictive ability results that are similar to those achieved by Ou and Penman, they find that the *Pr* trading strategy does not work well in the newly-examined five-year period. In fact, the 24-month hedge returns are actually negative during this period. Additionally, using pooled data, they find a monotonic increase in 12-month hedge returns. That is, returns from months 37 to 48 are greater than the returns from months 25 to 36; which in turn are greater than the returns from months 13 to 24; which in turn are greater than the returns from months 1 to 12.[104] This pattern of returns provides additional support for the idea that *Pr* may be proxying for expected returns.

Holthausen and Larcker also develop logit models that directly predict the sign of subsequent 12-month excess returns (i.e., abnormal return prediction models). In contrast, Ou and Penman first developed the link between financial statement variables and one-year-ahead earnings changes. It was then hypothesized that the information about future earnings contained in financial statements is not fully reflected in stock prices (i.e., an underutilized-earnings-information hypothesis). Assuming no flaws in the research design, the hypothesis is supported by the documentation of abnormal returns to the trading strategy. Holthausen and Larcker forgo the link between financial statement variables and earnings by predicting abnormal returns directly. They find that doing so generates abnormal returns that are greater than those generated by the

[104] Holthausen and Larcker [1992] examine returns over 48 months.

Ou and Penman strategy. This suggests that the underutilized-earnings-information hypothesis is not what is driving the results.[105]

Ball [1992] provides possible explanations for the Ou and Penman [1989a] results. Based on his analysis (which includes a review of the results of the three studies just discussed), Ball [1992, p. 338] concludes that the "*Pr* variable, which is a composite of various financial statement variables, proxies for differences in securities' expected returns."[106]

Overall, the trading strategy results of this study are in general agreement with these three studies. For example, the results of this study agree with Stober [1992] and Holthausen and Larcker [1992] in that abnormal returns are generated in periods extending beyond 36 months. This study is also in general agreement with Holthausen

[105]Although this result seems to indicate that abnormal return prediction models can earn abnormal returns, it is possible that the size controls used by Greig [1992] would explain the results.

[106]It appears that this conclusion has had an impact on the content of other studies. For example, in a working paper dated October 1991, Lev and Thiagarajan use a structured approach to select financial statement variables (i.e., selecting financial statement variables that have been explicitly said to be used by financial analysts in security valuation) and showed that a trading strategy based on these variables earned abnormal returns. Greig [1992] suggests that the Lev and Thiagarajan result is due to incorrect risk adjustment. In the published study, Lev and Thiagarajan [1993] have removed all references to a trading strategy and concentrate their efforts on examining the relationships among the financial statement variables, earnings persistence, and the earnings response coefficient.

and Larcker [1992] in that the trading strategy does not perform well in the more recent years examined by both studies (i.e., 1984 - 1988).[107]

Stratification of Sample Firms

The motivation to stratify the sample firms was to determine whether the effectiveness of the trading strategy could be increased by using information in addition to *Pr* when constructing the hedge portfolios. Unfortunately, two items serve to undermine the efficacy of this analysis. First, it was implicitly assumed that the basic trading strategy would perform well. Given the relatively poor performance of the trading strategy in most of the years, stratifying the sample firms may lead to few additional insights. Second, and more important, is the high potential that *Pr* proxies for differences in expected returns. It is possible that the stratifications will increase the proxy effects which will make the interpretation of the results problematic. Specifically, if the stratifications "work" in the sense that the hedge returns are larger than before an unresolved question remains: Did the stratifications work because they were effective in exploiting the underutilized information contained in financial statements or were they effective because they further sorted firms according to determinants of expected returns? Because *Pr* is correlated with firm size, prior stock price performance, and current changes in earnings, it appears likely that the latter is the more probable cause.

[107]The results between this study and Holthausen and Larcker [1992] are not directly comparable because Holthausen and Larcker included over-the-counter firms and did not restrict their sample to firms with December fiscal year-ends.

Predisclosure Information Stratification

The motivation to stratify firms on the basis of market value of equity was to determine whether the degree of security "mispricing" is greater for small firms' stocks than for large firms' stocks due to less predisclosure earnings information for small firms. If this conjecture is true, the returns to the trading strategy could be increased by limiting positions to stocks of small firms. To operationalize this stratification, size, as measured by the market value of equity, was chosen as the proxy for the amount of predisclosure earnings information. Procedurally, firms were ranked on the basis of market value of equity as of the beginning of the year in which trading positions were to be initiated. Five size-based portfolios were then formed. Quintile 1 represents the smallest firms and quintile 5 represents the largest firms. The trading strategy was then separately implemented for these two extreme quintiles (i.e., firms in the three middle quintiles were excluded from the trading strategy). Because the firms within each hedge portfolio consist of either relatively large or relatively small firms, size-adjusted returns (SARs) are the appropriate return metric to use.

Table 55 shows the 24-month SARs for the ten years the strategy was implemented. Panel A contains returns for the small-firm quintile and Panel B contains returns for the large-firm quintile. The results from this table can be compared with the 24-month SARs shown in Tables 40 through 49.[108] The first thing to note is that the size-based strategy generated 24-month SARs of comparable magnitude to the 24-

[108]As the previous section documented that the trading strategy generated returns extending beyond a 36-month period, the stratification results will focus on 24-month returns.

month SARs generated by the entire sample. In most years, the 24-month returns from the size-based strategy did not deviate by more than 1% to 3% from the overall sample 24-month returns. In some of the years the size-based returns were bigger, in other years they were smaller. For example, in 1982 and 1985 the returns for the two extreme portfolios were greater than the returns for the entire sample. In contrast, in 1981 and 1986 the returns were smaller. Additionally, in several instances (e.g., 1980, 1983, and 1988) the returns were larger for one quintile but smaller for the other.

The remaining discussion will examine whether the return performance differs between the two size-based portfolios as a function of the overall performance of the trading strategy. Recall that on an overall basis 1980 and 1981 were considered "good" years (24-month SARs between 11% and 17%); 1982, 1985, and 1986 were considered "moderate" years (24-month SARs between 1.5% and 9.5%); and 1983, 1984, 1987, 1988, and 1989 were considered "poor" years (24-month SARs between -17% and 1.5%).

In the two good years, there is little difference between the 24-month SARs generated by each size-based portfolio. In 1980, the small-firm hedge returns are bigger than the large-firm hedge returns, but only slightly so. For example, Model 6 had 24-month SARs of 18.85% and 17.38% for quintile 1 and 5, respectively. In contrast, the reverse situation holds in 1981 as large-firm returns are greater. For example, Model 6 had 24-month SARs of 12.50% and 13.16% for quintile 1 and 5, respectively. These findings are consistent across both models used to establish long and short positions.

In the moderate years the small-firm portfolio did not dominate the large-firm portfolio. Small-firm hedge returns exceeded large-firm hedge returns in 1982 and 1986, whereas the reverse situation occurred in 1985. Within these years, the differences were never large. The largest difference (2.63%) was in 1986 for Model 6, when the small-firm portfolio generated 24-month SARs of 8.84% while the large-firm portfolio had 24-month SARs of 6.21%.

Lastly, in the five years the overall strategy performed poorly, it was found that the small-firm portfolio fared worse than the large-firm portfolio in three of the years (1983, 1984, and 1989). In these years, the 24-month SARs were negative; therefore, doing worse implies even greater negative returns. In the other two years (1987 and 1988) the small-firm portfolio performed better than the large-firm portfolio. However, the amount by which the small-firm portfolio was better was minimal.

The overall conclusion from the predisclosure information stratification is that the small-firm portfolio did not dominate large-firm portfolio on a consistent basis, as anticipated. Additionally, there does not appear to be any relationship between the success of the overall trading strategy and the extent to which the small-firm portfolio outperforms the large-firm portfolio.

Magnitude of Current Earnings Changes Stratification

The motivation to stratify firms on the basis of current earnings changes is to take advantage of the fact that *Pr* identifies earnings reversals. Brooks and Buckmaster [1976, 1980] have shown that firms experiencing an extreme change in current earnings will likely experience a change in the opposite direction in the next period. Thus, both *Pr* and the current change in earnings contain information pertinent to predicting one-year-ahead earnings changes. By combining these variables, it is conjectured that the probability of observing an earnings reversal will be increased. Consequently, the effectiveness of the trading strategy may be enhanced if positions are limited to stocks that experienced an extreme change in current earnings combined with the appropriate *Pr* signal regarding one-year-ahead earnings.[109]

To implement this strategy the sample firms were stratified into quintiles on the basis of standardized earnings changes.[110] Long positions were then taken in stocks in the quintile experiencing the largest decrease in standardized earnings (quintile 1) that also had *Pr* values greater than .6. These are firms that have a high probability of experiencing an earnings increase next period. Short positions were taken in stocks in the quintile experiencing the largest increase in standardized earnings (quintile 5) that also have *Pr* values less than or equal to .4. These are firms that have a high probability of experiencing an earnings decrease next period.

The results of the stratification are shown in Table 56. Overall, the stratification increased 24-month hedge returns over those generated by the entire sample (see the 24-month returns in Tables 40 through 49). Similar to the size-based stratification, the

[109]An implicit assumption of this stratification is that the degree of security "mispricing" will be larger for firms experiencing an extreme change in current earnings.

[110]A firm's earnings change was standardized by the standard deviation of the firm's EPS changes over the five previous years.

remaining discussion will focus on whether the success of the stratification differs depending on the success of the entire sample (see Tables 40 through 49 for comparisons).

In the two good years (1980 and 1981) the 24-month hedge returns increased as a result of the stratification, irrespective of model or return metric used. In 1980, the increase in 24-month hedge returns ranged from .63% to 1.58%. In 1981, the increase was similar, ranging from .81% to 1.42%. The greatest impact of the stratifications was experienced in the moderate and poor years. Most of the 24-month hedge returns increased by more than 2%. For example, in 1986, Model 6 had an increase in 24-month hedge returns of 2.75% and 2.46% for market-adjusted and size-adjusted returns, respectively. In most of the poor years (1983, 1984, 1987, 1988, and 1989) the strategy resulted in reducing the negative 24-month hedge return generated by the full sample.

In summary, limiting positions to stocks that have experienced an extreme change in current earnings does increase the effectiveness of the trading strategy. The stratification increased the 24-month hedge returns in the years the overall sample performed "good" or "moderate." In the "poor" years, the stratification decreased the negative 24-month returns generated by the full sample; however, the stratified hedge position still generated negative 24-month returns.

Although the stratification increased the effectiveness of the trading strategy, it is likely it did so by further sorting firms according to determinants of expected returns. There are two reasons to expect this is the case. First, Ball, Kothari and Watts [1993] show that the distribution of earnings changes is leptokurtic (i.e., fat-tailed). The implication of this is that extreme earnings change firms are likely to experience relatively large risk changes too. Specifically, Ball, Kothari and Watts show that changes in betas from year *t* to year *t*+1 are a statistically significant function of earnings changes in year *t*. Portfolios of firms experiencing large earnings decreases in year *t* have decreasing portfolio betas from year *t* to year *t*+1. Conversely, portfolios of firms experiencing large earnings increases in year *t* have increasing portfolio betas from year *t* to year *t*+1.[111] Second, taking long (short) positions in firms experiencing large decreases (increases) in current earnings is similar to the procedure followed by DeBondt and Thaler [1985, 1987]. Therefore, the criticisms of their studies (see previous discussion) may be appropriate here too. In conclusion, the increased returns of the trading strategy may merely reflect differences in expected returns rather than further exploiting the underutilized information contained in financial statements.

Industry Stratification

The earnings prediction models developed in this study were estimated using pooled cross-sectional data. As firms in the same industry face similar operating characteristics, it was conjectured that industry-specific models may result in more accurate prediction models which, in turn, may increase the returns to the trading

[111]This finding can be seen in Ou and Penman [1989a, Table 7]; however, the implication on their trading strategy was not discussed.

strategy.[112] To examine this conjecture, industry-specific prediction models were estimated. Specifically, two digit SIC codes were used to identify firms within homogeneous industries (each industry must have at least 10 sample firms). The earnings prediction models were then re-estimated on an industry-specific basis over the same non-overlapping periods (i.e., 1975 - 1979 and 1980 - 1984) used to estimate the general models. Predictions of one-year-ahead earnings changes from these models were then used to enter into the trading strategy from 1980 through 1989.

The trading strategy results are shown in Table 57. The results indicate that estimating industry-specific models did not, on a consistent basis, increase 24-month hedge returns over those generated by the general models. Although the industry-specific model returns were larger in some years, they were smaller in other years. Additionally, the magnitude of the differences was generally not large as 24-month hedge returns were within 3% of each other in all but one of the years examined.

Analyzing the results as a function of the success of the general models does not lead to any clear insights. For example, in the two good years, the industry-specific models generated larger 24-month hedge returns in 1980 but smaller returns in 1981. For example, Model 3 market-adjusted returns were 2.78% larger in 1980 but were 1.84% smaller in 1981. Similarly, in the three moderate years, the industry-specific returns were larger in 1985 but smaller in 1982 and 1986. Note, however, that the differences in these three years never exceeded 2%.

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[112]This stratification is based on the assumption that industry-specific models will result in increased predictive ability which in turn will lead to larger trading strategy returns. As discussed in Chapter 3, this assumption may not be valid.

The industry-specific models generated larger negative 24-month hedge returns in three of the five poor years (1983, 1987, and 1988). In 1988, the returns were significantly more negative (ranging from -3.96% to -5.21%). In the 1983 and 1988 the returns were more negative, but never more than 3% less. In the other two years (1984 and 1989) the industry-specific models generated smaller negative 24-month hedge returns. The amount by which the returns was decreased was minimal, with reductions ranging from 1.61% to 2.84%.

The overall conclusion of the stratifications is that the size and the industry stratifications did not result in significant increases 24-month hedge returns. Although stratifying the sample on the basis of current earnings changes did increase the effectiveness of the trading strategy, it is likely it did so by further sorting firms according to determinants of expected returns.

CHAPTER 5

CONCLUSIONS AND SUGGESTIONS FOR FUTURE RESEARCH

In this final chapter a brief summary of the results will be provided. Attention will be paid to assessing the contribution of the study as it relates to the objectives set forth in the introductory chapter. Some suggestions for future research are then made.

This study had six main objectives. The first was to examine the relationships between the measures of firm performance identified by traditional financial statement analysis and future earnings changes in an attempt to document empirical regularities. To examine these relationships, univariate logit models were estimated on a yearly basis from 1975 through 1989. The objective of estimating annual univariate logit models was to determine the degree to which a measure of firm performance can predict one-year-ahead earnings changes. A variable was considered useful in predicting one-year-ahead earnings changes if it had the same coefficient sign and was statistically significant in most of the years in the 15-year period examined.

The results indicate that some variables do appear useful in predicting one-year-ahead earnings changes. Most of the variables identified as profitability measures were found to be negatively related to one-year-ahead earnings changes. Freeman, Ohlson, and Penman [1982] showed that return on equity exhibited mean-reverting behavior and was therefore useful in predicting one-year-ahead earnings changes. This study extends this finding by showing that a wide range of profitability measures exhibit mean-reverting behavior and are useful in predicting one-year-ahead earnings changes.

No other group of ratios was found to be systematically related to one-year-ahead earnings changes; however, several individual variables were. For example, change in dividends per share (variable 14) and the percentage change in total assets (variable 53) were consistently negatively related to one-year-ahead earnings changes. The overall results of this analysis can be summarized as follows: Collectively, some of the 61 variables do provide information that is useful in the prediction of one-year-ahead earnings changes. However, many of the variables have no apparent linkage to future earnings changes and therefore would not be useful in predicting earnings changes. This latter finding is intuitively appealing. That is, there is no reason to expect that many of these variables would provide a consistent signal regarding one-year-ahead earnings changes. However, not finding linkages for many of these variables may be partially attributable to structural change that affected sample firms' earnings series and may have altered the relationships between the measures of firm performance and future earnings changes.

A principal component analysis (PCA) was conducted on the 61 accounting variables. The major finding of the PCA was that the 61 variables represent a much broader information set than that represented in previous studies assessing the empirical similarities among financial ratios. Consequently, all of the 61 variables did not map into the seven or eight categories of firm performance found in other studies. Indeed, to explain an amount of variation comparable to other studies would entail retaining more than 20 principal components (PCs). Even variables within a category traditionally defined in financial statement analysis did not group under the same PC. For example, profitability measures formed four distinct PCs. Additionally, a number of individual variables provided unique information and therefore formed their own PCs. This finding is a contribution in that all previous studies have carefully chosen variables so they would map into the seven or eight categories of firm performance.

By expanding the set of variables analyzed we see that financial statements contain a much richer array of information than previously envisioned. This finding has implications for financial statement analysis. Specifically, previous studies on the empirical similarities among financial ratios have concluded that parsimonious prediction models can be developed by selecting one variable to represent each of the seven or eight dimensions of firm performance. To the extent that financial statements contain information that cannot be represented by seven or eight dimensions, the development of parsimonious prediction models is impaired.

In this study, the main objective of the PCA was to facilitate the development of parsimonious earnings prediction models. This objective was impaired somewhat because the 61 variables could not be described by a small number of PCs. Using PCA-based methods to select variables resulted in two earnings prediction models each containing 21 variables. However, using a scree graph to select the number of PCs to retain did result in a model containing only four variables. Although parsimonious, the four PCs used to select the variables only accounted for a third of the variation in the original data.

Once the independent variables were chosen, earnings prediction models were estimated. Specifically, models utilizing six different sets of independent variables were estimated: three sets chosen using PCA-based methods and three benchmark statistical models used for comparison purposes. The benchmark models were the two Ou and Penman models and a model derived from stepwise procedures. These six sets of independent variables were then combined with six different dependent variable specifications so that a total of 36 different model specifications were estimated. These 36 models were then estimated over two non-overlapping periods. Thus, a total of 72 earnings prediction models were estimated.

Three observations were noted with regard to the model estimation results. First, virtually all of the models were statistically significant at the .001 level; however, the stepwise models achieved the highest significance levels. Second, most of the coefficient signs in the multivariate models agreed with the results of the univariate logit estimations. It appears that the few sign disagreements that did occur can be attributed to multicollinearity. Lastly, the trichotomous logit models generally had the greatest number of significant variables within a given model while the OLS models had the least. Consequently, the overall significance levels of the trichotomous models exceeded that of either the dichotomous or the OLS models.

The second objective of this study was to evaluate the effect of different model specifications on the predictive ability of the models. For example, the motivation for the different dependent variable specifications was to ascertain if using the information in the dependent variable (earnings changes) more fully would lead to increased predictive ability. Because the binary specification of earnings changes (increase or decrease) excludes information that may be beneficial in the estimation of model parameters, it was thought that the predictive ability of the models could be increased if this information was used. Similarly, two different drift term specifications (one-year and four-year) were used to assess the impact on predictive ability.

The predictive ability findings can be summarized by the following four points. First, there was little difference in the predictive ability of the dichotomous and trichotomous logit models. Therefore, trichotomizing the dependent variable does not appear to be warranted. In contrast to the comparable results of the two logit specifications, the ordinary least squares (OLS) specification did not perform well. Many of the models using a one-year drift term predicted almost all earnings increases or decreases. A possible explanation for the poor results of the OLS models is that extreme observations may have dominated the estimation of model parameters. Consequently, the OLS models performed poorly when predictive ability tests were conducted in a subsequent period.

Given the poor performance of the OLS models relative to the logit models, the remaining analyses were conducted using the logit specifications only. Consequently, the last three points relate to those models only. Second, for a given set of independent variables, the highest predictive ability was achieved with models using a one-year drift term. Models using a one-year drift term also achieved greater success in predicting both earnings increases and decreases. Structural change may be a possible explanation for the superiority of the one-year drift models relative to the four-year drift models.

Specifically, to the extent that structural change has altered the earnings series of firms, the four-year drift may contain measurement error that adversely affects the models' ability to predict future earnings changes.

Third, a somewhat surprising finding was that the models with the strongest overall fit in the estimation period did not necessarily dominate in the predictive ability tests. For example, the parsimonious model that contained only four independent variables achieved results comparable to models using far more variables. This was probably due to the fact that many variables were not consistent predictors of one-year-ahead earnings changes. Consequently, variables that provided a good fit in the estimation period may not have been good predictors in the prediction period. This is sometimes referred to as the descriptive/predictive paradox or the "regression fallacy."

Fourth, the predictive ability of many of the models in this study (especially those using a one-year drift term) exceeded the predictive ability of the Ou and Penman models. Indeed, the parsimonious model achieved results comparable to their models. A major conclusion of the predictive ability tests is that a number of models, containing a variety of independent variables, can all achieve comparable predictive ability results.

The last four objectives of this study related to the simulated trading strategy. First, this study examined trading strategy returns for a period extending six years beyond that examined by Ou and Penman. Consequently, this study provides evidence on whether the Ou and Penman findings are time-period specific. The results of this study indicate that the trading strategy is not successful in periods subsequent to the Ou and Penman study. Ou and Penman found that the strategy worked well in eight of the

11 years they examined. In contrast, this study finds that the strategy performs well in only two of the ten years examined (1980 and 1981). In these two years the strategy performed as expected, with the long position generating positive returns and the short position generating negative returns. It should be noted that the Ou and Penman study showed that the trading strategy performed well in these two years also. In three other years (1982, 1985, and 1986), the strategy generated modest positive 24-month hedge returns. In 1982, the 24-month hedge returns were driven by the long position whereas in 1985 and 1986 the 24-month hedge returns were driven by the short position. In the other five years the trading strategy did not perform well. In 1983 and 1984 the strategy generated large negative 24-month hedge returns. The large negative hedge returns were attributable to the long position. In the other three years (1987, 1988, and 1989) the 24-month hedge returns were close to zero.

When results are averaged over the entire period examined, two different pictures emerge regarding the profitability of the trading strategy between this study and Ou and Penman [1989a]. On a pooled basis, the Ou and Penman results indicate that the strategy works well. In contrast, this study indicates the strategy does not work well. This result is due to "good" and "bad" years offsetting each other in some years as well as several years where the trading strategy generated 24-month returns that were close to zero.

The second trading strategy objective was to determine whether earnings prediction models that were similar to those used by Ou and Penman could generate abnormal returns. In the years the trading strategy worked well, the models examined in this study did generate results that were qualitatively similar to those obtained by Ou and Penman. Also, in these years it was shown that a parsimonious model can perform almost as well as a model generated through statistical procedures and that contains many more variables. However, as discussed previously, the trading strategy did not work well in most of the years examined in this study. This result is in agreement with the findings of Holthausen and Larcker [1992]. It is likely that the trading strategy would not be successful in these years, regardless of the models used.

The third trading strategy objective was to assess how long the abnormal returns to the trading strategy lasted. Consistent with Stober [1992] and Holthausen and Larcker [1992], this study documents that abnormal returns are generated in periods extending beyond 36 months. In most of the years examined, the long position generated positive returns and the short position generated negative returns in months 37 through 60. This is further evidence that *Pr* is proxying for differences in expected returns. This finding severely undermines Ou and Penman's assertion that *Pr* captures equity values that are not reflected in stock prices.

The last trading strategy objective was to ascertain whether three different stratifications of the sample firms would increase the effectiveness of the trading strategy. The insights gained from these analyses were lessened due to two reasons. First, when devising the stratifications it was implicitly assumed that the trading strategy would perform well in all of the years examined. Second, the potential that *Pr* proxies for differences in expected returns undermines the interpretation of the trading strategy results. Specifically, if the stratifications "work" in the sense that the hedge returns are larger than before an unresolved question remains: Did they work because they were effective in exploiting the underutilized information contained in financial statements or were they effective because they further sorted firms according to determinants of expected returns? Because *Pr* is correlated with firm size, prior stock price performance, and current changes in earnings, it appears likely that the latter is the more probable cause.

After conducting the stratifications it was found that two of the three did not markedly improve the performance of the trading strategy. The overall conclusion from the predisclosure information stratification is that the small-firm portfolio did not dominate the large-firm portfolio on a consistent basis, as anticipated. Additionally, there did not appear to be any relationship between the success of the overall trading strategy and the extent to which the small-firm portfolio outperformed the large-firm portfolio. Similarly, estimating industry-specific models did not, on a consistent basis, increase 24-month hedge returns over those generated by the general models. Although the industry-specific model returns were larger in some years, they were smaller in other years. Additionally, the magnitude of the differences in 24-month hedge returns between the industry-specific models and the general models was generally not large as hedge returns were within 3% of each other in all but one of the years examined.

In contrast, limiting positions to stocks that experienced an extreme change in current earnings did increase the effectiveness of the trading strategy. This stratification increased the 24-month hedge returns in the years the overall sample performed "good" or "moderate." In the "poor" years, the stratification decreased the negative 24-month returns generated by the full sample; however, the stratified hedge position still generated negative 24-month returns. Although the stratification increased the effectiveness of the trading strategy, it is likely it did so by further sorting firms according to determinants of expected returns rather than by further exploiting the underutilized information contained in financial statements.

As discussed previously, three studies that extended Ou and Penman [1989a] were published in 1992 (i.e., Greig [1992], Holthausen and Larcker [1992], and Stober [1992]) that have implications for this study. The major focus of these studies was the simulated trading strategy. Indeed, rather than estimating new earnings prediction models, both Greig [1992] and Stober [1992] used the identical Ou and Penman models. There were two major findings from these studies that have a direct impact on this study. First, the trading strategy generates abnormal returns in periods extending beyond 36 months. This suggests that *Pr* proxies for differences in expected returns rather than exploits the underutilized information contained in financial statements. Second, the success of the trading strategy appears to be time-period specific. Holthausen and Larcker [1992] document that the strategy does not perform well in years subsequent to the Ou and Penman study (1984 - 1988).

Brown reviews [1993, p. 299] these extensions of Ou and Penman [1989a] and concludes that "more work is needed to determine whether a financial statement anomaly exists and if it does, whether it is more pronounced for certain firms and time periods than for others." Consistent with this comment, this study makes a contribution by providing additional evidence on the financial statement anomaly. This study used different earnings prediction models and examined the trading strategy over a six-year period subsequent to Ou and Penman. The findings of this study are in general agreement with the two major conclusions of the Ou and Penman extensions. Additionally, the results of the stratifications provide insights on whether the anomaly is more pronounced for certain firms than for others. For example, the predisclosure information stratification conducted in this study documented that the trading strategy was not more successful when confined to small firms as the small-firm portfolio did not outperform the large-firm portfolio on a consistent basis.

The results on the first three objectives of this study are contributions to the accounting literature. First, no other study has looked at the Ou and Penman variables in an attempt to identify the relationships between measures of firm performance and future earnings changes. The results from this study can be viewed as an initial attempt to relate current financial statement variables to future earnings. Second, no other study has assessed the dimensionality of the accounting variables used in the Ou and Penman study. The results of this study show that financial statements contain a much richer array of information than previously envisioned. This finding is a contribution to the literature that has examined the empirical similarities among financial variables. Lastly, no other study has compared the predictive ability of a wide range of earnings prediction models. This study examined different sets of independent variables, different dependent variable specifications, and alternative drift term specifications.

I believe that future research in this area should be related to assessing the usefulness of financial statement variables in predicting one-year-ahead earnings changes. Specifically, more detailed work using industry-specific models may be warranted. For example, models could incorporate the industry average for each financial statement variable as the expected level for the variable. Another study could examine industries not covered here. Both this study and Ou and Penman excluded utilities and financial institutions as "these firms do not have attributes identified by the prediction models" (Ou and Penman [1989a, p. 302]). An extension would be to identify the attributes that facilitate the prediction of earnings in these specific industries. For example, information on nonperforming loans and exposure to interest-rate risk may prove valuable in the development of earnings prediction models for the banking industry.

Lastly, linking the prediction models to various partitions of earnings may provide interesting insights. For example, Thomas [1993] lists several ways that earnings can be partitioned into components: (1) recurring earnings versus non-recurring earnings, (2) accruals and cash flows, (3) different income statement line items, and (4) permanent, transitory and price-irrelevant components of earnings. Predicting components of earnings, rather than overall earnings, may provide insights on the relationships between financial statement variables and these components. Additionally, if *Pr* is useful in isolating the transitory component of current earnings (as Ou and Penman [1989b] contend), it may be worthwhile to examine differences in *Pr* measures across industries as earnings persistence should be related to industry characteristics such as barriers to entry and market share.

Table 1

Sample Firms Used in the Annual Univariate Logit Model Estimations

Year	Firms with required variables[a]	Firms deleted due to division by zero	Firms deleted due to illogical ratio	Final sample sizes
1975	913	109	3	801
1976	906	114	3	789
1977	881	108	4	769
1978	843	93	4	746
1979	820	89	2	729
1980	786	84	0	702
1981	740	80	2	658
1982	699	84	1	614
1983	640	74	1	565
1984	621	78	2	541
1985	580	89	0	491
1986	560	87	0	473
1987	565	97	0	468
1988	585	105	0	480
1989	552	96	0	456
1990	581	108	0	473

[a]In addition to the 61 accounting variables and the required earnings variables, firms also met the following criteria: (1) listed on either the New York or American Stock Exchanges, (2) not a utility (SIC code 49) or a financial institution (SIC codes 60-69), and (3) December fiscal year-end for the current and four previous years.

Table 2a

Descriptive Statistics for the Sixty-One Independent Variables for Years 1975 - 1979[a]

Accounting Variable	Mean	Standard Deviation	Quartiles				
			Maximum	75%	Median	25%	Minimum
1. Current Ratio	2.245	1.001	12.533	2.700	2.071	1.561	0.371
2. %Δ in Current Ratio	-0.002	0.300	6.873	0.068	-0.028	-0.121	-0.757
3. Quick Ratio	1.210	0.595	12.433	1.440	1.106	0.861	0.026
4. %Δ in Quick Ratio	0.012	0.367	7.466	0.095	-0.032	-0.154	-0.878
5. Days Sales in Accounts Receivable	53.439	29.487	422.477	63.774	49.818	38.381	0.627
6. %Δ in Days Sales in Accounts Receivable	0.026	0.191	3.660	0.074	0.012	-0.045	-0.835
7. Inventory Turnover	9.365	15.652	196.638	8.424	4.818	3.244	0.552
8. %Δ in Inventory Turnover	0.043	0.452	2.498	0.103	0.239	-0.045	-0.908
9. Inventory/Total Assets	0.227	0.141	0.885	0.322	0.229	0.115	0.001
10. %Δ in Inventory/Total Assets	0.023	0.520	5.799	0.081	-0.003	-0.081	-0.847
11. %Δ in Inventory	0.205	0.973	41.000	0.248	0.124	0.025	-0.823
12. %Δ in Sales	0.178	0.257	7.671	0.226	0.149	0.083	-0.772
13. %Δ in Depreciation	0.172	0.309	8.122	0.229	0.126	0.051	-0.753
14. Δ in Dividends Per Share	0.103	0.212	3.150	0.160	0.080	0.000	-3.321
15. Depreciation/Plant Assets	0.118	0.053	0.517	0.138	0.110	0.086	0.008
16. %Δ in Depreciation/Plant Assets	0.185	0.233	6.235	0.082	0.006	-0.070	-0.827
17. Return on Opening Equity	0.163	0.136	1.980	0.212	0.159	0.107	-1.804
18. Δ in Return on Opening Equity	0.008	0.139	1.837	0.036	0.007	-0.019	-1.876
19. %Δ in Capital Expenditures/Total Assets	0.257	0.968	25.300	0.428	0.083	-0.175	-0.972

[a]Seven of the original 68 variables were deleted due to missing observations. Descriptive statistics are based on a sample size of 3,834 over the period 1975 - 1979.

Table 2a - continued

Descriptive Statistics for the Sixty-One Independent Variables for Years 1975 - 1979

Accounting Variable	Mean	Standard Deviation	Quartiles				
			Maximum	75%	Median	25%	Minimum
20. 19. (one-year lag)	0.281	1.308	18.803	0.424	0.053	-0.194	-0.972
21. Debt-Equity Ratio	1.378	1.135	24.118	1.611	1.095	0.762	0.081
22. %Δ in Debt-Equity Ratio	0.075	0.367	6.686	0.145	0.021	-0.075	-0.899
23. Long-Term Debt to Equity	0.583	0.639	7.319	0.707	0.419	0.210	0.000
24. %Δ in Long-Term Debt to Equity	0.488	7.071	138.481	0.166	-0.059	-0.182	-0.993
25. Equity to Fixed Assets	1.722	2.295	54.034	2.016	1.339	0.844	0.115
26. %Δ in Equity to Fixed Assets	0.008	0.265	4.584	0.071	-0.003	-0.085	-0.793
27. Times Interest Earned	14.133	34.534	504.071	11.641	5.962	3.419	-41.644
28. %Δ in Times Interest Earned	0.121	4.211	79.663	0.268	-0.013	-0.256	-19.417
29. Sales/Total Assets	1.464	0.773	10.013	1.742	1.398	1.036	0.039
30. %Δ in Sales/Total Assets	0.022	0.187	5.707	0.075	0.017	-0.044	-0.648
31. Return on Total Assets	0.065	0.047	0.301	0.090	0.064	0.041	-0.515
32. Return on Closing Equity	0.132	0.143	0.714	0.182	0.141	0.099	-2.923
33. Gross Margin Ratio	0.303	0.144	0.866	0.372	0.279	0.206	0.004
34. %Δ in Gross Margin Ratio	0.015	0.186	1.840	0.045	-0.000	-0.044	-0.940
35. Operating Profit (before Depr.) to Sales	0.148	0.112	0.811	0.178	0.124	0.084	-0.134
36. %Δ in Operating Profit (before Depr.) to Sales	0.067	1.192	31.317	0.103	-0.001	-0.092	-21.145
37. Pretax Income to Sales	0.099	0.094	1.724	0.129	0.085	0.049	-0.321
38. %Δ in Pretax Income to Sales	0.334	21.438	58.415	0.194	0.004	-0.143	-42.747
39. Net Profit Margin	0.057	0.059	1.132	0.074	0.048	0.029	-0.321
40. %Δ in Net Profit Margin	-0.010	6.394	87.509	0.194	0.019	-0.114	-80.976
41. Sales to Total Cash	50.256	117.680	1910.91	55.752	26.976	12.554	0.418

Table 2a - continued

Descriptive Statistics for the Sixty-One Independent Variables for Years 1975 - 1979

Accounting Variable	Mean	Standard Deviation	Quartiles				
			Maximum	75%	Median	25%	Minimum
42. Sales to Accounts Receivable	11.613	33.789	597.543	8.866	6.774	5.260	0.626
43. Sales to Inventory	12.935	22.044	377.511	11.306	6.493	4.608	0.781
44. %Δ in Sales to Inventory	0.049	0.365	9.097	0.125	0.015	-0.066	-0.951
45. Sales to Working Capital	9.811	68.470	1950.793	8.097	4.918	3.441	-549.807
46. %Δ in Sales to Working Capital	0.328	6.287	226.341	0.180	0.042	-0.078	-41.548
47. Sales to Fixed Assets	5.701	8.086	133.074	6.659	4.242	2.278	0.041
48. %Δ in Production	0.199	0.550	3.560	0.245	0.155	0.079	-0.850
53. %Δ in Total Assets	0.162	0.208	2.197	0.207	0.123	0.062	-0.551
54. Cash Flow to Total Debt	0.237	0.175	1.506	0.295	0.199	0.129	-0.578
55. Working Capital/Total Assets	0.272	0.167	0.860	0.400	0.273	0.138	-0.239
56. %Δ in Working Capital/Total Assets	0.380	5.888	48.841	0.092	-0.022	-0.130	-23.986
57. Operating Income/Total Assets	0.171	0.077	0.499	0.216	0.167	0.125	-0.238
58. %Δ Operating Income/Total Assets	0.091	1.175	27.280	0.149	0.013	-0.102	-18.415
61. Repayment of Long-Term Debt as % of Total Long-Term Debt	0.314	2.157	48.077	0.233	0.109	0.054	0.000
62. Issuance of Long-Term Debt as % of Total Long-Term Debt	0.251	0.344	5.026	0.368	0.140	0.015	0.000
63. Purchase of Treasury Stock as % of Stock	0.010	0.046	0.986	0.001	0.000	0.000	0.000
65. %Δ in Long-Term Debt	0.703	8.725	167.998	0.296	0.037	-0.074	-0.987
66. Cash Dividend as % of Cash Flows	0.174	0.170	2.968	0.241	0.171	0.085	-2.037
67. %Δ in Working Capital	0.382	6.710	57.572	0.242	0.094	-0.025	-30.169
68. Net Income Over Cash Flows	0.555	1.866	9.787	0.736	0.630	0.504	-83.750

Table 2b

Descriptive Statistics for the Sixty-One Independent Variables for Years 1980 - 1984[a]

Accounting Variable	Mean	Standard Deviation	Quartiles				
			Maximum	75%	Median	25%	Minimum
1. Current Ratio	2.210	1.090	13.557	2.644	2.016	1.502	0.104
2. %Δ in Current Ratio	0.021	0.262	4.538	0.098	-0.008	-0.104	-0.842
3. Quick Ratio	1.217	0.671	8.861	1.443	1.084	0.813	0.037
4. %Δ in Quick Ratio	0.045	0.365	6.960	0.155	-0.005	-0.129	-0.868
5. Days Sales in Accounts Receivable	55.617	29.987	374.648	65.149	51.952	40.024	0.922
6. %Δ in Days Sales in Accounts Receivable	0.027	0.253	4.547	0.078	-0.001	-0.067	-0.763
7. Inventory Turnover	9.596	17.418	369.379	8.695	5.014	3.253	0.312
8. %Δ in Inventory Turnover	0.029	0.580	5.732	0.098	0.011	-0.073	-0.915
9. Inventory/Total Assets	0.209	0.136	0.798	0.295	0.200	0.101	0.001
10. %Δ in Inventory/Total Assets	-0.006	0.317	5.927	0.057	-0.031	-0.123	-0.983
11. %Δ in Inventory	0.118	0.767	25.007	0.178	0.041	-0.085	-0.984
12. %Δ in Sales	0.091	0.228	2.677	0.168	0.079	-0.017	-0.890
13. %Δ in Depreciation	0.153	0.340	10.037	0.217	0.113	0.028	-0.967
14. Δ in Dividends Per Share	0.036	0.238	5.620	0.100	0.020	0.000	-3.194
15. Depreciation/Plant Assets	0.125	0.057	0.616	0.146	0.115	0.091	0.008
16. %Δ in Depreciation/Plant Assets	0.044	0.263	6.182	0.112	0.028	-0.054	-0.834
17. Return on Opening Equity	0.115	0.230	3.738	0.194	0.131	0.064	-2.141
18. Δ in Return on Opening Equity	-0.018	0.249	4.958	0.026	-0.008	-0.060	-1.884
19. %Δ in Capital Expenditures/Total Assets	0.191	1.518	53.037	0.297	-0.031	-0.285	-0.976

[a]Seven of the original 68 variables were deleted due to missing observations. Descriptive statistics are based on a sample size of 3,080 over the period 1980 - 1984.

Table 2b - continued

Descriptive Statistics for the Sixty-One Independent Variables for Years 1980 - 1984

Accounting Variable	Mean	Standard Deviation	Quartiles				
			Maximum	75%	Median	25%	Minimum
20. 19. (one-year lag)	0.151	1.046	16.097	0.292	-0.026	-0.283	-0.976
21. Debt-Equity Ratio	2.082	18304	95.849	1.672	1.119	0.744	0.109
22. %Δ in Debt-Equity Ratio	0.224	2.963	108.917	0.123	-0.008	-0.111	-0.901
23. Long-Term Debt to Equity	0.853	3.589	100.599	0.712	0.398	0.195	0.001
24. %Δ in Long-Term Debt to Equity	0.490	6.257	106.816	0.169	-0.061	-0.196	-0.992
25. Equity to Fixed Assets	1.656	1.753	28.947	1.950	1.280	0.766	0.005
26. %Δ in Equity to Fixed Assets	0.018	0.393	8.352	0.079	-0.002	-0.088	-0.992
27. Times Interest Earned	10.193	29.134	632.778	8.685	4.221	2.084	-22.969
28. %Δ in Times Interest Earned	0.277	3.924	68.358	0.325	-0.046	-0.354	-45.568
29. Sales/Total Assets	1.423	0.773	8.266	1.708	1.326	0.985	0.092
30. %Δ in Sales/Total Assets	-0.006	0.169	2.894	0.059	-0.009	-0.083	-0.845
31. Return on Total Assets	0.050	0.061	0.248	0.083	0.054	0.027	-0.523
32. Return on Closing Equity	-0.034	3.844	1.479	0.168	0.119	0.062	-20.519
33. Gross Margin Ratio	0.303	0.148	0.882	0.377	0.276	0.201	0.002
34. %Δ in Gross Margin Ratio	0.039	0.770	4.563	0.062	0.006	-0.052	-0.942
35. Operating Profit (before Depr.) to Sales	0.131	0.111	0.773	0.162	0.109	0.069	-0.255
36. %Δ in Operating Profit (before Depr.) to Sales	0.108	2.216	33.253	0.124	-0.005	-0.152	-18.697
37. Pretax Income to Sales	0.073	0.105	1.160	0.115	0.066	0.027	-0.761
38. %Δ in Pretax Income to Sales	0.202	7.077	143.728	0.223	-0.021	-0.296	-65.674
39. Net Profit Margin	0.041	0.074	0.659	0.066	0.040	0.018	-1.003
40. %Δ in Net Profit Margin	-0.168	6.802	85.573	0.197	-0.011	-0.281	-179.327
41. Sales to Total Cash	68.014	270.783	6821.602	63.848	27.074	12.248	0.461

Table 2b - continued

Descriptive Statistics for the Sixty-One Independent Variables for Years 1980 - 1984

Accounting Variable	Mean	Standard Deviation	Quartiles				
			Maximum	75%	Median	25%	Minimum
42. Sales to Accounts Receivable	11.013	25.384	420.068	9.078	6.915	5.417	0.979
43. Sales to Inventory	13.815	25.607	517.071	12.270	7.111	4.908	0.522
44. %Δ in Sales to Inventory	0.066	0.547	16.845	0.132	0.024	-0.077	-0.953
45. Sales to Working Capital	12.825	105.397	1334.117	9.117	5.088	3.320	-883.879
46. %Δ in Sales to Working Capital	0.180	3.362	120.125	0.172	0.010	-0.140	-34.981
47. Sales to Fixed Assets	5.420	8.113	125.196	6.339	3.773	2.108	0.104
48. %Δ in Production	0.109	0.625	5.552	0.183	0.077	-0.036	-0.986
53. %Δ in Total Assets	0.111	0.258	5.854	0.159	0.076	-0.000	-0.809
54. Cash Flow to Total Debt	0.216	0.185	1.811	0.286	0.191	0.111	-1.085
55. Working Capital/Total Assets	0.255	0.179	0.849	0.382	0.246	0.116	-0.678
56. %Δ in Working Capital/Total Assets	0.095	8.587	51.604	0.115	-0.017	-0.148	-56.017
57. Operating Income/Total Assets	0.149	0.083	0.452	0.199	0.148	0.098	-0.415
58. %Δ Operating Income/Total Assets	0.138	2.583	69.815	0.151	-0.020	-0.204	-43.045
61. Repayment of Long-Term Debt as % of Total Long-Term Debt	0.427	2.838	45.266	0.285	0.127	0.060	0.000
62. Issuance of Long-Term Debt as % of Total Long-Term Debt	0.274	0.576	19.269	0.379	0.140	0.013	0.000
63. Purchase of Treasury Stock as % of Stock	0.018	0.080	1.186	0.003	0.000	0.000	0.000
65. %Δ in Long-Term Debt	0.545	7.302	107.471	0.226	-0.003	-0.112	-0.994
66. Cash Dividend as % of Cash Flows	0.185	0.427	7.821	0.266	0.173	0.060	-3.659
67. %Δ in Working Capital	0.259	10.923	216.870	0.220	0.047	-0.100	-160.729
68. Net Income Over Cash Flows	0.612	4.062	49.030	0.719	0.583	0.416	-44.668

Table 2c

Descriptive Statistics for the Sixty-One Independent Variables for Years 1985 - 1989[a]

Accounting Variable	Mean	Standard Deviation	Quartiles				
			Maximum	75%	Median	25%	Minimum
1. Current Ratio	2.179	1.362	24.194	2.561	1.884	1.374	0.189
2. %Δ in Current Ratio	0.032	0.417	8.529	0.108	0.108	0.129	-0.935
3. Quick Ratio	1.289	1.111	23.819	1.437	1.045	0.773	0.041
4. %Δ in Quick Ratio	0.061	0.564	14.031	0.150	-0.011	-0.151	-0.944
5. Days Sales in Accounts Receivable	58.898	28.005	293.686	71.142	54.821	42.411	0.970
6. %Δ in Days Sales in Accounts Receivable	0.039	0.215	2.920	0.098	0.018	-0.046	-0.715
7. Inventory Turnover	10.355	22.942	384.771	8.518	4.985	3.339	0.560
8. %Δ in Inventory Turnover	0.032	0.358	7.076	0.091	-0.001	-0.083	-0.962
9. Inventory/Total Assets	0.181	0.124	0.667	0.256	0.164	0.083	0.001
10. %Δ in Inventory/Total Assets	0.011	0.517	14.924	0.080	-0.019	-0.114	-0.939
11. %Δ in Inventory	0.113	0.941	21.425	0.179	0.051	-0.065	-0.921
12. %Δ in Sales	0.093	0.291	5.128	0.153	0.072	-0.011	-0.749
13. %Δ in Depreciation	0.126	0.370	5.646	0.186	0.087	-0.008	-0.894
14. Δ in Dividends Per Share	0.061	0.288	9.825	0.080	0.000	0.000	-9.900
15. Depreciation/Plant Assets	0.145	0.084	0.960	0.167	0.127	0.098	0.007
16. %Δ in Depreciation/Plant Assets	0.050	0.301	4.923	0.108	0.017	-0.063	-0.793
17. Return on Opening Equity	0.106	0.335	9.960	0.185	0.120	0.043	-3.405
18. Δ in Return on Opening Equity	0.001	0.412	7.007	0.043	-0.003	-0.056	-2.986
19. %Δ in Capital Expenditures/Total Assets	0.192	1.198	26.005	0.329	-0.010	-0.275	-0.968

[a]Seven of the original 68 variables were deleted due to missing observations. Descriptive statistics are based on a sample size of 2,368 over the period 1985 - 1989.

Table 2c - continued

Descriptive Statistics for the Sixty-One Independent Variables for Years 1985 - 1989

Accounting Variable	Mean	Standard Deviation	Quartiles				
			Maximum	75%	Median	25%	Minimum
20. 19. (one-year lag)	0.286	1.299	26.037	0.383	0.020	-0.254	-0.972
21. Debt-Equity Ratio	2.138	7.915	239.504	1.960	1.291	0.818	0.049
22. %Δ in Debt-Equity Ratio	0.225	2.106	78.291	0.216	0.014	-0.119	-0.995
23. Long-Term Debt to Equity	0.866	3.609	122.528	0.811	0.469	0.214	0.001
24. %Δ in Long-Term Debt to Equity	0.908	7.068	166.837	0.321	-0.038	-0.209	-0.999
25. Equity to Fixed Assets	1.703	2.299	40.110	1.921	1.274	0.732	0.008
26. %Δ in Equity to Fixed Assets	0.050	0.883	23.814	0.098	0.001	-0.107	-0.983
27. Times Interest Earned	10.214	41.268	1285.899	7.845	4.019	1.827	-116.048
28. %Δ in Times Interest Earned	4.236	96.453	408.848	0.408	-0.038	-0.377	-51.203
29. Sales/Total Assets	1.249	0.644	6.414	1.544	1.166	0.853	0.050
30. %Δ in Sales/Total Assets	0.002	0.201	1.698	0.069	-0.010	-0.081	-0.798
31. Return on Total Assets	0.039	0.072	0.330	0.076	0.046	0.017	-0.636
32. Return on Closing Equity	0.013	1.541	3.978	0.165	0.110	0.042	-20.815
33. Gross Margin Ratio	0.316	0.150	0.886	0.390	0.294	0.217	0.007
34. %Δ in Gross Margin Ratio	0.037	0.446	12.779	0.058	0.003	-0.053	-0.910
35. Operating Profit (before Depr.) to Sales	0.128	0.251	0.745	0.175	0.118	0.075	-0.344
36. %Δ in Operating Profit (before Depr.) to Sales	0.284	8.797	56.984	0.130	0.000	-0.131	-66.744
37. Pretax Income to Sales	0.056	0.244	1.574	0.112	0.065	0.022	-1.514
38. %Δ in Pretax Income to Sales	0.160	15.226	168.216	0.303	-0.018	-0.322	-180.506
39. Net Profit Margin	0.029	0.231	0.923	0.069	0.039	0.013	-1.244
40. %Δ in Net Profit Margin	0.168	21.778	172.979	0.321	-0.001	-0.330	-234.862
41. Sales to Total Cash	82.089	392.328	11396.860	66.592	23.506	9.281	0.220

Table 2c - continued

Descriptive Statistics for the Sixty-One Independent Variables for Years 1985 - 1989

Accounting Variable	Mean	Standard Deviation	Quartiles				
			Maximum	75%	Median	25%	Minimum
42. Sales to Accounts Receivable	9.483	20.641	418.476	8.389	6.410	5.040	0.972
43. Sales to Inventory	14.345	25.669	411.700	11.978	7.246	5.063	0.511
44. %Δ in Sales to Inventory	0.055	0.388	7.425	0.118	0.014	-0.085	-0.954
45. Sales to Working Capital	10.936	92.416	1535.828	9.082	4.886	2.968	-800.586
46. %Δ in Sales to Working Capital	0.184	4.372	94.484	0.248	0.014	-0.174	-118.219
47. Sales to Fixed Assets	5.127	8.295	195.999	5.628	3.617	1.929	0.111
48. %Δ in Production	0.112	0.549	15.281	0.171	0.067	-0.028	-0.964
53. %Δ in Total Assets	0.113	0.340	7.240	0.151	0.067	-0.007	-0.596
54. Cash Flow to Total Debt	0.191	0.258	3.201	0.265	0.169	0.094	-5.537
55. Working Capital/Total Assets	0.232	0.182	0.925	0.360	0.222	0.091	-0.600
56. %Δ in Working Capital/Total Assets	0.187	6.968	184.316	0.153	-0.019	-0.189	-64.770
57. Operating Income/Total Assets	0.136	0.081	0.502	0.185	0.136	0.091	-0.561
58. %Δ Operating Income/Total Assets	0.125	13017	70.454	0.145	-0.023	-0.188	-80.023
61. Repayment of Long-Term Debt as % of Total Long-Term Debt	0.479	2.997	83.309	0.390	0.163	0.062	0.000
62. Issuance of Long-Term Debt as % of Total Long-Term Debt	0.386	1.712	64.263	0.467	0.165	0.005	0.000
63. Purchase of Treasury Stock as % of Stock	0.044	0.156	3.321	0.030	0.000	0.000	0.000
65. %Δ in Long-Term Debt	0.793	7.922	157.384	0.305	0.000	-0.128	-0.988
66. Cash Dividend as % of Cash Flows	0.172	0.853	10.888	0.259	0.157	0.016	-12.567
67. %Δ in Working Capital	0.272	7.183	165.811	0.275	0.044	-0.152	-74.283
68. Net Income Over Cash Flows	0.527	4.316	76.667	0.696	0.558	0.373	-39.288

Table 3

Summary of Coefficient Signs and Statistical Significance of the Univariate Logit Estimations from 1975 Through 1989

		Number of observed coefficient signs out of 15[a]	
		+	-
Group 1:	**Short-Term Liquidity**		
1.	Current Ratio	5 (1)	10 (1)
2.	% Δ in Current Ratio	3 (0)	12 (3)
3.	Quick Ratio	4 (1)	11 (2)
4.	% Δ in Quick Ratio	6 (1)	9 (1)
Group 2:	**Financial Leverage and Debt Coverage**		
21.	Debt-Equity Ratio	12 (1)	3 (0)
22.	% Δ in Debt-Equity Ratio	15 (5)	0 (0)
23.	Long-Term Debt to Equity	12 (1)	3 (0)
24.	% Δ in Long-Term Debt to Equity	7 (0)	8 (0)
27.	Times Interest Earned	5 (1)	10 (5)
28.	% Δ in Times Interest Earned	3 (1)	12 (4)
Group 3:	**Profitability**		
17.	Return on Opening Equity	0 (0)	15 (15)
18.	Δ in Return on Opening Equity	3 (1)	12 (7)
31.	Return on Total Assets	0 (0)	15 (15)
32.	Return on Closing Equity	0 (0)	15 (15)
33.	Gross Margin Ratio	5 (0)	10 (4)
34.	% Δ in Gross Margin Ratio	9 (1)	6 (2)
35.	Operating Profit (before Depr.) to Sales	3 (1)	12 (8)
36.	% Δ in Operating Profit to Sales	7 (0)	8 (1)
37.	Pretax Income to Sales	1 (0)	14 (12)
38.	% Δ in Pretax Income to Sales	2 (0)	13 (5)
39.	Net Profit Margin	0 (0)	15 (12)
40.	% Δ in Net Profit Margin	2 (0)	13 (6)
54.	Cash Flow to Total Debt	1 (0)	14 (12)
57.	Operating Income/Total Assets	0 (0)	15 (13)
58.	% Δ in Operating Income/Total Assets	7 (0)	8 (0)

[a]Number of times statistically significant at the .10 level in parentheses.

Table 3 - continued

Summary of Coefficient Signs and Statistical Significance of the Univariate Logit Estimations from 1975 Through 1989

		Number of observed coefficient signs out of 15	
		+	-
Group 4a: Asset Utilization - Capital Intensity			
29.	Sales/Total Assets	4 (2)	11 (3)
30.	% Δ in Sales/Total Assets	13 (8)	2 (0)
47.	Sales to Fixed Assets	5 (1)	10 (4)
Group 4b: Asset Utilization - Inventory Intensity			
7.	Inventory Turnover	6 (2)	9 (6)
8.	% Δ in Inventory Turnover	13 (5)	2 (0)
43.	Sales to Inventory	7 (2)	8 (5)
44.	% Δ in Sales to Inventory	14 (3)	1 (0)
Group 4c: Asset Utilization - Receivable Intensity			
5.	Days Sales in Accounts Receivable	11 (4)	4 (0)
6.	% Δ in Days Sales in Accounts Receivable	7 (1)	8 (3)
42.	Sales to Accounts Receivable	6 (0)	9 (3)
Group 4d: Asset Utilization - Other Measures			
41.	Sales to Total Cash	4 (2)	11 (1)
45.	Sales to Working Capital	6 (0)	9 (1)
46.	% Δ in Sales to Working Capital	10 (1)	5 (0)
Group 5: Discretionary Costs			
19.	% Δ in Capital Expenditures/Total Assets	3 (0)	12 (4)
20.	19. (one-year lag)	4 (0)	11 (3)

Table 3 - continued

Summary of Coefficient Signs and Statistical Significance of the Univariate Logit Estimations from 1975 Through 1989

		Number of observed coefficient signs out of 15	
		+	-
Group 6:	**Growth Measures**		
11.	% Δ in Inventory	3 (0)	12 (6)
12.	% Δ in Sales	1 (0)	14 (6)
13.	% Δ in Depreciation	3 (0)	12 (4)
14.	Δ in Dividends Per Share	0 (0)	15 (11)
53.	% Δ in Total Assets	0 (0)	15 (12)
65.	% Δ in Long-Term Debt	4 (0)	11 (3)
67.	% Δ in Working Capital	6 (1)	9 (0)
Group 7:	**Miscellaneous**		
9.	Inventory/Total Assets	6 (2)	9 (1)
10.	% Δ in Inventory/Total Assets	5 (0)	10 (2)
15.	Depreciation/Plant Assets	13 (7)	2 (0)
16.	% Δ in Depreciation/Plant Assets	15 (9)	0 (0)
25.	Equity to Fixed Assets	7 (0)	8 (1)
26.	% Δ in Equity to Fixed Assets	6 (0)	9 (5)
48.	% Δ in Production	5 (0)	10 (5)
55.	Working Capital/Total Assets	6 (2)	9 (1)
56.	% Δ in Working Capital/Total Assets	7 (0)	8 (0)
61.	Repayment of Long-Term Debt as % of Total Long-Term Debt	7 (1)	8 (2)
62.	Issuance of Long-Term Debt as % of Total Long-Term Debt	3 (0)	12 (4)
63.	Purchase of Treasury Stock as % of Stock	8 (1)	7 (1)
66.	Cash Dividend as % of Cash Flows	10 (2)	5 (0)
68.	Net Income Over Cash Flows	7 (0)	8 (2)

Table 4

Spearman Correlation Matrices in 1980 for Groups of Accounting Variables Classified According to Traditional Financial Statement Analysis[a]

Group 1: Short-Term Liquidity

Accounting Variable #[b]	1	2	3	4
1	1.00000			
2	0.26715 (.0001)	1.00000		
3	0.81247 (.0001)	0.28683 (.0001)	1.00000	
4	0.23569 (.0001)	0.86792 (.0001)	0.30250 (.0001)	1.00000

Group 2: Financial Leverage and Debt Coverage

Accounting Variable #[b]	21	22	23	24	27	28
21	1.00000					
22	0.25807 (.0001)	1.00000				
23	0.83041 (.0001)	0.21673 (.0001)	1.00000			
24	0.25503 (.0001)	0.75279 (.0001)	0.32726 (.0001)	1.00000		
27	- 0.57259 (.0001)	-0.18082 (.0001)	-0.59307 (.0001)	-0.16855 (.0001)	1.00000	
28	-0.09955 (.0001)	-0.36723 (.0001)	-0.11087 (.0001)	-0.34903 (.0001)	-0.30647 (.0001)	1.00000

[a]Spearman correlations are based on 723 observations for 1980. P-values for correlation coefficients are in parentheses.

[b]See Appendix B for definitions of accounting variables.

Table 4 - continued

Spearman Correlation Matrices in 1980 for Groups of Accounting Variables Classified According to Traditional Financial Statement Analysis

Group 3: Profitability

Var. #	17	18	31	32	33	34	35	36	37	38	39	40	54	57	58
17	1.00000														
18	0.41879	1.00000													
	(.0001)														
31	0.88675	0.34705	1.00000												
	(.0001)	(.0001)													
32	0.96727	0.40089	0.89623	1.00000											
	(.0001)	(.0001)	(.0001)												
33	0.28998	0.09474	0.36878	0.30420	1.00000										
	(.0001)	(.0001)	(.0001)	(.0001)											
34	0.21616	0.45656	0.19883	0.21910	0.14846	1.00000									
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)										
35	0.48778	0.17373	0.53193	0.50317	0.58368	0.21444	1.00000								
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)									
36	0.25773	0.60678	0.22058	0.25747	0.10478	0.75176	0.23276	1.00000							
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)								
37	0.78198	0.32021	0.86548	0.78569	0.48184	0.21126	0.73961	0.21631	1.00000						
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)							
38	0.39986	0.83836	0.35826	0.38189	0.09859	0.53113	0.18582	0.69461	0.35868	1.00000					
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)						
39	0.79346	0.33118	0.87380	0.79500	0.46432	0.19478	0.71955	0.20453	0.97958	0.35646	1.00000				
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)					
40	0.42306	0.86979	0.38123	0.40637	0.09986	0.49841	0.18896	0.65682	0.36493	0.95676	0.37658	1.00000			
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)				
54	0.63148	0.25627	0.85213	0.63426	0.39430	0.15855	0.56065	0.17152	0.76638	0.27962	0.76618	0.29589	1.00000		
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)			
57	0.70813	0.22590	0.78177	0.73578	0.42055	0.23487	0.66154	0.26204	0.67255	0.22251	0.63573	0.23133	0.74294	1.00000	
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)		
58	0.21856	0.57940	0.21339	0.23592	0.08918	0.58486	0.21031	0.85298	0.16786	0.62026	0.16526	0.59045	0.18594	0.29458	1.00000
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	

Table 4 - continued

Spearman Correlation Matrices in 1980 for Groups of Accounting Variables Classified According to Traditional Financial Statement Analysis

Group 4: Asset Utilization Measures

Var. #	29	30	47	7	8	43	44	5	42	6	41	45	46
29	1.00000												
30	0.13397 (.0001)	1.00000											
47	0.72841 (.0001)	0.07331 (.0004)	1.00000										
7	0.06734 (.0010)	0.00583 (.7769)	-0.25179 (.0001)	1.00000									
8	0.03531 (.0858)	0.44946 (.0001)	-0.00004 (.9985)	0.11898 (.0001)	1.00000								
43	-0.02511 (.2219)	-0.00295 (.8860)	-0.31692 (.0001)	0.91383 (.0001)	0.13958 (.0001)	1.00000							
44	0.02760 (.1795)	0.43128 (.0001)	0.00599 (.7709)	0.03534 (.0855)	0.56619 (.0001)	0.16031 (.0001)	1.00000						
5	-0.30643 (.0001)	-0.05254 (.0106)	0.05029 (.0144)	-0.34695 (.0001)	-0.04720 (.0216)	-0.26844 (.0001)	-0.00002 (.9993)	1.00000					
42	0.30427 (.0001)	0.04884 (.0175)	-0.05134 (.0125)	0.33943 (.0001)	-0.00817 (.6911)	0.28444 (.0001)	0.01671 (.4162)	-0.94583 (.0001)	1.00000				
6	-0.04102 (.0459)	-0.42311 (.0001)	-0.01019 (.6200)	-0.05756 (.0051)	-0.37717 (.0001)	-0.02349 (.2531)	-0.17408 (.0001)	0.17199 (.0001)	-0.17552 (.0001)	1.00000			
41	0.45143 (.0001)	0.09287 (.0001)	0.17425 (.0001)	0.04150 (.0434)	-0.00670 (.7446)	-0.06034 (.0033)	-0.04119 (.0450)	-0.19437 (.0001)	0.17501 (.0001)	0.02679 (.1925)	1.00000		
45	0.28339 (.0001)	0.06399 (.0018)	-0.01291 (.5299)	0.37906 (.0001)	0.03254 (.1134)	0.34853 (.0001)	0.05411 (.0085)	-0.31505 (.0001)	0.31236 (.0001)	-0.03639 (.0766)	0.34691 (.0001)	1.00000	
46	0.06196 (.0026)	0.30927 (.0001)	0.02854 (.1650)	0.01521 (.4594)	0.19746 (.0001)	-0.00915 (.6565)	0.15314 (.0001)	-0.03338 (.0044)	0.03179 (.0220)	-0.20846 (.0001)	0.12062 (.0001)	0.33205 (.0001)	1.00000

Table 4 - continued

Spearman Correlation Matrices in 1980 for Groups of Accounting Variables Classified According to Traditional Financial Statement Analysis

Group 5: Discretionary Costs

Accounting Variable #	19	20
19	1.00000	
20	-0.27305 (.0001)	1.00000

Group 6: Growth Measures

Accounting Variable #	11	12	13	14	53	65	67
11	1.0000						
12	0.47510 (.0001)	1.00000					
13	0.32133 (.0001)	0.49272 (.0001)	1.00000				
14	0.12983 (.0001)	0.13004 (.0001)	0.09085 (.0001)	1.00000			
53	0.57760 (.0001)	0.54209 (.0001)	0.45527 (.0001)	0.22230 (.0001)	1.00000		
65	0.30617 (.0001)	0.21824 (.0001)	0.29493 (.0001)	0.06177 (.0026)	0.52010 (.0001)	1.00000	
67	0.18148 (.0001)	0.17943 (.0001)	0.07153 (.0001)	0.05364 (.0090)	0.27061 (.0001)	0.21706 (.0001)	1.00000

Table 4 - continued

Spearman Correlation Matrices in 1980 for Groups of Accounting Variables Classified According to Traditional Financial Statement Analysis

Group 7: Miscellaneous

Variable #	9	10	15	16	25	26	48	55	55	61	62	63	66	68
9	1.00000													
10	0.16702 (.0001)	1.00000												
15	0.26863 (.0001)	0.03664 (.0747)	1.00000											
16	0.05364 (.0090)	0.02225 (.2792)	0.25054 (.0001)	1.00000										
25	0.47855 (.0001)	-0.00272 (.8947)	0.49566 (.0001)	0.7424 (.0003)	1.00000									
26	-0.00274 (.8939)	-0.02022 (.3253)	0.10967 (.0001)	0.28373 (.0001)	0.18329 (.0001)	1.00000								
48	0.01209 (.5565)	0.27051 (.0001)	-0.04960 (.0158)	-0.08425 (.0001)	0.01048 (.6104)	-0.10593 (.0001)	1.00000							
55	0.62790 (.0001)	0.03459 (.0924)	0.35155 (.0001)	0.06348 (.0020)	0.74062 (.0001)	0.11729 (.0001)	-0.00198 (.9231)	1.00000						
56	0.00677 (.7421)	0.03269 (.1118)	0.07008 (.0006)	0.17779 (.0001)	0.09765 (.0001)	0.41178 (.0001)	-0.05540 (.0070)	0.23030 (.0001)	1.00000					
61	-0.02914 (.1563)	0.02652 (.1970)	0.09240 (.0001)	0.10153 (.0001)	0.04024 (.0502)	0.20203 (.0001)	-0.04644 (.0238)	-0.06221 (.0025)	0.01325 (.5192)	1.00000				
62	-0.11141 (.0001)	-0.08443 (.0001)	-0.07845 (.0001)	-0.10562 (.0001)	-0.15001 (.0001)	-0.16909 (.0001)	0.15647 (.0001)	-0.17767 (.0001)	0.00545 (.7908)	0.25093 (.0001)	1.00000			
63	-0.09964 (.0001)	0.03028 (.1408)	-0.02285 (.2663)	-0.01625 (.4294)	-0.04220 (.0400)	-0.12494 (.0001)	-0.01241 (.5462)	-0.10464 (.0001)	-0.06203 (.0025)	-0.05607 (.0063)	0.02064 (.3154)	1.00000		
66	-0.00743 (.7179)	-0.03296 (.1088)	-0.15453 (.0001)	-0.07774 (.0002)	0.02770 (.1778)	-0.06319 (.0021)	-0.05488 (.0076)	-0.03899 (.0578)	-0.03627 (.0776)	-0.08595 (.0001)	-0.01550 (.4510)	0.19293 (.0001)	1.00000	
68	0.17785 (.0001)	-0.00887 (.6662)	-0.04435 (.0309)	-0.03037 (.1395)	0.37635 (.0001)	0.02881 (.1611)	0.06285 (.0022)	0.26593 (.0001)	0.00196 (.9242)	0.00990 (.6303)	-0.06409 (.0018)	0.07291 (.0004)	-0.09854 (.0001)	1.00000

Table 5

Eigenvalues of the Correlation Matrix and the Percent of Variance Explained

Principal Component #	Eigenvalue	Percent of Variance Explained	Cumulative Variance Explained
1	7.37	.1208	.1208
2	5.80	.0951	.2159
3	4.19	.0686	.2846
4	3.11	.0510	.3356
5	2.81	.0461	.3817
6	2.54	.0416	.4233
7	2.25	.0368	.4601
8	2.14	.0350	.4952
9	2.05	.0337	.5288
10	1.97	.0323	.5611
11	1.83	.0300	.5911
12	1.69	.0277	.6188
13	1.65	.0271	.6459
14	1.52	.0250	.6709
15	1.39	.0228	.6937
16	1.35	.0221	.7158
17	1.31	.0215	.7372
18	1.19	.0195	.7567
19	1.11	.0181	.7748
20	1.02	.0167	.7916
21	1.02	.0167	.8082
22	0.99	.0162	.8244
23	0.92	.0151	.8395
24	0.86	.0140	.8535
25	0.84	.0138	.8673
26	0.77	.0126	.8798
27	0.74	.0121	.8920
28	0.65	.0106	.9025

Table 6

Accounting Variables with Component Loadings Greater than .70 for the Twenty-One Retained Principal Components

Principal Component #	Accounting Variable		Financial Variable Category		Component Loading
1	31.	Return on Total Assets	3.	Profitability	.809
	35.	Op. Profit (before Dep.) to Sales	3.	Profitability	.820
	37.	Pretax Income to Sales	3.	Profitability	.885*
	39.	Net Profit Margin	3.	Profitability	.852
	54.	Cash Flow to Total Debt	3.	Profitability	.789
	57.	Operating Income/Total Assets	3.	Profitability	.810
2	21.	Debt-Equity Ratio	2.	Financial Leverage & Debt Coverage	.916
	22.	%Δ in Debt-Equity Ratio	2.	Financial Leverage & Debt Coverage	.883
	23.	Long-Term Debt to Equity	2.	Financial Leverage & Debt Coverage	.929*
	32.	Return on Closing Equity	3.	Profitability	-.837
3	12.	%Δ in Sales	6.	Growth Measures	.837
	48.	%Δ in Production	7.	Miscellaneous	.839*
	53.	%Δ in Total Assets	6.	Growth Measures	.755
4	1.	Current Ratio	1.	Short-Term Liquidity	.900*
	3.	Quick Ratio	1.	Short-Term Liquidity	.788
	55.	Working Capital/Total Assets	7.	Miscellaneous	.759

*Indicates variable selected to represent the principal component.

Table 6 - continued

Accounting Variables with Component Loadings Greater than .70 for the Twenty-One Retained Principal Components

Principal Component #	Accounting Variable		Financial Variable Category		Component Loading
5	10.	%Δ in Inventory/Total Assets	7.	Miscellaneous	.890*
	11.	%Δ in Inventory	6.	Growth Measures	.771
	44.	%Δ in Sales to Inventory	4b.	Asset Utilization - Inventory Intensity	-.819
6	7.	Inventory Turnover	4b.	Asset Utilization - Inventory Intensity	.965*
	43.	Sales to Inventory	4b.	Asset Utilization - Inventory Intensity	.964
7	2.	%Δ in Current Ratio	1.	Short-Term Liquidity	.928*
	4.	%Δ in Quick Ratio	1.	Short-Term Liquidity	.916
8	24.	%Δ in Long-Term Debt to Equity	2.	Financial Leverage & Debt Coverage	.980
	65.	%Δ in Long-Term Debt	6.	Growth Measures	.987*
9	36.	%Δ in Operating Profit (before Depreciation) to Sales	3.	Profitability	.981
	58.	%Δ Operating Income/Total Assets	3.	Profitability	.985*
10	56.	%Δ in Working Capital/Total Assets	7.	Miscellaneous	.996*
	67.	%Δ in Working Capital	6.	Growth Measures	.994
11	25.	Equity to Fixed Assets	7.	Miscellaneous	.822*
	47.	Sales to Fixed Assets	4a.	Asset Utilization - Inventory Intensity	.755

Table 6 - continued

Accounting Variables with Component Loadings Greater than .70
for the Twenty-One Retained Principal Components

Principal Component #	Accounting Variable		Financial Variable Category		Component Loading
12	13.	%Δ in Depreciation	6.	Growth Measures	.914
	16.	%Δ in Depreciation/Plant Assets	7.	Miscellaneous	.915*
13	17.	Return on Opening Equity	3.	Profitability	.922*
	18.	Δ in Return on Opening Equity	3.	Profitability	.908
14	45.	Sales to Working Capital	4d.	Asset Utilization - Other Measures	.942
	46.	%Δ in Sales to Working Capital	4d.	Asset Utilization - Other Measures	.945*
15	30.	%Δ in Sales/Total Assets	4a.	Asset Utilization - Capital Intensity	.852*
16	42.	Sales to Accounts Receivable	4c.	Asset Utilization - Receivable Intensity	.944*
17	40.	%Δ in Net Profit Margin	3.	Profitability	.934*
18	19.	%Δ in Cap. Exp./Total Assets	5.	Discretionary Costs	.869*
19	14.	Δ in Dividends Per Share	6.	Growth Measures	.931*
20	28.	%Δ in Times Interest Earned	2.	Financial Leverage & Debt Coverage	.914*
21	15.	Depreciation/Plant Assets	7.	Miscellaneous	.791*

Table 7

Accounting Variables with the Largest Component Loading Associated with the Forty Discarded Principal Components

Principal Component #	Deleted Variable	Principal Component #	Deleted Variable
61	67. %Δ in Working Capital	41	37. Pretax Income to Sales
60	36. %Δ in Operating Profit (before Depreciation) to Sales	40	54. Cash Flow to Total Debt
59	21. Debt-Equity Ratio	39	47. Sales to Fixed Assets
58	39. Net Profit Margin	38	33. Gross Margin Ratio
57	7. Inventory Turnover	37	44. %Δ in Sales to Inventory
56	11. %Δ in Inventory	36	53. %Δ in Total Assets
55	24. %Δ in Long-Term Debt to Equity	35	8. %Δ in Inventory Turnover
54	12. %Δ in Sales	34	14. Δ in Dividends Per Share
53	13. %Δ in Depreciation	33	68. Net Income Over Cash Flows
52	3. Quick Ratio	32	66. Cash Dividend as % of Cash Flows
51	32. Return on Closing Equity	31	41. Sales to Total Cash
50	55. Working Capital/Total Assets	30	20. 19. (one-year lag)
49	4. %Δ in Quick Ratio	29	63. Purchase of Treasury Stock as % of Stock
48	48. %Δ in Production	28	27. Times Interest Earned
47	22. %Δ in Debt-Equity Ratio	27	34. %Δ in Gross Margin Ratio
46	35. Operating Profit (before Depreciation) to Sales	26	26. %Δ in Equity to Fixed Assets
45	31. Return on Total Assets	25	5. Days Sales in Accounts Receivable
44	17. Return on Opening Equity	24	28. %Δ in Times Interest Earned
43	45. Sales to Working Capital	23	61. Repayment of Long-Term Debt as % of Total Long-Term Debt
42	38. %Δ in Pretax Income to Sales	22	19. %Δ in Capital Expenditures/Total Assets

Table 8

Selected Variables by Categories
Identified by Traditional Financial Statement Analysis

Financial Variable Category	Accounting Variables Chosen by Retaining Principal Components	Accounting Variables Chosen by Discarding Principal Components
1. Short-Term Liquidity	1. Current Ratio 2. %Δ in Current Ratio	1. Current Ratio 2. %Δ in Current Ratio
2. Financial Leverage and Debt Coverage	23. Long-Term Debt to Equity 28. %Δ in Times Interest Earned	23. Long-Term Debt to Equity
3. Profitability	17. Return on Opening Equity 37. Pretax Income to Sales 40. %Δ in Net Profit Margin 58. %Δ in Op. Income/Total Assets	18. Δ in Return on Opening Equity 40. %Δ in Net Profit Margin 57. Operating Income/Total Assets 58. %Δ Op. Income/Total Assets
4a. Asset Utilization - Capital Intensity	30. %Δ in Sales/Total Assets	30. %Δ in Sales/Total Assets
4b. Asset Utilization - Inventory Intensity	7. Inventory Turnover	43. Sales to Inventory 44. %Δ in Sales to Inventory
4c. Asset Utilization - Receivable Intensity	42. Sales to Accounts Receivable	6. %Δ in Days Sales in Acc. Rec. 42. Sales to Accounts Receivable

Table 8 - continued

Selected Variables by Categories
Identified by Traditional Financial Statement Analysis

Financial Variable Category	Accounting Variables Chosen by Retaining Principal Components	Accounting Variables Chosen by Discarding Principal Components
4d. Asset Utilization - Other Measures	46. %Δ in Sales to Working Capital	46. %Δ in Sales to Working Capital
5. Discretionary Costs	19. %Δ in Capital Expenditures/Total Assets	--
6. Growth Measures	14. Δ in Dividends Per Share 65. %Δ in Long-Term Debt	65. %Δ in Long-Term Debt
7. Miscellaneous	10. %Δ in Inventory/Total Assets 15. Depreciation/Plant Assets 16. %Δ in Depreciation/Plant Assets 25. Equity to Fixed Assets 48. %Δ in Production 56. %Δ in Working Capital/Total Assets	9. Inventory/Total Assets 10. %Δ in Inventory/Total Assets 15. Depreciation/Plant Assets 16. %Δ in Depreciation/Plant Assets 25. Equity to Fixed Assets 56. %Δ in Working Capital/Total Assets 62. Issuance of Long-Term Debt as % of Total Long-Term Debt

Table 9

Summary of the Seventy-Two Earnings Prediction Models Estimated[a]

		Specification of Earnings Change Used as the Independent Variable					
		Dichotomous		Trichotomous		Standardized	
Model #	Method Used to Select Independent Variables	4-year drift	1-year drift	4-year drift	1-year drift	4-year drift	1-year drift
1	Retaining Principal Components	1a	1b	1c	1d	1e	1f
2	Discarding Principal Components	2a	2b	2c	2d	2e	2f
3	Scree Graph	3a	3b	3c	3d	3e	3f
4	Ou and Penman (1965-1972 Estimation Period)	4a	4b	4c	4d	4e	4f
5	Ou and Penman (1973-1977 Estimation Period)	5a	5b	5c	5d	5e	5f
6	Stepwise Procedures	6a	6b	6c	6d	6e	6f

[a]Six different sets of independent variables were estimated with six different dependent variable specifications. The resulting 36 models were then estimated over two non-overlapping time periods: 1975 - 1979 and 1980 - 1984.

Table 10

Distribution of Earnings Changes When Using Either a Four-Year or a One-Year Drift Term[a]

	EPS change defined using 4-year drift		EPS change defined using 1-year drift		
Year	Number and % Increases	Number and % Decreases	Number and % Increases	Number and % Decreases	Total Sample
1975	517 (64.54%)	284 (35.36%)	476 (59.43%)	325 (40.57%)	801
1976	423 (53.61%)	366 (46.39%)	446 (56.53%)	343 (43.47%)	789
1977	480 (62.42%)	289 (37.58%)	416 (54.10%)	353 (45.90%)	769
1978	443 (59.38%)	303 (40.62%)	389 (52.14%)	357 (47.86%)	746
1979	265 (36.35%)	464 (63.65%)	225 (30.86%)	504 (69.14%)	729
1980	303 (43.16%)	399 (56.84%)	345 (49.15%)	357 (50.85%)	702
1981	161 (24.47%)	497 (75.53%)	183 (27.81%)	475 (72.19%)	658
1982	342 (55.70%)	272 (44.30%)	418 (68.08%)	196 (31.92%)	614
1983	356 (63.01%)	209 (36.99%)	275 (48.67%)	290 (51.33%)	565
1984	201 (37.15%)	340 (62.85%)	159 (29.39%)	382 (70.61%)	541
1985	219 (44.60%)	272 (55.40%)	244 (49.69%)	247 (50.31%)	491
1986	272 (57.51%)	201 (42.49%)	270 (57.08%)	203 (42.92%)	473
1987	270 (57.69%)	198 (42.31%)	221 (47.22%)	247 (52.78%)	468
1988	203 (42.29%)	277 (57.71%)	177 (36.88%)	303 (63.13%)	480
1989	158 (34.65%)	298 (65.35%)	186 (40.79%)	270 (59.21%)	456
1990	152 (32.14%)	321 (67.86%)	199 (42.07%)	274 (57.93%)	473
Total	4,765 (48.85%)	4,990 (51.15%)	4,629 (47.45%)	5,126 (52.55%)	9,755
1975-79	2,128 (55.50%)	1,706 (44.50%)	1,952 (50.91%)	1,882 (49.09%)	3,834
1980-84	1,363 (44.25%)	1,717 (55.75%)	1,380 (44.81%)	1,700 (55.19%)	3,080
1985-90	1,274 (44.84%)	1,567 (55.16%)	1,297 (45.65%)	1,544 (54.35%)	2,841

[a]Firms that experienced no change in earnings are categorized as earnings decreases.

Table 11

Dichotomous Logit Earnings Prediction Models

Models 1a and 1b: Variables Chosen by Retaining Principal Components

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Model χ^2 (d.f.)[a]	302.74 (21)		519.46 (21)		411.41 (21)		576.59 (21)	
% Concordant Pairs[b]	64.8%		72.0%		71.2%		76.2%	
Rank Correlation[b]	.303		.447		.429		.529	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
Intercept	0.7952	14.234 (.0002)	0.6855	9.265 (.0023)	0.1707	1.421 (.2332)	0.4371	8.289 (.0040)
1. Current Ratio	0.0510	0.908 (.3407)	0.0598	1.172 (.2789)	0.0482	1.135 (.2867)	0.0502	1.123 (.2893)
2. % Δ in Current Ratio	-0.2316	1.433 (.2313)	0.4700	4.663 (.0308)	-0.3815	4.302 (.0381)	-0.1456	0.596 (.4400)
7. Inventory Turnover	-0.0042	1.801 (.1796)	-0.0012	0.152 (.6966)	-0.0003	0.022 (.8835)	0.0041	2.456 (.1171)
10. % Δ in Inv./ Total Assets	-0.3799	4.916 (.0266)	-0.1035	0.496 (.4811)	-0.2555	3.207 (.0733)	-0.1750	1.445 (.2294)
14. Δ in Dividends Per Share	-0.1856	0.678 (.4103)	-0.0720	0.090 (.7643)	-1.3922	29.032 (.0001)	-0.6906	8.340 (.0038)
15. Depreciation/ Plant Assets	0.2370	0.063 (.8019)	-0.3087	0.098 (.7542)	0.9333	1.397 (.2372)	-2.1813	6.612 (.0101)
16. % Δ in Dep./ Plant Assets	0.1399	0.273 (.6015)	0.6826	5.611 (.0178)	0.3456	3.122 (.0773)	1.2996	28.85 (.0001)
17. Return on Opening Equity	-5.0189	72.476 (.0001)	-6.1740	75.054 (.0001)	-3.5031	51.743 (.0001)	-3.4149	45.72 (.0001)
19. % Δ in Capital Exp/Total Assets	-0.0133	0.068 (.7943)	0.0177	0.127 (.7211)	-0.1772	14.636 (.0001)	-0.1921	14.78 (.0001)
23. Long-Term Debt to Equity	-0.0422	0.261 (.6097)	0.0079	0.008 (.9293)	-0.0242	5.774 (.0163)	-0.0275	3.665 (.0556)
25. Equity to Fixed Assets	-0.0354	2.650 (.1036)	-0.0302	1.615 (.2038)	-0.0084	0.084 (.7714)	0.0435	1.850 (.1737)
28. % Δ in Times Interest Earned	-0.0087	0.312 (.5768)	-0.4201	16.810 (.0001)	0.0177	2.441 (.1182)	-0.0834	8.896 (.0029)
30. % Δ in Sales/ Total Assets	0.9289	5.974 (.0145)	-1.0472	6.197 (.0128)	-0.3515	1.621 (.2030)	-2.1024	40.86 (.0001)
37. Pretax Income to Sales	1.1883	3.916 (.0478)	2.0748	9.397 (.0022)	-1.7698	7.258 (.0071)	-1.7783	7.048 (.0079)
40. % Δ in Net Profit Margin	0.0185	4.089 (.0432)	-0.2915	10.907 (.0010)	0.0045	0.516 (.4725)	-0.0781	8.398 (.0038)
42. Sales to Acc. Receivable	-0.0006	0.198 (.6562)	0.0007	0.292 (.5893)	0.0003	0.036 (.8499)	-0.0006	0.140 (.7088)

Table 11 - continued
Dichotomous Logit Earnings Prediction Models
Models 1a and 1b: Variables Chosen by Retaining Principal Components

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
46. % Δ in Sales to Working Capital	-0.0092	1.412 (.2347)	-0.0075	0.442 (.5060)	-0.0071	0.228 (.6328)	-0.0109	0.407 (.5234)
48. % Δ in Production	0.0832	0.151 (.6975)	-0.0849	0.148 (.7006)	0.0520	0.212 (.6454)	-0.0837	0.569 (.4505)
56. % Δ in Working Capital/TA	0.0185	0.497 (.4808)	-0.0462	1.976 (.1599)	0.0008	0.027 (.8693)	-0.0022	0.256 (.6129)
58. % Δ in Op. Income/TA	0.0823	2.801 (.0942)	0.0081	0.020 (.8887)	-0.0018	0.011 (.9181)	-0.2047	11.75 (.0006)
65. % Δ in Long-Term Debt	-0.0024	0.176 (.6749)	-0.0043	0.426 (.5141)	0.0007	0.004 (.9497)	0.0102	0.871 (.3508)

[a] The model χ^2 statistic is a measure of the goodness of fit of the model. It tests the null hypothesis that all parameters in the model are zero. The degrees of freedom (d.f.) equals the number of independent variables, excluding the intercept, contained in the model. A χ^2 (21 d.f.) of 46.92 (38.93) is significant at the .001 (.01) level.

[b] For matched pairs of estimated probability of an earnings increase (*Pr*) and directional realized earnings changes. Under the null hypothesis of no association, the percentage of concordant pairs is expected to be 50 percent and the rank correlation is zero.

[c] θ is the maximum likelihood estimate of the coefficient on the accounting variable. The χ^2 statistic (and associated p-value) assesses the individual significance of each independent variable.

Table 12

Trichotomous Logit Earnings Prediction Models

Models 1c and 1d: Variables Chosen by Retaining Principal Components

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Model χ^2 (d.f.)[a]	434.19 (21)		633.37 (21)		463.08 (21)		669.79 (21)	
% Concordant Pairs[b]	64.1%		69.7%		67.9%		73.3%	
Rank Correlation[b]	.289		.401		.363		.472	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
Intercept 1	1.4042	54.281 (.0001)	1.7199	73.364 (.0001)	0.9315	53.765 (.0001)	1.3034	93.866 (.0001)
Intercept 2	-0.0825	0.192 (.6613)	0.1306	0.437 (.5084)	-0.6210	24.028 (.0001)	-0.3286	6.129 (.0133)
1. Current Ratio	0.0329	0.470 (.4931)	0.0690	1.967 (.1607)	0.0287	0.509 (.4758)	0.0419	1.015 (.3138)
2. % Δ in Current Ratio	-0.4513	6.010 (.0135)	0.2542	1.979 (.1595)	-.2756	3.082 (.0792)	-0.2698	2.783 (.0953)
7. Inventory Turnover	-0.0040	2.105 (.1468)	0.0005	0.026 (.8716)	0.0001	0.005 (.9447)	0.0030	1.718 (.1900)
10. % Δ in Inv./ Total Assets	-0.3562	6.160 (.0131)	-0.1283	0.971 (.3246)	-0.4791	13.440 (.0002)	-0.3594	7.800 (.0052)
14. Δ in Dividends Per Share	-0.3365	2.705 (.1000)	-0.1207	0.328 (.5672)	-1.9669	71.359 (.0001)	-0.6862	11.774 (.0006)
15. Depreciation/ Plant Assets	0.9699	1.289 (.2563)	0.0335	0.002 (.9694)	1.8987	7.290 (.0069)	-0.6458	0.790 (.3743)
16. % Δ in Dep./ Plant Assets	0.2768	1.413 (.2345)	0.5539	5.160 (.0231)	0.4768	7.402 (.0065)	1.2010	34.365 (.0001)
17. Return on Opening Equity	-4.7153	89.184 (.0001)	-6.7266	132.30 (.0001)	-2.7268	55.134 (.0001)	-3.2247	61.079 (.0001)
19. % Δ in Capital Exp/Total Assets	-0.0020	0.002 (.9645)	-0.0290	0.440 (.5070)	-0.0518	3.290 (.0697)	-0.0673	3.782 (.0518)
23. Long-Term Debt to Equity	0.0122	0.027 (.8689)	-0.0468	0.371 (.5426)	0.0410	13.483 (.0002)	-0.0274	5.387 (.0203)
25. Equity to Fixed Assets	-0.0687	8.569 (.0034)	-0.0259	1.692 (.1933)	0.0122	0.224 (.6364)	0.0239	0.754 (.3852)
28. % Δ in Times Interest Earned	-0.0078	0.394 (.5302)	-0.4335	33.166 (.0001)	0.0131	1.813 (.1781)	-0.0671	14.008 (.0002)
30. % Δ in Sales/ Total Assets	0.6237	3.423 (.0643)	-0.7143	3.850 (.0498)	-0.4547	3.510 (.0610)	-1.9564	50.998 (.0001)
37. Pretax Income to Sales	1.2982	5.883 (.0153)	1.7003	8.791 (.0030)	-1.1549	5.005 (.0253)	-1.1560	4.665 (.0308)
40. % Δ in Net Profit Margin	0.0150	4.831 (.0279)	-0.0267	0.844 (.3582)	-0.0007	0.011 (.9166)	-0.0919	18.495 (.0001)
42. Sales to Acc. Receivable	-0.0007	0.371 (.5424)	0.0008	0.411 (.5213)	0.0008	0.314 (.5754)	0.0006	0.192 (.6616)

Table 12 - continued

Trichotomous Logit Earnings Prediction Models

Models 1c and 1d: Variables Chosen by Retaining Principal Components

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
46. % Δ in Sales to Working Capital	-0.0082	1.454 (.2279)	-0.0087	1.226 (.2681)	-0.0159	1.490 (.2222)	-0.0252	2.346 (.1256)
48. % Δ in Production	-0.1271	1.765 (.1840)	0.0979	1.012 (.3145)	0.1226	1.637 (.2007)	-0.0157	0.028 (.8679)
56. % Δ in Working Capital/TA	0.0417	2.984 (.0841)	-0.0223	0.809 (.3683)	0.0017	0.133 (.7149)	-0.0015	0.131 (.7178)
58. % Δ in Op. Income/TA	0.0529	1.948 (.1628)	-0.1567	3.518 (.0607)	-0.0142	0.839 (.3597)	-0.2603	25.521 (.0001)
65. % Δ in Long-Term Debt	-0.0039	0.547 (.4595)	-0.0057	1.026 (.3111)	-0.0072	0.578 (.4470)	0.0059	0.405 (.5245)

[a] The model χ^2 statistic is a measure of the goodness of fit of the model. It tests the null hypothesis that all parameters in the model are zero. The degrees of freedom (d.f.) equals the number of independent variables, excluding the intercepts, contained in the model. A χ^2 (21 d.f.) of 46.92 (38.93) is significant at the .001 (.01) level.

[b] For matched pairs of estimated probability of an earnings increase (*Pr*) and directional realized earnings changes. Under the null hypothesis of no association, the percentage of concordant pairs is expected to be 50 percent and the rank correlation is zero.

[c] θ is the maximum likelihood estimate of the coefficient on the accounting variable. The χ^2 statistic (and associated p-value) assesses the individual significance of each independent variable.

Table 13

Ordinary Least Squares Earnings Prediction Models

Models 1e and 1f: Variables Chosen by Retaining Principal Components

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Model F (d.f.)[a]	3.634 (21)		2.236 (21)		7.745 (21)		1.802 (21)	
R^2	.0332		.0218		.0505		.0122	
Adjusted R^2	.0241		.0126		.0440		.0054	
Accounting Variable	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)
Intercept	0.8014	3.022 (.0025)	1.1166	3.564 (.0004)	-0.6417	-3.077 (.0021)	-0.4249	-2.082 (.0374)
1. Current Ratio	-0.0134	-0.193 (.8470)	-0.0819	-1.001 (.3169)	0.0403	0.596 (.5514)	-0.0019	-0.028 (.9777)
2. % Δ in Current Ratio	-0.2371	-1.044 (.2966)	-0.1967	-0.733 (.4634)	-0.1504	-0.579 (.5623)	-0.2135	-0.841 (.4006)
7. Inventory Turnover	-0.0044	-1.096 (.2733)	-0.0045	-0.959 (.3376)	0.0029	0.820 (.4120)	0.0046	1.345 (.1787)
10. % Δ in Inv./ Total Assets	-0.1196	-1.266 (.2058)	-0.1442	-1.292 (.1964)	-0.4298	-2.252 (.0244)	-0.4654	-2.491 (.0128)
14. Δ in Dividends Per Share	0.1866	-0.655 (.5128)	0.5140	1.526 (.1270)	-1.1830	-4.602 (.0001)	-0.2697	-1.072 (.2839)
15. Depreciation/ Plant Assets	-2.9730	-2.428 (.0153)	-2.3633	-1.634 (.1023)	1.5698	1.351 (.1769)	0.9512	0.836 (.4031)
16. % Δ in Dep./ Plant Assets	0.7304	2.201 (.0278)	0.5706	1.456 (.1455)	0.5378	2.185 (.0290)	0.4542	1.886 (.0594)
17. Return on Opening Equity	-3.4500	-6.613 (.0001)	-1.2411	-2.014 (.0441)	-1.1451	-3.669 (.0002)	-0.4332	-1.418 (.1562)
19. % Δ in Capital Exp/Total Assets	0.0383	0.611 (.5411)	0.0012	0.017 (.9867)	-0.0526	-1.322 (.1862)	-0.0676	-1.739 (.0822)
23. Long-Term Debt to Equity	-0.0759	-0.745 (.4565)	-0.2788	-2.317 (.0206)	0.0078	0.727 (.4675)	0.0064	0.606 (.5446)
25. Equity to Fixed Assets	-0.0053	-0.185 (.8535)	0.0076	0.225 (.8219)	-0.0173	-0.416 (.6778)	0.0201	0.493 (.6220)
28. % Δ in Times Interest Earned	-0.0133	-0.914 (.3607)	-0.0188	-1.096 (.2733)	0.0129	0.834 (.4045)	-0.0001	-0.009 (.9927)
30. % Δ in Sales/ Total Assets	0.4129	0.872 (.3835)	-0.5193	-0.928 (.3534)	0.6630	1.675 (.0940)	0.6970	1.800 (.0720)
37. Pretax Income to Sales	2.0745	2.799 (.0052)	3.9988	4.568 (.0001)	-2.9822	-4.280 (.0001)	0.7753	1.137 (.2556)
40. % Δ in Net Profit Margin	0.0058	0.605 (.5452)	-0.0007	-0.058 (.9538)	0.0005	0.050 (.9601)	-0.0067	-0.765 (.4443)
42. Sales to Acc. Receivable	0.0011	0.634 (.5262)	0.0022	1.052 (.2929)	0.0030	1.289 (.1974)	0.0048	2.117 (.0343)

Table 13 - continued

Ordinary Least Squares Earnings Prediction Models

Models 1e and 1f: Variables Chosen by Retaining Principal Components

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Accounting Variable	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)
46. % Δ in Sales to Working Capital	-0.0034	-0.364 (.7156)	-0.0044	-0.395 (.6930)	-0.0312	-1.775 (.0759)	-0.0242	-1.411 (.1583)
48. % Δ in Production	-0.2366	-1.762 (.0782)	0.0129	0.081 (.9353)	-0.1358	-0.874 (.3823)	-0.0786	-0.517 (.6053)
56. % Δ in Working Capital/TA	0.0026	-0.567 (.5705)	0.0013	0.244 (.8072)	0.0023	0.330 (.7412)	0.0025	0.373 (.7095)
58. % Δ in Op. Income/TA	0.0672	1.292 (.1964)	0.0328	0.533 (.5939)	-0.0007	-0.031 (.9756)	0.0008	0.032 (.9742)
65. % Δ in Long-Term Debt	0.0017	0.247 (.8048)	-0.0009	-0.113 (.9100)	0.0174	1.140 (.2542)	0.0125	0.839 (.4013)

[a] The model F statistic is a measure of the goodness of fit of the model. It tests the null hypothesis that all parameters in the model are zero. The numerator degrees of freedom (d.f.) equals the number of independent variables, excluding the intercept, contained in the model. All of the models are significant at the .001 level.

[b] β is the ordinary least squares estimate of the coefficient on the accounting variable. The t statistic (and associated p-value) assesses the individual significance of each independent variable.

Table 14

Dichotomous Logit Earnings Prediction Models

Models 2a and 2b: Variables Chosen by Discarding Principal Components

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Model χ^2 (d.f.)[a]	167.29 (21)		535.41 (21)		254.81 (21)		683.89 (21)	
% Concordant Pairs[b]	60.3%		72.5%		66.8%		79.2%	
Rank Correlation[b]	.214		.457		.342		.588	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
Intercept	0.7729	12.467 (.0004)	0.7847	11.104 (.0009)	0.3215	4.507 (.0338)	0.1228	0.519 (.4711)
1. Current Ratio	0.1806	10.211 (.0014)	0.2091	12.244 (.0005)	0.0861	3.390 (.0656)	0.0539	1.083 (.2980)
2. % Δ in Current Ratio	-0.3866	4.353 (.0369)	0.0111	0.002 (.9611)	-0.4415	6.501 (.0108)	-0.2233	1.298 (.2545)
6. % Δ in Days Sales in AR	-0.2613	0.785 (.3757)	-0.1261	0.154 (.6948)	0.0470	0.071 (.7897)	0.2640	1.336 (.2477)
9. Inventory/ Total Assets	-1.8069	17.987 (.0001)	-2.3078	26.009 (.0001)	0.1258	0.121 (.7275)	0.2671	0.456 (.4994)
10. % Δ in Inv./ Total Assets	-0.5109	4.891 (.0270)	-0.1845	1.682 (.1947)	-0.3116	3.981 (.0460)	-0.1134	0.424 (.5150)
15. Depreciation/ Plant Assets	1.6263	3.056 (.0804)	0.6347	0.391 (.5317)	3.0972	15.973 (.0001)	0.3150	0.139 (.7096)
16. % Δ in Dep./ Plant Assets	0.3307	1.697 (.1927)	0.7098	6.812 (.0091)	0.7738	14.336 (.0002)	1.3048	29.193 (.0001)
18. Δ in Return on Opening Equity	-0.1748	0.235 (.6278)	-6.1949	45.140 (.0001)	0.0847	0.224 (.6358)	-7.4957	176.27 (.0001)
23. Long-Term Debt to Equity	-0.1389	3.135 (.0766)	-0.1988	4.898 (.0269)	-0.0054	0.529 (.4672)	-0.0260	2.161 (.1415)
25. Equity to Fixed Assets	-0.0328	2.078 (.1495)	-0.0253	0.992 (.3192)	-0.0987	11.086 (.0009)	-0.0255	0.622 (.4302)
30. % Δ in Sales/ Total Assets	1.0074	5.010 (.0252)	-0.6973	2.488 (.1147)	-0.1387	0.196 (.6583)	-1.5948	19.899 (.0001)
40. % Δ in Net Profit Margin	0.0044	0.362 (.5474)	-0.3111	13.510 (.0002)	-0.0076	0.768 (.3808)	-0.0154	0.923 (.3368)
42. Sales to Accts. Receivable	0.0001	0.009 (.9246)	0.0015	1.239 (.2657)	0.0006	0.173 (.6778)	.00003	0.001 (.9872)
43. Sales to Inventory	-0.0080	8.880 (.0029)	-0.0068	6.526 (.0106)	-0.0003	0.033 (.8562)	0.0032	2.117 (.1457)
44. % Δ in Sales to Inventory	-0.1420	0.406 (.5242)	0.0887	0.196 (.6582)	-0.0579	0.379 (.5384)	0.0695	0.342 (.5585)

Table 14 - continued

Dichotomous Logit Earnings Prediction Models

Models 2a and 2b: Variables Chosen by Discarding Principal Components

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
46. % Δ in Sales to Working Capital	-0.0061	0.742 (.3889)	-0.0089	0.727 (.3937)	-0.0135	0.750 (.3866)	-0.0122	0.529 (.4670)
56. % Δ in Working Capital/TA	0.0159	0.526 (.4684)	-0.0175	0.268 (.6045)	0.0023	0.274 (.6006)	0.0002	0.001 (.9729)
57. Operating Inc./ Total Assets	-3.5628	29.696 (.0001)	-3.9397	28.690 (.0001)	-6.5431	150.49 (.0001)	-4.2667	54.872 (.0001)
58. % Δ in Op. Income/TA	0.0570	1.721 (.1896)	0.0751	1.890 (.1692)	0.0111	0.463 (.4964)	-0.0816	4.636 (.0313)
62. Issuance of LTD as % of LTD	0.0209	0.023 (.8799)	0.0292	0.038 (.8457)	-0.2132	5.896 (.0152)	-0.4101	11.613 (.0007)
65. % Δ in Long-Term Debt	-0.0017	0.102 (.7491)	-0.0033	0.319 (.5724)	0.0058	1.111 (.2918)	0.0043	0.487 (.4853)

[a] The model χ^2 statistic is a measure of the goodness of fit of the model. It tests the null hypothesis that all parameters in the model are zero. The degrees of freedom (d.f.) equals the number of independent variables, excluding the intercept, contained in the model. A χ^2 (21 d.f.) of 46.92 (38.93) is significant at the .001 (.01) level.

[b] For matched pairs of estimated probability of an earnings increase (*Pr*) and directional realized earnings changes. Under the null hypothesis of no association, the percentage of concordant pairs is expected to be 50 percent and the rank correlation is zero.

[c] θ is the maximum likelihood estimate of the coefficient on the accounting variable. The χ^2 statistic (and associated p-value) assesses the individual significance of each independent variable.

Table 15

Trichotomous Logit Earnings Prediction Models

Models 2c and 2d: Variables Chosen by Discarding Principal Components

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Model χ^2 (d.f.)[a]	277.71 (21)		715.17 (21)		251.16 (21)		850.23 (21)	
% Concordant Pairs[b]	59.7%		72.0%		63.8%		75.9%	
Rank Correlation[b]	.203		.445		.282		.523	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
Intercept 1	1.3703	47.006 (.0001)	1.6937	63.897 (.0001)	1.0155	54.828 (.0001)	1.0691	51.443 (.0001)
Intercept 2	-0.0701	0.126 (.7227)	0.0740	0.126 (.7227)	-0.4625	11.548 (.0007)	-0.6414	18.767 (.0001)
1. Current Ratio	0.1627	10.279 (.0013)	0.1985	13.955 (.0002)	0.0802	3.727 (.0535)	0.0525	1.362 (.2432)
2. % Δ in Current Ratio	-0.5522	10.278 (.0013)	-0.1787	1.016 (.3134)	-0.4023	7.048 (.0079)	-0.3887	5.450 (.0196)
6. % Δ in Days Sales in AR	0.0895	0.116 (.7333)	0.2170	0.586 (.4438)	0.0175	0.012 (.9115)	0.1626	0.733 (.3918)
9. Inventory/ Total Assets	-1.6471	18.418 (.0001)	-2.0215	25.802 (.0001)	-0.1452	0.205 (.6508)	-0.1124	0.107 (.7437)
10. % Δ in Inv./ Total Assets	-0.3008	2.682 (.1015)	-0.2178	3.766 (.0523)	-0.4653	11.032 (.0009)	-0.3341	4.761 (.0291)
15. Depreciation/ Plant Assets	2.4707	8.466 (.0036)	0.7928	0.771 (.3799)	3.7492	28.925 (.0001)	1.5877	4.708 (.0300)
16. % Δ in Dep./ Plant Assets	0.3098	1.859 (.1728)	0.4932	4.254 (.0392)	0.7742	18.300 (.0001)	1.0015	24.854 (.0001)
18. Δ in Return on Opening Equity	-0.3932	1.430 (.2318)	-9.6051	158.05 (.0001)	-0.0163	0.100 (.9202)	-7.5872	260.75 (.0001)
23. Long-Term Debt to Equity	-0.1208	2.861 (.0908)	-0.2319	8.553 (.0034)	0.0044	0.355 (.5516)	-0.0280	3.226 (.0725)
25. Equity to Fixed Assets	-0.0686	7.415 (.0065)	-0.0223	1.124 (.2890)	-0.0620	6.173 (.0130)	-0.0264	0.881 (.3478)
30. % Δ in Sales/ Total Assets	0.3271	0.713 (.3985)	0.0673	0.031 (.8605)	-0.3010	1.204 (.2725)	-1.4408	22.570 (.0001)
40. % Δ in Net Profit Margin	0.0038	0.341 (.5591)	-0.0324	1.777 (.1825)	-0.0140	2.608 (.1063)	-0.0279	3.642 (.0563)
42. Sales to Accts. Receivable	0.0002	0.020 (.8876)	0.0016	1.734 (.1879)	0.0011	0.664 (.4153)	0.0013	0.831 (.3620)
43. Sales to Inventory	-0.0061	7.442 (.0064)	-0.0039	2.920 (.0875)	0.0001	0.002 (.9648)	0.0006	0.102 (.7489)
44. % Δ in Sales to Inventory	0.1361	0.491 (.4835)	0.1163	0.464 (.4960)	-0.0189	0.063 (.8014)	0.0689	0.482 (.4877)

Table 15 - continued

Trichotomous Logit Earnings Prediction Models

Models 2c and 2d: Variables Chosen by Discarding Principal Components

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
46. % Δ in Sales to Working Capital	-0.0070	1.143 (.2850)	-0.0106	1.840 (.1750)	-0.0203	2.262 (.1326)	-0.0261	2.792 (.0947)
56. % Δ in Working Capital/TA	0.0395	3.122 (.0772)	-0.0001	0.0002 (.9888)	0.0025	0.388 (.5333)	0.0009	0.046 (.8309)
57. Operating Inc./ Total Assets	-3.8463	42.273 (.0001)	-3.8406	35.045 (.0001)	-5.1683	129.41 (.0001)	-3.5673	53.306 (.0001)
58. % Δ in Op. Income/TA	0.0542	2.121 (.1453)	-0.0061	0.011 (.9164)	0.0051	0.126 (.7222)	-0.0849	7.984 (.0047)
62. Issuance of LTD as % of LTD	-0.0369	0.084 (.7720)	-0.0297	0.512 (.8210)	-0.1068	3.031 (.0817)	-0.1900	8.190 (.0042)
65. % Δ in Long-Term Debt	-0.0043	0.713 (.3984)	-0.0042	0.698 (.4034)	0.0046	0.881 (.3478)	0.0058	1.231 (.2673)

[a] The model χ^2 statistic is a measure of the goodness of fit of the model. It tests the null hypothesis that all parameters in the model are zero. The degrees of freedom (d.f.) equals the number of independent variables, excluding the intercepts, contained in the model. A χ^2 (21 d.f.) of 46.92 (38.93) is significant at the .001 (.01) level.

[b] For matched pairs of estimated probability of an earnings increase (*Pr*) and directional realized earnings changes. Under the null hypothesis of no association, the percentage of concordant pairs is expected to be 50 percent and the rank correlation is zero.

[c] θ is the maximum likelihood estimate of the coefficient on the accounting variable. The χ^2 statistic (and associated p-value) assesses the individual significance of each independent variable.

Table 16

Ordinary Least Squares Earnings Prediction Models

Models 2e and 2f: Variables Chosen by Discarding Principal Components

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Model F (d.f.)[a]	2.559 (21)		2.481 (21)		6.468 (21)		2.195 (21)	
R^2	.0236		.0229		.0425		.0148	
Adjusted R^2	.0144		.0137		.0360		.0081	
Accounting Variable	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)
Intercept	1.1917	4.129 (.0001)	1.2649	3.732 (.0002)	-0.1767	-0.758 (.4483)	-0.5145	-2.268 (.0234)
1. Current Ratio	0.1279	1.724 (.0848)	-0.0280	-0.321 (.7480)	0.1280	1.790 (.0736)	0.0392	0.564 (.5730)
2. % Δ in Current Ratio	-0.3155	-1.342 (.1796)	-0.2590	-0.938 (.3483)	-0.3093	-1.191 (.2337)	-0.2614	-1.034 (.3012)
6. % Δ in Days Sales in AR	-0.0005	-0.001 (.9990)	-0.2011	-0.449 (.6535)	0.1802	0.664 (.5065)	0.2221	0.841 (.4003)
9. Inventory/ Total Assets	-2.5533	-4.554 (.0001)	-2.1306	-3.235 (.0012)	-1.2211	-2.197 (.0281)	-1.1136	-2.059 (.0396)
10. % Δ in Inv./ Total Assets	-0.1215	-1.174 (.2405)	-0.1221	-1.004 (.3153)	-0.4242	-2.029 (.0425)	-0.4608	-2.265 (.0236)
15. Depreciation/ Plant Assets	-1.5562	-1.261 (.2073)	-3.5823	-2.472 (.0135)	3.9735	3.411 (.0007)	1.3703	1.209 (.2269)
16. % Δ in Dep./ Plant Assets	0.5993	1.859 (.0632)	0.7487	1.977 (.0481)	0.6303	2.566 (.0103)	0.5245	2.194 (.0283)
18. Δ in Return on Opening Equity	-0.5498	-1.165 (.2441)	-0.7507	-1.354 (.1758)	-0.0537	-0.214 (.8303)	-0.0751	-0.308 (.7579)
23. Long-Term Debt to Equity	-0.2387	-2.276 (.0229)	-0.3447	-2.798 (.0052)	0.0039	0.362 (.7171)	0.0062	0.588 (.5564)
25. Equity to Fixed Assets	0.0137	0.456 (.6481)	0.0535	1.522 (.1282)	-0.0735	-1.750 (.0802)	0.0243	0.595 (.5519)
30. % Δ in Sales/ Total Assets	-0.2201	-0.435 (.6639)	-0.9242	-1.554 (.1204)	0.8109	1.790 (.0735)	0.6551	1.486 (.1374)
40. % Δ in Net Profit Margin	-0.0036	-0.376 (.7071)	-0.0077	-0.689 (.4910)	-0.0052	-0.573 (.5666)	-0.0115	-1.309 (.1907)
42. Sales to Accts. Receivable	0.0020	1.136 (.2562)	0.0015	0.736 (.4617)	0.0053	2.212 (.0271)	0.0052	2.240 (.0251)
43. Sales to Inventory	-0.0080	-2.525 (.0116)	-0.0072	-1.921 (.0549)	-0.0002	-0.070 (.9441)	0.0018	0.707 (.4794)
44. % Δ in Sales to Inventory	0.2419	1.080 (.2804)	0.2281	0.867 (.3861)	0.0824	0.641 (.5219)	0.0037	0.030 (.9764)

Table 16 - continued

Ordinary Least Squares Earnings Prediction Models

Models 2e and 2f: Variables Chosen by Discarding Principal Components

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Accounting Variable	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)
46. % Δ in Sales to Working Capital	-0.0046	-0.487 (.6263)	-0.0048	-0.433 (.6648)	-0.0366	-2.076 (.0380)	-0.0272	-1.581 (.1140)
56. % Δ in Working Capital/TA	0.0034	0.680 (.4967)	0.0031	0.533 (.5938)	0.0023	0.344 (.7311)	0.0019	0.280 (.7797)
57. Operating Inc./ Total Assets	-3.1459	-3.676 (.0002)	-3.7423	-3.723 (.0002)	-6.4036	-8.549 (.0001)	-1.4324	-1.965 (.0495)
58. % Δ in Op. Income/TA	0.0748	1.397 (.1627)	0.0246	0.391 (.6957)	0.0165	0.697 (.4856)	-0.0006	-0.028 (.9779)
62. Issuance of LTD as % of LTD	-0.1838	-1.021 (.3075)	-0.0563	-0.266 (.7899)	-0.2601	-2.501 (.0124)	-0.2081	-2.056 (.0399)
65. % Δ in Long-Term Debt	0.0020	0.310 (.7564)	0.0006	0.073 (.9421)	0.0088	1.021 (.3074)	0.0076	0.901 (.3675)

[a] The model F statistic is a measure of the goodness of fit of the model. It tests the null hypothesis that all parameters in the model are zero. The numerator degrees of freedom (d.f.) equals the number of independent variables, excluding the intercept, contained in the model. All models are significant at the .001 level.

[b] β is the ordinary least squares estimate of the coefficient on the accounting variable. The t statistic (and associated p-value) assesses the individual significance of each independent variable.

Table 17

Dichotomous Logit Earnings Prediction Models

Models 3a and 3b: Variables Chosen by Scree Graph

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Model χ^2 (d.f.)[a]	51.95 (4)		104.08 (4)		237.93 (4)		211.39 (4)	
% Concordant Pairs[b]	53.6%		58.2%		66.4%		65.8%	
Rank Correlation[b]	.092		.175		.335		.323	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
Intercept	0.1936	1.937 (.1640)	-0.0174	0.015 (.9038)	0.1389	2.319 (.1278)	0.0859	0.891 (.3452)
1. Current Ratio	0.0696	2.434 (.1188)	0.0866	3.708 (.0541)	0.0483	1.885 (.1698)	0.0692	3.892 (.0485)
23. Long-Term Debt to Equity	-0.0682	0.929 (.3352)	0.0282	0.155 (.6940)	-0.0116	1.701 (.1921)	-0.0074	0.787 (.3749)
37. Pretax Income to Sales	-1.9984	15.032 (.0001)	-2.3622	17.913 (.0001)	-6.6112	176.05 (.0001)	-5.7692	143.52 (.0001)
48. % Δ in Production	0.0222	0.112 (.7379)	-0.7080	13.163 (.0003)	-0.0631	0.738 (.3903)	-0.3796	7.015 (.0081)

[a] The model χ^2 statistic is a measure of the goodness of fit of the model. It tests the null hypothesis that all parameters in the model are zero. The degrees of freedom (d.f.) equals the number of independent variables, excluding the intercept, contained in the model. A χ^2 (4 d.f.) of 18.43 (13.28) is significant at the .001 (.01) level. A χ^2 (16 d.f.) of 39.99 (32.00) is significant at the .001 (.01) level.

[b] For matched pairs of estimated probability of an earnings increase (*Pr*) and directional realized earnings changes. Under the null hypothesis of no association, the percentage of concordant pairs is expected to be 50 percent and the rank correlation is zero.

[c] θ is the maximum likelihood estimate of the coefficient on the accounting variable. The χ^2 statistic (and associated p-value) assesses the individual significance of each independent variable.

Table 18

Trichotomous Logit Earnings Prediction Models

Models 3c and 3d: Variables Chosen by Scree Graph

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Model χ^2 (d.f.)[a]	32.31 (4)		160.34 (4)		217.35 (4)		209.77 (4)	
% Concordant Pairs[b]	52.8%		56.4%		63.0%		63.3%	
Rank Correlation[b]	.080		.143		.269		.275	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
Intercept 1	0.8493	43.547 (.0001)	0.7971	37.281 (.0001)	1.0550	155.51 (.0001)	1.0460	152.22 (.0001)
Intercept 2	-0.5484	18.367 (.0001)	-0.6099	21.954 (.0001)	-0.4082	24.312 (.0001)	-0.4131	24.773 (.0001)
1. Current Ratio	0.0224	0.307 (.5796)	0.0968	5.631 (.0176)	0.0435	1.941 (.1636)	0.0488	2.438 (.1185)
23. Long-Term Debt to Equity	-0.0157	0.059 (.8089)	-0.0185	0.081 (.7763)	-0.0009	0.015 (.9024)	-0.0072	1.192 (.2750)
37. Pretax Income to Sales	-1.8600	16.369 (.0001)	-2.8778	34.653 (.0001)	-5.1365	169.92 (.0001)	-4.6522	143.78 (.0001)
48. % Δ in Production	-0.0211	0.109 (.7416)	-0.0834	0.714 (.3982)	-0.1323	1.796 (.1803)	-0.5112	16.766 (.0001)

[a] The model χ^2 statistic is a measure of the goodness of fit of the model. It tests the null hypothesis that all parameters in the model are zero. The degrees of freedom (d.f.) equals the number of independent variables, excluding the intercepts, contained in the model. A χ^2 (4 d.f.) of 18.43 (13.28) is significant at the .001 (.01) level.

[b] For matched pairs of estimated probability of an earnings increase (*Pr*) and directional realized earnings changes. Under the null hypothesis of no association, the percentage of concordant pairs is expected to be 50 percent and the rank correlation is zero.

[c] θ is the maximum likelihood estimate of the coefficient on the accounting variable. The χ^2 statistic (and associated p-value) assesses the individual significance of each independent variable.

Table 19

Ordinary Least Squares Earnings Prediction Models

Models 3e and 3f: Variables Chosen by Scree Graph

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Model F (d.f.)[a]	22.512 (4)		0.143 (4)		0.408 (4)		7.995 (4)	
R^2	.0285		.0002		.0007		.0141	
Adjusted R^2	.0272		-.0011		-.0011		.0123	
Accounting Variable	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)
Intercept	-0.3692	-2.646 (.0082)	-0.1264	-0.931 (.3521)	0.0517	0.274 (.7839)	0.7753	3.529 (.0004)
1. Current Ratio	0.0247	0.453 (.6507)	-0.0156	-0.295 (.7683)	-0.0067	-0.110 (.9122)	-0.0904	-1.275 (.2025)
23. Long-Term Debt to Equity	0.0006	0.060 (.9518)	0.0029	0.281 (.7788)	-0.0542	-0.558 (.5769)	-0.2868	-2.531 (.0114)
37. Pretax Income to Sales	-5.3289	-9.292 (.0001)	-0.2673	-0.479 (.6321)	-0.3846	-0.602 (.5470)	-3.3173	-4.456 (.0001)
48. % Δ in Production	-0.0518	-0.633 (.5267)	-0.0237	-0.297 (.7663)	-0.0822	-0.899 (.3687)	-0.0173	-0.162 (.8714)

[a] The model F statistic is a measure of the goodness of fit of the model. It tests the null hypothesis that all parameters in the model are zero. The numerator degrees of freedom (d.f.) equals the number of independent variables, excluding the intercept, contained in the model. An F statistic of 4.62 (3.32) is significant at the .001 (.01) level.

[b] β is the ordinary least squares estimate of the coefficient on the accounting variable. The t statistic (and associated p-value) assesses the individual significance of each independent variable.

Table 20

Dichotomous Logit Earnings Prediction Models

Models 4a and 4b: Ou and Penman 1965-1972 Variables

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Model χ^2 (d.f.)[a]	342.75 (16)		423.14 (16)		446.13 (16)		498.17 (16)	
% Concordant Pairs[b]	66.3%		68.8%		71.4%		72.8%	
Rank Correlation[b]	.333		.381		.432		.460	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
Intercept	0.1161	0.550 (.4583)	0.1480	0.826 (.3636)	0.1168	1.048 (.3060)	0.0178	0.023 (.8776)
8. % Δ in Inventory Turnover	-0.0929	0.159 (.6898)	-0.0937	0.295 (.5871)	-0.0158	0.071 (.7906)	0.0437	0.330 (.5656)
10. % Δ in Inv./ Total Assets	-0.3787	4.123 (.0423)	-0.1474	0.982 (.3218)	-0.1816	1.672 (.1960)	-0.2110	2.221 (.1362)
13. % Δ in Depreciation	-0.4649	4.104 (.0428)	0.5591	5.607 (.0179)	-0.4753	6.578 (.0130)	0.3636	3.260 (.0710)
14. Δ in Dividends Per Share	-0.2511	1.152 (.2832)	0.0010	0.000 (.9965)	-1.2451	23.520 (.0001)	-0.4181	3.589 (.0581)
16. % Δ in Dep./ Plant Assets	0.4051	1.584 (.2083)	0.4786	2.268 (.1320)	0.7753	9.131 (.0025)	0.9442	12.338 (.0004)
19. % Δ in Capital Exp./Total Assets	-0.0062	0.013 (.9084)	-0.0393	0.621 (.4308)	-0.1428	8.262 (.0040)	-0.2325	18.561 (.0001)
20. 19. (one-year lag)	-0.0888	4.995 (.0254)	-0.1009	7.019 (.0081)	-0.1115	6.189 (.0129)	0.0371	0.084 (.3595)
22. % Δ in Debt-Equity Ratio	0.4319	6.929 (.0085)	0.1205	0.564 (.4525)	0.0093	0.014 (.9040)	0.0304	0.078 (.7798)
30. % Δ in Sales/ Total Assets	1.2843	9.064 (.0026)	-1.2491	7.917 (.0049)	-0.3903	2.031 (.1541)	-2.7894	77.565 (.0001)
31. Return on Total Assets	-13.821	12.269 (.0005)	-13.043	9.903 (.0017)	-18.079	88.082 (.0001)	-20.475	95.520 (.0001)
32. Return on Closing Equity	-3.4018	6.369 (.0116)	-6.1021	16.263 (.0001)	0.0257	0.046 (.8295)	-0.023	0.010 (.9203)
33. Gross Margin Ratio	1.0133	8.213 (.0042)	0.8057	5.087 (.0241)	0.1832	.0364 (.5462)	0.1474	0.229 (.6323)
54. Cash Flow to Total Debt	1.5059	6.753 (.0094)	1.5602	6.982 (.0082)	1.3237	10.174 (.0014)	2.3294	29.474 (.0001)
57. Operating Inc./ Total Assets	3.5831	8.225 (.0041)	2.3148	3.169 (.0750)	2.0159	4.138 (.0419)	1.6210	2.604 (.1066)
61. Repmt. of LTD as % of LTD	-0.0029	0.017 (.8964)	0.0236	0.606 (.4363)	-0.0267	1.519 (.2178)	-0.0991	9.543 (.0020)
66. Cash Div. as % of Cash Flows	1.1010	11.073 (.0009)	1.8238	25.528 (.0001)	0.3148	5.706 (.0169)	0.4356	11.431 (.0007)

[a, b, c] See notes a, b and c to Table 17.

Table 21

Trichotomous Logit Earnings Prediction Models

Models 4c and 4d: Ou and Penman 1965 - 1972 Variables

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Model χ^2 (d.f.)[a]	459.09 (16)		544.45 (16)		512.22 (16)		549.63 (16)	
% Concordant Pairs[b]	64.8%		67.2%		68.1%		69.1%	
Rank Correlation[b]	.302		.349		.367		.387	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
Intercept 1	0.7669	29.357 (.0001)	1.2091	66.636 (.0001)	0.8692	71.794 (.0001)	0.8526	66.816 (.0001)
Intercept 2	-0.7398	27.314 (.0001)	-0.3449	5.567 (.0183)	-0.6992	46.879 (.0001)	-0.7294	49.275 (.0001)
8. % Δ in Inventory Turnover	-0.1857	2.060 (.1512)	0.0104	0.007 (.9352)	0.0286	0.297 (.5859)	-0.0224	0.202 (.6529)
10. % Δ in Inv./ Total Assets	-0.4075	6.866 (.0088)	-0.1178	0.961 (.3269)	-0.3730	8.257 (.0041)	-0.3455	7.863 (.0050)
13. % Δ in Depreciation	-0.3989	3.907 (.0481)	0.5207	6.260 (.0124)	-0.5880	14.663 (.0001)	0.2544	2.336 (.1264)
14. Δ in Dividends Per Share	-0.3043	2.126 (.1448)	-0.0580	0.077 (.7808)	-1.8488	61.892 (.0001)	-0.4408	5.544 (.0185)
16. % Δ in Dep./ Plant Assets	0.4585	2.679 (.1017)	0.3318	1.395 (.2376)	1.0854	23.580 (.0001)	0.9585	17.880 (.0001)
19. % Δ in Capital Exp./Total Assets	-0.0117	0.063 (.8026)	-0.0831	3.407 (.0649)	-0.0098	0.121 (.7284)	-0.0880	5.844 (.0156)
20. 19. (one-year lag)	-0.0892	6.799 (.0091)	-0.1126	11.537 (.0007)	-0.0550	2.478 (.1155)	0.0407	1.323 (.2501)
22. % Δ in Debt-Equity Ratio	0.4977	11.394 (.0007)	0.1689	1.398 (.2370)	0.0918	1.148 (.2839)	0.0324	0.2378 (.6258)
30. % Δ in Sales/ Total Assets	0.9669	6.668 (.0098)	-1.0615	7.553 (.0060)	-0.6014	6.083 (.0136)	-2.6646	100.22 (.0001)
31. Return on Total Assets	-17.667	25.832 (.0001)	-11.164	9.552 (.0020)	-17.089	100.32 (.0001)	-20.860	155.64 (.0001)
32. Return on Closing Equity	-2.7421	5.521 (.0188)	-7.7432	34.570 (.0001)	0.0359	0.078 (.7803)	0.0663	0.564 (.4527)
33. Gross Margin Ratio	0.9541	9.059 (.0026)	0.5825	3.321 (.0684)	0.5297	3.899 (.0483)	0.1515	0.317 (.5735)
54. Cash Flow to Total Debt	1.3167	6.900 (.0086)	1.1557	5.038 (.0248)	1.3990	15.116 (.0001)	2.5312	47.156 (.0001)
57. Operating Inc./ Total Assets	4.8953	19.185 (.0001)	3.4062	8.852 (.0029)	2.9552	11.686 (.0006)	2.1191	5.943 (.0148)
61. Repmt. of LTD as % of LTD	-0.0138	0.341 (.5595)	0.0047	0.025 (.8755)	-0.0249	2.339 (.1262)	-0.0890	13.112 (.0003)
66. Cash Div. as % of Cash Flows	1.0614	13.676 (.0002)	1.8792	35.237 (.0001)	0.3088	7.476 (.0063)	0.5672	17.745 (.0001)

[a, b, c] See notes a, b and c to Table 24.

Table 22
Ordinary Least Squares Earnings Prediction Models
Models 4e and 4f: Ou and Penman 1965 - 1972 Variables

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Model F (d.f.)[a]	5.080 (16)		4.250 (16)		13.749 (16)		3.622 (16)	
R^2	.0352		.0296		.0670		.0186	
Adjusted R^2	.0283		.0227		.0621		.0134	
Accounting Variable	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)
Intercept	-0.2372	-1.266 (.2056)	-0.4319	-1.958 (.0504)	-0.2720	-1.672 (.0946)	-0.6936	-4.333 (.0001)
8. % Δ in Inventory Turnover	-0.0958	-0.545 (.5860)	-0.0580	-0.280 (.7796)	0.1002	1.155 (.2483)	0.0557	0.652 (.5143)
10. % Δ in Inv./ Total Assets	-0.1597	-1.615 (.1065)	-0.1589	-1.364 (.1726)	-0.3220	-1.680 (.0931)	-0.3922	-2.079 (.0377)
13. % Δ in Depreciation	-0.5131	-1.824 (.0683)	-0.0609	-0.184 (.8542)	-0.7500	-3.260 (.0011)	-0.3757	-1.659 (.0972)
14. Δ in Dividends Per Share	-0.1462	-0.504 (.6146)	0.3407	0.996 (.3192)	-0.9210	-3.554 (.0004)	-0.3150	-1.235 (.2169)
16. % Δ in Dep./ Plant Assets	0.7911	2.067 (.0388)	0.5783	1.284 (.1994)	1.1191	3.643 (.0003)	0.7431	2.458 (.0140)
19. % Δ in Capital Exp./Total Assets	0.0293	0.455 (.6490)	-0.0197	-0.260 (.7946)	-0.0100	-0.239 (.8112)	-0.0352	-0.855 (.3927)
20. 19. (one-year lag)	-0.1015	-2.232 (.0257)	-0.1059	-1.978 (.0481)	-0.0045	-0.080 (.9363)	0.0257	0.463 (.6436)
22. % Δ in Debt-Equity Ratio	0.4851	2.563 (.0105)	0.5051	2.266 (.0236)	0.0330	0.496 (.6200)	0.0186	0.285 (.7760)
30. % Δ in Sales/ Total Assets	0.4875	0.942 (.3465)	-0.1332	-0.219 (.8270)	0.2345	0.612 (.5405)	0.1584	0.420 (.6745)
31. Return on Total Assets	-11.030	-2.991 (.0028)	-6.5786	-1.515 (.1299)	-16.888	-7.969 (.0001)	-9.2149	-4.418 (.0001)
32. Return on Closing Equity	-0.1050	-0.141 (.8876)	-1.7917	-2.048 (.0407)	0.0709	0.818 (.4133)	0.0269	0.316 (.7520)
33. Gross Margin Ratio	1.4365	3.150 (.0017)	2.4050	4.478 (.0001)	-0.9869	-2.197 (.0281)	-0.3232	-0.731 (.4648)
54. Cash Flow to Total Debt	1.1416	1.840 (.0658)	-0.5339	-0.731 (.4649)	2.0610	3.532 (.0004)	1.1183	1.947 (.0516)
57. Operating Inc./ Total Assets	0.6248	0.425 (.6711)	1.3229	0.764 (.4451)	2.2089	1.668 (.0955)	5.7491	4.410 (.0001)
61. Repmt. of LTD as % of LTD	0.0008	0.028 (.9766)	-0.0198	-0.611 (.5416)	-0.0025	-0.119 (.9051)	-0.0012	-0.061 (.9514)
66. Cash Div. as % of Cash Flows	1.0331	2.972 (.0030)	0.6987	1.707 (.0879)	0.1334	0.971 (.3314)	0.0386	0.286 (.7752)

[a, b] See note a and b to Table 25.

Table 23

Dichotomous Logit Earnings Prediction Models

Models 5a and 5b: Ou and Penman 1973-1977 Variables

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Model χ^2 (d.f.)[a]	390.03 (18)		597.72 (18)		482.03 (18)		785.78 (18)	
% Concordant Pairs[b]	67.7%		74.6%		72.3%		80.3%	
Rank Correlation[b]	.359		.496		.450		.611	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
Intercept	0.7488	12.902 (.0003)	0.7767	11.824 (.0006)	0.1358	1.173 (.2788)	-0.0708	0.267 (.6056)
2. % Δ in Current Ratio	-1.1276	7.220 (.0072)	-0.7995	3.173 (.0749)	-1.8315	27.240 (.0001)	-1.0412	7.476 (.0063)
4. % Δ in Quick Ratio	0.9627	7.152 (.0075)	0.9568	6.700 (.0096)	1.3017	23.404 (.0001)	0.7348	6.290 (.0121)
9. Inventory/ Total Assets	-1.2581	5.679 (0.172)	-1.3970	6.151 (.0131)	-0.5315	1.488 (.2225)	-0.6137	1.748 (.1862)
10. % Δ in Inv./ Total Assets	0.1756	0.090 (.7638)	-0.2399	0.149 (.6995)	-0.3903	2.015 (.1557)	-3.2618	17.186 (.0001)
11. % Δ in Inventory	-0.1955	0.208 (.6486)	0.1353	0.100 (.7514)	0.3136	4.264 (.0389)	2.5889	17.834 (.0001)
12. % Δ in Sales	0.7532	5.814 (.0159)	0.0284	.007 (.9324)	-0.3395	2.054 (.1518)	-1.7258	34.088 (.0001)
14. Δ in Dividends Per Share	-0.1995	0.776 (.3784)	0.0531	0.049 (.8239)	-1.1053	18.454 (.0001)	-0.8941	11.697 (.0006)
17. Return on Opening Equity	-7.1766	44.201 (.0001)	-8.6437	45.594 (.0001)	-1.7514	9.638 (.0019)	-0.2070	0.066 (.7971)
18. Δ in Return on Opening Equity	2.8064	23.714 (.0001)	-7.7025	95.678 (.0001)	1.2128	11.003 (.0009)	-6.9370	129.219 (.0001)
20. % Δ in Cap. Exp/TA (1-yr lag)	-0.1042	7.810 (.0052)	-0.1125	8.249 (.0041)	-0.0826	3.960 (.0466)	0.0563	1.844 (.1745)
21. Debt-Equity Ratio	-0.0252	0.139 (.7089)	0.0082	0.011 (.9164)	-0.0158	5.751 (.0165)	-0.0124	1.829 (.1763)
31. Return on Total Assets	-6.7203	4.463 (.0346)	0.6153	0.027 (.8690)	-13.868	45.728 (.0001)	-9.7682	16.325 (.0001)
38. % Δ in Pretax Income to Sales	0.0010	0.103 (.7480)	0.0009	0.091 (.7628)	-0.0117	2.451 (.1174)	-0.0971	8.661 (.0033)
41. Sales to Total Cash	-0.0013	5.480 (.0195)	-0.0019	6.350 (.0117)	0.0001	0.446 (.5044)	.00004	0.075 (.7848)
53. % Δ in Total Assets	0.1592	0.089 (.7652)	0.8213	2.224 (.1359)	-0.7805	5.095 (.0240)	-2.6032	13.885 (.0002)
55. Working Cap./ Total Assets	0.8820	3.416 (.0645)	0.5750	1.300 (.2542)	1.1296	10.196 (.0014)	0.8608	5.138 (.0234)

Table 23 - continued

Dichotomous Logit Earnings Prediction Models

Models 5a and 5b: Ou and Penman 1973-1977 Variables

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
57. Operating Inc./ Total Assets	5.8796	23.091 (.0001)	3.0674	5.367 (.0205)	3.5750	13.315 (.0003)	2.4950	5.460 (.0195)
61. Repmt. of LTD as % of LTD	0.0033	0.022 (.8831)	0.0342	1.203 (.2727)	-0.0254	1.493 (.2217)	-0.0648	4.429 (.0354)

[a] The model χ^2 statistic is a measure of the goodness of fit of the model. It tests the null hypothesis that all parameters in the model are zero. The degrees of freedom (d.f.) equals the number of independent variables, excluding the intercept, contained in the model. A χ^2 (18 d.f.) of 42.44 (34.81) is significant at the .001 (.01) level.

[b] For matched pairs of estimated probability of an earnings increase (*Pr*) and directional realized earnings changes. Under the null hypothesis of no association, the percentage of concordant pairs is expected to be 50 percent and the rank correlation is zero.

[c] θ is the maximum likelihood estimate of the coefficient on the accounting variable. The χ^2 statistic (and associated p-value) assesses the individual significance of each independent variable.

Table 24

Trichotomous Logit Earnings Prediction Models

Models 5c and 5d: Ou and Penman 1973 - 1977 Variables

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Model χ^2 (d.f.)[a]	501.77 (18)		855.63 (18)		544.93 (18)		957.77 (18)	
% Concordant Pairs[b]	66.0%		73.7%		68.9%		76.9%	
Rank Correlation[b]	.326		.479		.384		.543	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
Intercept 1	1.6215	81.382 (.0001)	1.9096	86.693 (.0001)	0.9626	75.053 (.0001)	0.9893	67.923 (.0001)
Intercept 2	0.1034	0.344 (.5575)	0.2317	1.335 (.2479)	-0.6200	31.603 (.0001)	-0.7614	40.659 (.0001)
2. % Δ in Current Ratio	-1.2200	11.009 (.0009)	-1.0252	6.829 (.0090)	-1.6885	30.812 (.0001)	-1.8048	30.005 (.0001)
4. % Δ in Quick Ratio	0.9240	8.623 (.0033)	1.0324	9.826 (.0017)	1.2017	25.769 (.0001)	1.2331	23.591 (.0001)
9. Inventory/ Total Assets	-1.1572	6.103 (.0135)	-1.0838	4.807 (.0283)	-0.8529	5.023 (.0250)	-0.9131	5.169 (.0230)
10. % Δ in Inv./ Total Assets	-0.2199	0.182 (.6700)	-0.3134	0.331 (.5650)	-0.5628	5.677 (.0172)	-0.4858	3.060 (.0803)
11. % Δ in Inventory	0.0925	0.065 (.7996)	0.1584	0.187 (.6656)	0.3081	6.540 (.0105)	0.3413	5.568 (.0183)
12. % Δ in Sales	0.2591	1.507 (.2196)	0.4510	4.859 (.0275)	-0.4267	4.334 (.0374)	-1.4345	36.406 (.0001)
14. Δ in Dividends Per Share	-0.2865	1.961 (.1614)	-0.0177	0.007 (.9340)	-1.7488	54.685 (.0001)	-0.8518	15.588 (.0001)
17. Return on Opening Equity	-4.1605	26.943 (.0001)	-8.4184	57.780 (.0001)	-1.5860	11.919 (.0006)	0.4038	0.388 (.5333)
18. Δ in Return on Opening Equity	1.7817	14.986 (.0001)	-9.2970	170.92 (.0001)	0.7785	7.606 (.0058)	-7.6601	240.50 (.0001)
20. % Δ in Cap. Exp/TA (1-yr lag)	-0.0947	8.652 (.0033)	-0.1184	11.852 (.0006)	-0.0524	2.362 (.1243)	0.0349	0.941 (.3320)
21. Debt-Equity Ratio	0.1254	6.394 (.0115)	-0.0293	0.184 (.6681)	0.0028	0.410 (.5222)	-0.0151	3.802 (.0512)
31. Return on Total Assets	-14.530	29.062 (.0001)	-0.5410	0.027 (.8695)	-12.532	52.337 (.0001)	-10.893	29.179 (.0001)
38. % Δ in Pretax Income to Sales	0.0019	0.408 (.5232)	0.0011	0.185 (.6669)	-0.0109	3.330 (.0680)	-0.0600	11.202 (.0008)
41. Sales to Total Cash	-0.0011	5.486 (.0192)	-0.0021	10.488 (.0012)	0.0001	0.850 (.3567)	.00004	0.070 (.7908)
53. % Δ in Total Assets	-0.1236	0.076 (.7835)	0.3485	0.572 (.4494)	-0.6145	5.062 (.0245)	-0.3273	1.205 (.2722)
55. Working Cap./ Total Assets	0.5037	1.421 (.2333)	0.2540	0.325 (.5687)	1.2693	16.882 (.0001)	1.0926	11.104 (.0009)

Table 24 - continued

Trichotomous Logit Earnings Prediction Models

Models 5c and 5d: Ou and Penman 1973 - 1977 Variables

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
57. Operating Inc./ Total Assets	6.5738	36.631 (.0001)	3.3888	8.361 (.0038)	4.7154	31.318 (.0001)	2.8847	10.090 (.0015)
61. Repmt. of LTD as % of LTD	-0.0110	0.1913 (.6619)	0.0241	0.707 (.4005)	-0.0194	1.922 (.1657)	-0.0355	2.467 (.1163)

[a] The model χ^2 statistic is a measure of the goodness of fit of the model. It tests the null hypothesis that all parameters in the model are zero. The degrees of freedom (d.f.) equals the number of independent variables, excluding the intercepts, contained in the model. A χ^2 (18 d.f.) of 42.44 (34.81) is significant at the .001 (.01) level. A χ^2 (16 d.f.) of 39.39 (32.00) is significant at the .001 (.01) level.

[b] For matched pairs of estimated probability of an earnings increase (*Pr*) and directional realized earnings changes. Under the null hypothesis of no association, the percentage of concordant pairs is expected to be 50 percent and the rank correlation is zero.

[c] θ is the maximum likelihood estimate of the coefficient on the accounting variable. The χ^2 statistic (and associated p-value) assesses the individual significance of each independent variable.

Table 25

Ordinary Least Squares Earnings Prediction Models

Models 5e and 5f: Ou and Penman 1973 - 1977 Variables

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Model F (d.f.)[a]	5.173 (18)		2.939 (18)		14.157 (18)		5.167 (18)	
R^2	.0402		.0232		.0769		.0295	
Adjusted R^2	.0324		.0153		.0714		.0238	
Accounting Variable	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)
Intercept	0.9053	3.719 (.0002)	0.6320	2.192 (.0285)	-0.1950	-1.115 (.2650)	-0.5251	-3.057 (.0023)
2. % Δ in Current Ratio	-1.5167	-2.992 (.0028)	-1.2457	-2.075 (.0381)	-1.3312	-3.256 (.0011)	-1.2410	-3.085 (.0021)
4. % Δ in Quick Ratio	1.1893	2.864 (.0042)	0.8956	1.821 (.0687)	1.0541	3.540 (.0004)	0.9646	3.293 (.0010)
9. Inventory/ Total Assets	-1.4205	-2.147 (.0319)	-0.9570	-1.221 (.2222)	-1.4728	-2.384 (.0172)	-1.1724	-1.929 (.0538)
10. % Δ in Inv./ Total Assets	0.2267	0.323 (.7469)	-0.0420	-0.051 (.9597)	-1.6135	-4.359 (.0001)	-1.4005	-3.846 (.0001)
11. % Δ in Inventory	-0.1693	-0.370 (.7113)	-0.0086	-0.016 (.9873)	0.9559	5.076 (.0001)	0.7702	4.157 (.0001)
12. % Δ in Sales	0.0880	0.328 (.7426)	-0.0014	-0.004 (.9966)	0.4216	1.260 (.2076)	0.4322	1.313 (.1892)
14. Δ in Dividends Per Share	-0.1194	-0.414 (.6792)	0.3638	1.064 (.2876)	-0.8860	-3.432 (.0006)	-0.2943	-1.158 (.2468)
17. Return on Opening Equity	-2.4771	-3.158 (.0016)	-2.3100	-2.486 (.0130)	-0.2372	-0.564 (.5731)	-0.2694	-0.651 (.5153)
18. Δ in Return on Opening Equity	1.0439	2.128 (.0334)	-0.0036	-0.006 (.9950)	0.2994	0.992 (.3213)	0.1396	0.470 (.6384)
20. % Δ in Cap. Exp/TA (1-yr lag)	-0.1086	-2.434 (.0150)	-0.1038	-1.963 (.0497)	0.0097	0.174 (.8621)	0.0412	0.753 (.4514)
21. Debt-Equity Ratio	-0.1188	-1.830 (.0674)	-0.0771	-1.002 (.3162)	-0.0042	-0.899 (.3689)	0.0004	0.079 (.9372)
31. Return on Total Assets	-7.7670	-2.598 (.0094)	3.0742	0.868 (.3854)	-12.328	-6.236 (.0001)	-6.1075	-3.140 (.0017)
38. % Δ in Pretax Income to Sales	-0.0001	-0.010 (.9921)	-0.0011	-0.343 (.7318)	-0.0019	-0.223 (.8235)	-0.0126	-1.517 (.1295)
41. Sales to Total Cash	-0.0010	-1.964 (.0496)	-0.0009	-1.555 (.1200)	-0.0002	-0.732 (.4641)	-0.0002	-1.112 (.2663)
53. % Δ in Total Assets	-0.0204	-0.035 (.9722)	0.4883	0.704 (.4816)	-2.8367	-6.578 (.0001)	-2.1543	-5.077 (.0001)
55. Working Cap./ Total Assets	0.1639	0.275 (.7835)	-0.2435	-0.345 (.7304)	1.0529	2.145 (.0320)	0.5759	1.192 (.2332)

Table 25 - continued

Ordinary Least Squares Earnings Prediction Models

Models 5e and 5f: Ou and Penman 1973 - 1977 Variables

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Accounting Variable	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)
57. Operating Inc./ Total Assets	2.7960	2.002 (.0454)	3.6303	2.194 (.0283)	2.4081	1.975 (.0483)	5.9552	4.965 (.0001)
61. Repmt. of LTD as % of LTD	0.0030	0.109 (.9134)	-0.0196	-0.606 (.5444)	-0.0012	-0.058 (.9538)	0.0001	0.006 (.9949)

[a] The model F statistic is a measure of the goodness of fit of the model. It tests the null hypothesis that all parameters in the model are zero. The numerator degrees of freedom (d.f.) equals the number of independent variables, excluding the intercept, contained in the model. All models are significant at the .001 level.

[b] β is the ordinary least squares estimate of the coefficient on the accounting variable. The t statistic (and associated p-value) assesses the individual significance of each independent variable.

Table 26

Dichotomous Logit Earnings Prediction Models

Models 6a and 6b: Variables Selected by Stepwise Procedures

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Model χ^2 (d.f.)[a]	426.05 (16)		591.60 (8)		479.21 (13)		910.10 (22)	
% Concordant Pairs[b]	68.9%		74.4%		71.9%		81.1%	
Rank Correlation[b]	.382		.493		.442		.630	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
Intercept	0.5965	7.946 (.0048)	0.4532	7.948 (.0048)	-0.0755	0.335 (.5630)	0.1525	0.879 (.3486)
1. Current Ratio	-0.1488	3.410 (.0648)	-	-	-	-	-	-
3. Quick Ratio	0.4448	9.832 (.0017)	0.2777	10.023 (.0015)	-	-	-	-
10. % Δ in Inv./ Total Assets	-0.3328	4.007 (.0453)	-	-	-	-	-4.1313	29.658 (.0001)
11. % Δ in Inventory	-	-	-	-	-	-	2.9632	25.070 (.0001)
12. % Δ in Sales	0.9087	10.653 (.0011)	-	-	-	-	-	-
13. % Δ in Depreciation	-	-	0.4530	7.007 (.0081)	-	-	0.9715	15.184 (.0001)
14. Δ in Dividends Per Share	-	-	-	-	-1.2627	23.892 (.0001)	-0.9356	11.776 (.0006)
15. Depreciation/ Plant Assets	-	-	-	-	-	-	-2.3114	6.272 (.0123)
17. Return on Opening Equity	-6.4979	47.405 (.0001)	-6.5845	112.80 (.0001)	-	-	-	-
18. Δ in Return on Opening Equity	2.5288	17.673 (.0001)	-5.7664	59.794 (.0001)	-	-	-5.7025	78.951 (.0001)
19. % Δ in Capital Exp/Total Assets	-	-	-	-	-0.2172	21.079 (.0001)	-0.2739	24.286 (.0001)
20. 19. (one-year lag)	-0.1068	8.074 (.0045)	-0.1290	9.296 (.0023)	-0.1299	7.828 (.0051)	-	-
21. Debt-Equity Ratio	-	-	-	-	-	-	-0.0987	3.186 (.0743)
23. Long-Term Debt to Equity	-	-	-	-	-	-	-0.1167	2.926 (.0872)
25. Equity to Fixed Assets	-	-	-	-	-	-	0.1252	13.625 (.0002)
27. Times Interest Earned	0.0034	4.126 (.0422)	-	-	-	-	0.0033	3.834 (.0502)

Table 26 - continued

Dichotomous Logit Earnings Prediction Models

Models 6a and 6b: Variables Selected by Stepwise Procedures

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
29. Sales/Total Assets	-0.1633	6.547 (.0105)	-	-	-	-	-	-
30. % Δ in Sales/ Total Assets	-	-	-	-	-	-	-2.5981	48.060 (.0001)
31. Return on Total Assets	-12.107	16.338 (.0001)	-	-	-24.065	97.634 (.0001)	-18.628	67.989 (.0001)
32. Return on Closing Equity	-	-	-	-	-	-	-0.7812	9.590 (.0020)
33. Gross Margin Ratio	-	-	-	-	1.0300	7.010 (.0081)	-	-
34. % Δ in Gross Margin Ratio	0.7849	6.086 (.0136)	-	-	-	-	-1.5497	22.249 (.0001)
35. Op. Prof.(before Dep.) to Sales	-	-	1.3968	8.175 (.0042)	-3.4340	19.476 (.0001)	-	-
37. Pretax Income to Sales	-	-	-	-	2.3726	6.408 (.0114)	-	-
38. % Δ in Pretax Income to Sales	-	-	-	-	-	-	-0.0873	7.808 (.0052)
40. % Δ in Net Profit Margin	-	-	-0.2178	10.354 (.0013)	-	-	0.0196	3.269 (.0706)
41. Sales to Total Cash	-0.0011	4.620 (.0316)	-0.0019	6.4826 (.0109)	-	-	-	-
43. Sales to Inventory	-0.0060	5.810 (.0159)	-	-	-	-	-	-
45. Sales to Working Capital	-0.0013	3.370 (.0664)	-	-	-	-	-	-
53. % Δ in Total Assets	-	-	-	-	-	-	-4.3333	35.556 (.0001)
54. Cash Flow to Total Debt	-	-	-	-	1.3623	11.258 (.0008)	-	-
55. Working Capital/ Total Assets	-	-	-	-	0.4596	3.020 (.0822)	-	-
57. Operating Inc./ Total Assets	6.8972	30.089 (.0001)	-	-	4.7086	18.585 (.0001)	5.9056	23.603 (.0001)
62. Issuance of LTD as % of LTD	-	-	-	-	-0.2132	7.838 (.0051)	-0.3412	15.236 (.0001)

Table 26 - continued

Dichotomous Logit Earnings Prediction Models

Models 6a and 6b: Variables Selected by Stepwise Procedures

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
63. Purchase of TS as % of Stock	-	-	-	-	1.5474	7.739 (.0054)	1.8178	7.910 (.0049)
66. Cash Div. as % of Cash Flows	1.0029	9.264 (.0023)	-	-	0.2853	4.514 (.0336)	0.4093	14.831 (.0001)

[a] The model χ^2 statistic is a measure of the goodness of fit of the model. It tests the null hypothesis that all parameters in the model are zero. The degrees of freedom (d.f.) equals the number of independent variables, excluding the intercept, contained in the model. All of the models are significant at the .001 level.

[b] For matched pairs of estimated probability of an earnings increase (*Pr*) and directional realized earnings changes. Under the null hypothesis of no association, the percentage of concordant pairs is expected to be 50 percent and the rank correlation is zero.

[c] θ is the maximum likelihood estimate of the coefficient on the accounting variable. The χ^2 statistic (and associated p-value) assesses the individual significance of each independent variable.

Table 27

Trichotomous Logit Earnings Prediction Models

Models 6c and 6d: Variables Selected by Stepwise Procedures

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Model χ^2 (d.f.)[a]	508.89 (13)		782.74 (13)		557.43 (14)		1,084.49 (23)	
% Concordant Pairs[b]	66.2%		73.9%		68.5%		77.4%	
Rank Correlation[b]	.330		.483		.374		.553	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
Intercept 1	1.4638	81.979 (.0001)	1.6334	85.570 (.0001)	0.7596	34.196 (.0001)	0.8461	50.520 (.0001)
Intercept 2	-0.0531	0.112 (.7376)	-0.0633	0.134 (.7147)	-0.8253	40.330 (.0001)	-0.9535	63.904 (.0001)
2. % Δ in Current Ratio	-	-	-1.2395	11.284 (.0008)	-2.0347	40.863 (.0001)	-2.0347	40.863 (.0001)
3. Quick Ratio	-	-	0.1331	2.707 (.0999)	-	-	-	-
4. % Δ in Quick Ratio	-	-	1.2508	16.412 (.0001)	-	-	1.5062	38.410 (.0001)
5. Days Sales in Accounts Rec.	-	-	-	-	-0.0037	6.989 (.0082)	-	-
6. % Δ in Days Sales in AR	0.5400	4.396 (.0360)	-	-	-	-	-	-
8. % Δ in Inventory Turnover	0.7436	12.831 (.0003)	-	-	-	-	-	-
9. Inventory/ Total Assets	-	-	-0.8661	7.903 (.0049)	-	-	-	-
10. % Δ in Inv./ Total Assets	-	-	-	-	-0.3373	7.102 (.0077)	-	-
12. % Δ in Sales	1.5493	18.674 (.0001)	-	-	-	-	-0.9748	13.136 (.0003)
13. Δ in Depreciation	-	-	0.5798	15.110 (.0001)	-0.5282	14.435 (.0001)	-	-
14. Δ in Dividends Per Share	-	-	-	-	-1.8217	60.267 (.0001)	-0.8306	14.012 (.0002)
16. % Δ in Dep./ Plant Assets	-	-	-	-	0.9391	21.035 (.0001)	1.1098	24.840 (.0001)
17. Return on Opening Equity	-5.1882	82.664 (.0001)	-8.1845	135.72 (.0001)	-	-	-1.5087	3.8673 (.0492)
18. Δ in Return on Opening Equity	1.3204	7.638 (.0057)	-7.3931	109.92 (.0001)	-	-	-6.7031	164.25 (.0001)
20. 19. (one-year lag)	-0.1038	9.945 (.0016)	-0.1184	12.344 (.0004)	-	-	-	-
23. Long-Term Debt to Equity	-	-	-	-	-	-	-0.1612	29.985 (.0001)

Table 27 - continued

Trichotomous Logit Earnings Prediction Models

Models 6c and 6d: Variables Selected by Stepwise Procedures

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
25. Equity to Fixed Assets	-	-	-	-	0.0615	7.158 (.0075)	0.0810	9.289 (.0023)
26. % Δ in Equity to Fixed Assets	-	-	-	-	-	-	-0.4293	5.128 (.0235)
28. % Δ in Times Interest Earned	-	-	-0.2004	10.546 (.0012)	-	-	-	-
29. Sales/Total Assets	-0.1459	5.012 (.0252)	-	-	-	-	-	-
30. % Δ in Sales/ Total Assets	-	-	-	-	-0.7307	9.469 (.0021)	-1.0502	9.309 (.0023)
31. Return on Total Assets	-	-	-	-	-19.320	126.85 (.0001)	-20.785	56.886 (.0001)
32. Return on Closing Equity	-	-	-	-	-	-	-0.3132	8.839 (.0029)
33. Gross Margin Ratio	-	-	-	-	1.7751	26.563 (.0001)	-	-
34. % Δ in Gross Margin Ratio	0.4993	3.724 (.0536)	-	-	-	-	-0.8483	14.296 (.0002)
35. Op. Prof.(before Dep.) to Sales	3.6246	22.545 (.0001)	-	-	-2.0698	17.584 (.0001)	-	-
36. % Δ in # 35	-	-	-	-	-	-	0.3107	9.564 (.0020)
38. % Δ in Pretax Income to Sales	-	-	-	-	-	-	-0.0477	8.637 (.0033)
39. Net Profit Margin	-6.4584	15.604 (.0001)	-	-	-	-	-	-
41. Sales to Total Cash	-	-	-0.0019	9.343 (.0022)	-	-	-	-
43. Sales to Inventory	-0.0041	4.227 (.0398)	-	-	-	-	-	-
46. % Δ in Sales to Working Capital	-	-	-	-	-	-	-0.0412	3.307 (.0690)
48. % Δ in Production	-1.0116	20.179 (.0001)	-	-	-	-	0.1455	4.670 (.0307)
54. Cash Flow to Total Debt	-	-	-	-	1.2239	11.791 (.0006)	1.6654	13.304 (.0003)
57. Operating Inc./ Total Assets	-	-	2.9476	12.653 (.0004)	4.5014	21.874 (.0001)	3.8499	14.825 (.0001)
58. % Δ in Op. Inc./ Total Assets	-	-	-	-	-	-	-0.3587	15.232 (.0001)

Table 27 - continued

Trichotomous Earnings Prediction Models

Models 6c and 6d: Variables Selected by Stepwise Procedures

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Accounting Variable	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)	θ^c	χ^2 (Prob)
61. Repmnt. of LTD as % of LTD	-	-	-	-	-	-	-0.1009	12.791 (.0003)
63. Purchase of TS as % of Stock	-	-	2.1005	4.097 (.0430)	1.5673	10.315 (.0013)	-	-
66. Cash Div. as % of Cash Flows	0.7786	8.664 (.0032)	0.8558	7.947 (.0048)	0.3015	7.474 (.0063)	0.4590	21.666 (.0001)

[a] The model χ^2 statistic is a measure of the goodness of fit of the model. It tests the null hypothesis that all parameters in the model are zero. The degrees of freedom (d.f.) equals the number of independent variables, excluding the intercepts, contained in the model. All of the models are significant at the .001 level.

[b] For matched pairs of estimated probability of an earnings increase (*Pr*) and directional realized earnings changes. Under the null hypothesis of no association, the percentage of concordant pairs is expected to be 50 percent and the rank correlation is zero.

[c] θ is the maximum likelihood estimate of the coefficient on the accounting variable. The χ^2 statistic (and associated p-value) assesses the individual significance of each independent variable.

Table 28

Ordinary Least Squares Earnings Prediction Models

Models 6e and 6f: Variables Selected by Stepwise Procedures

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Model F (d.f.)[a]	10.31 (12)		10.60 (7)		16.68 (19)		9.52 (14)	
R^2	.0525		.0321		.0938		.0417	
Adjusted R^2	.0496		.0304		.0882		.0373	
Accounting Variable	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)
Intercept	0.5035	1.949 (.0514)	0.8111	3.025 (.0025)	-0.4226	-1.709 (.0878)	-0.6699	-2.579 (.0099)
1. Current Ratio	-	-	-	-	0.1520	2.147 (.0319)	-	-
2. % Δ in Current Ratio	-	-	-	-	-1.6454	-3.899 (.0001)	-	-
3. Quick Ratio	0.2162	2.597 (.0095)	-	-	-	-	-	-
4. % Δ in Quick Ratio	-	-	-	-	1.0749	3.628 (.0003)	-	-
5. Days Sales in Accounts Rec.	-	-	-	-	-0.0041	-1.926 (.0542)	-0.0056	-2.478 (.0132)
9. Inventory/ Total Assets	-	-	-1.2329	-2.366 (.0180)	-1.4875	-2.718 (.0066)	-1.9515	-3.980 (.0001)
10. % Δ in Inv./ Total Assets	-	-	-	-	-1.5286	-4.302 (.0001)	-1.5436	-4.585 (.0001)
11. % Δ in Inventory	-	-	-	-	0.8776	4.774 (.0001)	0.7510	4.195 (.0001)
14. Δ in Dividends Per Share	-	-	-	-	-0.8874	-3.494 (.0005)	-	-
15. Depreciation/ Plant Assets	-2.9752	-2.538 (.0112)	-3.0033	-2.191 (.0286)	-	-	-	-
16. % Δ in Dep./ Plant Assets	-	-	0.5165	1.735 (.0827)	-	-	-	-
20. 19. (one-year lag)	-0.0960	-2.172 (.0300)	-0.1082	-2.083 (.0374)	-	-	-	-
22. % Δ in Debt-Equity Ratio	0.7762	3.968 (.0001)	0.6270	3.297 (.0010)	-	-	-	-
23. Long-Term Debt to Equity	-0.3880	-3.636 (.0003)	-0.4926	-4.293 (.0001)	-	-	-	-
25. Equity to Fixed Assets	-	-	-	-	-	-	0.1173	3.102 (.0019)
26. % Δ in Equity to Fixed Assets	-	-	-	-	0.3537	2.291 (.0220)	-	-

Table 28 - continued

Ordinary Least Squares Earnings Prediction Models

Models 6e and 6f: Variables Selected by Stepwise Procedures

	1975-79 Estimation				1980-84 Estimation			
	4-year drift		1-year drift		4-year drift		1-year drift	
Accounting Variable	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)	β^b	t (Prob)
27. Times Interest Earned	-	-	-	-	-	-	0.0062	2.970 (.0030)
29. Sales/Total Assets	-	-	-	-	0.3469	3.760 (.0002)	0.3261	3.572 (.0004)
31. Return on Total Assets	-8.9613	-4.830 (.0001)	-	-	-17.894	-7.983 (.0001)	-9.6602	-5.765 (.0001)
33. Gross Margin Ratio	-	-	2.6915	5.580 (.0001)	-	-	1.1199	2.198 (.0281)
34. % Δ in Gross Margin Ratio	1.0316	3.264 (.0011)	-	-	-	-	-	-
35. Op. Prof.(before Dep.) to Sales	4.2607	4.868 (.0001)	-	-	-	-	-	-
37. Pretax Income to Sales	-	-	-	-	1.8975	1.960 (.0500)	-	-
39. Net Profit Margin	-4.1186	-2.133 (.0331)	-	-	-	-	-	-
40. % Δ in Net Profit Margin	-	-	-	-	0.0156	1.749 (.0804)	-	-
41. Sales to Total Cash	-0.0011	-2.122 (.0339)	-	-	-	-	-	-
45. Sales to Working Capital	-	-	-	-	-0.0012	-3.017 (.0026)	-0.0011	-2.764 (.0058)
48. % Δ in Production	-	-	-	-	0.2244	2.567 (.0103)	-	-
53. % Δ in Total Assets	-1.2887	-3.635 (.0003)	-	-	-2.3578	-6.023 (.0001)	-1.7389	-4.698 (.0001)
54. Cash Flow to Total Debt	-	-	-	-	1.5918	2.702 (.0069)	-	-
57. Operating Inc./ Total Debt	-	-	-	-	-	-	5.0657	3.896 (.0001)
62. Issuance of LTD as % of LTD	-	-	-	-	-0.2053	-1.995 (.0461)	-0.1795	-1.780 (.0751)
63. Purchase of TS as % of Stock	-	-	-	-	2.4893	3.413 (.0007)	1.9684	2.766 (.0057)
66. Cash Div. as % of Cash Flows	0.6379	1.788 (.0738)	-	-	-	-	-	-

[a], [b] See note a and b to Table 25.

Table 29

Frequency of Individual Variable Significance for Models 1 Through 5[a]

Model #	Method Used to Select Independent Variables	# of Ind. Variables	Specification of Earnings Change (Source)	1975-79 Estimation 4-year drift	1975-79 Estimation 1-year drift	1980-84 Estimation 4-year drift	1980-84 Estimation 1-year drift
1	Retaining Principal Components	21	Dichotomous (Table 11)	6	7	8	11
			Trichotomous (Table 12)	9	6	10	12
			Standardized (Table 13)	5	3	7	5
2	Discarding Principal Components	21	Dichotomous (Table 14)	9	8	8	12
			Trichotomous (Table 15)	9	7	7	6
			Standardized (Table 16)	6	6	11	6
3	Scree Graph	4	Dichotomous (Table 17)	1	3	1	3
			Trichotomous (Table 18)	1	2	1	2
			Standardized (Table 19)	1	0	0	2
4	Ou and Penman (1965-1972 Est. Period)	16	Dichotomous (Table 20)	11	9	9	9
			Trichotomous (Table 21)	11	10	10	10
			Standardized (Table 22)	8	5	8	6
5	Ou and Penman (1973-1977 Est. Period)	18	Dichotomous (Table 23)	10	8	12	13
			Trichotomous (Table 24)	10	9	14	13
			Standardized (Table 25)	10	5	10	8

[a]This table summarizes the number of individual coefficient estimates that are statistically significant at the .10 level. The source of the information is Tables 11 through 25.

Table 30

Predictive Performance of Dichotomous Earnings Prediction Models Over 1980 - 1985 (1975 - 1979 Estimation Period)

Panel A: Model 1a - Four-Year Drift

	Probability Cutoff Scheme: (.5,.5)[a]					Probability Cutoff Scheme: (.6,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	702	37.983	59.69%	74.26%	48.62%	282	51.509	69.86%	86.03%	54.79%
1981	658	5.247	45.90%	72.67%	37.22%	269	7.856	50.93%	81.91%	34.29%
1982	614	72.606	67.26%	91.23%	37.13%	327	46.102	75.23%	95.52%	31.73%
1983	565	61.611	70.44%	87.64%	41.15%	307	65.984	77.85%	94.20%	44.00%
1984	541	9.287	48.61%	83.58%	27.94%	273	7.719	53.11%	92.91%	18.49%
1985	491	22.368	56.82%	84.02%	34.93%	259	29.611	62.55%	95.31%	30.53%
Panel B: Model 1b - One-Year Drift										
1980	702	121.318	70.80%	69.86%	71.71%	379	140.969	80.47%	79.06%	81.91%
1981	658	50.216	64.29%	67.76%	62.95%	355	68.218	71.55%	78.44%	68.20%
1982	614	107.410	75.57%	85.41%	54.59%	414	122.034	83.09%	92.10%	58.18%
1983	565	102.520	71.33%	69.82%	72.76%	340	102.137	77.65%	74.03%	80.64%
1984	541	67.198	68.21%	71.70%	66.75%	321	84.290	75.39%	81.42%	72.11%
1985	491	66.671	67.82%	79.92%	55.87%	316	83.612	75.63%	91.48%	55.71%

[a]Under the (.5,.5) cutoff scheme an earnings increase (decrease) is predicted when $Pr > .5$ ($Pr \leq .5$). Under the (.6,.4) scheme an earnings increase (decrease) is predicted when $Pr \geq .6$ ($Pr \leq .4$). Observations with Pr between .4 and .6 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 30 - continued

Predictive Performance of Dichotomous Earnings Prediction Models Over 1980 - 1985 (1975 - 1979 Estimation Period)

Panel C: Model 2a - Four-Year Drift

	Probability Cutoff Scheme: (.5,.5)[a]					Probability Cutoff Scheme: (.6,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	702	13.823	54.27%	74.26%	39.10%	179	16.750	63.69%	85.39%	42.22%
1981	658	0.166	39.36%	68.32%	29.98%	207	1.079	45.41%	79.17%	27.41%
1982	614	13.597	59.28%	81.87%	30.88%	262	13.380	67.94%	91.72%	24.73%
1983	565	25.558	65.84%	85.11%	33.01%	236	13.672	72.03%	93.29%	23.61%
1984	541	2.433	45.66%	81.09%	24.71%	231	0.364	42.86%	84.54%	12.69%
1985	491	17.656	54.79%	86.76%	29.04%	197	17.763	62.94%	95.24%	26.09%
Panel D: Model 2b - One-Year Drift										
1980	702	11.311	55.70%	72.75%	39.22%	179	5.710	58.66%	79.35%	36.78%
1981	658	53.978	62.77%	73.22%	58.74%	369	76.432	71.00%	83.21%	64.29%
1982	614	66.902	72.64%	86.12%	43.88%	423	80.392	80.38%	91.77%	46.73%
1983	565	125.866	73.63%	71.27%	75.86%	350	125.819	80.00%	80.12%	79.89%
1984	541	75.624	69.32%	72.96%	67.80%	321	79.326	74.77%	79.82%	71.98%
1985	491	124.558	73.73%	90.16%	57.49%	320	110.275	79.06%	94.44%	59.29%

[a] Under the (.5,.5) cutoff scheme an earnings increase (decrease) is predicted when $Pr > .5$ ($Pr \leq .5$). Under the (.6,.4) scheme an earnings increase (decrease) is predicted when $Pr \geq .6$ ($Pr \leq .4$). Observations with Pr between .4 and .6 are dropped.

[b] A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 30 - continued

Predictive Performance of Dichotomous Earnings Prediction Models Over 1980 - 1985 (1975 - 1979 Estimation Period)

Panel E: Model 3a - Four-Year Drift

	Probability Cutoff Scheme: (.5,.5)[a]					Probability Cutoff Scheme: (.6,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	702	18.193	51.42%	90.10%	22.06%	41	12.159	78.05%	83.33%	70.59%
1981	658	6.225	35.41%	90.68%	17.51%	29	4.623	58.62%	100%	33.33%
1982	614	17.961	59.94%	92.11%	19.49%	71	15.832	77.47%	95.75%	41.67%
1983	565	10.065	64.07%	91.29%	17.70%	58	8.487	79.31%	90.91%	42.86%
1984	541	0.024	41.04%	86.07%	14.41%	46	1.831	63.04%	92.59%	21.05%
1985	491	14.553	51.53%	94.06%	17.28%	59	2.984	76.27%	100%	6.67%
Panel F: Model 3b - One-Year Drift										
1980	702	43.374	62.25%	49.86%	74.23%	116	27.049	75.86%	43.18%	95.83%
1981	658	6.729	59.73%	45.90%	65.05%	100	3.543	68.00%	40.74%	78.08%
1982	614	42.935	66.61%	71.77%	55.61%	123	44.689	82.93%	83.52%	81.25%
1983	565	16.298	58.58%	53.09%	63.79%	87	12.956	68.97%	66.07%	74.19%
1984	541	37.991	68.39%	52.20%	75.13%	69	13.084	73.91%	64.00%	79.55%
1985	491	19.639	59.88%	66.39%	53.44%	79	29.859	81.01%	88.64%	71.43%

[a]Under the (.5,.5) cutoff scheme an earnings increase (decrease) is predicted when $Pr > .5$ ($Pr \leq .5$). Under the (.6,.4) scheme an earnings increase (decrease) is predicted when $Pr \geq .6$ ($Pr \leq .4$). Observations with Pr between .4 and .6 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 30 - continued

Predictive Performance of Dichotomous Earnings Prediction Models Over 1980 - 1985 (1975 - 1979 Estimation Period)

Panel G: Model 4a - Four-Year Drift

	Probability Cutoff Scheme: (.5,.5)[a]					Probability Cutoff Scheme: (.6,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	702	43.670	61.25%	71.29%	53.63%	314	65.538	71.02%	86.99%	57.14%
1981	658	13.052	53.50%	71.43%	44.67%	297	12.234	53.20%	81.00%	39.09%
1982	614	60.353	66.29%	87.72%	39.34%	363	56.208	74.10%	94.93%	34.92%
1983	565	38.609	67.61%	85.11%	37.80%	325	53.074	76.92%	93.80%	38.38%
1984	541	21.953	52.12%	86.07%	32.06%	295	15.860	55.93%	91.04%	26.09%
1985	491	29.968	58.25%	85.84%	36.03%	280	17.103	60.71%	91.78%	26.86%
Panel H: Model 4b - One-Year Drift										
1980	702	74.197	66.10%	56.23%	75.63%	386	89.098	73.83%	64.89%	82.32%
1981	658	22.079	53.95%	73.77%	46.31%	297	12.541	53.87%	80.77%	39.38%
1982	614	51.208	70.85%	84.21%	42.34%	363	53.068	79.06%	92.62%	39.13%
1983	565	21.385	57.52%	85.09%	31.38%	325	27.691	63.69%	93.78%	27.70%
1984	541	1.305	41.77%	77.99%	26.70%	295	4.498	46.44%	88.18%	21.62%
1985	491	12.307	56.82%	80.74%	33.20%	280	8.640	59.64%	88.88%	24.41%

[a]Under the (.5,.5) cutoff scheme an earnings increase (decrease) is predicted when $Pr > .5$ ($Pr \leq .5$). Under the (.6,.4) scheme an earnings increase (decrease) is predicted when $Pr \geq .6$ ($Pr \leq .4$). Observations with Pr between .4 and .6 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 30 - continued

Predictive Performance of Dichotomous Earnings Prediction Models Over 1980 - 1985 (1975 - 1979 Estimation Period)

Panel I: Model 5a - Four-Year Drift

	Probability Cutoff Scheme: (.5,.5)[a]					Probability Cutoff Scheme: (.6,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	702	43.924	62.25%	65.35%	59.90%	352	82.877	73.86%	79.38%	69.27%
1981	658	24.668	55.32%	72.67%	49.70%	320	25.251	60.94%	76.19%	53.49%
1982	614	85.408	69.38%	81.29%	54.41%	334	78.681	75.75%	91.04%	52.63%
1983	565	60.940	70.26%	86.24%	43.06%	359	73.176	78.27%	95.16%	40.54%
1984	541	4.849	48.43%	77.61%	31.18%	324	4.170	51.54%	83.33%	26.11%
1985	491	23.735	58.25%	79.45%	41.18%	286	27.342	62.24%	89.85%	36.49%
Panel J: Model 5b - One-Year Drift										
1980	702	107.423	69.52%	71.59%	67.51%	430	152.448	79.77%	79.26%	80.28%
1981	658	97.235	69.30%	75.96%	66.74%	395	87.744	72.91%	81.39%	68.80%
1982	614	95.327	74.76%	85.64%	51.53%	446	122.455	81.61%	92.14%	55.47%
1983	565	124.531	73.10%	80.36%	66.21%	357	125.997	79.55%	85.71%	73.14%
1984	541	64.712	66.54%	74.84%	63.09%	338	67.155	70.41%	83.05%	63.64%
1985	491	50.561	65.17%	80.74%	49.80%	322	73.506	73.60%	89.71%	54.42%

[a]Under the (.5,.5) cutoff scheme an earnings increase (decrease) is predicted when $Pr > .5$ ($Pr \leq .5$). Under the (.6,.4) scheme an earnings increase (decrease) is predicted when $Pr \geq .6$ ($Pr \leq .4$). Observations with Pr between .4 and .6 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 30 - continued

Predictive Performance of Dichotomous Earnings Prediction Models Over 1980 - 1985 (1975 - 1979 Estimation Period)

Panel K: Model 6a - Four-Year Drift

	Probability Cutoff Scheme: (.5,.5)[a]					Probability Cutoff Scheme: (.6,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	702	37.174	61.68%	63.70%	60.15%	365	61.616	70.41%	73.01%	68.32%
1981	658	13.357	52.74%	68.94%	47.48%	347	16.955	57.64%	72.90%	50.83%
1982	614	63.314	66.94%	79.82%	50.74%	386	78.720	73.83%	88.99%	52.20%
1983	565	75.895	71.86%	87.64%	44.98%	377	90.287	78.79%	93.70%	47.97%
1984	541	3.083	48.61%	73.13%	34.12%	345	7.386	52.75%	81.63%	31.31%
1985	491	22.225	57.84%	79.45%	40.44%	305	27.380	61.31%	89.58%	36.02%
Panel L: Model 6b - One-Year Drift										
1980	702	129.790	71.51%	70.72%	72.27%	429	147.475	79.25%	76.39%	82.16%
1981	658	79.721	67.17%	74.32%	64.42%	400	88.581	73.00%	80.92%	69.14%
1982	614	91.913	74.27%	84.45%	52.55%	435	121.880	81.84%	90.73%	59.02%
1983	565	113.613	72.39%	73.82%	71.03%	356	140.962	81.46%	81.11%	81.82%
1984	541	52.853	65.25%	71.70%	62.57%	343	57.053	69.10%	78.86%	63.64%
1985	491	76.089	69.04%	81.15%	57.09%	326	89.102	75.46%	88.69%	61.39%

[a]Under the (.5,.5) cutoff scheme an earnings increase (decrease) is predicted when $Pr > .5$ ($Pr \leq .5$). Under the (.6,.4) scheme an earnings increase (decrease) is predicted when $Pr \geq .6$ ($Pr \leq .4$). Observations with Pr between .4 and .6 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 31

Predictive Performance of Trichotomous Earnings Prediction Models Over 1980 - 1985 (1975 - 1979 Estimation Period)

Panel A: Model 1c - Four-Year Drift

	Probability Cutoff Scheme: (.33,.33)[a]					Probability Cutoff Scheme: (.4,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	639	53.643	64.01%	69.47%	59.60%	322	59.067	71.12%	75.68%	67.24%
1981	592	12.569	53.38%	68.39%	48.05%	307	16.140	57.00%	76.47%	47.32%
1982	571	67.835	67.95%	89.47%	39.92%	352	66.422	75.00%	93.78%	41.73%
1983	524	51.375	70.04%	83.73%	45.16%	325	72.177	77.23%	91.08%	50.89%
1984	508	20.235	53.54%	82.72%	35.96%	278	14.152	57.55%	88.55%	29.93%
1985	462	24.808	58.66%	82.46%	38.65%	282	37.156	63.83%	93.28%	37.16%
Panel B: Model 1d - One-Year Drift										
1980	615	105.869	70.73%	79.75%	60.88%	403	129.615	78.66%	87.50%	67.60%
1981	573	29.805	55.67%	77.91%	46.83%	360	44.060	63.33%	83.46%	52.36%
1982	570	93.050	77.02%	90.77%	44.38%	445	91.511	80.90%	95.12%	41.03%
1983	500	99.064	71.60%	83.06%	60.32%	375	109.314	76.53%	87.56%	64.84%
1984	478	41.399	59.41%	81.76%	49.39%	303	57.075	67.99%	87.83%	55.85%
1985	442	48.551	64.93%	88.94%	39.81%	331	52.865	70.09%	93.09%	39.86%

[a]Under the (.33,.33) cutoff scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .33. Similarly, under the (.4,.4) scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .4. Observations between these cutoffs are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 31 - continued

Predictive Performance of Trichotomous Earnings Prediction Models Over 1980 - 1985 (1975 - 1979 Estimation Period)

Panel C: Model 2c - Four-Year Drift

	Probability Cutoff Scheme: (.33,.33)[a]					Probability Cutoff Scheme: (.4,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	661	22.818	58.70%	64.48%	54.18%	263	31.773	66.54%	76.03%	58.45%
1981	623	2.922	49.12%	63.40%	44.47%	255	4.289	51.76%	70.73%	42.77%
1982	585	15.496	60.17%	80.61%	33.73%	315	14.446	66.67%	87.56%	29.82%
1983	541	36.611	67.28%	80.35%	44.10%	273	31.085	75.53%	89.50%	39.13%
1984	501	6.484	50.50%	75.79%	35.05%	238	0.656	48.74%	79.81%	24.63%
1985	463	15.214	55.94%	81.99%	34.13%	233	13.600	60.52%	90.91%	27.68%
Panel D: Model 2d - One-Year Drift										
1980	621	98.794	69.08%	85.85%	51.49%	432	130.225	77.08%	93.33%	56.77%
1981	579	40.484	55.27%	84.52%	43.31%	387	48.726	60.47%	90.37%	44.44%
1982	574	63.332	74.56%	92.73%	33.14%	469	68.640	78.89%	95.65%	32.26%
1983	493	138.224	76.06%	84.49%	67.74%	351	131.914	80.63%	87.03%	73.49%
1984	456	62.301	64.25%	84.35%	54.69%	313	67.959	70.61%	87.20%	59.57%
1985	451	99.384	71.62%	93.62%	47.69%	359	88.224	74.37%	95.10%	47.10%

[a] Under the (.33,.33) cutoff scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .33. Similarly, under the (.4,.4) scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .4. Observations between these cutoffs are dropped.

[b] A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 31 - continued

Predictive Performance of Trichotomous Earnings Prediction Models Over 1980 - 1985 (1975 - 1979 Estimation Period)

Panel E: Model 3c - Four-Year Drift

	Probability Cutoff Scheme: (.33,.33)[a]					Probability Cutoff Scheme: (.4,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	682	27.137	57.33%	76.85%	42.19%	51	17.694	78.43%	64.00%	92.31%
1981	637	13.796	45.53%	81.82%	33.95%	44	17.052	81.82%	27.27%	80.00%
1982	604	40.845	64.24%	84.96%	37.74%	61	24.742	83.61%	92.31%	68.18%
1983	554	17.051	63.54%	78.35%	37.93%	54	12.834	77.78%	81.58%	68.75%
1984	526	5.335	49.43%	76.26%	33.23%	47	7.318	70.21%	84.62%	52.38%
1985	478	20.767	56.28%	84.98%	33.21%	53	12.966	83.02%	95.00%	46.15%

Panel F: Model 3d - One-Year Drift

Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	671	38.563	61.70%	74.63%	48.49%	130	27.782	73.08%	71.21%	75.00%
1981	632	1.870	44.62%	71.10%	34.64%	125	9.282	60.80%	75.56%	52.50%
1982	597	34.725	68.84%	81.66%	40.96%	186	47.631	83.33%	87.33%	66.67%
1983	549	1.174	51.55%	72.66%	31.56%	130	3.859	63.85%	76.47%	40.00%
1984	517	9.566	48.74%	77.42%	36.46%	105	10.815	63.81%	83.67%	46.43%
1985	479	19.676	59.08%	81.67%	36.40%	140	24.887	72.14%	93.98%	40.35%

[a]Under the (.33,.33) cutoff scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .33. Similarly, under the (.4,.4) scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .4. Observations between these cutoffs are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 31 - continued

Predictive Performance of Trichotomous Earnings Prediction Models Over 1980 - 1985 (1975 - 1979 Estimation Period)

Panel G: Model 4c - Four-Year Drift

	Probability Cutoff Scheme: (.33,.33)[a]					Probability Cutoff Scheme: (.4,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	627	45.754	63.64%	63.18%	64.00%	369	71.520	71.82%	75.15%	69.12%
1981	587	26.338	59.80%	67.12%	57.37%	349	25.199	61.32%	72.90%	56.20%
1982	565	70.924	68.67%	84.64%	47.97%	381	75.109	75.07%	90.83%	48.23%
1983	526	59.686	70.34%	81.79%	50.26%	331	54.984	75.53%	87.56%	50.00%
1984	499	27.456	56.91%	80.83%	41.83%	312	35.907	62.18%	88.72%	42.46%
1985	451	33.743	60.98%	43.95%	81.77%	298	26.842	62.75%	87.76%	38.41%
Panel H: Model 4d - One-Year Drift										
1980	618	79.697	67.96%	70.61%	65.25%	413	94.765	74.09%	77.63%	70.10%
1981	584	26.800	56.51%	73.96%	49.40%	363	34.419	61.43%	80.00%	52.26%
1982	576	81.717	75.87%	90.32%	42.20%	443	78.859	80.14%	93.03%	42.48%
1983	523	28.595	60.23%	84.73%	35.63%	371	32.661	65.77%	34.16%	90.00%
1984	493	17.372	54.36%	74.51%	45.29%	351	22.075	57.26%	81.10%	43.75%
1985	452	24.753	60.84%	84.48%	35.91%	332	21.459	62.65%	89.44%	30.92%

[a]Under the (.33,.33) cutoff scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .33. Similarly, under the (.4,.4) scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .4. Observations between these cutoffs are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 31 - continued

Predictive Performance of Trichotomous Earnings Prediction Models Over 1980 - 1985 (1975 - 1979 Estimation Period)

Panel I: Model 5c - Four-Year Drift

	Probability Cutoff Scheme: (.33,.33)[a]					Probability Cutoff Scheme: (.4,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	644	59.539	65.53%	63.35%	67.22%	392	82.361	73.47%	69.46%	76.44%
1981	602	26.264	59.30%	67.55%	56.54%	348	25.004	62.64%	69.52%	59.67%
1982	572	75.247	69.06%	80.75%	54.00%	377	74.279	74.01%	87.22%	54.00%
1983	532	64.349	71.05%	83.24%	49.48%	364	70.260	76.92%	91.06%	47.46%
1984	499	16.521	55.31%	75.26%	42.62%	328	14.174	57.01%	79.43%	40.11%
1985	449	23.700	59.24%	77.61%	44.35%	307	21.286	61.56%	84.21%	39.35%
Panel J: Model 5d - One-Year Drift										
1980	613	114.051	70.96%	83.12%	58.69%	444	131.598	77.48%	86.94%	65.83%
1981	549	66.312	62.66%	83.93%	53.28%	405	63.555	65.68%	86.21%	54.23%
1982	572	108.144	77.62%	92.91%	43.50%	466	93.698	80.90%	94.78%	41.32%
1983	497	124.518	74.45%	87.55%	60.42%	382	140.151	80.10%	91.87%	65.90%
1984	454	53.468	61.89%	84.93%	50.97%	330	59.120	65.76%	90.98%	50.96%
1985	434	66.036	67.51%	90.95%	43.19%	344	64.735	70.93%	93.12%	43.87%

[a]Under the (.33,.33) cutoff scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .33. Similarly, under the (.4,.4) scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .4. Observations between these cutoffs are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 31 - continued

Predictive Performance of Trichotomous Earnings Prediction Models Over 1980 - 1985 (1975 - 1979 Estimation Period)

Panel K: Model 6c - Four-Year Drift

	Probability Cutoff Scheme: (.33,.33)[a]					Probability Cutoff Scheme: (.4,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	619	54.607	65.27%	61.76%	68.01%	338	75.284	73.96%	70.95%	76.32%
1981	592	15.046	57.43%	62.67%	55.66%	324	18.759	59.88%	71.15%	54.55%
1982	562	88.777	70.82%	82.76%	55.14%	351	75.369	74.64%	88.52%	54.23%
1983	516	76.574	72.67%	82.88%	54.10%	350	84.532	77.71%	89.87%	55.28%
1984	494	26.671	56.88%	79.01%	44.09%	318	19.566	58.81%	82.73%	40.22%
1985	453	26.056	60.26%	76.21%	46.96%	288	28.261	62.85%	86.76%	41.45%
Panel L: Model 6d - One-Year Drift										
1980	596	120.383	71.64%	86.09%	56.80%	447	151.435	79.19%	89.88%	66.00%
1981	563	57.600	59.33%	85.96%	47.70%	406	55.012	63.30%	86.81%	50.38%
1982	567	77.023	76.19%	92.00%	38.32%	484	79.724	79.96%	94.18%	38.21%
1983	498	128.729	74.70%	87.80%	61.07%	400	136.166	79.00%	89.77%	66.49%
1984	471	40.610	57.32%	86.09%	43.75%	351	50.607	62.11%	91.20%	46.02%
1985	449	66.543	67.04%	92.17%	40.64%	372	71.531	70.43%	94.53%	42.11%

[a]Under the (.33,.33) cutoff scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .33. Similarly, under the (.4,.4) scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .4. Observations between these cutoffs are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 32

Predictive Performance of Ordinary Least Squares Earnings Prediction Models Over 1980 - 1985 (1975 - 1979 Estimation Period)

Panel A: Model 1e - Four-Year Drift

	Probability Cutoff Scheme: 0.0[a]					Probability Cutoff Scheme: (-.50,.50)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	702	30.329	60.54%	60.07%	60.90%	133	20.799	72.93%	60.00%	79.55%
1981	658	10.050	55.62%	60.25%	54.12%	114	7.424	64.04%	59.52%	66.67%
1982	614	26.497	61.73%	78.07%	41.18%	135	19.661	70.37%	85.90%	49.12%
1983	565	31.983	63.89%	69.10%	55.02%	142	31.088	73.94%	75.90%	71.19%
1984	541	19.008	55.45%	74.63%	44.12%	118	15.211	64.41%	88.89%	43.75%
1985	491	32.356	61.51%	73.52%	51.84%	138	36.291	75.36%	86.11%	63.64%
Panel B: Model 1f - One-Year Drift										
1980	702	1.197	62.11%	94.77%	7.25%	492	0.103	64.02%	97.19%	2.33%
1981	658	3.164	34.80%	92.54%	4.19%	462	3.452	33.55%	94.90%	1.97%
1982	614	0.083	66.12%	94.48%	6.09%	445	0.007	66.52%	96.68%	3.47%
1983	565	6.709	69.74%	93.95%	12.50%	390	3.383	73.59%	96.54%	7.92%
1984	541	0.249	45.66%	90.65%	8.14%	358	0.040	46.09%	93.29%	6.19%
1985	491	0.598	55.40%	91.54%	10.50%	335	3.348	58.21%	96.84%	7.59%

[a]Under the 0.0 cutoff scheme an earnings increase (decrease) is when the predicted standardized earnings change is greater (less) than 0.0. Under the (-.50,.50) scheme an earnings increase (decrease) is when the predicted standardized earnings change is greater (less) than .50 (-.50). Observations between -.50 and .50 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 32 - continued

Predictive Performance of Ordinary Least Squares Earnings Prediction Models Over 1980 - 1985 (1975 - 1979 Estimation Period)

Panel C: Model 2e - Four-Year Drift

	Probability Cutoff Scheme: 0.0[a]					Probability Cutoff Scheme: (-.50,.50)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	702	3.967	53.70%	54.46%	53.13%	147	12.514	65.31%	56.92%	71.95%
1981	658	1.712	52.74%	53.42%	52.52%	149	0.408	46.98%	48.00%	46.46%
1982	614	2.867	55.21%	70.76%	35.66%	164	0.775	59.15%	76.70%	29.51%
1983	565	23.527	63.19%	71.91%	48.33%	162	5.632	65.43%	78.70%	38.89%
1984	541	3.848	51.76%	64.18%	44.41%	125	3.985	58.40%	68.33%	49.23%
1985	491	21.661	58.66%	74.43%	45.96%	130	14.961	66.15%	85.07%	46.03%
Panel D: Model 2f - One-Year Drift										
1980	702	0.015	40.60%	13.41%	86.26%	359	0.584	38.44%	5.68%	96.15%
1981	658	0.343	61.25%	17.11%	84.65%	335	0.013	61.79%	7.38%	92.96%
1982	614	1.727	40.55%	28.30%	66.50%	230	0.341	36.52%	20.73%	75.76%
1983	565	0.381	38.41%	23.17%	74.40%	243	0.142	36.63%	12.05%	89.61%
1984	541	0.041	52.87%	14.63%	84.75%	274	2.220	51.09%	4.76%	90.54%
1985	491	4.090	51.53%	30.51%	77.63%	213	3.152	53.52%	16.67%	91.43%

[a]Under the 0.0 cutoff scheme an earnings increase (decrease) is when the predicted standardized earnings change is greater (less) than 0.0. Under the (-.50,.50) scheme an earnings increase (decrease) is when the predicted standardized earnings change is greater (less) than .50 (-.50). Observations between -.50 and .50 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 32 - continued

Predictive Performance of Ordinary Least Squares Earnings Prediction Models Over 1980 - 1985 (1975 - 1979 Estimation Period)

Panel E: Model 3e - Four-Year Drift

	Probability Cutoff Scheme: 0.0[a]					Probability Cutoff Scheme: (-.50,.50)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	702	14.427	58.69%	4.95%	99.50%	548	7.411	64.42%	3.00%	99.71%
1981	658	17.831	76.44%	7.45%	98.79%	509	16.492	81.93%	5.21%	99.76%
1982	614	14.713	49.02%	10.53%	97.43%	388	12.876	59.02%	9.30%	98.61%
1983	565	8.932	41.95%	9.55%	97.13%	411	4.509	42.34%	5.24%	98.77%
1984	541	14.542	65.06%	10.95%	97.06%	394	6.394	70.81%	6.78%	98.19%
1985	491	30.501	61.51%	16.89%	97.43%	317	12.364	66.88%	8.85%	99.02%
Panel F: Model 3f - One-Year Drift										
1980	702	1.682	37.18%	0.00%	99.62%	281	1.312	36.29%	0.00%	100.00%
1981	658	1.889	65.50%	0.44%	100.00%	264	1.342	64.40%	0.00%	100.00%
1982	614	0.948	32.41%	0.48%	100.00%	218	0.891	32.57%	0.00%	100.00%
1983	565	1.276	30.27%	0.76%	100.00%	223	0.993	25.12%	0.00%	100.00%
1984	541	0.017	54.53%	0.41%	99.66%	201	0.008	44.26%	0.00%	100.00%
1985	491	0.807	44.81%	0.37%	100.00%	198	0.726	47.31%	0.00%	100.00%

[a]Under the 0.0 cutoff scheme an earnings increase (decrease) is when the predicted standardized earnings change is greater (less) than 0.0. Under the (-.50,.50) scheme an earnings increase (decrease) is when the predicted standardized earnings change is greater (less) than .50 (-.50). Observations between -.50 and .50 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 32 - continued

Predictive Performance of Ordinary Least Squares Earnings Prediction Models Over 1980 - 1985 (1975 - 1979 Estimation Period)

Panel G: Model 4e - Four-Year Drift

	Probability Cutoff Scheme: 0.0[a]					Probability Cutoff Scheme: (-.50,.50)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	702	19.401	60.68%	22.77%	89.47%	376	29.364	69.41%	19.40%	97.11%
1981	658	36.197	74.62%	31.68%	88.53%	339	46.153	81.42%	33.78%	94.72%
1982	614	15.806	54.23%	32.16%	81.99%	283	25.477	63.96%	41.30%	85.52%
1983	565	9.372	49.73%	32.02%	79.90%	224	14.918	57.59%	33.33%	88.78%
1984	541	18.294	63.77%	37.81%	79.12%	216	19.954	67.59%	48.84%	80.00%
1985	491	16.557	60.49%	40.64%	76.47%	232	24.621	67.67%	49.49%	81.20%
Panel H: Model 4f - One-Year Drift										
1980	702	2.677	62.25%	93.18%	10.31%	451	3.072	65.85%	98.31%	4.49%
1981	658	3.990	35.11%	89.04%	6.51%	430	6.209	34.19%	96.69%	0.36%
1982	614	0.689	63.36%	89.21%	8.63%	407	2.054	63.39%	93.73%	2.94%
1983	565	1.794	67.79%	91.18%	12.50%	361	1.606	72.02%	96.28%	1.09%
1984	541	0.126	46.58%	92.68%	8.14%	369	1.689	48.78%	98.86%	3.11%
1985	491	2.363	51.93%	86.40%	9.13%	311	0.573	55.63%	94.38%	3.76%

[a]Under the 0.0 cutoff scheme an earnings increase (decrease) is when the predicted standardized earnings change is greater (less) than 0.0. Under the (-.50,.50) scheme an earnings increase (decrease) is when the predicted standardized earnings change is greater (less) than .50 (-.50). Observations between -.50 and .50 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 32 - continued

Predictive Performance of Ordinary Least Squares Earnings Prediction Models Over 1980 - 1985 (1975 - 1979 Estimation Period)

Panel I: Model 5e - Four-Year Drift

	Probability Cutoff Scheme: 0.0[a]					Probability Cutoff Scheme: (-.50,.50)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	702	41.780	62.96%	56.44%	67.92%	192	51.767	77.60%	67.12%	84.03%
1981	658	33.587	61.40%	66.46%	59.76%	169	21.276	68.64%	65.15%	70.87%
1982	614	50.636	65.31%	76.90%	50.74%	202	28.526	74.26%	84.89%	50.79%
1983	565	48.581	67.96%	78.93%	49.28%	206	49.663	80.58%	92.52%	50.85%
1984	541	17.667	55.64%	72.64%	45.59%	184	9.331	60.87%	73.91%	47.83%
1985	491	18.299	57.84%	73.52%	45.22%	190	20.275	65.79%	89.22%	38.64%
Panel J: Model 5f - One-Year Drift										
1980	702	3.401	62.39%	92.95%	11.07%	506	0.055	64.82%	96.71%	2.91%
1981	658	0.203	35.87%	94.30%	4.88%	473	0.689	35.52%	96.41%	2.29%
1982	614	5.001	62.38%	89.45%	5.08%	400	0.103	66.00%	94.51%	4.72%
1983	565	2.620	69.20%	94.71%	8.93%	408	0.277	72.30%	97.32%	3.67%
1984	541	0.037	46.03%	91.06%	8.47%	392	3.572	45.15%	94.54%	1.91%
1985	491	2.416	56.42%	92.28%	11.87%	342	2.946	59.06%	97.47%	6.25%

[a]Under the 0.0 cutoff scheme an earnings increase (decrease) is when the predicted standardized earnings change is greater (less) than 0.0. Under the (-.50,.50) scheme an earnings increase (decrease) is when the predicted standardized earnings change is greater (less) than .50 (-.50). Observations between -.50 and .50 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 32 - continued

Predictive Performance of Ordinary Least Squares Earnings Prediction Models Over 1980 - 1985 (1975 - 1979 Estimation Period)

Panel K: Model 6e - Four-Year Drift

	Probability Cutoff Scheme: 0.0[a]					Probability Cutoff Scheme: (-.50,.50)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1980	702	34.573	62.11%	52.81%	69.17%	208	27.166	69.71%	52.33%	81.97%
1981	658	13.388	58.21%	58.39%	58.15%	200	4.219	59.50%	51.47%	63.64%
1982	614	37.515	63.36%	73.98%	50.00%	241	22.097	67.63%	83.33%	44.33%
1983	565	36.519	64.96%	71.07%	54.55%	250	32.803	70.00%	78.81%	56.57%
1984	541	19.255	56.93%	70.15%	49.12%	212	9.570	58.02%	77.42%	42.86%
1985	491	35.200	61.91%	74.89%	51.47%	228	17.490	60.96%	84.91%	40.16%
Panel L: Model 6d - One-Year Drift										
1980	702	0.091	60.68%	91.14%	9.54%	473	2.978	64.06%	97.34%	5.81%
1981	658	0.438	36.17%	92.11%	6.51%	461	0.568	35.36%	95.65%	3.00%
1982	614	0.001	64.66%	90.89%	9.14%	432	2.362	64.35%	95.83%	1.39%
1983	565	5.481	69.38%	93.45%	12.50%	409	0.159	73.11%	97.38%	1.92%
1984	541	0.377	45.47%	91.46%	7.12%	403	0.181	47.64%	95.34%	3.81%
1985	491	1.576	56.01%	91.54%	11.87%	353	1.464	58.36%	95.10%	8.05%

[a]Under the 0.0 cutoff scheme an earnings increase (decrease) is when the predicted standardized earnings change is greater (less) than 0.0. Under the (-.50,.50) scheme an earnings increase (decrease) is when the predicted standardized earnings change is greater (less) than .50 (-.50). Observations between -.50 and .50 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 33

Predictive Performance of Dichotomous Earnings Prediction Models Over 1985 - 1990 (1980 - 1984 Estimation Period)

Panel A: Model 1a - Four-Year Drift

	Probability Cutoff Scheme: (.5,.5)[a]					Probability Cutoff Scheme: (.6,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	491	39.640	64.97%	54.34%	73.53%	285	52.872	71.93%	59.69%	82.05%
1986	473	41.529	63.64%	56.62%	73.13%	274	43.516	68.98%	63.12%	77.19%
1987	468	11.355	55.13%	41.85%	73.23%	258	19.994	59.30%	42.86%	83.65%
1988	480	45.725	67.08%	44.33%	83.75%	312	42.591	72.11%	42.61%	89.34%
1989	456	17.986	64.69%	43.04%	76.17%	288	38.690	73.96%	48.35%	85.79%
1990	473	61.640	71.04%	61.84%	75.39%	268	73.005	78.73%	67.78%	84.27%
Panel B: Model 1b - One-Year Drift										
1985	491	59.711	67.41%	63.93%	70.85%	294	67.232	73.81%	71.43%	76.43%
1986	473	39.118	63.64%	58.52%	70.44%	290	49.347	70.00%	65.70%	76.27%
1987	468	49.776	66.03%	45.70%	84.21%	346	54.226	69.36%	45.91%	89.30%
1988	480	64.086	71.87%	44.63%	87.79%	353	67.579	77.05%	42.10%	93.72%
1989	456	65.966	70.83%	47.31%	87.04%	308	65.830	75.65%	47.83%	92.23%
1990	473	87.254	72.52%	61.81%	80.29%	301	99.614	80.07%	67.80%	87.98%

[a]Under the (.5,.5) cutoff scheme an earnings increase (decrease) is predicted when $Pr > .5$ ($Pr \leq .5$). Under the (.6,.4) scheme an earnings increase (decrease) is predicted when $Pr \geq .6$ ($Pr \leq .4$). Observations with *Pr* between .4 and .6 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 33 - continued

Predictive Performance of Dichotomous Earnings Prediction Models Over 1985 - 1990 (1980 - 1984 Estimation Period)

Panel C: Model 2a - Four-Year Drift

	Probability Cutoff Scheme: (.5,.5)[a]					Probability Cutoff Scheme: (.6,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	491	17.941	60.49%	48.86%	69.85%	236	15.058	63.98%	50.50%	74.07%
1986	473	5.755	54.12%	46.32%	64.68%	236	10.543	59.32%	52.55%	68.69%
1987	468	.768	49.79%	37.78%	66.16%	209	3.629	53.11%	41.41%	71.61%
1988	480	12.255	60.21%	39.90%	75.09%	243	11.021	65.43%	38.20%	81.17%
1989	456	5.266	60.53%	37.97%	72.48%	221	10.720	66.97%	41.10%	79.73%
1990	473	41.212	68.71%	54.61%	75.39%	211	42.484	75.36%	65.22%	80.28%
Panel D: Model 2b - One-Year Drift										
1985	491	46.455	65.38%	63.11%	67.61%	391	47.475	67.26%	63.18%	71.58%
1986	473	67.751	66.60%	54.44%	82.76%	325	75.208	73.23%	63.31%	83.97%
1987	468	61.279	67.31%	43.89%	88.26%	350	67.494	71.14%	44.30%	93.23%
1988	480	87.632	74.38%	50.85%	88.12%	365	94.981	80.27%	54.46%	91.70%
1989	456	72.077	71.49%	55.91%	82.22%	310	93.855	79.68%	63.72%	88.83%
1990	473	105.760	74.42%	67.84%	79.20%	339	111.689	79.35%	70.14%	86.15%

[a] Under the (.5,.5) cutoff scheme an earnings increase (decrease) is predicted when $Pr > .5$ ($Pr \leq .5$). Under the (.6,.4) scheme an earnings increase (decrease) is predicted when $Pr \geq .6$ ($Pr \leq .4$). Observations with Pr between .4 and .6 are dropped.

[b] A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 33 - continued

Predictive Performance of Dichotomous Earnings Prediction Models Over 1985 - 1990 (1980 - 1984 Estimation Period)

Panel E: Model 3a - Four-Year Drift

	Probability Cutoff Scheme: (.5,.5)[a]					Probability Cutoff Scheme: (.6,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	491	37.228	64.56%	53.43%	73.53%	209	49.612	74.16%	60.20%	86.49%
1986	473	14.496	56.24%	43.38%	73.63%	193	26.887	64.25%	52.03%	85.71%
1987	468	8.208	53.00%	35.56%	76.77%	192	13.157	56.77%	31.82%	90.24%
1988	480	29.152	64.38%	38.92%	83.03%	217	43.876	76.04%	40.79%	95.04%
1989	456	22.478	66.45%	40.51%	80.20%	212	41.400	77.83%	39.39%	95.21%
1990	473	65.480	72.52%	57.90%	79.44%	187	69.974	84.00%	65.52%	92.25%
Panel F: Model 3b - One-Year Drift										
1985	491	19.593	59.88%	50.82%	68.83%	183	35.679	70.49%	56.25%	86.21%
1986	473	7.873	54.55%	43.70%	68.97%	175	16.508	60.57%	51.24%	81.48%
1987	468	11.632	58.33%	38.46%	76.11%	195	14.348	63.59%	33.71%	88.68%
1988	480	31.650	67.29%	39.55%	83.50%	203	41.771	78.82%	40.98%	95.07%
1989	456	27.091	64.91%	39.25%	82.59%	192	43.959	73.96%	37.66%	98.26%
1990	473	43.570	66.81%	49.25%	79.56%	176	47.242	75.57%	51.95%	93.94%

[a]Under the (.5,.5) cutoff scheme an earnings increase (decrease) is predicted when $Pr > .5$ ($Pr \leq .5$). Under the (.6,.4) scheme an earnings increase (decrease) is predicted when $Pr \geq .6$ ($Pr \leq .4$). Observations with *Pr* between .4 and .6 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 33 - continued

Predictive Performance of Dichotomous Earnings Prediction Models Over 1985 - 1990 (1980 - 1984 Estimation Period)

Panel G: Model 4a - Four-Year Drift

	Probability Cutoff Scheme: (.5,.5)[a]					Probability Cutoff Scheme: (.6,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	491	19.981	60.90%	51.14%	68.75%	308	36.730	67.53%	58.33%	75.61%
1986	473	38.040	63.42%	58.46%	70.15%	279	44.458	69.18%	64.24%	76.32%
1987	468	8.956	54.91%	44.44%	69.19%	274	20.799	59.49%	43.21%	83.04%
1988	480	54.472	68.33%	45.32%	85.20%	337	61.796	73.89%	48.84%	89.42%
1989	456	50.348	70.39%	52.53%	79.87%	279	49.185	75.99%	51.68%	87.37%
1990	473	27.148	64.48%	57.24%	67.91%	264	46.164	73.11%	61.22%	80.12%
Panel H: Model 4b - One-Year Drift										
1985	491	41.671	64.56%	65.16%	63.97%	297	37.009	67.68%	68.18%	67.13%
1986	473	13.814	58.56%	58.15%	59.11%	287	20.093	64.11%	67.25%	59.48%
1987	468	18.432	60.26%	42.53%	76.11%	311	25.099	63.02%	43.59%	82.58%
1988	480	37.953	68.33%	40.68%	84.49%	354	43.312	72.88%	40.00%	89.74%
1989	456	56.593	69.52%	50.54%	82.59%	298	55.529	73.49%	48.30%	90.00%
1990	473	66.433	69.77%	60.80%	76.28%	287	87.091	78.05%	67.20%	86.42%

[a]Under the (.5,.5) cutoff scheme an earnings increase (decrease) is predicted when $Pr > .5$ ($Pr \leq .5$). Under the (.6,.4) scheme an earnings increase (decrease) is predicted when $Pr \geq .6$ ($Pr \leq .4$). Observations with Pr between .4 and .6 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 33 - continued

Predictive Performance of Dichotomous Earnings Prediction Models Over 1985 - 1990 (1980 - 1984 Estimation Period)

Panel I: Model 5a - Four-Year Drift

	Probability Cutoff Scheme: (.5,.5)[a]					Probability Cutoff Scheme: (.6,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	491	29.002	62.93%	52.97%	70.96%	308	42.880	68.83%	59.31%	77.30%
1986	473	31.100	62.16%	57.72%	68.16%	286	43.405	68.18%	61.85%	77.88%
1987	468	9.619	54.91%	43.33%	70.71%	285	12.876	57.89%	44.85%	75.83%
1988	480	51.536	67.92%	47.78%	82.67%	327	59.071	74.92%	51.30%	87.74%
1989	456	40.184	69.08%	48.73%	79.87%	301	32.891	72.09%	45.92%	84.73%
1990	473	56.209	70.19%	61.18%	74.45%	287	53.152	74.56%	61.22%	81.48%
Panel J: Model 5b - One-Year Drift										
1985	491	46.455	65.38%	63.11%	67.61%	391	47.475	67.26%	63.18%	71.58%
1986	473	42.382	63.42%	54.44%	75.37%	395	52.013	66.83%	57.92%	78.16%
1987	468	39.605	64.10%	39.82%	85.83%	407	54.211	66.83%	38.22%	92.13%
1988	480	96.093	75.21%	45.20%	92.74%	419	110.774	78.76%	45.14%	96.36%
1989	456	56.726	69.52%	51.07%	82.22%	374	55.466	71.92%	52.82%	83.62%
1990	473	67.214	69.98%	59.30%	77.74%	378	72.887	73.28%	60.64%	82.06%

[a]Under the (.5,.5) cutoff scheme an earnings increase (decrease) is predicted when $Pr > .5$ ($Pr \leq .5$). Under the (.6,.4) scheme an earnings increase (decrease) is predicted when $Pr \geq .6$ ($Pr \leq .4$). Observations with Pr between .4 and .6 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 33 - continued

Predictive Performance of Dichotomous Earnings Prediction Models Over 1985 - 1990 (1980 - 1984 Estimation Period)

Panel K: Model 6a - Four-Year Drift

	Probability Cutoff Scheme: (.5,.5)[a]					Probability Cutoff Scheme: (.6,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	491	17.970	60.29%	52.05%	66.91%	308	39.729	68.51%	58.27%	76.92%
1986	473	41.982	63.64%	56.25%	73.63%	294	48.497	69.39%	64.00%	77.31%
1987	468	3.197	52.56%	44.07%	64.14%	277	16.326	58.84%	46.71%	77.27%
1988	480	54.439	68.33%	47.78%	83.39%	328	55.484	72.87%	47.66%	89.00%
1989	456	35.441	67.76%	50.63%	76.85%	310	47.586	73.87%	51.43%	85.37%
1990	473	48.195	68.92%	59.87%	73.21%	311	64.633	74.92%	64.60%	80.81%
Panel L: Model 6b - One-Year Drift										
1985	491	87.397	71.08	68.44	73.68%	356	93.085	75.56%	74.01%	77.09%
1986	473	75.609	68.71	60.74	79.31%	355	75.571	71.27%	60.70%	85.06%
1987	468	69.978	68.38	44.80	89.47%	379	74.526	71.77%	45.24%	92.89%
1988	480	100.474	75.63	92.74	46.33%	405	104.864	79.51%	47.73%	94.87%
1989	456	114.776	76.32	61.83	86.30%	350	109.984	79.43%	62.77%	90.14%
1990	473	114.273	75.26	69.85	79.20%	351	115.752	79.20%	73.03%	83.92%

[a]Under the (.5,.5) cutoff scheme an earnings increase (decrease) is predicted when $Pr > .5$ ($Pr \leq .5$). Under the (.6,.4) scheme an earnings increase (decrease) is predicted when $Pr \geq .6$ ($Pr \leq .4$). Observations with Pr between .4 and .6 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 34

Predictive Performance of Trichotomous Earnings Prediction Models Over 1985 - 1990 (1980 - 1984 Estimation Period)

Panel A: Model 1c - Four-Year Drift

	Probability Cutoff Scheme: (.33,.33)[a]					Probability Cutoff Scheme: (.4,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	438	29.550	61.42%	74.74%	50.82%	235	31.533	67.66%	81.36%	53.85%
1986	416	19.918	63.22%	74.90%	46.15%	234	23.110	71.79%	84.91%	44.00%
1987	401	11.435	59.10%	62.88%	54.07%	227	14.366	63.88%	68.12%	57.30%
1988	426	47.596	67.61%	61.93%	71.60%	276	48.956	72.10%	66.97%	75.45%
1989	415	37.389	65.30%	67.38%	64.23%	232	29.235	68.10%	68.97%	67.59%
1990	429	45.983	62.70%	80.56%	53.68%	236	47.104	71.19%	81.00%	63.97%
Panel B: Model 1d - One-Year Drift										
1985	407	58.531	68.80%	81.13%	55.38%	274	58.379	73.72%	89.81%	52.14%
1986	399	41.735	67.42%	77.29%	54.12%	259	42.222	72.59%	84.91%	53.00%
1987	400	45.169	67.00%	59.79%	73.46%	264	59.586	73.86%	70.40%	76.98%
1988	415	81.111	74.46%	59.35%	83.46%	285	81.595	78.60%	66.98%	85.47%
1989	377	61.730	71.09%	61.73%	78.14%	227	70.974	78.41%	72.73%	82.81%
1990	408	89.822	73.04%	78.45%	68.72%	270	61.881	73.70%	79.70%	67.88%

[a]Under the (.33,.33) cutoff scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .33. Similarly, under the (.4,.4) scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .4. Observations between these cutoffs are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 34 - continued

Predictive Performance of Trichotomous Earnings Prediction Models Over 1985 - 1990 (1980 - 1984 Estimation Period)

Panel C: Model 2c - Four-Year Drift

	Probability Cutoff Scheme: (.33,.33)[a]					Probability Cutoff Scheme: (.4,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	450	10.533	56.22%	69.80%	45.16%	232	18.304	62.50%	82.30%	43.70%
1986	431	8.469	58.93%	70.68%	42.86%	215	4.566	64.19%	83.45%	28.95%
1987	429	0.127	52.68%	62.25%	39.44%	205	0.299	57.56%	72.52%	31.08%
1988	436	23.987	61.47%	64.55%	59.11%	227	14.518	62.11%	67.35%	58.14%
1989	424	11.772	57.08%	64.19%	53.26%	211	8.667	57.35%	71.79%	48.87%
1990	430	28.798	57.91%	79.43%	47.40%	198	23.030	62.63%	86.42%	46.15%
Panel D: Model 2d - One-Year Drift										
1985	436	119.706	75.69%	85.25%	66.21%	283	113.115	81.27%	92.81%	67.69%
1986	390	94.017	74.87%	76.13%	73.21%	285	109.169	81.40%	86.42%	74.80%
1987	396	66.839	70.71%	60.00%	80.09%	285	71.391	75.09%	63.64%	84.97%
1988	419	112.409	78.04%	68.71%	83.09%	308	111.154	81.82%	74.07%	86.00%
1989	378	88.498	74.07%	77.22%	71.82%	250	100.592	81.60%	85.05%	79.02%
1990	390	94.657	74.10%	80.68%	68.69%	295	86.709	76.61%	85.62%	67.79%

[a]Under the (.33,.33) cutoff scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .33. Similarly, under the (.4,.4) scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .4. Observations between these cutoffs are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 34 - continued

Predictive Performance of Trichotomous Earnings Prediction Models Over 1985 - 1990 (1980 - 1984 Estimation Period)

Panel E: Model 3c - Four-Year Drift

	Probability Cutoff Scheme: (.33,.33)[a]					Probability Cutoff Scheme: (.4,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	450	22.383	59.11%	78.26%	42.80%	203	31.397	69.96%	84.68%	52.17%
1986	425	4.815	57.65%	70.85%	39.33%	185	12.790	68.11%	50.88%	75.78%
1987	424	6.840	57.31%	62.45%	50.28%	178	18.060	66.29%	65.25%	68.33%
1988	429	30.896	62.47%	69.89%	57.31%	188	46.600	75.00%	75.00%	75.00%
1989	420	22.897	60.48%	68.06%	56.52%	161	19.366	67.70%	66.18%	68.82%
1990	429	35.941	59.21%	82.19%	47.35%	192	34.901	69.27%	84.52%	57.41%
Panel F: Model 3d - One-Year Drift										
1985	455	21.379	60.22%	78.17%	42.04%	204	32.293	70.09%	86.61%	50.00%
1986	439	0.034	52.85%	67.33%	33.51%	183	3.713	62.84%	73.98%	40.00%
1987	429	7.709	56.41%	61.19%	52.19%	177	8.242	61.02%	62.89%	58.75%
1988	437	31.922	63.16%	67.30%	60.79%	179	48.292	76.54%	75.71%	77.06%
1989	421	16.557	59.62%	62.64%	57.49%	156	23.505	69.23%	66.27%	72.60%
1990	435	27.965	60.92%	50.41%	74.60%	186	45.504	74.73%	81.44%	67.42%

[a]Under the (.33,.33) cutoff scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .33. Similarly, under the (.4,.4) scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .4. Observations between these cutoffs are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 34 - continued

Predictive Performance of Trichotomous Earnings Prediction Models Over 1985 - 1990 (1980 - 1984 Estimation Period)

Panel G: Model 4c - Four-Year Drift

	Probability Cutoff Scheme: (.33,.33)[a]					Probability Cutoff Scheme: (.4,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	425	21.812	59.76%	72.58%	49.79%	261	39.262	67.43%	84.17%	53.19%
1986	407	32.109	66.09%	52.80%	74.80%	262	30.155	71.37%	83.14%	48.89%
1987	402	11.017	58.71%	60.52%	56.21%	242	11.306	61.98%	67.13%	54.55%
1988	426	61.990	70.42%	58.52%	78.80%	283	60.537	73.85%	67.50%	78.53%
1989	397	49.245	67.76%	70.80%	66.15%	263	54.386	73.00%	75.26%	71.69%
1990	420	22.636	58.81%	72.54%	51.80%	250	19.320	61.60%	77.36%	50.00%
Panel H: Model 4d - One-Year Drift										
1985	437	30.845	62.93%	79.02%	46.01%	292	32.273	66.78%	86.16%	43.61%
1986	410	13.033	61.22%	73.86%	43.20%	276	10.847	64.49%	83.04%	34.29%
1987	408	16.085	60.05%	56.12%	63.68%	276	22.371	64.13%	60.00%	68.38%
1988	425	53.951	70.35%	54.66%	79.92%	304	47.072	72.70%	57.41%	81.12%
1989	408	52.297	68.63%	64.12%	71.85%	260	38.350	69.62%	62.71%	75.35%
1990	407	57.058	68.06%	75.27%	62.22%	271	46.404	70.48%	77.94%	62.96%

[a]Under the (.33,.33) cutoff scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .33. Similarly, under the (.4,.4) scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .4. Observations between these cutoffs are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 34 - continued

Predictive Performance of Trichotomous Earnings Prediction Models Over 1985 - 1990 (1980 - 1984 Estimation Period)

Panel I: Model 5c - Four-Year Drift

	Probability Cutoff Scheme: (.33,.33)[a]					Probability Cutoff Scheme: (.4,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	429	19.338	59.67%	69.74%	51.28%	267	23.440	64.05%	76.92%	51.82%
1986	416	27.401	64.66%	73.68%	51.48%	273	33.836	71.43%	81.01%	53.19%
1987	406	12.714	59.36%	61.00%	56.97%	253	11.899	61.66%	64.05%	58.00%
1988	415	65.888	71.08%	61.99%	77.46%	286	89.509	78.67%	74.36%	81.66%
1989	401	41.227	67.33%	63.45%	69.53%	252	41.009	70.63%	70.83%	70.51%
1990	410	39.394	64.15%	73.33%	59.64%	260	36.402	66.92%	79.44%	58.17%
Panel J: Model 5d - One-Year Drift										
1985	412	93.943	73.30%	84.54%	61.95%	291	99.690	79.04%	91.14%	64.66%
1986	403	93.425	74.19%	73.59%	75.00%	290	109.287	81.03%	82.53%	79.03%
1987	396	73.765	71.46%	56.99%	84.29%	297	76.829	75.42%	60.00%	88.27%
1988	426	165.945	83.10%	69.74%	90.51%	330	155.601	86.06%	77.68%	90.37%
1989	365	97.717	76.44%	73.51%	78.50%	260	94.737	80.38%	79.13%	81.38%
1990	390	92.466	73.85%	80.34%	68.40%	314	92.336	76.75%	83.66%	70.19%

[a]Under the (.33,.33) cutoff scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .33. Similarly, under the (.4,.4) scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .4. Observations between these cutoffs are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 34 - continued

Predictive Performance of Trichotomous Earnings Prediction Models Over 1985 - 1990 (1980 - 1984 Estimation Period)

Panel K: Model 6c - Four-Year Drift

	Probability Cutoff Scheme: (.33,.33)[a]					Probability Cutoff Scheme: (.4,.4)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	438	35.928	62.10%	79.49	48.15%	281	42.833	65.84%	88.62%	48.10%
1986	407	32.173	65.85%	75.83	51.50%	257	21.158	69.65%	82.94%	43.68%
1987	407	8.080	57.49%	59.57	54.65%	249	6.207	59.04%	64.83%	50.96%
1988	437	58.447	69.34%	59.46	76.59%	300	64.674	74.00%	65.63%	80.23%
1989	395	46.021	67.34%	70.23	65.91%	264	47.124	71.59%	71.57%	71.60%
1990	417	22.335	59.47%	70.50	53.96%	264	26.694	64.39%	75.45%	56.49%
Panel L: Model 6d - One-Year Drift										
1985	410	103.930	74.39%	86.21%	62.80%	314	86.937	76.11%	88.76%	61.38%
1986	396	91.646	74.49%	76.32%	72.02%	299	106.192	80.27%	83.63%	75.78%
1987	386	61.976	70.47%	57.71%	81.04%	296	81.945	76.69%	64.12%	86.67%
1988	417	143.349	81.53%	68.49%	88.56%	339	146.334	84.66%	75.21%	89.64%
1989	374	94.812	75.67%	72.33%	78.14%	286	95.218	79.02%	77.52%	80.25%
1990	397	90.218	73.05%	81.46%	66.21%	303	91.895	77.23%	84.87%	69.54%

[a]Under the (.33,.33) cutoff scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .33. Similarly, under the (.4,.4) scheme an earnings increase (decrease) is predicted when the probability of observing a large increase (large decrease) is greater than .4. Observations between these cutoffs are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 35

Predictive Performance of Ordinary Least Squares Earnings Prediction Models Over 1985 - 1990 (1980 - 1984 Estimation Period)

Panel A: Model 1e - Four-Year Drift

	Probability Cutoff Scheme: 0.0[a]					Probability Cutoff Scheme: (-.50,.50)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	491	36.155	63.54%	26.94%	93.01%	347	12.009	65.42%	14.62%	95.85%
1986	473	25.405	54.76%	28.31%	90.55%	330	18.713	56.67%	22.54%	94.27%
1987	468	7.639	48.93%	18.15%	90.91%	330	7.349	50.91%	14.44%	94.67%
1988	480	16.978	61.88%	18.72%	93.50%	362	7.339	64.92%	11.28%	96.07%
1989	456	27.731	69.30%	22.78%	93.96%	333	28.198	74.77%	14.58%	99.16%
1990	473	45.324	72.94%	28.29%	94.08%	350	46.620	79.71%	30.23%	95.83%
Panel B: Model 1f - One-Year Drift										
1985	491	0.028	46.44%	19.49%	79.91%	55	10.552	69.09%	46.43%	92.59%
1986	473	0.015	38.90%	22.99%	77.54%	71	0.152	49.30%	30.00%	74.19%
1987	468	2.146	42.95%	24.61%	81.46%	64	4.635	62.50%	56.76%	70.37%
1988	480	1.571	48.54%	18.80%	85.51%	61	0.013	52.46%	28.57%	72.73%
1989	456	1.936	52.41%	21.40%	83.70%	48	2.797	62.50%	36.36%	84.62%
1990	473	17.123	61.31%	30.43%	85.34%	39	2.113	63.80%	39.41%	85.91%

[a]Under the 0.0 cutoff scheme an earnings increase (decrease) is when the predicted standardized earnings change is greater (less) than 0.0. Under the (-.50,.50) scheme an earnings increase (decrease) is when the predicted standardized earnings changes is greater than .50 (-.50). Observations between -.50 and .50 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 35 - continued

Predictive Performance of Ordinary Least Squares Earnings Prediction Models Over 1985 - 1990 (1980 - 1984 Estimation Period)

Panel C: Model 2e - Four-Year Drift

	Probability Cutoff Scheme: 0.0[a]					Probability Cutoff Scheme: (-.50,.50)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	491	12.456	59.47%	22.37%	89.34%	328	10.022	62.50%	17.16%	93.81%
1986	473	9.003	50.32%	22.06%	88.56%	313	11.420	52.72%	19.65%	93.57%
1987	468	1.450	47.22%	20.00%	84.34%	302	1.756	48.68%	15.57%	89.63%
1988	480	3.956	58.54%	19.70%	87.00%	328	8.129	66.16%	17.24%	92.92%
1989	456	9.279	65.57%	22.15%	88.59%	307	7.488	70.68%	16.48%	93.52%
1990	473	13.594	60.25%	37.68%	77.82%	78	2.580	55.13%	39.13%	78.13%
Panel D: Model 2f - One-Year Drift										
1985	491	0.762	49.08%	27.21%	76.26%	81	1.897	55.56%	24.39%	87.50%
1986	473	2.591	43.34%	28.96%	78.26%	103	0.629	46.60%	28.79%	78.38%
1987	468	2.945	45.94%	31.55%	76.16%	89	1.869	51.69%	33.33%	80.00%
1988	480	6.767	52.29%	28.95%	81.31%	97	0.045	46.39%	27.59%	74.36%
1989	456	7.178	55.48%	32.75%	78.41%	62	0.433	53.23%	34.38%	73.33%
1990	473	13.594	60.25%	37.68%	77.82%	78	2.580	55.13%	39.13%	78.13%

[a]Under the 0.0 cutoff scheme an earnings increase (decrease) is when the predicted standardized earnings change is greater (less) than 0.0. Under the (-.50,.50) scheme an earnings increase (decrease) is when the predicted standardized earnings changes is greater than .50 (-.50). Observations between -.50 and .50 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 35 - continued

Predictive Performance of Ordinary Least Squares Earnings Prediction Models Over 1985 - 1990 (1980 - 1984 Estimation Period)

Panel E: Model 3e - Four-Year Drift

	Probability Cutoff Scheme: 0.0[a]					Probability Cutoff Scheme: (-.50,.50)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	491	30.890	63.54%	47.03%	76.84%	374	31.827	66.23%	49.06%	81.71%
1986	473	22.667	57.72%	42.28%	78.61%	351	23.216	59.34%	44.71%	80.43%
1987	468	5.140	49.15%	21.85%	86.36%	360	7.794	56.81%	33.27%	91.73%
1988	480	21.380	62.92%	26.11%	89.89%	352	22.442	64.29%	28.43%	93.11%
1989	456	18.693	67.32%	27.85%	88.26%	360	17.312	62.47%	23.85%	86.39%
1990	473	38.178	71.04%	38.82%	86.29%	354	39.221	77.31%	46.42%	89.93%
Panel F: Model 3f - One-Year Drift										
1985	491	0.088	54.58%	94.85%	4.57%	398	0.216	52.26%	97.14%	2.13%
1986	473	1.540	66.38%	91.64%	5.07%	385	0.494	67.53%	93.75%	4.42%
1987	468	1.425	64.10%	92.43%	4.64%	401	0.674	65.09%	95.19%	3.05%
1988	480	1.466	53.54%	93.23%	4.21%	410	0.475	52.68%	96.80%	2.09%
1989	456	1.413	48.90%	93.01%	4.41%	385	1.491	47.79%	97.33%	1.01%
1990	473	20.874	39.32%	86.96%	2.26%	397	9.393	38.54%	93.79%	.85%

[a]Under the 0.0 cutoff scheme an earnings increase (decrease) is when the predicted standardized earnings change is greater (less) than 0.0. Under the (-.50,.50) scheme an earnings increase (decrease) is when the predicted standardized earnings changes is greater than .50 (-.50). Observations between -.50 and .50 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 35 - continued

Predictive Performance of Ordinary Least Squares Earnings Prediction Models Over 1985 - 1990 (1980 - 1984 Estimation Period)

Panel G: Model 4e - Four-Year Drift

	Probability Cutoff Scheme: 0.0[a]					Probability Cutoff Scheme: (-.50,.50)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	491	44.329	65.38%	35.62%	89.34%	359	35.824	66.85%	29.80%	93.75%
1986	473	30.363	56.24%	31.25%	90.05%	331	35.787	60.73%	31.07%	94.81%
1987	468	21.177	52.78%	23.70%	92.42%	339	17.520	53.69%	18.82%	96.08%
1988	480	29.044	63.96%	23.65%	93.50%	383	33.007	68.41%	20.83%	97.07%
1989	456	43.670	71.27%	28.48%	93.96%	346	37.807	75.43%	22.55%	97.54%
1990	473	57.630	74.00%	36.84%	91.59%	346	44.577	76.59%	31.00%	95.12%

Panel H: Model 4f - One-Year Drift

Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	491	2.836	51.93%	37.87%	69.41%	120	2.302	55.00%	35.94%	76.79%
1986	473	7.468	47.99%	36.12%	76.81%	121	8.118	57.02%	39.19%	85.11%
1987	468	4.551	45.30%	28.39%	80.79%	109	14.948	62.39%	44.78%	90.48%
1988	480	5.490	51.04%	24.06%	84.58%	132	10.966	59.09%	22.39%	96.92%
1989	456	23.618	59.43%	32.31%	86.78%	111	20.536	72.07%	44.68%	92.19%
1990	473	11.055	59.62%	34.30%	79.32%	102	9.671	63.42%	36.48%	84.39%

[a]Under the 0.0 cutoff scheme an earnings increase (decrease) is when the predicted standardized earnings change is greater (less) than 0.0. Under the (-.50,.50) scheme an earnings increase (decrease) is when the predicted standardized earnings changes is greater than .50 (-.50). Observations between -.50 and .50 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 35 - continued

Predictive Performance of Ordinary Least Squares Earnings Prediction Models Over 1985 - 1990 (1980 - 1984 Estimation Period)

Panel I: Model 5e - Four-Year Drift

	Probability Cutoff Scheme: 0.0[a]					Probability Cutoff Scheme: (-.50,.50)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	491	40.973	64.97%	36.07%	88.24%	350	40.063	67.71%	34.23%	92.54%
1986	473	45.773	59.41%	36.03%	91.04%	329	35.965	61.40%	33.52%	93.46%
1987	468	14.116	51.07%	21.48%	91.41%	325	18.920	53.23%	19.67%	96.48%
1988	480	27.240	63.75%	24.14%	92.78%	367	34.142	70.57%	21.71%	97.06%
1989	456	28.636	69.30%	26.58%	91.95%	334	30.108	76.05%	23.91%	95.87%
1990	473	55.656	73.57%	39.47%	89.72%	337	54.758	79.23%	35.56%	95.14%
Panel J: Model 5f - One-Year Drift										
1985	491	1.365	51.53%	42.65%	62.56%	150	3.720	56.67%	41.77%	73.24%
1986	473	13.734	52.64%	43.58%	74.64%	154	12.088	56.49%	40.00%	87.04%
1987	468	12.772	51.28%	38.49%	78.15%	142	8.464	54.93%	35.23%	87.04%
1988	480	19.747	55.83%	31.95%	85.51%	142	15.659	61.27%	29.73%	95.59%
1989	456	18.432	53.99%	32.43%	82.76%	138	13.926	60.36%	29.34%	88.61%
1990	473	3.210	56.03%	36.71%	71.05%	112	7.511	64.29%	40.82%	82.54%

[a]Under the 0.0 cutoff scheme an earnings increase (decrease) is when the predicted standardized earnings change is greater (less) than 0.0. Under the (-.50,.50) scheme an earnings increase (decrease) is when the predicted standardized earnings changes is greater than .50 (-.50). Observations between -.50 and .50 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 35 - continued

Predictive Performance of Ordinary Least Squares Earnings Prediction Models Over 1985 - 1990 (1980 - 1984 Estimation Period)

Panel K: Model 6e - Four-Year Drift

	Probability Cutoff Scheme: 0.0[a]					Probability Cutoff Scheme: (-.50,.50)[a]				
Year	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct	# of Observ.	χ^2 from 2 x 2 Table[b]	% Correct Predictions	% Increases Correct	% Decreases Correct
1985	491	20.565	61.51%	34.70%	83.09%	333	23.759	64.86%	33.57%	88.42%
1986	473	33.585	58.14%	36.76%	87.06%	345	34.076	60.29%	33.86%	92.31%
1987	468	16.123	52.99%	27.41%	87.88%	333	11.940	51.95%	21.58%	92.31%
1988	480	27.536	63.96%	27.09%	90.97%	382	28.067	68.06%	23.08%	94.98%
1989	456	29.652	69.08%	32.28%	88.59%	353	19.183	72.24%	25.96%	91.57%
1990	473	30.885	69.77%	38.16%	84.74%	332	39.974	74.70%	37.25%	91.30%
Panel L: Model 6f - One-Year Drift										
1985	491	3.132	52.75%	43.01%	64.84%	181	8.582	60.77%	52.22%	69.23%
1986	473	10.218	51.80%	43.28%	72.46%	185	19.565	61.08%	49.18%	84.13%
1987	468	7.505	50.43%	39.43%	73.51%	173	9.178	53.76%	36.61%	85.25%
1988	480	13.190	55.00%	34.59%	80.37%	190	8.510	60.53%	31.46%	86.14%
1989	456	9.934	50.96%	29.88%	74.93%	114	8.962	58.21%	35.43%	80.21%
1990	473	8.416	49.63%	36.21%	71.48%	121	8.236	53.44%	39.33%	72.81%

[a]Under the 0.0 cutoff scheme an earnings increase (decrease) is when the predicted standardized earnings change is greater (less) than 0.0. Under the (-.50,.50) scheme an earnings increase (decrease) is when the predicted standardized earnings changes is greater than .50 (-.50). Observations between -.50 and .50 are dropped.

[b]A χ^2 statistic with one degree of freedom of 6.63 (10.83) is significant at the .01 (.001) level.

Table 36

Overall Correct Predictions for the Dichotomous and Trichotomous Logit Earnings Prediction Models - Pooled Results From 1980 Through 1985

		Four-Year Drift Models		One-Year Drift Models	
Model #	Method Used to Select Independent Variables	Probability Cutoff Scheme		Probability Cutoff Scheme	
Panel A: Dichotomous Logit Model		**(.5, .5)**	**(.6, .4)**	**(.5, .5)**	**(.6, .4)**
1	Retaining PCs	58.12%	64.92%	69.67%	77.30%
2	Discarding PCs	53.20%	59.15%	67.97%	73.98%
3	Scree Graph	50.57%	72.13%	62.57%	75.11%
4	Ou and Penman (1965-72)	54.84%	65.31%	57.84%	62.76%
5	Ou and Penman (1973-77)	60.64%	67.10%	69.73%	76.30%
6	Stepwise Procedures	59.94%	65.79%	69.69%	76.69%
Panel B: Trichotomous Logit Model		**.33**	**.40**	**.33**	**.40**
1	Retaining PCs	61.26%	66.96%	66.56%	72.95%
2	Discarding PCs	56.95%	61.62%	68.47%	73.68%
3	Scree Graph	56.06%	79.15%	55.76%	69.50%
4	Ou and Penman (1965-72)	63.39%	68.11%	62.63%	66.87%
5	Ou and Penman (1973-77)	63.25%	67.60%	69.18%	73.48%
6	Stepwise Procedures	63.89%	67.98%	67.70%	72.33%

Table 37

Overall Correct Predictions for the Dichotomous and Trichotomous Logit Earnings Prediction Models - Pooled Results From 1985 Through 1990

		Four-Year Drift Models		One-Year Drift Models	
Model #	Method Used to Select Independent Variables	Probability Cutoff Scheme		Probability Cutoff Scheme	
Panel A: Dichotomous Logit Model		**(.5, .5)**	**(.6, .4)**	**(.5, .5)**	**(.6, .4)**
1	Retaining PCs	64.43%	70.84%	68.72%	74.32%
2	Discarding PCs	58.98%	64.03%	69.93%	75.16%
3	Scree Graph	62.86%	72.18%	61.97%	70.50%
4	Ou and Penman (1965-72)	63.73%	69.87%	65.17%	69.88%
5	Ou and Penman (1973-77)	64.53%	69.41%	67.94%	70.81%
6	Stepwise Procedures	63.58%	69.73%	72.56%	76.12%
Panel B: Trichotomous Logit Model		**.33**	**.40**	**.33**	**.40**
1	Retaining PCs	63.22%	69.12%	70.30%	75.14%
2	Discarding PCs	57.38%	61.05%	74.58%	79.63%
3	Scree Graph	59.37%	69.38%	58.86%	69.07%
4	Ou and Penman (1965-72)	63.62%	68.20%	65.20%	68.03%
5	Ou and Penman (1973-77)	64.37%	68.99%	75.39%	79.78%
6	Stepwise Procedures	63.59%	67.41%	74.93%	78.99%

Table 38

Summary of Years Covered by the Simulated Trading Strategy

Model Estimation Period[a]	Predictive Ability Tests[b]	Time Period Covered by the Simulated Trading Strategy[c]	Months Covered[d]
1975 - 1979	1980	April 1981 - March 1986	60
1975 - 1979	1981	April 1982 - March 1987	60
1975 - 1979	1982	April 1983 - March 1988	60
1975 - 1979	1983	April 1984 - March 1989	60
1975 - 1979	1984	April 1985 - March 1990	60
1980 - 1984	1985	April 1986 - March 1991	60
1980 - 1984	1986	April 1987 - March 1992	60
1980 - 1984	1987	April 1988 - March 1992	48
1980 - 1984	1988	April 1989 - March 1992	36
1980 - 1984	1989	April 1990 - March 1992	24

[a]Earnings prediction models were estimated over two non-overlapping time periods: 1975 through 1979 and 1980 through 1984.

[b]The earnings prediction models were used to calculate *Pr*, the probability of an earnings increase in the subsequent year, and to conduct predictive ability tests. For example, the predictive ability test for 1980 used accounting variables from 1980 to predict the probability of an earnings increase in 1981.

[c]The simulated trading strategy consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks with $Pr \leq 0.4$. Positions are entered into at the end of the third month (i.e., start of the fourth month) following fiscal year-end. As all firms in this study have December fiscal year-ends, positions were entered into on the first trading day of April.

[d]Holding-period returns to the hedge portfolio were calculated over a 60-month period when possible. However, this study used returns through December 1992 so that the holding period was less than 60 months for the last three years. In these years, returns were calculated for the longest 12-month period available.

Table 39

Sample Firms Included in the Simulated Trading Strategy

Year	COMPUSTAT Sample[a]	Firms not Listed on CRSP at Month 1[b]	Trading Strategy Sample
1980	702	18	684
1981	658	15	643
1982	614	12	602
1983	565	10	555
1984	541	9	532
1985	491	7	484
1986	473	8	465
1987	468	6	462
1988	480	9	471
1989	456	7	449

[a]Sample sizes are from Table 1.

[b]Month 1 represents the first month of the holding period. It is the end of the third month (i.e., start of the fourth month) follwing fiscal year-end. CRSP is the Center for Research in Security Prices at the University of Chicago.

Table 40

Market-Adjusted and Size-Adjusted Returns to the Hedge Portfolio[a] For Fiscal Year Ended December 31, 1980

	Month of Holding Period[b]				
	12	24	36	48	60
Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	0.0361	0.1016	0.1179	0.1542	0.1707
Short Portfolio	-0.0465	-0.1289	-0.1519	-0.1987	-0.2200
Hedge Portfolio	0.0825	0.2305	0.2698	0.3529	0.3908
(B): Size-Adjusted Returns					
Long Portfolio	0.0175	0.0497	0.0559	0.0731	0.0886
Short Portfolio	-0.0383	-0.1107	-0.1222	-0.1599	-0.1937
Hedge Portfolio	0.0559	0.1604	0.1781	0.2330	0.2823
Model 6: Stepwise Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	0.0371	0.1134	0.1213	0.1586	0.1756
Short Portfolio	-0.0419	-0.1399	-0.1369	-0.1791	-0.1982
Hedge Portfolio	0.0790	0.2533	0.2582	0.3377	0.3739
(B): Size-Adjusted Returns					
Long Portfolio	0.0161	0.0504	0.0514	0.0672	0.0814
Short Portfolio	-0.0359	-0.1195	-0.1143	-0.1495	-0.1812
Hedge Portfolio	0.0520	0.1699	0.1657	0.2168	0.2626

[a]The hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks with $Pr \leq 0.4$.

[b]The holding period begins at the end of the third month following fiscal year-end (month 0).

Table 41

Market-Adjusted and Size-Adjusted Returns to the Hedge Portfolio[a]
For Fiscal Year Ended December 31, 1981

	Month of Holding Period[b]				
	12	24	36	48	60
Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	0.0615	0.1817	0.2009	0.2628	0.2910
Short Portfolio	-0.0124	-0.0355	-0.0406	-0.0530	-0.0587
Hedge Portfolio	0.0739	0.2172	0.2415	0.3159	0.3497
(B): Size-Adjusted Returns					
Long Portfolio	0.0088	0.0280	0.0279	0.0366	0.0443
Short Portfolio	-0.0257	-0.0876	-0.0820	-0.1072	-0.1299
Hedge Portfolio	0.0345	0.1156	0.1099	0.1438	0.1742
Model 6: Stepwise Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	0.0664	0.2138	0.2170	0.2838	0.3142
Short Portfolio	-0.0115	-0.0377	-0.0376	-0.0491	-0.0544
Hedge Portfolio	0.0779	0.2515	0.2546	0.3330	0.3686
(B): Size-Adjusted Returns					
Long Portfolio	0.0104	0.0355	0.0332	0.0434	0.0526
Short Portfolio	-0.0283	-0.0987	-0.0903	-0.1181	-0.1430
Hedge Portfolio	0.0387	0.1342	0.1235	0.1615	0.1957

[a]The hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks with $Pr \leq 0.4$.

[b]The holding period begins at the end of the third month following fiscal year-end (month 0).

Table 42

Market-Adjusted and Size-Adjusted Returns to the Hedge Portfolio[a]
For Fiscal Year Ended December 31, 1982

	Month of Holding Period[b]				
	12	24	36	48	60
Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	0.0452	0.1087	0.1479	0.1935	0.2142
Short Portfolio	0.0239	0.0581	0.0780	0.1020	0.1130
Hedge Portfolio	0.0214	0.0506	0.0699	0.0914	0.1012
(B): Size-Adjusted Returns					
Long Portfolio	0.0239	0.0629	0.0761	0.0995	0.1205
Short Portfolio	0.0003	0.0008	0.0010	0.0012	0.0015
Hedge Portfolio	0.0236	0.0621	0.0751	0.0982	0.1190
Model 6: Stepwise Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	0.0489	0.1144	0.1598	0.2091	0.2315
Short Portfolio	0.0229	0.0543	0.0749	0.0979	0.1084
Hedge Portfolio	0.0260	0.0601	0.0850	0.1111	0.1230
(B): Size-Adjusted Returns					
Long Portfolio	0.0203	0.0555	0.0648	0.0847	0.1026
Short Portfolio	0.0038	0.0105	0.0120	0.0157	0.0191
Hedge Portfolio	0.0165	0.0450	0.0527	0.0690	0.0836

[a]The hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks with $Pr \leq 0.4$.

[b]The holding period begins at the end of the third month following fiscal year-end (month 0).

Table 43

Market-Adjusted and Size-Adjusted Returns to the Hedge Portfolio[a]
For Fiscal Year Ended December 31, 1983

	Month of Holding Period[b]				
	12	24	36	48	60
Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	-0.0641	-0.2029	-0.2096	-0.2742	-0.3036
Short Portfolio	-0.0181	-0.0563	-0.0592	-0.0774	-0.0857
Hedge Portfolio	-0.0460	-0.1466	-0.1504	-0.1968	-0.2178
(B): Size-Adjusted Returns					
Long Portfolio	-0.0435	-0.1332	-0.1386	-0.1813	-0.2197
Short Portfolio	-0.0024	-0.0072	-0.0076	-0.0100	-0.0121
Hedge Portfolio	-0.0411	-0.1260	-0.1310	-0.1713	-0.2076
Model 6: Stepwise Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	-0.0705	-0.2447	-0.2305	-0.3015	-0.3338
Short Portfolio	-0.0213	-0.0726	-0.0697	-0.0912	-0.1010
Hedge Portfolio	-0.0492	-0.1721	-0.1608	-0.2103	-0.2329
(B): Size-Adjusted Returns					
Long Portfolio	-0.0457	-0.1488	-0.1455	-0.1903	-0.2305
Short Portfolio	-0.0024	-0.0076	-0.0076	-0.0099	-0.0120
Hedge Portfolio	-0.0433	-0.1412	-0.1379	-0.1804	-0.2185

[a]The hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks with $Pr \leq 0.4$.

[b]The holding period begins at the end of the third month following fiscal year-end (month 0).

Table 44

Market-Adjusted and Size-Adjusted Returns to the Hedge Portfolio[a]
For Fiscal Year Ended December 31, 1984

Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift

	Month of Holding Period[b]				
	12	24	36	48	60
(A): Market-Adjusted Returns					
Long Portfolio	-0.0657	-0.2324	-0.2147	-0.2808	-0.3109
Short Portfolio	-0.0223	-0.0806	-0.0730	-0.0955	-0.1057
Hedge Portfolio	-0.0433	-0.1518	-0.1417	-0.1854	-0.2052
(B): Size-Adjusted Returns					
Long Portfolio	-0.0493	-0.1757	-0.1570	-0.2054	-0.2288
Short Portfolio	-0.0076	-0.0279	-0.0243	-0.0318	-0.0386
Hedge Portfolio	-0.0416	-0.1478	-0.1326	-0.1735	-0.1902

Model 6: Stepwise Dichotomous Logit Using a One-Year Drift

	12	24	36	48	60
(A): Market-Adjusted Returns					
Long Portfolio	-0.0802	-0.2953	-0.2621	-0.3428	-0.3795
Short Portfolio	-0.0237	-0.0910	-0.0774	-0.1013	-0.1122
Hedge Portfolio	-0.0565	-0.2043	-0.1846	-0.2415	-0.2674
(B): Size-Adjusted Returns					
Long Portfolio	-0.0598	-0.1949	-0.1905	-0.2493	-0.3020
Short Portfolio	-0.0073	-0.0247	-0.0231	-0.0302	-0.0366
Hedge Portfolio	-0.0525	-0.1702	-0.1674	-0.2190	-0.2653

[a]The hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks with $Pr \leq 0.4$.

[b]The holding period begins at the end of the third month following fiscal year-end (month 0).

Table 45

Market-Adjusted and Size-Adjusted Returns to the Hedge Portfolio[a]
For Fiscal Year Ended December 31, 1985

	Month of Holding Period[b]				
	12	24	36	48	60
Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	0.0077	0.0205	0.0244	0.0316	0.0351
Short Portfolio	-0.0320	-0.0866	-0.1018	-0.1319	-0.1464
Hedge Portfolio	0.0396	0.1071	0.1262	0.1635	0.1815
(B): Size-Adjusted Returns					
Long Portfolio	0.0051	0.0133	0.0159	0.0206	0.0234
Short Portfolio	-0.0073	-0.0194	-0.0227	-0.0296	-0.0336
Hedge Portfolio	0.0123	0.0327	0.0386	0.0502	0.0570
Model 6: Stepwise Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	0.0123	0.0327	0.0393	0.0509	0.0565
Short Portfolio	-0.0320	-0.0859	-0.1018	-0.1320	-0.1465
Hedge Portfolio	0.0443	0.1186	0.1411	0.1828	0.2029
(B): Size-Adjusted Returns					
Long Portfolio	0.0012	0.0032	0.0038	0.0050	0.0057
Short Portfolio	-0.0043	-0.0114	-0.0135	-0.0175	-0.0199
Hedge Portfolio	0.0055	0.0146	0.0173	0.0225	0.0255

[a]The hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks with $Pr \leq 0.4$.

[b]The holding period begins at the end of the third month following fiscal year-end (month 0).

Table 46

Market-Adjusted and Size-Adjusted Returns to the Hedge Portfolio[a]
For Fiscal Year Ended December 31, 1986

	Month of Holding Period[b]				
	12	24	36	48	60
Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	0.0173	0.0497	0.0551	0.0715	0.0793
Short Portfolio	-0.0280	-0.0804	-0.0892	-0.1156	-0.1283
Hedge Portfolio	0.0453	0.1301	0.1443	0.1871	0.2076
(B): Size-Adjusted Returns					
Long Portfolio	0.0117	0.0314	0.0367	0.0477	0.0541
Short Portfolio	-0.0179	-0.0475	-0.0562	-0.0732	-0.0830
Hedge Portfolio	0.0296	0.0789	0.0929	0.1209	0.1371
Model 6: Stepwise Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	0.0209	0.0597	0.0665	0.0862	0.0957
Short Portfolio	-0.0320	-0.0903	-0.1020	-0.1322	-0.1467
Hedge Portfolio	0.0530	0.1500	0.1685	0.2185	0.2424
(B): Size-Adjusted Returns					
Long Portfolio	0.0132	0.0352	0.0413	0.0537	0.0609
Short Portfolio	-0.0222	-0.0598	-0.0696	-0.0905	-0.1026
Hedge Portfolio	0.0354	0.0950	0.1109	0.1443	0.1636

[a]The hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks with $Pr \leq 0.4$.

[b]The holding period begins at the end of the third month following fiscal year-end (month 0).

Table 47

Market-Adjusted and Size-Adjusted Returns to the Hedge Portfolio[a]
For Fiscal Year Ended December 31, 1987

	Month of Holding Period[b]			
	12	24	36	48
Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift				
(A): Market-Adjusted Returns				
Long Portfolio	-0.0384	-0.0972	-0.1221	-0.1582
Short Portfolio	-0.0264	-0.0677	-0.0840	-0.1089
Hedge Portfolio	-0.0120	-0.0295	-0.0381	-0.0494
(B): Size-Adjusted Returns				
Long Portfolio	-0.0034	-0.0083	-0.0105	-0.0137
Short Portfolio	-0.0060	-0.0150	-0.0188	-0.0245
Hedge Portfolio	0.0027	0.0067	0.0083	0.0108
Model 6: Stepwise Dichotomous Logit Using a One-Year Drift				
(A): Market-Adjusted Returns				
Long Portfolio	-0.0407	-0.1048	-0.1295	-0.1679
Short Portfolio	-0.0227	-0.0579	-0.0721	-0.0935
Hedge Portfolio	-0.0180	-0.0469	-0.0574	-0.0744
(B): Size-Adjusted Returns				
Long Portfolio	-0.0035	-0.0087	-0.0108	-0.0141
Short Portfolio	-0.0054	-0.0135	-0.0170	-0.0221
Hedge Portfolio	0.0020	0.0048	0.0062	0.0080

[a]The hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks with $Pr \leq 0.4$.

[b]The holding period begins at the end of the third month following fiscal year-end (month 0). Returns through December 1992 were used in this study so the maximum holding period for this portfolio was 48 months.

Table 48

Market-Adjusted and Size-Adjusted Returns to the Hedge Portfolio[a]
For Fiscal Year Ended December 31, 1988

	Month of Holding Period[b]		
	12	24	36
Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift			
(A): Market-Adjusted Returns			
Long Portfolio	-0.0380	-0.0949	-0.1211
Short Portfolio	-0.0243	-0.0602	-0.0774
Hedge Portfolio	-0.0137	-0.0347	-0.0436
(B): Size-Adjusted Returns			
Long Portfolio	-0.0105	-0.0258	-0.0329
Short Portfolio	0.0036	0.0088	0.0113
Hedge Portfolio	-0.0141	-0.0346	-0.0442
Model 6: Stepwise Dichotomous Logit Using a One-Year Drift			
(A): Market-Adjusted Returns			
Long Portfolio	-0.0421	-0.1059	-0.1341
Short Portfolio	-0.0252	-0.0626	-0.0802
Hedge Portfolio	-0.0169	-0.0433	-0.0539
(B): Size-Adjusted Returns			
Long Portfolio	-0.0110	-0.0269	-0.0344
Short Portfolio	0.0037	0.0092	0.0115
Hedge Portfolio	-0.0147	-0.0361	-0.0460

[a]The hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks with $Pr \leq 0.4$.

[b]The holding period begins at the end of the third month following fiscal year-end (month 0). Returns through December 1992 were used in this study so the maximum holding period for this portfolio was 36 months.

Table 49

Market-Adjusted and Size-Adjusted Returns to the Hedge Portfolio[a]
For Fiscal Year Ended December 31, 1989

	Month of Holding Period[b]	
	12	24
Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift		
(A): Market-Adjusted Returns		
Long Portolio	-0.0270	-0.0698
Short Portfolio	-0.0272	-0.0712
Hedge Portfolio	0.0002	0.0014
(B): Size-Adjusted Returns		
Long Portfolio	-0.0084	-0.0213
Short Portfolio	-0.0038	-0.0098
Hedge Portfolio	-0.0046	-0.0115
Model 6: Stepwise Dichotomous Logit Using a One-Year Drift		
(A): Market-Adjusted Returns		
Long Portfolio	-0.0293	-0.0765
Short Portfolio	-0.0282	-0.0742
Hedge Portfolio	-0.0011	-0.0023
(B): Size-Adjusted Returns		
Long Portfolio	-0.0116	-0.0291
Short Portfolio	-0.0060	-0.0153
Hedge Portfolio	-0.0056	-0.0138

[a]The hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks with $Pr \leq 0.4$.

[b]The holding period begins at the end of the third month following fiscal year-end (month 0). Returns through December 1992 were used in this study so the maximum holding period for this portfolio was 24 months.

Table 50

Average Market-Adjusted and Size-Adjusted Returns to the Hedge Portfolio[a] For Fiscal Years Ended December 31, 1980 Through December 31, 1984

Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift

	Month of Holding Period[b] 12	24	36	48	60
(A): Market-Adjusted Returns					
Long Portfolio	0.0026	-0.0087	0.0085	0.0111	0.0123
Short Portfolio	-0.0151	-0.0486	-0.0493	-0.0645	-0.0714
Hedge Portfolio	0.0177	0.0400	0.0578	0.0756	0.0837
(B): Size-Adjusted Returns					
Long Portfolio	-0.0085	-0.0337	-0.0271	-0.0355	-0.0390
Short Portfolio	-0.0148	-0.0465	-0.0470	-0.0615	-0.0745
Hedge Portfolio	0.0062	0.0129	0.0199	0.0260	0.0355

Model 6: Stepwise Dichotomous Logit Using a One-Year Drift

	12	24	36	48	60
(A): Market-Adjusted Returns					
Long Portfolio	0.0003	-0.0197	0.0011	0.0014	0.0016
Short Portfolio	-0.0151	-0.0574	-0.0494	-0.0646	-0.0715
Hedge Portfolio	0.0154	0.0377	0.0504	0.0660	0.0731
(B): Size-Adjusted Returns					
Long Portfolio	-0.0117	-0.0405	-0.0373	-0.0488	-0.0592
Short Portfolio	-0.0140	-0.0480	-0.0446	-0.0584	-0.0708
Hedge Portfolio	0.0023	0.0075	0.0073	0.0096	0.0116

[a]The hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks with $Pr \leq 0.4$.

[b]The holding period begins at the end of the third month following fiscal year-end (month 0). All holding-period returns are the average of the individual year returns shown in Tables 40 through 44.

Table 51

Average Market-Adjusted and Size-Adjusted Returns to the Hedge Portfolio[a] For Fiscal Years Ended December 31, 1985 Through December 31, 1989

Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift

	Month of Holding Period[b] 12	24	36	48	60
(A): Market-Adjusted Returns					
Long Portfolio	-0.0157	-0.0383	-0.0409	-0.0184	0.0572
Short Portfolio	-0.0276	-0.0732	-0.0881	-0.1188	-0.1373
Hedge Portfolio	0.0119	0.0349	0.0472	0.1004	0.1945
(B): Size-Adjusted Returns					
Long Portfolio	-0.0011	-0.0021	0.0023	0.0182	0.0388
Short Portfolio	-0.0063	-0.0166	-0.0216	-0.0424	-0.0583
Hedge Portfolio	0.0052	0.0144	0.0239	0.0606	0.0970

Model 6: Stepwise Dichotomous Logit Using a One-Year Drift

	12	24	36	48	60
(A): Market-Adjusted Returns					
Long Portfolio	-0.0158	-0.0390	-0.0395	-0.0103	0.0761
Short Portfolio	-0.0280	-0.0742	-0.0890	-0.1192	-0.1466
Hedge Portfolio	0.0122	0.0352	0.0496	0.1090	0.2227
(B): Size-Adjusted Returns					
Long Portfolio	-0.0023	-0.0053	-0.0001	0.0149	0.0333
Short Portfolio	-0.0068	-0.0182	-0.0221	-0.0434	-0.0612
Hedge Portfolio	0.0045	0.0129	0.0220	0.0583	0.0945

[a]The hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks with $Pr \leq 0.4$.

[b]The holding period begins at the end of the third month following fiscal year-end (month 0). All holding-period returns are the average of the individual year returns shown in Tables 45 through 49.

Table 52

Average Market-Adjusted and Size-Adjusted Returns to the Hedge Portfolio[a] For Fiscal Years Ended December 31, 1980 Through December 31, 1989

Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift

	Month of Holding Period[b]				
	12	24	36	48	60
(A): Market-Adjusted Returns					
Long Portfolio	-0.0065	-0.0235	-0.0135	0.0004	0.0251
Short Portfolio	-0.0213	-0.0609	-0.0666	-0.0849	-0.0903
Hedge Portfolio	0.0148	0.0374	0.0531	0.0853	0.1154
(B): Size-Adjusted Returns					
Long Portfolio	-0.0048	-0.0179	-0.0141	-0.0153	-0.0168
Short Portfolio	-0.0105	-0.0315	-0.0357	-0.0544	-0.0699
Hedge Portfolio	0.0057	0.0136	0.0217	0.0390	0.0531

Model 6: Stepwise Dichotomous Logit Using a One-Year Drift

	12	24	36	48	60
(A): Market-Adjusted Returns					
Long Portfolio	-0.0077	-0.0293	-0.0169	-0.0029	0.0229
Short Portfolio	-0.0216	-0.0658	-0.0670	-0.0851	-0.0929
Hedge Portfolio	0.0138	0.0365	0.0501	0.0821	0.1158
(B): Size-Adjusted Returns					
Long Portfolio	-0.0070	-0.0229	-0.0208	-0.0249	-0.0327
Short Portfolio	-0.0104	-0.0331	-0.0346	-0.0528	-0.0680
Hedge Portfolio	0.0034	0.0102	0.0139	0.0278	0.0353

[a]The hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks with $Pr \leq 0.4$.

[b]The holding period begins at the end of the third month following fiscal year-end (month 0). All holding-period returns are the average of the individual year returns shown in Tables 40 through 49.

Table 53

Comparison of 24-Month Returns From Common Years Covered by this Study and by Ou and Penman [1989a][a]

1980	*Market-Adjusted Returns*			*Size-Adjusted Returns*		
	Ou and Penman	Model 3	Model 6	Ou and Penman	Model 3	Model 6
Long Portfolio	.1100	.1016	.1134	.0050	.0497	.0504
Short Portfolio	-.1550	-.1289	-.1399	-.0800	-.1107	-.1195
Hedge Portfolio	.2650	.2305	.2533	.0850	.1604	.1699
1981	*Market-Adjusted Returns*			*Size-Adjusted Returns*		
	Ou and Penman	Model 3	Model 6	Ou and Penman	Model 3	Model 6
Long Portfolio	.1700	.1817	.2138	.0400	.0280	.0355
Short Portfolio	-.1350	-.0355	-.0377	-.1200	-.0876	-.0987
Hedge Portfolio	.3050	.2172	.2515	.1600	.1156	.1342
1982	*Market-Adjusted Returns*			*Size-Adjusted Returns*		
	Ou and Penman	Model 3	Model 6	Ou and Penman	Model 3	Model 6
Long Portfolio	.0225	.1087	.1144	.0080	.0629	.0555
Short Portfolio	.0075	.0581	.0543	.0030	.0008	.0105
Hedge Portfolio	.0150	.0506	.0601	.0050	.0621	.0450
1983	*Market-Adjusted Returns*			*Size-Adjusted Returns*		
	Ou and Penman	Model 3	Model 6	Ou and Penman	Model 3	Model 6
Long Portfolio	-.1700	-.2029	-.2447	-.0850	-.1332	-.1488
Short Portfolio	-.0650	-.0563	-.0726	-.0400	.0072	-.0076
Hedge Portfolio	-.1050	-.1466	-.1721	-.0450	-.1260	-.1412

[a]The Ou and Penman [1989a] returns are estimated from Figures 1 and 2 of that study.

Table 54

Average Market-Adjusted and Size-Adjusted Returns to the Hedge Portfolio[a] Measured Over Five Successive Twelve-Month Holding Periods[b] For Fiscal Years Ended December 31, 1980 Through December 31, 1989

Panel A: Average Returns - All Years (1980 - 1989)				
12-Month Return Interval	Model 3 Market-Adjusted Returns	Model 3 Size-Adjusted Returns	Model 6 Market-Adjusted Returns	Model 6 Size-Adjusted Returns
0 - 12	0.0148	0.0057	0.0138	0.0034
13 - 24	0.0226	0.0079	0.0227	0.0068
25 - 36	0.0157	0.0081	0.0136	0.0037
37 - 48	0.0322	0.0173	0.0320	0.0139
49 - 60	0.0301	0.0112	0.0337	0.0075
Panel B: Average Returns - Good Years (1980 and 1981)				
12-Month Return Interval	Model 3 Market-Adjusted Returns	Model 3 Size-Adjusted Returns	Model 6 Market-Adjusted Returns	Model 6 Size-Adjusted Returns
1 - 12	0.0782	0.0452	0.0785	0.0454
13 - 24	0.1457	0.0928	0.1740	0.1067
25 - 36	0.0318	0.0060	0.0040	-0.0075
37 - 48	0.0788	0.0444	0.0790	0.0446
49 - 60	0.0359	0.0399	0.0359	0.0400

[a]The hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks with $Pr \leq 0.4$.

[b]The first twelve-month holding period begins at the end of the third month following fiscal year-end (month 0).

Table 54 - continued

Average Market-Adjusted and Size-Adjusted Returns to the Hedge Portfolio[a] Measured Over Five Successive Twelve-Month Holding Periods[b] For Fiscal Years Ended December 31, 1980 Through December 31, 1989

Panel C: Average Returns - Moderate Years (1982, 1985, and 1986)				
12-Month Return Interval	Model 3 Market-Adjusted Returns	Model 3 Size-Adjusted Returns	Modei 6 Market-Adjusted Returns	Model 6 Size-Adjusted Returns
0 - 12	0.0354	0.0218	0.0411	0.0191
13 - 24	0.0605	0.0361	0.0685	0.0324
25 - 36	0.0175	0.0110	0.0220	0.0088
37 - 48	0.0339	0.0209	0.0393	0.0183
49 - 60	0.0161	0.0146	0.0186	0.0123
Panel D: Average Returns - Poor Years (1983 and 1984)				
12-Month Return Interval	Model 3 Market-Adjusted Returns	Model 3 Size-Adjusted Returns	Model 6 Market-Adjusted Returns	Model 6 Size-Adjusted Returns
1 - 12	-0.0438	-0.0488	-0.0529	-0.0479
13 - 24	-0.1034	-0.1164	-0.1354	-0.1078
25 - 36	0.0057	0.0074	0.0155	0.0031
37 - 48	-0.0437	-0.0486	-0.0532	-0.0471
49 - 60	-0.0189	-0.0311	-0.0243	-0.0422

[a]The hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks with $Pr \leq 0.4$.

[b]The first twelve-month holding period begins at the end of the third month following fiscal year-end (month 0).

Table 55

Twenty-Four Month Size-Adjusted Returns to the Hedge Portfolios When the Trading Strategy is Separately Implemented for the Largest and Smallest of Five Size-Based Portfolios[a]

	24-Month Size-Adjusted Returns for Fiscal Year Ended December 31[b]				
	1980	1981	1982	1983	1984
Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift					
(A): Size Quintile 1 (Smallest Firms)					
Long Portfolio	0.0491	0.0261	0.0725	-0.1402	-0.1533
Short Portfolio	-0.1083	-0.0844	-0.0036	-0.0010	0.0106
Hedge Portfolio	0.1574	0.1105	0.0761	-0.1392	-0.1639
(B): Size Quintile 5 (Largest Firms)					
Long Portfolio	0.0530	0.0301	0.0673	-0.0996	-0.1578
Short Portfolio	-0.0903	-0.0848	0.0048	0.0152	-0.0183
Hedge Portfolio	0.1433	0.1149	0.0625	-0.1148	-0.1395
Model 6: Stepwise Dichotomous Logit Using a One-Year Drift					
(A): Size Quintile 1 (Smallest Firms)					
Long Portfolio	0.0753	0.0376	0.0662	-0.1438	-0.1923
Short Portfolio	-0.1132	-0.0874	0.0099	0.0025	-0.0241
Hedge Portfolio	0.1885	0.1250	0.0563	-0.1463	-0.1682
(B): Size Quintile 5 (Largest Firms)					
Long Portfolio	0.0697	0.0428	0.0546	-0.1296	-0.1748
Short Portfolio	-0.1041	0.0888	0.0098	0.0091	-0.0311
Hedge Portfolio	0.1738	0.1316	0.0448	-0.1387	-0.1437

[a]Hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks with $Pr \leq 0.4$.

[b]Holding period begins at the end of the third month following fiscal year-end (month 0).

Table 55 - continued

Twenty-Four Month Size-Adjusted Returns to the Hedge Portfolios When the Trading Strategy is Separately Implemented for the Largest and Smallest of Five Size-Based Portfolios[a]

	24-Month Size-Adjusted Returns for Fiscal Year Ended December 31[b]				
	1985	1986	1987	1988	1989
Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift					
(A): Size Quintile 1 (Smallest Firms)					
Long Portfolio	0.0117	0.0386	0.0042	-0.0203	-0.0306
Short Portfolio	-0.0262	-0.0360	0.0011	0.0038	-0.0039
Hedge Portfolio	0.0379	0.0746	0.0031	-0.0241	-0.0267
(B): Size Quintile 5 (Largest Firms)					
Long Portfolio	0.0263	0.0512	-0.0034	-0.0303	-0.0190
Short Portfolio	-0.0220	-0.0067	-0.0008	0.0116	-0.0007
Hedge Portfolio	0.0483	0.0579	-0.0026	-0.0419	-0.0183
Model 6: Stepwise Dichotomous Logit Using a One-Year Drift					
(A): Size Quintile 1 (Smallest Firms)					
Long Portfolio	0.0031	0.0296	-0.0126	-0.0254	-0.0267
Short Portfolio	-0.0150	-0.0588	-0.0043	0.0019	-0.0053
Hedge Portfolio	0.0181	0.0884	0.0083	-0.0273	-0.0214
(B): Size Quintile 5 (Largest Firms)					
Long Portfolio	0.0051	0.0236	-0.0095	-0.0291	-0.0136
Short Portfolio	-0.0195	-0.0385	-0.0114	0.0106	0.0006
Hedge Portfolio	0.0246	0.0621	0.0019	-0.0397	-0.0142

[a]Hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks with $Pr \leq 0.4$.

[b]Holding period begins at the end of the third month following fiscal year-end (month 0).

Table 56

Twenty-Four Month Returns to the Hedge Portfolio When the Trading Strategy is Implemented on the Basis of Current Earnings Changes[a]

	24-Month Size-Adjusted Returns for Fiscal Year Ended December 31[b]				
	1980	1981	1982	1983	1984
Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	0.1136	0.1857	0.0773	-0.1543	-0.2032
Short Portfolio	-0.1327	-0.0434	-0.0075	-0.0330	-0.0697
Hedge Portfolio	0.2463	0.2291	0.0848	-0.1213	-0.1335
(B): Size-Adjusted Returns					
Long Portfolio	0.0612	0.0320	0.0761	-0.1219	-0.1669
Short Portfolio	-0.1115	-0.0978	0.0057	-0.0165	-0.0357
Hedge Portfolio	0.1727	0.1298	0.0704	-0.1054	-0.1312
Model 6: Stepwise Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	0.1238	0.2081	0.1092	-0.1939	-0.2318
Short Portfolio	-0.1404	-0.0515	0.0396	-0.0603	-0.0509
Hedge Portfolio	0.2642	0.2596	0.0696	-0.1336	-0.1809
(B): Size-Adjusted Returns					
Long Portfolio	0.0638	0.0416	0.0638	-0.1306	-0.1872
Short Portfolio	-0.1124	-0.1055	0.0110	-0.0068	-0.0276
Hedge Portfolio	0.1762	0.1471	0.0528	-0.1238	-0.1596

[a]Hedge portfolio consists of taking long positions in stocks experiencing a large decrease in current earnings (quintile 1) with $Pr > 0.6$ and short positions in stocks experiencing a large increase in current earnings (quintile 5) with $Pr \leq 0.4$.

[b]Holding period begins at the end of the third month following fiscal year-end (month 0).

Table 56 - continued

Twenty-Four Month Returns to the Hedge Portfolio When the Trading Strategy is Implemented on the Basis of Current Earnings Changes[a]

	24-Month Size-Adjusted Returns for Fiscal Year Ended December 31[b]				
	1985	1986	1987	1988	1989
Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	0.0494	0.0581	-0.0828	-0.0869	-0.0587
Short Portfolio	-0.0896	-0.0929	-0.0782	-0.0639	-0.0818
Hedge Portfolio	0.1390	0.1510	-0.0046	-0.0230	0.0231
(B): Size-Adjusted Returns					
Long Portfolio	0.0198	0.0421	0.0460	-0.0132	-0.0057
Short Portfolio	-0.0463	-0.0554	-0.0236	0.0147	-0.0163
Hedge Portfolio	0.0661	0.0975	0.0224	-0.0279	0.0106
Model 6: Stepwise Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	0.0462	0.0692	-0.0948	-0.0962	-0.0619
Short Portfolio	-0.0981	-0.1083	-0.0723	-0.0608	-0.0816
Hedge Portfolio	0.1443	0.1775	-0.0225	-0.0354	0.0197
(B): Size-Adjusted Returns					
Long Portfolio	0.0126	0.0471	-0.0066	-0.0421	-0.0103
Short Portfolio	-0.0265	-0.0725	-0.0312	-0.0124	-0.0245
Hedge Portfolio	0.0391	0.1196	0.0246	-0.0297	0.0142

[a]Hedge portfolio consists of taking long positions in stocks experiencing a large decrease in current earnings (quintile 1) with $Pr > 0.6$ and short positions in stocks experiencing a large increase in current earnings (quintile 5) with $Pr \leq 0.4$.

[b]Holding period begins at the end of the third month following fiscal year-end (month 0).

Table 57

Twenty-Four Month Returns to the Hedge Portfolio When the Trading Strategy is Implemented Using Industry-Specific Earnings Prediction Models[a]

	24-Month Size-Adjusted Returns for Fiscal Year Ended December 31[b]				
	1980	1981	1982	1983	1984
Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	0.1196	0.1754	0.0981	-0.1969	-0.2227
Short Portfolio	-0.1387	-0.0234	0.0594	-0.0367	-0.0880
Hedge Portfolio	0.2583	0.1988	0.0387	-0.1602	-0.1347
(B): Size-Adjusted Returns					
Long Portfolio	0.0630	0.0218	0.0533	-0.1316	-0.1223
Short Portfolio	-0.1102	-0.0844	0.0046	-0.0152	-0.0089
Hedge Portfolio	0.1732	0.1062	0.0487	-0.1164	-0.1312
Model 6: Stepwise Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	0.1256	0.2081	0.0904	-0.2729	-0.2607
Short Portfolio	-0.1483	-0.0221	0.0431	-0.0816	-0.0772
Hedge Portfolio	0.2739	0.2302	0.0473	-0.1913	-0.1835
(B): Size-Adjusted Returns					
Long Portfolio	0.0612	0.0348	0.0210	-0.1493	-0.1680
Short Portfolio	-0.1259	-0.0875	-0.0076	0.0063	-0.0139
Hedge Portfolio	0.1871	0.1223	0.0286	-0.1556	-0.1541

[a]Hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions with $Pr \leq 0.4$.

[b]Holding period begins at the end of the third month following fiscal year-end (month 0).

Table 57 - continued

Twenty-Four Month Returns to the Hedge Portfolio When the Trading Strategy is Implemented Using Industry-Specific Earnings Prediction Models[a]

	24-Month Size-Adjusted Returns for Fiscal Year Ended December 31[b]				
	1985	1986	1987	1988	1989
Model 3: Parsimonious Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	0.0192	0.0516	-0.1041	-0.1195	-0.0586
Short Portfolio	-0.1074	-0.0702	-0.0492	-0.0353	-0.0821
Hedge Portfolio	0.1266	0.1218	-0.0549	-0.0842	0.0235
(B): Size-Adjusted Returns					
Long Portfolio	0.0184	0.0281	-0.0258	-0.0540	-0.0199
Short Portfolio	-0.0291	-0.0422	-0.0086	0.0202	-0.0131
Hedge Portfolio	0.0475	0.0703	-0.0172	-0.0742	-0.0068
Model 6: Stepwise Dichotomous Logit Using a One-Year Drift					
(A): Market-Adjusted Returns					
Long Portfolio	0.0445	0.0502	-0.1202	-0.1421	-0.0555
Short Portfolio	-0.0920	-0.0875	-0.0452	-0.0467	-0.0816
Hedge Portfolio	0.1365	0.1377	-0.0750	-0.0954	0.0261
(B): Size-Adjusted Returns					
Long Portfolio	0.0106	0.0386	-0.0407	-0.0908	-0.0144
Short Portfolio	-0.0171	-0.0457	-0.0208	0.0136	-0.0171
Hedge Portfolio	0.0277	0.0843	-0.0199	-0.0772	0.0027

[a]Hedge portfolio consists of taking long positions in stocks with $Pr > 0.6$ and short positions in stocks $Pr \leq 0.4$.

[b]Holding period begins at the end of the third month following fiscal year-end (month 0).

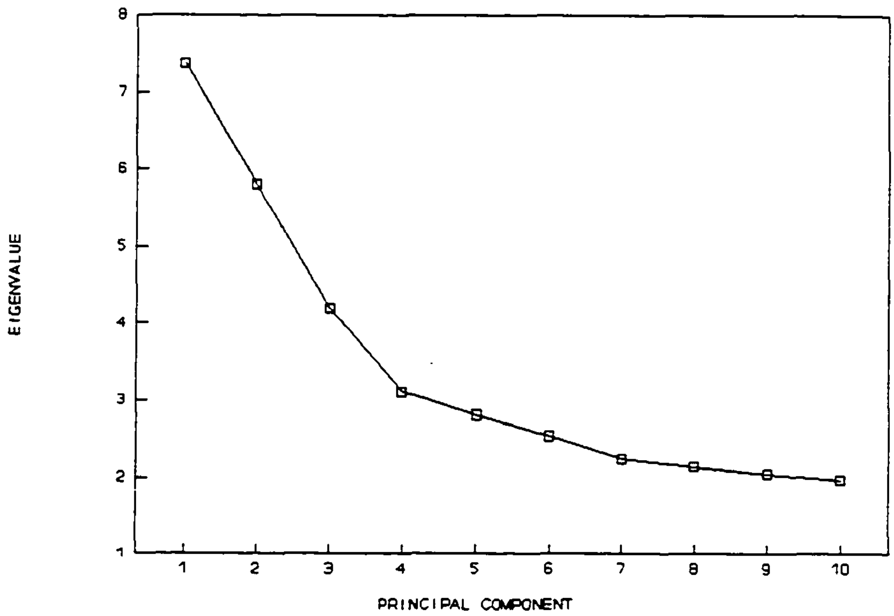
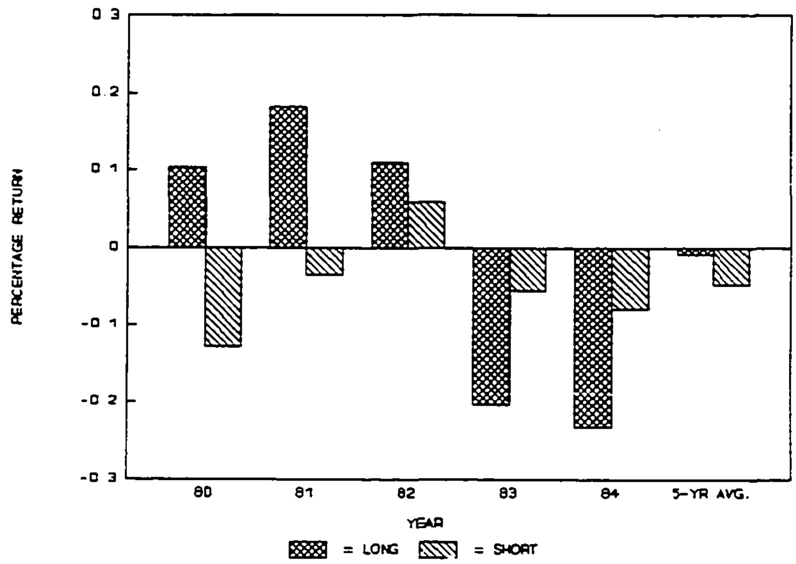


Figure 1: Scree graph plotting the eigenvalues of the first ten principal components. Eigenvalues obtained from a principal component analysis conducted on 61 accounting variables using 1980 data.

Panel A: Long and Short Positions Separately



Panel B: Hedge Position

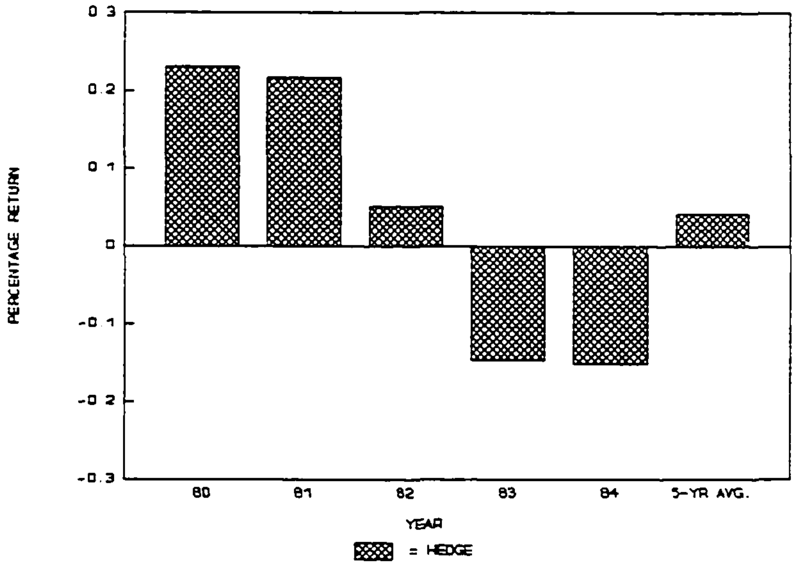
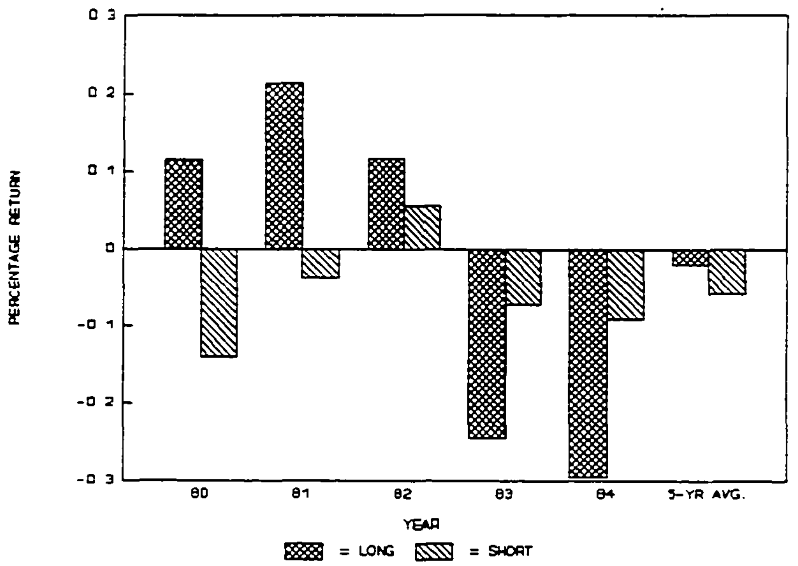


Figure 2: Average market-adjusted returns over 24 months associated with Model 3 over the 1980 - 1984 period. Long positions are taken in stocks with $Pr > 0.6$ and short positions are taken in stocks with $Pr \leq 0.4$.

Panel A: Long and Short Positions Separately



Panel B: Hedge Position

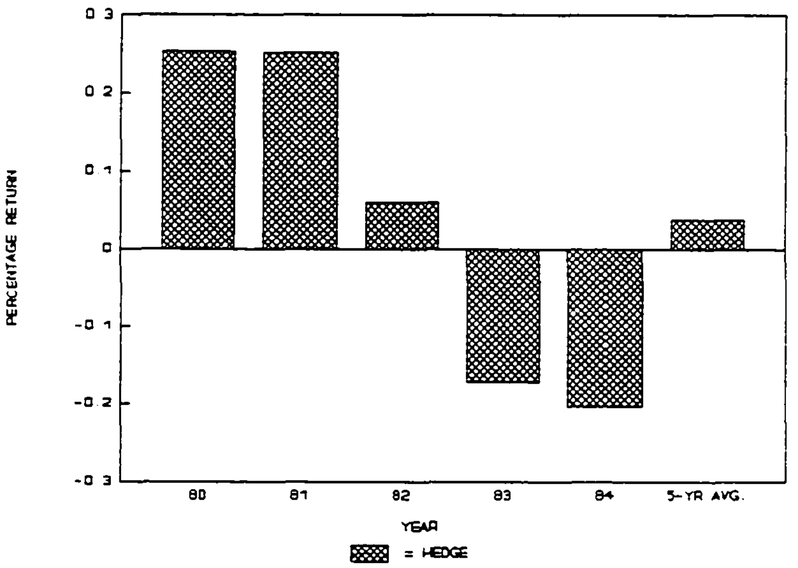
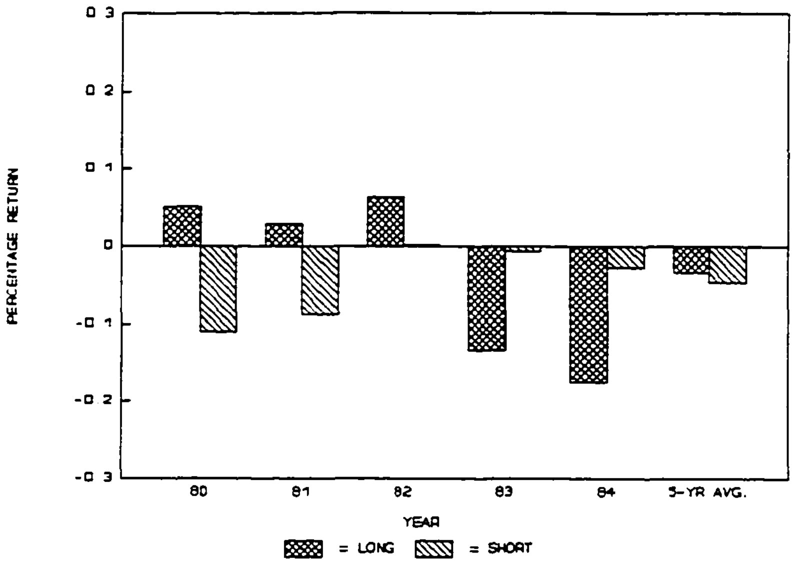


Figure 3: Average market-adjusted returns over 24 months associated with Model 6 over the 1980 - 1984 period. Long positions are taken in stocks with $Pr > 0.6$ and short positions are taken in stocks with $Pr \leq 0.4$.

Panel A: Long and Short Positions Separately



Panel B: Hedge Position

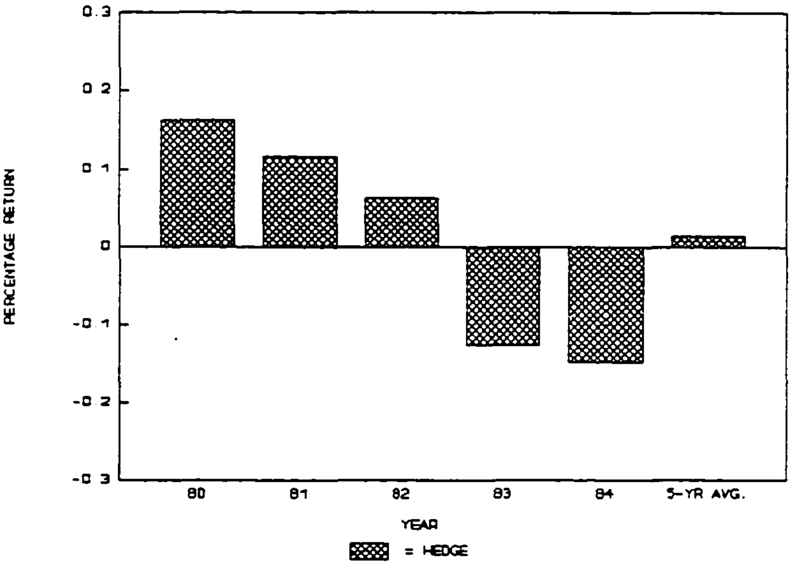
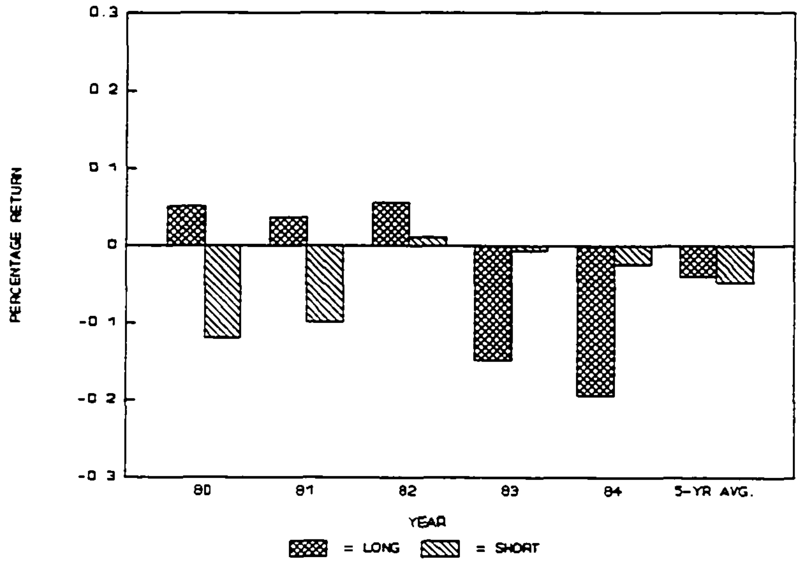


Figure 4: Average size-adjusted returns over 24 months associated with Model 3 over the 1980 - 1984 period. Long positions are taken in stocks with $Pr > 0.6$ and short positions are taken in stocks with $Pr \leq 0.4$.

Panel A: Long and Short Positions Separately



Panel B: Hedge Position

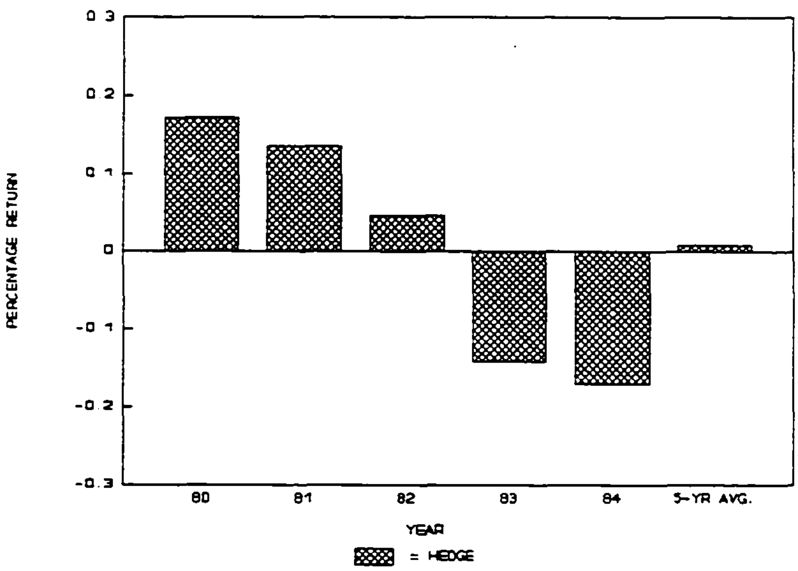
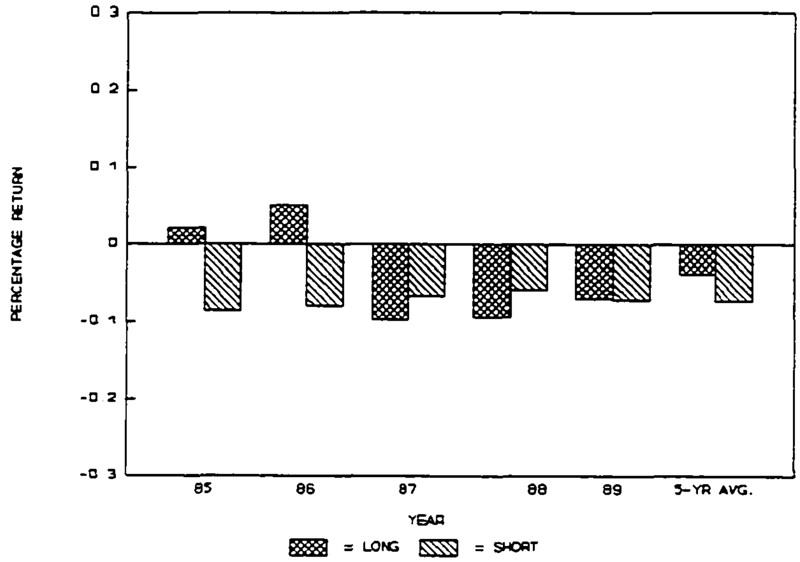


Figure 5: Average size-adjusted returns over 24 months associated with Model 6 over the 1980 - 1984 period. Long positions are taken in stocks with $Pr > 0.6$ and short positions are taken in stocks with $Pr \leq 0.4$.

Panel A: Long and Short Positions Separately



Panel B: Hedge Position

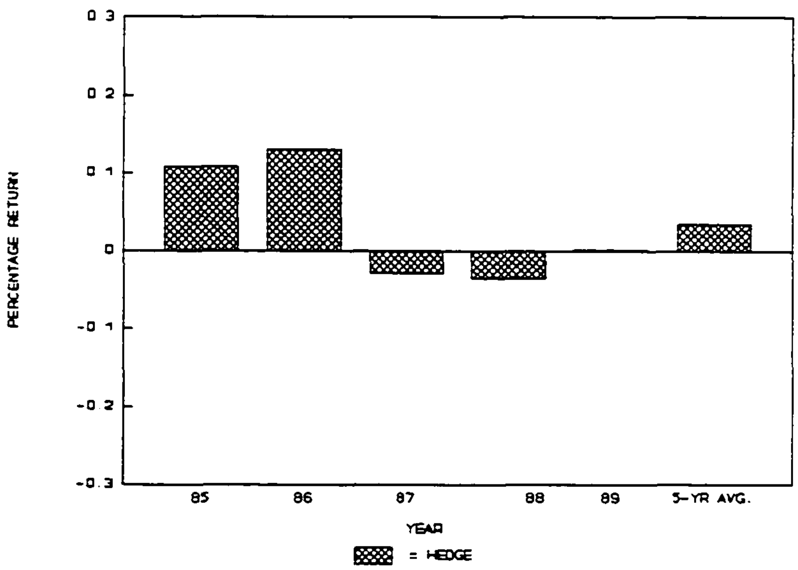
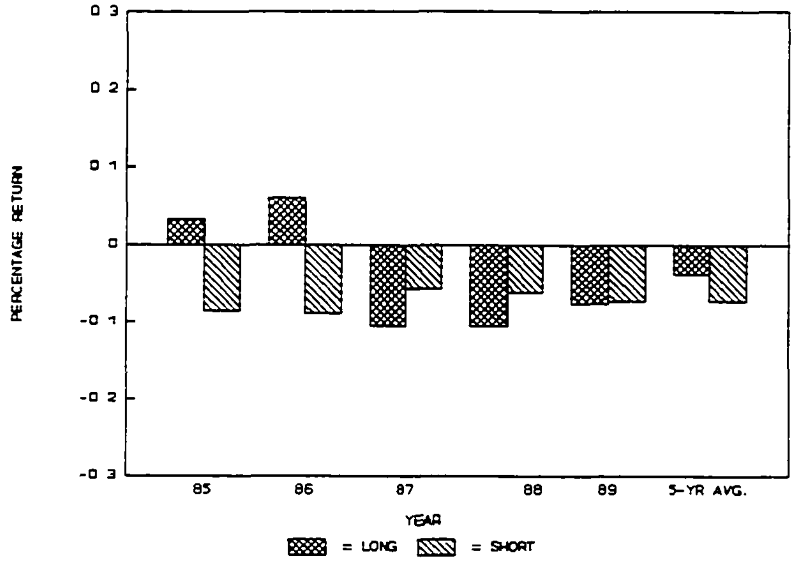


Figure 6: Average market-adjusted returns over 24 months associated with Model 3 over the 1985 - 1989 period. Long positions are taken in stocks with $Pr > 0.6$ and short positions are taken in stocks with $Pr \leq 0.4$.

Panel A: Long and Short Positions Separately



Panel B: Hedge Position

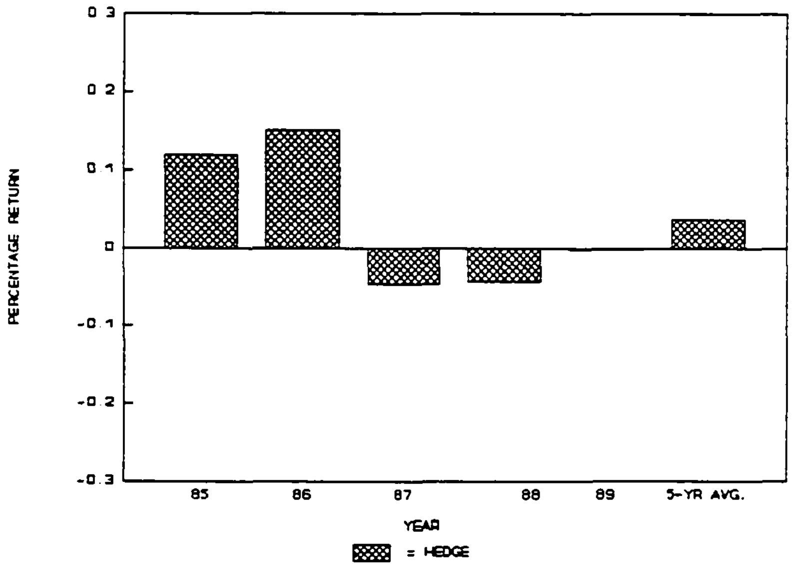
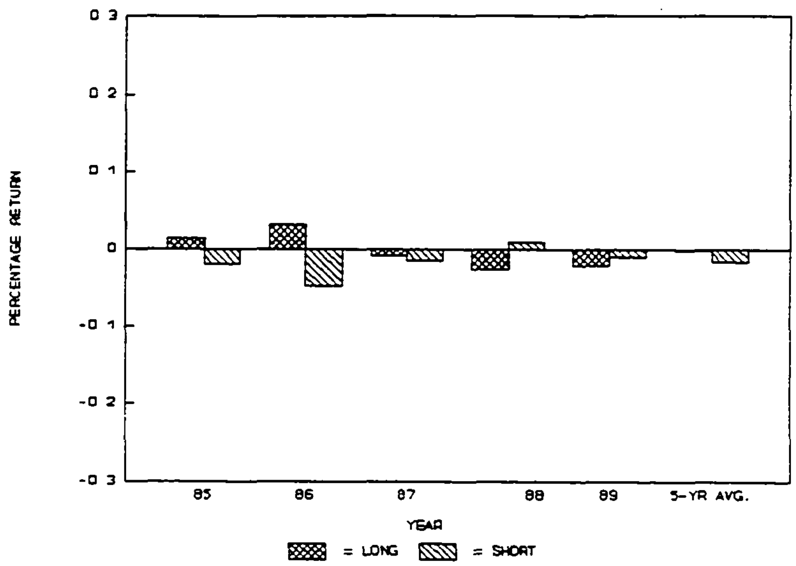


Figure 7: Average market-adjusted returns over 24 months associated with Model 6 over the 1985 - 1989 period. Long positions are taken in stocks with $Pr > 0.6$ and short positions are taken in stocks with $Pr \leq 0.4$.

Panel A: Long and Short Positions Separately



Panel B: Hedge Position

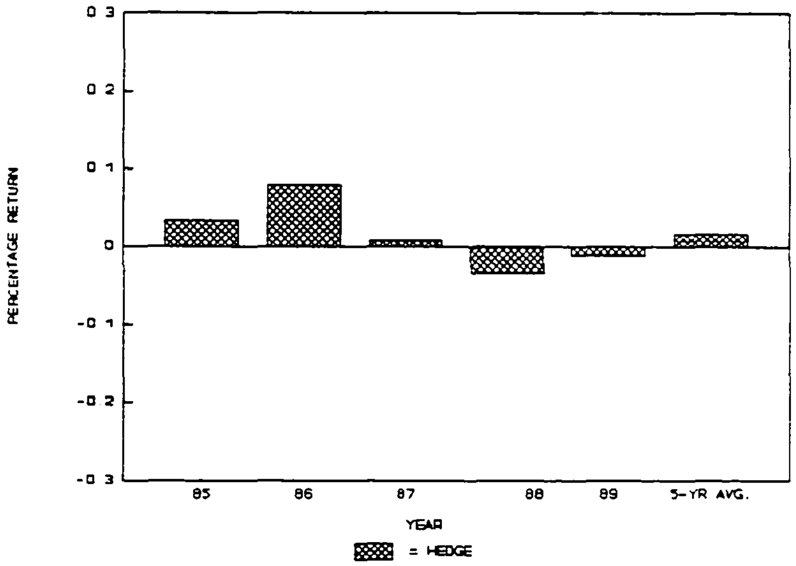
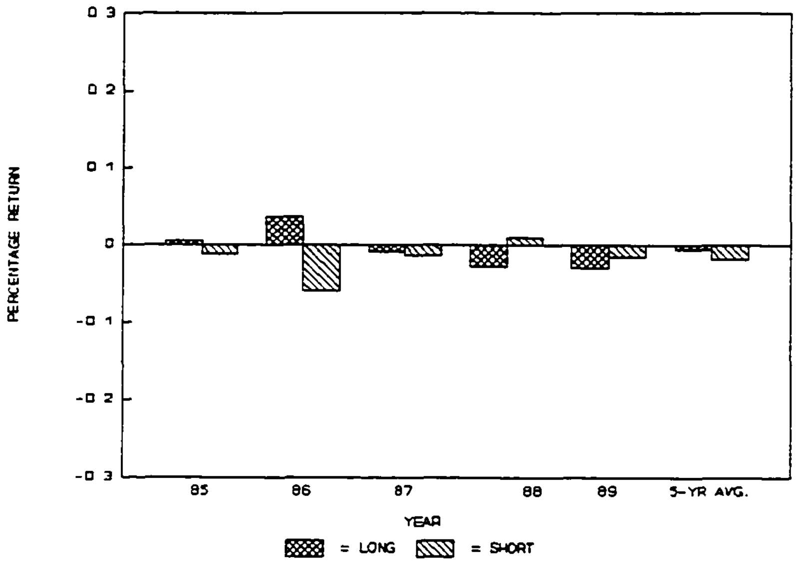


Figure 8: Average size-adjusted returns over 24 months associated with Model 3 over the 1985 - 1989 period. Long positions are taken in stocks with $Pr > 0.6$ and short positions are taken in stocks with $Pr \leq 0.4$.

Panel A: Long and Short Positions Separately



Panel B: Hedge Position

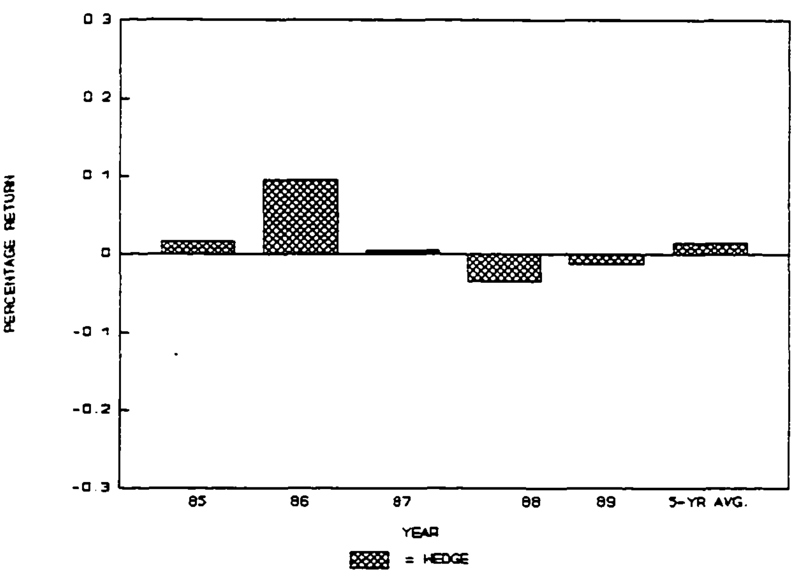


Figure 9: Average size-adjusted returns over 24 months associated with Model 6 over the 1985 - 1989 period. Long positions are taken in stocks with $Pr > 0.6$ and short positions are taken in stocks with $Pr \leq 0.4$.

APPENDIX A

Accounting Variables Used in the Analyses

1. Current Ratio
2. %Δ in Current Ratio
3. Quick Ratio
4. %Δ in Quick Ratio
5. Days Sales in Accounts Receivable
6. %Δ in Days Sales in Accounts Receivable
7. Inventory Turnover
8. %Δ in Inventory Turnover
9. Inventory/Total Assets
10. %Δ in Inventory/Total Assets
11. %Δ in Inventory
12. %Δ in Sales
13. %Δ in Depreciation
14. Δ in Dividends Per Share
15. Depreciation/Plant Assets
16. %Δ in Depreciation/Plant Assets
17. Return on Opening Equity
18. Δ in Return on Opening Equity
19. %Δ in Capital Expenditures/Total Assets
20. 19. (one-year lag)
21. Debt-Equity Ratio
22. %Δ in Debt-Equity Ratio
23. Long-Term Debt to Equity
24. %Δ in Long-Term Debt to Equity
25. Equity to Fixed Assets
26. %Δ in Equity to Fixed Assets
27. Times Interest Earned
28. %Δ in Times Interest Earned
29. Sales/Total Assets
30. %Δ in Sales/Total Assets
31. Return on Total Assets
32. Return on Closing Equity
33. Gross Margin Ratio
34. %Δ in Gross Margin Ratio
35. Operating Profit (before Depreciation) to Sales
36. %Δ in Operating Profit (before Depreciation) to Sales
37. Pretax Income to Sales
38. %Δ in Pretax Income to Sales
39. Net Profit Margin
40. %Δ in Net Profit Margin
41. Sales to Total Cash
42. Sales to Accounts Receivable
43. Sales to Inventory
44. %Δ in Sales to Inventory
45. Sales to Working Capital
46. %Δ in Sales to Working Capital
47. Sales to Fixed Assets
48. %Δ in Production
49. %Δ in R&D
50. %Δ in (R&D/Sales)
51. %Δ in Advertising Expense
52. %Δ in (Advertising/Sales)
53. %Δ in Total Assets
54. Cash Flow to Total Debt
55. Working Capital/Total Assets
56. %Δ in Working Capital/Total Assets
57. Operating Income/Total Assets
58. %Δ Operating Income/Total Assets
59. %Δ in Total Uses of Funds
60. %Δ in Total Sources of Funds
61. Repayment of Long-Term Debt as % of Total Long-Term Debt
62. Issuance of Long-Term Debt as % of Total Long-Term Debt
63. Purchase of Treasury Stock as % of Stock
64. %Δ in Funds
65. %Δ in Long-Term Debt
66. Cash Dividend as % of Cash Flows
67. %Δ in Working Capital
68. Net Income over Cash Flows

APPENDIX B

Classification of 68 Variables According to Traditional Financial Statement Analysis

1. Short-Term Liquidity

Levels	%Δ in Levels
1. Current Ratio	2. %Δ in Current Ratio
3. Quick Ratio	4. %Δ in Quick Ratio

2. Financial Leverage and Debt Coverage

Levels	%Δ in Levels
21. Debt-Equity Ratio	22. %Δ in Debt-Equity Ratio
23. Long-Term Debt to Equity	24. %Δ in Long-Term Debt to Equity
27. Times Interest Earned	28. %Δ in Times Interest Earned

3. Profitability

Levels	%Δ in Levels
17. Return on Opening Equity	18. Δ in Return on Opening Equity*
31. Return on Total Assets	
32. Return on Closing Equity	
33. Gross Margin Ratio	34. %Δ in Gross Margin Ratio
35. Operating Profit (before Depreciation) to Sales	36. %Δ in Operating Profit (before Depreciation) to Sales
37. Pretax Income to Sales	38. %Δ in Pretax Income to Sales
39. Net Profit Margin	40. %Δ in Net Profit Margin
54. Cash Flow to Total Debt**	
57. Operating Income/Total Assets	58. %Δ Operating Income/Total Assets

4a. Asset Utilization - Capital Intensity

Levels	%Δ in Levels
29. Sales/Total Assets	30. %Δ in Sales/Total Assets
47. Sales to Fixed Assets	

4b. Asset Utilization - Inventory Intensity

Levels	%Δ in Levels
7. Inventory Turnover	8. %Δ in Inventory Turnover
43. Sales to Inventory	44. %Δ in Sales to Inventory

4c. Asset Utilization - Receivable Intensity

Levels	%Δ in Levels
5. Days Sales in Accounts Receivable	6. %Δ in Days Sales in Accounts Receivable
42. Sales to Accounts Receivable	

4d. Asset Utilization - Other Measures

Levels	%Δ in Levels
41. Sales to Total Cash	
45. Sales to Working Capital	46. %Δ in Sales to Working Capital

5. Discretionary Costs (all measures expressed as %Δ in levels)

19. %Δ in Capital Expenditures/Total Assets
20. %Δ in Capital Expenditures/Total Assets (one-year lag)
49. %Δ in R&D
50. %Δ in (R&D/Sales)
51. %Δ in Advertising Expense
52. %Δ in (Advertising/Sales)

6. Growth Measures (all measures expressed as %Δ in levels)

11. %Δ in Inventory
12. %Δ in Sales
13. %Δ in Depreciation
14. Δ in Dividends Per Share*
53. %Δ in Total Assets
59. %Δ in Total Uses of Funds
60. %Δ in Total Sources of Funds
64. %Δ in Funds
65. %Δ in Long-Term Debt
67. %Δ in Working Capital

7. Miscellaneous

Levels	%Δ in Levels
9. Inventory/Total Assets	10. %Δ in Inventory/Total Assets
15. Depreciation/Plant Assets	16. %Δ in Depreciation/Plant Assets
25. Equity to Fixed Assets	26. %Δ in Equity to Fixed Assets
55. Working Capital/Total Assets	48. %Δ in Production
61. Repayment of Long-Term Debt as % of Long-Term Debt	56. %Δ in Working Capital/Total Assets
62. Issuance of Long-Term Debt as % of Total Long-Term Debt	
63. Purchase of Treasury Stock as % of Stock	
66. Cash Dividend as % of Cash Flows	
68. Net Income over Cash Flows	

* These variables are measured as the Δ versus the %Δ from the previous year.

** As in Ou and Penman [1989a], cash flow is defined as net income plus depreciation. When defined as such, this ratio has been shown to group empirically with profitability ratios.

Appendix C

Univariate Logit Estimations for the Sixty-One Accounting Variables Grouped According to Traditional Financial Statement Analysis

Group 1: Short-Term Liquidity

YEAR	1. Current Ratio			2. % Δ in Current Ratio			3. Quick Ratio			4. % Δ in Quick Ratio		
	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob
1975	0.030	0.250	.6170	-0.158	0.684	.4082	0.037	0.106	.7448	0.204	1.380	.2402
1976	-0.066	0.923	.3367	-0.378	1.475	.2245	-0.142	1.342	.2466	-0.138	0.280	.5970
1977	0.133	2.346	.1256	-0.289	0.888	.3458	-0.045	0.123	.7259	-0.156	0.401	.5268
1978	0.065	0.679	.4098	-0.326	0.801	.3709	0.327	4.986	.0256	0.443	2.128	.1446
1979	-0.016	0.041	.8395	0.156	0.733	.3920	0.166	1.845	.1744	-0.228	2.078	.1494
1980	0.091	1.303	.2537	-0.844	6.886	.0087	-0.052	0.154	.6945	-0.368	2.395	.1217
1981	-0.172	3.106	.0780	-1.514	10.516	.0012	-0.355	3.967	.0464	-0.102	0.176	.6752
1982	0.153	4.364	.0367	0.229	0.443	.5055	-0.050	0.189	.6644	0.478	3.514	.0608
1983	-0.073	0.847	.3573	-0.431	2.335	.1265	-0.201	3.204	.0735	-0.240	1.202	.2729
1984	-0.139	2.629	.1049	-0.116	0.096	.7562	-0.198	2.224	.1359	0.233	0.726	.3841
1985	-0.044	0.358	.5496	-1.055	8.584	.0034	-0.141	1.741	.1870	-0.611	5.726	.0167
1986	-0.026	0.102	.7495	-0.394	1.435	.2309	-0.014	0.016	.8993	-0.082	0.140	.7080
1987	-0.012	0.047	.8283	-0.117	0.295	.5870	-0.023	0.119	.7294	0.021	0.016	.8993
1988	-0.026	0.134	.7147	-0.465	2.639	.1043	0.013	0.025	.8733	-0.129	0.528	.4675
1989	-0.111	2.022	.1551	0.058	0.112	.7378	-0.062	0.479	.4891	0.049	0.170	.6801

Appendix C - continued

Univariate Logit Estimations for the Sixty-One Accounting Variables Grouped According to Traditional Financial Statement Analysis

Group 2: Financial Leverage & Debt Coverage

YEAR	21. Debt-Equity Ratio			22. % Δ in Debt-Equity Ratio			23. Long-Term Debt to Equity			24. % Δ in Long-Term Debt to Equity			27. Times Interest Earned		
	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob
1975	0.007	0.062	.8078	0.169	0.791	.3737	0.014	0.039	.8429	-0.033	1.153	.2829	0.001	0.148	.7001
1976	-0.010	0.101	.7510	0.040	0.044	.8332	0.029	0.141	.7069	-0.021	0.301	.5831	0.000	0.007	.9323
1977	-0.042	0.532	.4660	0.373	1.526	.2167	-0.044	0.151	.6980	-0.023	0.730	.3929	-0.002	0.429	.5127
1978	-0.089	1.732	.1893	0.143	0.448	.5035	-0.156	1.888	.1695	-0.011	0.813	.3673	0.001	0.273	.6015
1979	0.104	1.896	.1686	0.538	5.960	.0146	0.072	0.332	.5644	0.040	0.968	.3252	0.002	0.743	.3888
1980	0.012	0.315	.5749	0.192	1.402	.2363	0.005	0.031	.8608	-0.021	0.369	.5435	0.018	7.122	.0076
1981	0.147	9.900	.0017	0.492	4.256	.0391	0.205	6.742	.0094	0.000	0.000	.9961	-0.016	3.636	.0565
1982	0.013	0.687	.4071	0.200	1.587	.2077	0.023	0.398	.5282	0.011	0.317	.5732	-0.018	7.611	.0058
1983	0.058	1.335	.2480	0.147	0.725	.3944	0.087	0.930	.3349	0.010	0.483	.4870	-0.008	4.596	.0320
1984	0.001	0.102	.7495	0.329	3.927	.0475	-0.005	0.173	.6772	-0.006	0.080	.7773	-0.019	6.999	.0082
1985	0.074	2.427	.1192	0.595	9.814	.0017	0.153	2.187	.1392	0.011	1.128	.2882	-0.015	5.080	.0242
1986	0.007	0.311	.5771	0.166	1.258	.2620	0.013	0.243	.6219	0.027	0.772	.3795	-0.002	0.243	.6221
1987	0.032	0.899	.3432	0.082	0.475	.4907	0.056	1.023	.3117	-0.005	0.177	.6742	-0.001	0.012	.9146
1988	0.038	1.465	.2262	0.306	4.708	.0300	0.060	1.141	.2854	0.013	1.363	.2430	-0.006	1.804	.1792
1989	0.056	1.996	.1577	0.210	2.372	.1235	0.060	0.084	.3593	-0.019	0.106	.7453	-0.001	0.622	.4305

Appendix C - continued

Univariate Logit Estimations for the Sixty-One Accounting Variables Grouped According to Traditional Financial Statement Analysis

Group 2: Financial Leverage & Debt Coverage (continued)

YEAR	28. % Δ in Times Interest Earned		
	β	χ^2	Prob
1975	0.004	0.658	.4174
1976	0.041	4.397	.0360
1977	-0.059	1.698	.1925
1978	-0.005	0.128	.7207
1979	-0.020	0.356	.5508
1980	0.019	0.950	.3298
1981	-0.035	1.208	.2716
1982	-0.104	3.291	.0697
1983	-0.013	0.885	.3469
1984	-0.104	4.605	.0319
1985	-0.361	17.023	.0001
1986	-0.005	0.988	.3202
1987	-0.028	1.428	.2321
1988	-0.231	9.154	.0025
1989	-0.026	0.745	.3880

Appendix C - continued

Univariate Logit Estimations for the Sixty-One Accounting Variables Grouped According to Traditional Financial Statement Analysis

Group 3: Profitability

YEAR	17. Return on Opening Equity			18. Δ in Return on Opening Equity			31. Return on Total Assets			32. Return on Closing Equity			33. Gross Margin Ratio		
	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob
1975	-8.219	72.589	.0001	-1.346	6.879	.0087	-17.748	73.549	.0001	-7.490	52.193	.0001	-0.531	1.102	.3144
1976	-4.396	30.433	.0001	-0.404	1.237	.2662	-11.481	34.128	.0001	-6.510	33.972	.0001	0.304	0.348	.5549
1977	-5.792	40.466	.0001	0.538	0.696	.4041	-8.148	17.100	.0001	-6.819	34.290	.0001	-0.072	0.020	.8888
1978	-3.325	18.550	.0001	1.203	3.558	.0592	-3.617	4.434	.0352	-4.119	15.338	.0001	0.787	2.142	.1433
1979	-3.215	21.535	.0001	-0.825	2.519	.1125	-9.097	26.664	.0001	-4.192	22.500	.0001	0.038	0.005	.9429
1980	-5.930	53.624	.0001	-0.304	1.117	.7906	-14.344	53.327	.0001	-3.877	21.620	.0001	-1.947	12.282	.0005
1981	-4.224	33.061	.0001	0.120	0.123	.7259	-13.309	41.957	.0001	-3.487	22.260	.0001	-0.836	1.671	.1961
1982	-6.347	53.650	.0001	-0.662	1.637	.2007	-14.413	56.741	.0001	-5.558	38.616	.0001	-1.883	12.085	.0005
1983	-5.456	40.396	.0001	-0.447	0.645	.4221	-11.187	33.498	.0001	-4.181	19.305	.0001	-1.234	4.651	.0310
1984	-3.242	23.026	.0001	-1.192	4.023	.0449	-11.584	38.451	.0001	-1.458	8.405	.0037	-0.302	0.242	.6231
1985	-5.442	44.062	.0001	-2.959	16.304	.0001	-11.939	41.610	.0001	-4.697	33.473	.0001	-1.497	5.674	.0172
1986	-3.993	27.662	.0001	-1.878	8.562	.0034	-9.600	27.525	.0001	-3.109	17.471	.0001	0.156	0.056	.8129
1987	-2.018	12.553	.0004	-1.046	5.399	.0202	-6.767	15.565	.0001	-3.156	16.699	.0001	-0.739	1.400	.2368
1988	-4.815	39.344	.0001	-2.356	14.183	.0002	-11.766	37.744	.0001	-2.796	16.977	.0001	0.295	0.237	.6268
1989	-5.049	35.542	.0001	-2.846	16.568	.0001	-12.367	33.207	.0001	-4.055	24.377	.0001	-0.003	0.000	.9959

Appendix C - continued

Univariate Logit Estimations for the Sixty-One Accounting Variables Grouped According to Traditional Financial Statement Analysis

Group 3: Profitability (continued)

YEAR	34. % Δ in Gross Margin Ratio			35. Operating Profit (before depreciation) to Sales			36. % Δ in Operating Profit to Sales			37. Pretax Income to Sales			38. % Δ in Pretax Income to Sales		
	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob
1975	-0.190	0.279	.5971	-3.106	17.794	.0001	0.034	0.403	.5257	-7.548	49.613	.0001	-0.024	1.924	.1654
1976	-0.111	0.531	.4663	-0.996	2.146	.1430	0.048	0.645	.4220	-4.649	22.993	.0001	0.011	0.556	.4561
1977	0.155	0.110	.7399	-1.936	8.334	.0039	0.001	0.001	.9897	-3.857	16.895	.0001	-0.020	0.312	.5767
1978	0.151	0.102	.7495	1.569	4.687	.0304	0.035	0.424	.5151	0.248	0.076	.7833	0.001	0.277	.5987
1979	0.818	4.968	.0258	-0.075	0.012	.9114	0.028	0.121	.7283	-1.951	4.809	.0283	-0.111	3.819	.0507
1980	-0.596	1.340	.2471	-4.622	26.178	.0001	-0.007	0.015	.9034	-6.139	34.069	.0001	-0.044	2.688	.1011
1981	0.312	1.313	.2519	-5.356	19.328	.0001	-0.045	1.107	.2929	-9.009	39.146	.0001	-0.092	5.931	.0149
1982	-0.753	3.337	.0677	-5.134	34.095	.0001	-0.256	4.652	.0310	-8.411	53.685	.0001	-0.128	8.108	.0044
1983	0.215	0.607	.4358	-2.563	10.694	.0011	0.033	0.668	.4136	-4.672	22.633	.0001	-0.002	0.024	.8778
1984	0.171	0.465	.4951	-1.753	3.783	.0518	0.003	0.015	.9022	-4.847	20.254	.0001	-0.034	2.677	.1018
1985	-1.197	5.390	.0203	-5.028	21.825	.0001	-0.024	0.469	.4934	-7.905	40.194	.0001	-0.127	8.288	.0040
1986	0.084	0.300	.5841	-0.671	0.484	.4866	-0.021	0.183	.6689	-4.586	18.870	.0001	-0.067	5.737	.0166
1987	0.029	0.030	.8620	0.280	0.561	.4537	-0.137	2.669	.1023	-0.254	0.370	.5429	-0.002	0.113	.7370
1988	-0.734	2.552	.1102	0.067	0.082	.7745	-0.057	0.610	.4349	-0.296	0.701	.4025	-0.012	1.379	.2404
1989	0.091	0.051	.8210	0.863	0.874	.3498	-0.004	0.029	.8639	-7.554	29.560	.0001	-0.049	2.005	.1568

Appendix C - continued

Univariate Logit Estimations for the Sixty-One Accounting Variables Grouped According to Traditional Financial Statement Analysis

Group 3: Profitability (continued)

YEAR	39. Net Profit Margin			40. % Δ in Net Profit Margin			54. Cash Flow to Total Debt			57. Operating Income/ Total Assets			58. % Δ in Operating Income/Total Assets		
	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob
1975	-12.417	47.764	.0001	-0.069	4.278	.0386	-2.073	24.113	.0001	-7.001	45.910	.0001	0.030	0.378	.5389
1976	-7.214	19.769	.0001	-0.008	0.140	.7081	-1.571	13.741	.0002	-3.941	15.825	.0001	0.057	0.749	.3869
1977	-6.606	17.432	.0001	-0.063	2.716	.0993	-0.463	1.190	.2754	-2.770	7.293	.0069	0.050	0.272	.6022
1978	-0.278	0.038	.8446	0.005	0.475	.4907	0.547	1.570	.2102	-1.090	1.217	.2698	0.052	0.755	.3850
1979	-3.650	6.152	.0131	-0.008	0.170	.6805	-1.610	10.685	.0011	-3.150	10.153	.0014	0.010	0.019	.8905
1980	-10.430	34.774	.0001	-0.126	5.089	.0241	-2.727	26.011	.0001	-6.262	35.517	.0001	-0.002	0.002	.9666
1981	-14.756	39.034	.0001	-0.012	1.283	.7574	-3.654	27.433	.0001	-5.677	22.172	.0001	-0.062	1.499	.2208
1982	-13.088	48.568	.0001	-0.117	7.509	.0061	-2.886	30.988	.0001	-7.508	44.717	.0001	-0.147	2.591	.1074
1983	-7.738	23.089	.0001	-0.322	1.588	.2077	-1.913	15.695	.0001	-4.637	16.562	.0001	0.048	1.151	.2834
1984	-7.396	20.135	.0001	-0.034	2.660	.1029	-3.375	28.213	.0001	-6.159	24.208	.0001	0.024	0.014	.9066
1985	-12.686	40.041	.0001	-0.137	10.993	.0009	-7.949	25.525	.0001	-6.065	24.231	.0001	-0.024	0.562	.4534
1986	-7.600	20.164	.0001	-0.119	8.970	.0027	-1.300	5.661	.0174	-2.867	5.473	.0193	-0.027	0.294	.5877
1987	-0.113	0.094	.7590	0.002	0.250	.6171	-0.092	0.100	.7521	-1.594	1.713	.1907	-0.076	1.216	.2702
1988	-0.157	0.375	.5403	-0.014	1.278	.2582	-1.087	4.499	.0339	-4.420	13.026	.0003	-0.022	0.325	.5688
1989	-10.768	29.625	.0001	-0.026	0.970	.3246	-1.963	10.911	.0010	-3.696	7.367	.0066	-0.002	0.012	.9113

Appendix C - continued

Univariate Logit Estimations for the Sixty-One Accounting Variables Grouped According to Traditional Financial Statement Analysis

Group 4a: Asset Utilization - Capital Intensity

YEAR	29. Sales/Total Assets			30. % Δ in Sales/Total Assets			47. Sales to Fixed Assets		
	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob
1975	-0.217	4.644	.0312	-0.164	0.113	.7371	-0.020	2.253	.1334
1976	-0.139	2.269	.1320	1.361	7.202	.0073	-0.002	0.018	.8943
1977	-0.077	0.699	.4031	2.430	12.898	.0003	-0.024	4.905	.0268
1978	-0.537	20.606	.0001	1.611	7.971	.0048	-0.028	5.086	.0241
1979	-0.030	0.087	.7686	0.244	0.688	.4070	0.006	0.530	.4668
1980	0.194	3.533	.0602	-0.339	0.474	.4913	0.015	1.658	.1978
1981	0.207	3.863	.0490	0.269	0.194	.6601	0.029	5.176	.0229
1982	-0.028	0.070	.7916	0.790	2.122	.1452	-0.005	0.156	.6926
1983	-0.387	10.788	.0010	1.639	7.867	.0050	-0.094	17.360	.0001
1984	-0.057	0.217	.6415	0.083	0.039	.8840	0.005	0.579	.4469
1985	0.011	0.007	.9330	1.557	6.994	.0082	-0.019	1.258	.2620
1986	-0.202	2.200	.1380	0.686	1.671	.1960	-0.014	0.681	.4093
1987	-0.092	0.402	.5263	0.787	3.673	.0553	-0.025	3.228	.0724
1988	-0.126	0.597	.4399	0.917	4.420	.0355	0.003	0.140	.7085
1989	0.083	0.243	.6220	1.912	7.443	.0064	-0.002	0.054	.8157

Appendix C - continued

Univariate Logit Estimations for the Sixty-One Accounting Variables Grouped According to Traditional Financial Statement Analysis

Group 4b: Asset Utilization - Inventory

YEAR	7. Inventory Turnover			8. % Δ in Inventory Turnover			43. Sales to Inventory			4. % Δ in Sales to Inventory		
	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob
1975	-0.003	0.375	.5713	0.864	4.547	.0330	0.001	0.101	.7508	0.295	1.566	.2108
1976	0.002	0.191	.6620	1.091	9.381	.0022	0.001	0.102	.7489	0.417	2.116	.1457
1977	-0.007	2.531	.1116	-0.100	0.084	.7718	-0.007	4.875	.0273	-0.161	0.684	.4083
1978	-0.021	12.040	.0005	1.347	9.443	.0021	-0.011	8.075	.0045	1.047	9.823	.0017
1979	0.000	0.002	.9692	0.109	0.799	.3714	0.001	0.113	.7370	0.271	1.443	.2297
1980	-0.007	1.214	.2706	0.305	0.459	.4982	-0.008	2.581	.1082	0.170	0.338	.5610
1981	0.009	2.793	.0947	0.181	0.192	.6609	0.003	0.586	.4441	0.074	0.334	.5635
1982	-0.011	4.219	.0400	0.068	0.587	.4436	-0.010	5.698	.0170	0.027	0.021	.8851
1983	-0.012	5.250	.0219	0.993	4.777	.0288	-0.009	5.415	.0200	0.812	4.968	.0258
1984	0.008	2.639	.1043	0.047	0.037	.8468	0.006	3.213	.0730	0.139	0.362	.5474
1985	-0.015	4.101	.0429	0.075	0.142	.7068	-0.016	6.390	.0115	0.058	0.074	.7851
1986	-0.011	2.991	.0837	0.760	2.741	.0978	-0.005	1.566	.2108	1.065	7.329	.0068
1987	0.002	0.325	.5684	0.310	1.233	.2669	0.002	0.385	.5349	0.221	1.094	.2957
1988	-0.011	2.945	.0862	0.423	2.341	.1260	-0.007	2.367	.1239	0.236	0.526	.4683
1989	0.007	2.760	.0966	-0.121	0.105	.7458	0.007	3.822	.0506	0.520	1.966	.1609

Appendix C - continued

Univariate Logit Estimations for the Sixty-One Accounting Variables Grouped According to Traditional Financial Statement Analysis

Group 4c: Asset Utilization - Receivable Intensity

YEAR	5. Days Sales in Accounts Receivable			6. % Δ in Days Sales in Accounts Receivable			42. Sales to Accounts Receivable		
	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob
1975	0.006	3.650	.0561	0.208	0.262	.6090	-0.009	4.419	.0355
1976	0.004	2.176	.1401	-0.110	0.074	.7852	-0.000	0.000	.9965
1977	-0.004	2.034	.1539	-1.228	5.180	.0229	0.005	1.981	.1593
1978	0.007	6.244	.0125	-0.374	1.046	.3064	-0.022	7.780	.0053
1979	0.004	2.112	.1462	0.392	1.202	.2730	-0.001	0.035	.8525
1980	-0.001	0.035	.8512	0.612	2.679	.1018	0.000	0.012	.9728
1981	0.003	0.851	.3563	0.541	3.575	.0587	0.003	1.221	.2692
1982	-0.003	1.306	.2532	-0.219	0.540	.4625	-0.005	2.232	.1352
1983	0.002	0.671	.4126	-0.838	4.540	.0331	-0.011	4.670	.0307
1984	0.004	1.632	.2014	0.561	1.465	.2262	0.007	2.186	.1392
1985	-0.001	0.082	.7744	-0.986	3.559	.0592	0.001	0.012	.9143
1986	0.007	4.282	.0385	0.139	0.152	.1516	-0.007	1.823	.1769
1987	0.001	0.080	.7773	-0.256	0.338	.5609	-0.000	0.000	.9988
1988	0.007	3.753	.0527	-0.332	0.628	.4282	-0.011	1.094	.2955
1989	0.005	2.126	.1448	0.325	0.238	.6254	0.000	0.004	.9514

Appendix C - continued

Univariate Logit Estimations for the Sixty-One Accounting Variables Grouped According to Traditional Financial Statement Analysis

Group 4d: Asset Utilization - Other Measures

YEAR	41. Sales to Total Cash			45. Sales to Working Capital			46. % Δ in Sales to Working Capital		
	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob
1975	-0.003	2.508	.1133	0.003	0.582	.4455	0.041	0.655	.4183
1976	-0.001	2.028	.1545	-0.001	0.025	.8749	0.026	0.594	.4408
1977	-0.001	0.486	.4858	-0.003	1.006	.3158	-0.031	0.209	.6475
1978	-0.002	3.665	.0556	0.000	0.096	.7570	0.016	0.594	.4407
1979	0.000	0.955	.3284	-0.001	0.863	.3529	-0.007	0.339	.5605
1980	0.002	3.647	.0562	-0.002	0.834	.3612	-0.068	0.960	.3271
1981	-0.000	0.601	.8064	-0.000	0.186	.6664	-0.007	0.135	.7135
1982	0.001	1.668	.1965	-0.007	4.419	.0355	0.027	0.232	.6301
1983	-0.001	1.098	.2948	0.001	0.607	.4360	0.035	0.465	.4954
1984	0.003	9.021	.0027	-0.000	0.043	.8364	0.013	0.126	.7223
1985	-0.000	0.009	.9245	0.001	0.211	.6459	0.093	2.733	.0983
1986	-0.000	0.840	.3593	-0.001	1.347	.2458	0.013	0.665	.4150
1987	-0.000	0.785	.3757	0.002	0.500	.4795	0.009	0.078	.7806
1988	-0.000	0.037	.8476	-0.000	0.028	.8653	0.008	0.193	.6606
1989	-0.000	0.001	.9742	0.001	0.948	.3303	-0.011	0.093	.7605

Appendix C - continued

Univariate Logit Estimations for the Sixty-One Accounting Variables Grouped According to Traditional Financial Statement Analysis

Group 5: Discretionary Costs

YEAR	19. % Δ Capital Expense/Total Assets			20. % Δ in Capital Expense/Total Assets (one-year lag)		
	β	χ^2	Prob	β	χ^2	Prob
1975	-0.251	5.934	.0148	-0.136	3.299	.0693
1976	0.030	0.220	.6395	-0.452	14.279	.0002
1977	-0.041	0.238	.6257	-0.091	2.268	.1321
1978	-0.085	0.754	.3852	-0.097	1.756	.1851
1979	-0.001	0.000	.9923	-0.089	1.212	.2709
1980	-0.092	0.821	.3650	-0.202	3.523	.0605
1981	-0.073	0.627	.4284	0.033	0.060	.8070
1982	-0.117	1.600	.2059	0.007	0.010	.9213
1983	-0.170	3.384	.0658	-0.146	2.313	.1283
1984	-0.336	7.301	.0069	-0.034	0.130	.7184
1985	-0.030	0.084	.7717	0.000	0.000	.9919
1986	-0.137	2.761	.0966	-0.102	1.469	.2254
1987	0.016	0.081	.7764	-0.011	0.025	.8733
1988	0.112	1.398	.2371	0.034	0.245	.6205
1989	-0.067	0.346	.5562	-0.168	2.034	.1538

Appendix C - continued

Univariate Logit Estimations for the Sixty-One Accounting Variables Grouped According to Traditional Financial Statement Analysis

Group 6: Growth Measures

YEAR	11. % Δ in Inventory			12. % Δ in Sales			13. % Δ in Depreciation			14. % Δ in Dividends Per Share			53. % Δ in Total Assets		
	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob
1975	-0.917	12.698	.0004	-1.677	17.070	.0001	-0.642	2.441	.1182	-3.979	42.765	.0001	-3.326	31.509	.0001
1976	-0.347	2.191	.1388	-0.147	0.191	.6624	-0.686	3.727	.0535	-1.214	7.342	.0067	-1.344	8.774	.0031
1977	-0.573	4.918	.0266	-0.426	0.969	.3251	-0.913	8.117	.0044	-0.641	2.917	.0877	-2.335	18.072	.0001
1978	-0.648	8.570	.0034	-0.009	0.001	.9794	-0.660	5.160	.0231	-0.415	1.321	.2505	-0.954	5.855	.0155
1979	0.029	0.042	.8369	0.121	0.324	.5691	0.197	0.968	.3250	-1.355	8.809	.0030	-0.031	0.010	.9193
1980	-0.533	5.380	.0204	-1.766	18.089	.0001	-0.391	1.767	.1838	-2.171	21.085	.0001	-1.889	16.731	.0001
1981	-0.196	0.728	.3936	-0.401	0.966	.3258	-0.082	0.068	.7944	-2.529	14.871	.0001	-0.446	1.030	.3102
1982	-1.552	16.288	.0001	-2.067	18.539	.0001	-2.664	31.351	.0001	-3.143	24.709	.0001	-3.822	37.295	.0001
1983	-0.135	0.855	.3551	-0.593	1.855	.1732	-0.241	0.412	.5209	-2.306	14.291	.0002	-1.175	9.959	.0016
1984	0.055	0.496	.4814	-0.843	3.432	.0640	0.054	0.102	.7497	-1.934	7.316	.0068	-0.832	2.572	.1088
1985	-0.085	0.586	.4441	-0.318	0.340	.5597	0.030	0.005	.9450	-1.097	3.784	.0518	-1.297	7.075	.0078
1986	0.008	0.108	.7424	-1.090	6.418	.0113	-0.074	0.158	.6907	-0.236	0.267	.6052	-1.032	10.754	.0010
1987	-0.297	1.692	.1934	-0.026	0.013	.9102	-0.080	0.087	.7685	-0.602	2.206	.1374	-0.608	3.163	.0753
1988	-0.368	1.913	.1666	-0.328	1.003	.3166	-0.165	0.432	.5111	-1.548	5.797	.0160	-1.340	7.408	.0065
1989	-1.023	6.293	.0121	-1.397	5.046	.0247	-0.080	0.076	.7824	-0.063	0.763	.3826	-1.846	9.286	.0023

Appendix C - continued

Univariate Logit Estimations for the Sixty-One Accounting Variables Grouped According to Traditional Financial Statement Analysis

Group 6: Growth Measures (continued)

YEAR	65. % Δ Long-Term Debt			67. % Δ in Working Capital		
	β	χ^2	Prob	β	χ^2	Prob
1975	-0.050	2.848	.0915	-0.065	0.840	.3593
1976	-0.031	0.734	.3917	-0.036	0.757	.3844
1977	-0.035	0.519	.4715	-0.031	0.642	.4231
1978	-0.010	0.836	.3604	-0.001	0.000	.9871
1979	0.025	0.949	.3301	0.023	1.334	.2481
1980	-0.030	0.969	.3249	0.139	3.254	.0712
1981	-0.278	2.798	.0944	0.007	1.031	.3100
1982	-0.079	1.514	.2186	0.006	0.402	.5263
1983	0.003	0.159	.6900	-0.011	0.127	.7221
1984	-0.025	0.717	.3971	-0.013	0.402	.5261
1985	0.009	0.950	.3296	-0.033	0.806	.3694
1986	-0.016	0.281	.5960	-0.030	0.487	.4853
1987	-0.021	0.809	.3683	0.010	0.495	.4816
1988	0.006	0.334	.5633	0.000	0.000	.9997
1989	-0.306	3.907	.0481	-0.004	0.089	.7650

Appendix C - continued

Univariate Logit Estimations for the Sixty-One Accounting Variables Grouped According to Traditional Financial Statement Analysis

Group 7: Miscellaneous

YEAR	9. Inventory/Total Assets			10. % Δ in Inventory/ Total Assets			15. Depreciation/Plant Assets			16. % Δ in Depreciation/ Plant Assets			25. Equity to Fixed Assets		
	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob
1975	-0.056	0.010	.9198	-0.441	2.716	.0993	3.855	7.111	.0077	2.274	19.893	.0001	0.009	0.032	.8589
1976	0.179	0.114	.7352	-0.107	0.600	.4384	4.206	9.010	.0027	0.692	2.966	.0850	-0.000	0.000	.9876
1977	0.741	1.918	.1661	-0.133	0.765	.3819	0.664	0.222	.6376	0.052	0.018	.8924	-0.046	1.433	.2313
1978	-1.056	3.916	.0478	-0.483	4.299	.0381	0.590	0.178	.6735	0.319	0.619	.4313	0.001	0.000	.9844
1979	-0.496	0.828	.3628	0.060	0.045	.8306	1.590	1.146	.2843	0.834	4.725	.0297	0.008	0.046	.8303
1980	1.141	4.414	.0356	-0.474	2.551	.1102	4.012	4.515	.0336	0.478	2.220	.1362	0.072	2.333	.1267
1981	0.687	1.131	.2875	-0.244	0.436	.5089	5.560	12.197	.0005	0.993	5.178	.0229	0.047	0.654	.4186
1982	2.541	15.886	.0001	-0.496	2.214	.1368	1.342	0.872	.3504	0.283	0.515	.4729	-0.026	0.356	.5508
1983	-0.245	0.125	.7240	0.122	0.230	.6315	1.038	0.471	.4924	1.784	12.408	.0002	-0.188	8.937	.0028
1984	-0.623	0.854	.3554	0.259	1.196	.2742	-0.211	0.020	.8881	0.794	6.191	.0128	-0.058	1.227	.2679
1985	-0.350	0.238	.6258	-0.039	0.102	.7494	0.434	0.121	.7275	1.260	7.509	.0061	-0.000	0.000	.9912
1986	-0.415	0.325	.5684	-0.002	0.000	.9897	2.838	4.875	.0272	0.554	3.146	.0761	0.059	0.925	.3361
1987	-0.413	0.304	.5812	-0.234	0.349	.5546	-0.998	0.808	.3686	0.131	0.178	.6727	-0.015	0.148	.7006
1988	-0.053	0.005	.9428	0.303	0.810	.3683	3.312	8.345	.0039	0.349	1.498	.2210	0.003	0.011	.9149
1989	-1.120	1.682	.1946	0.299	0.302	.5826	3.866	10.466	.0012	1.788	12.172	.0005	-0.003	0.006	.9360

Appendix C - continued

Univariate Logit Estimations for the Sixty-One Accounting Variables Grouped According to Traditional Financial Statement Analysis

Group 7: Miscellaneous (continued)

YEAR	26. % Δ in Equity to Fixed Assets			48. % Δ in Production			55. Working Capital/ Total Assets			56. % Δ in Working Capital/Total Assets			61. Repayment of LTD of % of LTD		
	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob
1975	-0.214	1.823	.1769	-1.352	13.812	.0002	0.256	0.349	.5544	0.018	0.448	.5033	-0.062	0.569	.4508
1976	0.106	0.237	.6267	0.120	0.220	.6391	0.156	0.133	.7158	-0.026	0.412	.5120	-0.311	3.653	.0560
1977	-0.418	1.678	.1952	-0.517	2.617	.1058	0.625	1.949	.1628	-0.020	0.090	.7649	-0.063	0.792	.3734
1978	0.219	0.541	.4620	-0.158	0.240	.6244	-0.418	0.875	.3495	0.012	0.026	.8715	0.008	0.004	.9480
1979	0.094	0.126	.7224	0.062	0.601	.4383	-0.256	0.305	.5806	-0.021	0.690	.4060	0.003	0.016	.8975
1980	0.175	0.267	.6051	-1.408	16.536	.0001	0.866	3.745	.0530	-0.111	2.306	.1288	0.038	0.242	.6228
1981	0.162	0.983	.3214	-0.413	1.519	.2177	-0.309	0.370	.5428	0.011	0.987	.3203	0.179	3.551	.0595
1982	-0.379	1.974	.1601	-1.200	11.789	.0006	1.181	6.923	.0085	0.012	0.766	.3815	-0.012	0.107	.7441
1983	-0.605	3.821	.0506	0.037	0.223	.6366	-0.591	1.492	.2218	-0.020	0.195	.6585	-0.134	3.981	.0460
1984	0.130	0.470	.4928	-0.569	2.633	.1047	-1.234	5.833	.0157	-0.009	0.334	.5634	-0.002	0.014	.9071
1985	-1.134	7.979	.0047	-0.075	0.266	.6060	-0.005	0.000	.9917	-0.003	0.010	.9210	0.039	0.167	.6829
1986	-0.765	5.353	.0207	-0.609	4.334	.0374	-0.553	1.245	.2646	-0.025	0.316	.5741	0.053	0.161	.6875
1987	-0.463	4.563	.0327	0.069	0.083	.7731	-0.293	0.350	.5541	0.011	0.494	.4820	-0.022	0.531	.4662
1988	-0.375	2.106	.1468	0.109	0.450	.5022	0.017	0.001	.9749	0.008	0.094	.7591	-0.009	0.308	.5792
1989	-0.768	4.566	.0326	-0.981	4.961	.0259	-0.915	2.566	.1092	-0.004	0.113	.7366	0.029	0.426	.5137

Appendix C - continued

Univariate Logit Estimations for the Sixty-One Accounting Variables Grouped According to Traditional Financial Statement Analysis

Group 7: Miscellaneous (continued)

YEAR	62. Issuance of LTD as % of Stock			63. Purchase of TS as % of TS			66. Cash Dividend as % of Cash Flows			68. Net Income over Cash Flows		
	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob	β	χ^2	Prob
1975	-0.426	2.609	.1062	-9.454	7.871	.0050	0.579	1.730	.1884	-0.362	7.798	.0052
1976	-1.007	14.243	.0002	-2.072	0.708	.4002	0.055	0.093	.7609	-0.052	0.388	.5331
1977	-0.550	5.361	.0206	0.501	0.035	.8507	1.726	8.509	.0035	-0.460	3.635	.0566
1978	-0.184	0.865	.3523	-0.477	0.112	.7384	0.345	0.430	.5119	-0.281	1.751	.1857
1979	0.136	0.367	.5448	2.233	1.939	.1637	0.303	0.727	.3939	0.058	0.259	.6106
1980	0.350	2.027	.1545	-1.221	0.592	.4415	-0.030	0.004	.9515	0.096	1.099	.2945
1981	-0.275	0.833	.3613	0.865	0.300	.5836	-0.382	1.604	.2053	0.005	0.171	.6791
1982	-0.033	0.119	.7303	0.323	0.141	.7077	0.168	0.390	.5321	0.063	2.308	.1287
1983	-0.438	5.171	.0230	1.487	0.649	.4206	0.242	0.945	.3310	-0.024	0.488	.4849
1984	0.001	0.000	.9945	0.571	0.628	.4282	0.500	3.283	.0700	-0.011	0.351	.5538
1985	-0.029	0.012	.9147	-0.647	1.088	.2970	-0.120	0.435	.5095	0.018	0.568	.4510
1986	-0.579	5.471	.0193	3.119	5.551	.0185	0.118	0.649	.4205	0.046	1.098	.2947
1987	-0.121	0.464	.4956	-0.572	0.462	.4966	0.054	0.365	.5459	0.015	0.427	.5137
1988	-0.007	0.349	.5546	0.224	0.126	.7231	-0.099	0.240	.6240	-0.068	1.450	.2286
1989	-0.035	0.140	.7081	-1.057	1.055	.3044	-0.266	1.780	.1821	-0.039	0.291	.5895

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