The Effect of Accounting Method Choice on Earnings Quality: A Study of Analysts' Forecasts of Earnings and Book Value

Kris Rowland Martin

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Fred Richardson, chairman
Bob Brown
Cintia Easterwood
John Easterwood
Wayne Leininger

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(ABSTRACT)

Whether the quality of a firm's reported earnings affects investors' ability to predict future earnings and stock returns is still a subject of much debate among accounting researchers. Lev (1989) suggests that low quality earnings may be causing the relatively low correlation between reported earnings and stock returns (or the market's evaluation of future earnings). This dissertation used the valuation model described in Ohlson (1995) and Feltham and Ohlson (1995) to explore the possible links between accounting method choices and the ability of investors to use reported earnings to predict future earnings. The results demonstrate that prior researchers' assumptions regarding which accounting methods are generally conservative or liberal are reasonably accurate over large numbers of firms. The results also show that one group of analysts (Value Line Investment Survey) is able to predict future earnings more accurately over medium-term and long-term forecast horizons for firms using generally conservative accounting methods than those firms employing generally liberal accounting methods.

This research adds to the prior "quality of earnings" research by showing that analysts can predict earnings more accurately for certain classes of firms (i.e., firms using conservative accounting methods), thus increasing our knowledge of what constitutes high-quality earnings. The research also explores the effects of growth on the quality of earnings question, the effects of firm size, leverage, and industry membership on the relationship, and the robustness of the Feltham and Ohlson Model to alternative definitions of key components of the model.

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CHAPTER 1 INTRODUCTION AND MOTIVATION

In the time since McNichols' (1985) call for a theory of accounting method choice and/or capital markets' use of accounting information, few researchers have attempted any formal theory formulation. Because managers are allowed some latitude in choosing accounting methods to compute their firm's earnings, the question arises whether one calculation of earnings may have a higher "quality" than another, equally acceptable, calculation of earnings. Whether the quality of a firm's reported earnings affects investors' ability to predict future earnings and stock returns is still a subject of much debate among accounting researchers. Lev (1989) suggests that low quality earnings may be causing the relatively low correlation between reported earnings and stock returns (or the market's evaluation of future earnings). Using the valuation model described in Ohlson (1995) and Feltham and Ohlson (1995), I explored the possible links between accounting method choices and the ability of investors to use reported earnings to predict future earnings.

Arguments abound regarding whether generally accepted accounting principles (GAAP) should require all companies to use uniform accounting methods for all transactions regardless of the type of transaction. For example, Blasch et al. (1996) state that the "lack of uniformity in EPS requirements in the global arena is potentially problematic," and "[s]tandardizing EPS is crucial for the efficient allocation of capital resources" while Beresford (1999) states that "standards setters... are tempted to go overboard and pursue uniformity past the point of diminishing returns."

Possibly, a current shortcoming of existing GAAP is that companies must employ different levels of uniformity for different classes of transactions. Wolk, Tierney, and Dodd (2001) discuss the issue of uniformity by classifying GAAP into one of three categories: (1) *rigid uniformity* – companies use the same accounting methods for all similar or related transactions (e.g., expensing of all research and development expenditures); (2) *finite uniformity* – companies use a set of rules to determine which method to use in a given transaction (e.g., accounting for leases as operating leases or capitalized leases); or (3) *flexible uniformity* – companies have a choice of methods to allow management to communicate its private information regarding a specific situation (e.g., accelerated vs. straight-line depreciation). Lev

(1989) believes that this inconsistent application of uniformity throughout GAAP may have an effect on market values of equity securities. He asserts:

> "if different accounting measurement and valuation principles affect the predictive ability (quality) of earnings with respect to future securities' outcomes, then such principles will have an effect on market values. This important effect, of GAAP on market values, via the impact of GAAP on the predictive contribution of earnings and other financial variables, is largely unresearched..."

A more complete knowledge of how accounting method choices affect market values, via the effect of method choices on earnings quality, is crucial to future decisions regarding changes in GAAP. If, for example, the portfolio of management's choices of accounting methods were structured primarily to facilitate the manipulation of reported earnings, the Financial Accounting Standards Board (FASB) would have to give serious consideration to mandating rigid uniformity for all transactions. For example, in light of Enron's alleged accounting irregularities, brought to the public eye in late 2001, accounting standard setters are reconsidering the accounting and reporting standards for partnership accounting, off-balance-sheet financing, and stock options. Gleckman, in his commentary on the Enron scandal, states that "Enron's collapse has brought the issue to a head by exposing the incentives executives have to inflate earnings . . . " (Howard Gleckman in *Business Week*, April 1, 2002, p. 35).

On the other hand, if managers choose accounting methods primarily to reflect more accurately their private information, the FASB should allow more flexible standards. For example, Dharan and Mascarenhas (1992) examined firms in the oil and gas industry; many of the firms had changed depreciation accounting methods in the years just before the study. The authors concluded that when an industry is affected by economic events that significantly change the industry's growth options, "the firms in the industry may change to accounting methods that better reflect the changed economic reality."

Stock analysts at every level of proficiency have attempted to decipher the puzzle of the various principles allowed by generally accepted accounting principles. Recent anecdotal evidence reaffirms that investors react to the accounting policies that companies use in reporting annual financial information. For example, *Barron's* describes an accounting policy used by Microsoft that was "the most conservative accounting we have ever experienced in the industry." The policy deferred 40% of revenues related to Microsoft's Windows 95 product. Microsoft recognized the deferred revenues ratably over 18 months, thereby reducing (i.e., "smoothing") the effects of the expected $800 million in revenues in the month of August, 1995. (*Barron's*, September 25, 1995, p. 25). As another example, the *Wall Street Journal* reports on a battle between financial analysts and Just for Feet, Inc. The analysts claimed that the footwear retailer "is boosting its profits by using 'aggressive accounting policies.'" In this instance, Just for Feet amortized its pre-opening costs for new stores over 12 months instead of showing all the pre-opening costs as expenses when the stores opened (*Wall Street Journal*, August 30, 1995, p. S2).

Since the seminal Ball and Brown (1968) research showed that accounting information does affect stock prices, many researchers have tried to explain more fully the relationship between the price of a firm's stock and the accounting policies followed by that firm. Feltham and Ohlson's (1995) valuation model explains a firm's stock price in terms of the firm's accounting-based book value and estimated future abnormal earnings and is a good example of several relatively recent attempts to demonstrate the usefulness of accounting information.

Feltham and Ohlson (1995) show analytically that the price of a firm's common stock is equal to the book value per share of the company adjusted for any future expected abnormal earnings (either positive or negative). The model applies to all firms regardless of a firm's choice of accounting methods or a firm's dividend policy; therefore, researchers should be able to use the model to test assumptions used in previous accounting-method-choice literature and to relate the choice of accounting methods to the ability of investors to predict future earnings.

As discussed in Bernard (1995), the traditional view of capital market research and the view espoused by Feltham and Ohlson (1995) have the same goal in mind: estimating the current value of a firm's securities. Beaver (1989) frames the traditional view in a three-step process: (1) relate current financial statement data (e.g., current earnings) to future financial statement data (commonly referred to as *fundamental analysis*), (2) relate future financial statement data to estimated future dividends, and (3) relate estimated future dividends to the current value of the firm using the dividend discount model. Easton (1985) collapses steps (1) and (2) into one step, which he refers to as the "information link," and he refers to the third step as the "valuation link." He summarizes his research by stating that earnings appear to predict future dividends reasonably well and that discounted future dividends are highly correlated with stock prices.

Bernard (1995) cites several problems encountered by researchers using the traditional discounted dividends framework. For example, researchers have had difficulty showing how price (i.e., value) changes are affected by earnings levels, earnings changes, changes in various balance sheet accounts, or the effects of additional company disclosures. Researchers have also wrestled with the proper scaling factors and whether data should be differenced, according to Bernard (1995).

The Feltham-Ohlson model approaches the issue of estimating current value from a different perspective. With this model, step (1) is the same as the traditional approach (i.e., the fundamental analysis step is the same), but step (2) relates future financial statement data (i.e., future book values and future earnings) directly to the price of a firm's stock. The present research examines the gap in accounting research and theory development, as posited in Lev (1989), via this accounting-based valuation model described in Ohlson (1995), Feltham and Ohlson (1995), and Feltham and Ohlson (1999). In the framework of the model and using a cross-section of publicly traded firms, the present tests examined two things: (1) the validity of the assumptions used in prior research concerning conservative and liberal accounting methods, and (2) the level of earnings quality for groups of firms *vis-a vis* reported and expected book values, reported and expected earnings, and managers' voluntary choices of accounting methods. The tests compared the earnings quality of those firms using generally conservative, generally liberal, or a mixed portfolio of accounting methods to determine if a firm's choice of accounting methods affects the quality of that firm's reported earnings. More specifically, the tests described below were applied to examine several hypotheses about how management's choice of accounting methods affects the quality of a firm's reported earnings.

The remainder of the dissertation is organized as follows: Chapter Two provides a discussion of the literature related to the Feltham-Ohlson model, earnings quality, and other related topics. The chapter also develops the associated hypotheses for the current research effort. Chapter Three describes the research methodology utilized in the tests of prior research assumptions and the tests of the relationship between accounting method portfolios and earnings quality. Chapter Four presents the analyses and results of the statistical tests. Chapter Five provides and summary of the findings, implications of the findings on future research, and the limitations of the present research effort.

CHAPTER 2 LITERATURE REVIEW AND DEVELOPMENT OF HYPOTHESES

This chapter incorporates a review of the relevant literature for the present study. The first section contains a discussion of the Feltham and Ohlson model, leading to the first hypothesis. The second section embraces the assumptions used in previous research. The third section provides a discussion of theories of earnings quality and the definition of earnings quality. In the final section, potential confounding effects suggested in prior research are examined for how they could affect the present study.

2.1 Feltham and Ohlson's Model

Preinreich (1938) derives a formula for calculating the value of a single capital asset. He concludes, "[T]heoretically, this statement is true for any book value and any method of depreciation...In practice, it is the well-known formula for appraising the capital value of a business by past experience" (p. 240). Ohlson (1995) and Feltham and Ohlson (1995) give credit to Preinreich (1938), Edwards and Bell (1961), and others in their derivation of a model relating a firm's stock price to the firm's accounting-based book value and future expected abnormal earnings. Peasnell (1982) shows that a discounted cash-flow stream can be replaced by a stream of discounted incomes, where income is defined as the "excess of accounting profit over (a measure of) the opportunity cost of capital invested in the business." The measure of income used by Peasnell (1982), more popularly called residual income, is nearly identical to the definition given by Feltham and Ohlson (1995, 1999); however, other researchers credit Feltham and Ohlson with re-introducing the model into modern accounting research. Bernard (1995) refers to the Feltham and Ohlson studies as "among the most important developments in capital markets research in the last several years"; Lundholm (1995) says the papers are "landmark works in financial accounting."

2.1.1 Description of the Feltham-Ohlson Model

The Feltham-Ohlson model has its foundation in the well-established financial theory that the value of a firm is equal to the present value of expected future cash dividends[1]:

$$P_t = \Sigma E_t[d_{t+\tau}]/(r+1)^{\tau} \text{ as } \tau=1 \text{ to } \infty, \tag{1}$$

where

P_t = the market value (price) of the firm's equity at date *t*;

r = the discount rate, or the risk-free rate in Ohlson (1995) and Feltham and Ohlson (1995);

$E_t[.]$ = the expected value operator conditioned on information at date *t*;

d_t = the expected dividend at date *t*.

The model then utilizes two "attributes" of accounting, both of which reflect assumptions about how dividends affect book value and earnings, to yield an equation made up only of accounting-related numbers (i.e., book value and earnings). First, the model assumes ***clean surplus accounting*** – that is, that book values change as the result of dividends[2] and earnings *only*. Given this assumption, the change in book value from one period to the next is equal to the earnings minus dividends[3]. Second, the model assumes that dividends are "paid out of" book values, not current earnings.

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[1] Assumptions are (1) homogeneous investor beliefs, (2) risk neutrality, and (3) a nonstochastic and flat term structure of interest rates.

[2] In this discussion dividends may be positive or negative (i.e., capital contributions) without any loss of usefulness of the model.

[3] Accounting theorists will recognize *clean surplus* as another name for *all-inclusive* or *comprehensive income*. Under current U.S. generally accepted accounting principles (GAAP), companies use a *modified* approach in computing net income; for example, current GAAP take exception to clean surplus accounting for foreign currency translations (some effects shown directly in comprehensive income), accounting for marketable securities classified as "available for sale" (market changes shown directly in comprehensive income), and prior period adjustments (effects of errors shown as an adjustment to retained earnings). Most other GAAP-based accounting relies on the clean surplus relation, and the Financial Accounting Standards Board has recently required greater emphasis on comprehensive income.

These two attributes are modeled as:

$bv_{t-1} = bv_t + d_t - x_t$	clean surplus accounting	(2)
$\delta bv_t/\delta d_t = -1$	dividends reduce book value	(3)
$\delta x_t/\delta d_t = 0$	dividends do not affect current earnings	

where
bv_t = the (accounting) book value of the firm at date *t, and*
x_t = the earnings of the firm from date *t-1* to *t.*

The model introduces the concept of abnormal earnings (x^a_t) as the difference between earnings and a return on the beginning-of-period book value:

$x^a_t = x_t - r(bv_{t-1})$, or
$x_t = x^a_t + r(bv_{t-1})$. (4)

Using the dividend discount model, the clean surplus relationship, and the definition of abnormal earnings, the following derivation is possible:

$d_t = x_t + bv_{t-1} - bv_t$	clean surplus
$= x^a_t + r(bv_{t-1}) + bv_{t-1} - bv_t$	substitution
$= x^a_t + (r+1)bv_{t-1} - bv_t$	simplification

Substituting into the dividend discount model (1) yields

$P_t = bv_t + \Sigma E_t[x^a_{t+\tau}]/(1+r)^{\tau}$ as τ=1 to ∞, (5)

provided that $E_t[bv_{t+\tau}]/(r+1)^{\tau} \rightarrow 0$ as $\tau \rightarrow \infty$. Simply stated, the price of a firm's stock is equal to the book value per share of the firm plus (or minus) any discounted future expected abnormal earnings. Feltham and Ohlson (1999) generalize the theoretical model by allowing investors to be other than risk neutral and by allowing interest rates to vary from a flat, nonstochastic term structure.

That this model can distinguish between conservative and liberal (or *aggressive*) accounting systems may not be immediately apparent. According to Feltham and Ohlson (1995), unbiased accounting implies that a firm’s market value (i.e., price) exactly equals the firm’s book value, while conservative accounting will cause the existence of unrecorded goodwill, due to an understated book value of the firm's assets and/or expectations of greater than normal (i.e., abnormal) future earnings. Using clean surplus accounting, the Feltham-Ohlson model represents the unrecorded goodwill that arises from conservative accounting as expected future abnormal returns. Lundholm (1995) argues through several examples that "conservative accounting...causes decreases in current book value and exactly offsetting increases in future expected abnormal earnings" (p. 757). More specifically, a conservative accounting system, as compared to a system not employing conservative accounting methods, is one in which the firm's book value represents a relatively smaller proportion of its market value, and the firm's stream of discounted future abnormal earnings represents a relatively larger proportion of its market value.

2.1.2 Research Utilizing the Feltham-Ohlson Model

Several recent empirical studies have utilized the Feltham-Ohlson model. Using Value Line data and estimates, Bernard (1995) showed that 68 percent of the change in equity market prices can be explained by the current book value and only three years[4] of forecasted abnormal earnings. He went on to explain that a less than 100 percent association is largely due to the restrictive assumptions he used in implementing the model. He also demonstrated that forecasted dividends (i.e., the traditional approach) only explain 29 percent of the variation in stock prices.

McCarthy and Schneider (1995) used the Feltham-Ohlson model to analyze reported goodwill. They decomposed the book value variable of the model into net assets[5] (excluding goodwill) and goodwill. They found that investors view goodwill as an asset and include goodwill in their analyses of the value of the firm.

Tiras (1996) used the Feltham-Ohlson model to analyze the relevance of several measures of deferred compensation to the market performance of a firm's stock. His primary focus was on the effects of companies' deferred compensation plans on the expected growth in earnings for those same firms (i.e., he did not consider the conservative vs. liberal accounting methods question). He found that ESOPs and employee stock options are relevant in the valuation of a firm's stock after controlling for differential expected earnings and book values (the variables from the Feltham-Ohlson model). He also found that the market places a higher

[4] This is a reduced version of the complete Model, which assumes an infinite forecast horizon.

[5] Originally, McCarthy and Schneider (1995) decomposed book value into assets (excluding goodwill), goodwill, and liabilities. This book value decomposition produced a serious problem with multicollinearity; therefore, the researchers combined the assets and liabilities into one book value (excluding goodwill) variable.

value on firms that defer more compensation.

Collins, et al. (1999) examined firms that report net losses in one or more years. They argue that traditional value models are difficult to adjust for firms that have net losses, but that the book value component of the Feltham-Ohlson model may provide information about the value of the firm's securities. Their conclusion is that the "results are consistent with book value serving as a value-relevant proxy for expected future normal earnings for loss firms . . ."

Ali et. al (2001) do not reference the Feltham and Ohlson papers directly, but they study the relationship between a firm's book-to-market ratio (a key element in the Feltham-Ohlson studies) and changes in institutional ownership. Based on a review of several prior studies, they assume that small BV/MV ratios (and large amounts of R&D expenditures) are proxies for unrecorded intangible assets. They state that "accounting numbers for firms with high levels of unrecorded intangible assets do not provide much value-relevant information," indicating that firms with a small BV/MV ratio have lower quality accounting information. They conclude that changes in institutional ownership are more likely to produce abnormal returns for firms with a small BV/MV ratio.

The current research uses the model's emphasis on reported and expected earnings and book values to separate the firms that use conservative, liberal, or "mixed" accounting systems. Lundholm (1995) has shown that there is a reduction in current book value for firms using conservative accounting. Therefore, other things being equal (especially with firms having similar earnings growth prospects), firms utilizing conservative accounting systems should have smaller BV/MV ratios than similar firms using liberal accounting systems. This leads to the first hypothesis, stated in the null, then the alternative form:

H_{O1}: The BV/MV ratio is unable to distinguish among firms using generally conservative accounting methods, generally liberal accounting methods, or combinations of accounting methods.

H_{A1}: The BV/MV ratio will be smaller for firms using generally conservative accounting methods, somewhat larger for firms using combinations of accounting methods, and even larger for firms using generally liberal accounting methods.

2.2 Assumptions Used in Previous Research

As stated earlier, one purpose of this research is to examine several assumptions made in previous studies related to the effects of accounting method choices on the level of reported earnings. If the Feltham-Ohlson model can differentiate levels of conservatism in accounting systems, future researchers and analysts may be able to improve the methods used to analyze differences in accounting method choices. That is, if the BV/MV relationship does in fact reflect the level of conservatism in a given firm's accounting system, researchers and analysts may be able to reduce the amount of detailed analysis of the specific accounting methods employed by the firm. A related benefit would be that researchers and analysts could also examine less obvious causes of conservatism (e.g., unusual accruals, excessive write-offs, etc.) in financial reporting.

Researchers and analysts have regularly made assumptions about how a specific choice of an accounting method will affect the current year's earnings. These same researchers and analysts point out less regularly, however, that an effect on current year's earnings will have an opposite effect on all future reported earnings (due to the self-balancing nature of accounting)[6]. For example, a majority of the sources cited in Table 2.1 (discussed in detail later in this chapter) agree with each other on which accounting methods tend to increase a firm's reported earnings and which methods tend to decrease the earnings reported by a firm. Almost without exception, each of the sources shown in Table 2.1 also fails to mention the ongoing, reverse effects on future earnings calculations of the accounting choices that managers make.

Specifically, the researchers and analysts discussed in Table 2.1 (and others not discussed herein) generally agree that accounting methods including the following will decrease reported earnings: use of last-in, first-out (LIFO) inventory accounting (when prices are rising), accelerating depreciation, deferral of investment tax credits (ITC), expensing of construction interest and research and development (R&D) costs, and the use of purchase accounting for acquisitions. Researchers and analysts also agree that accounting methods such as the following will increase reported earnings: use of first-in, first-out (FIFO) inventory accounting, use of straight-line depreciation, flow-through ITC accounting, capitalizing construction interest and R&D costs, and pooling of interests accounting for acquisitions. Note that current GAAP either

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[6] Firms in industries that require a great deal of R&D, for example, will have smaller reported income in the year of incurrence than what would emerge if they were allowed to capitalize and amortize R&D costs as assets; of course, in the years after the write-off, income would be greater for the "immediately expense" firms. In a recent *Business Week* cover story (October 5, 1998), writers criticized required R&D write-offs, stating that "writing off all R&D costs

require or deny usage of several of these methods while allowing flexibility in the choice of other methods.

Much has been written regarding firms' choices in accounting method selection. It would not be possible to record or explore all possible research, but Table 2.1 summarizes several articles that demonstrate the point made above -- that researchers and analysts overwhelmingly use particular assumptions about whether accounting methods increase or decrease net income.

The most common analyses involve the inventory method and the depreciation method decisions: the treatment of the investment tax credit by companies was also a fairly common research topic until the credit was eliminated in the tax code. Table 2.1 describes briefly several inventory-only papers (Panel A), a few depreciation-only papers (Panel B), several less-well-covered areas (e.g., purchase vs. pooling for consolidations), and a good amount of research that looks at combinations of the accounting methods (Panels B, C, and D).

The remaining parts of this section consider briefly the literature summarized in Table 2.1. Again, this is by no means a comprehensive listing of relevant research -- the papers discussed were chosen as representative of the vast body of accounting literature on the related topics.

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today will likely give future earnings a boost." The cover story was devoted to a critique of current "loose" accounting standards for publicly traded corporations.

Table 2.1 Summary of Accounting Methods literature (Panel A - Inventory Methods)

	Method Assumptions		
Authors	**Income increasing**	**Income decreasing**	**Summary of results**
Holdren (1964)	FIFO	LIFO	Current ratio not affected by method used; inventory turnover strongly affected by method used
Hunt (1985)	FIFO	LIFO	Significant differences for financing restrictions and percentage of management ownership for firms using different methods
Niehaus (1989)	FIFO	LIFO	Firms are more likely to use LIFO when the percentage of management ownership is either very high or very low
Lee and Hsieh (1985)	FIFO	LIFO	Two-digit SIC classifies 86% of inventory choices
Lee and Petruzzi (1989)	FIFO	LIFO	Firms that adopt LIFO face less uncertainty than non-adopters in future tax savings related to LIFO
Frankel and Trezevant (1994)	FIFO	LIFO	Firms using LIFO, especially those with high tax rates, appear to purchase extra inventory at year-end
Hughes, Schwartz, and Thakor (1994)	FIFO	LIFO	Theoretical model that suggests that FIFO will be used by higher quality firms and that a switch to LIFO will precede increases in debt levels
Dopuch and Pincus (1988)	FIFO	LIFO	Firms using LIFO tend to be larger, more capital intensive, higher inventory turnover firms; firms using FIFO tend to show higher growth rates; no difference in debt/equity ratios among firms
Suojanen (1957)	FIFO	LIFO	The use of LIFO by the copper industry may have resulted in artificially inflated prices to pay for income taxes increased due to a depletion of LIFO inventory reserves

Table 2.1 Summary of Accounting Methods literature (Panel B - Methods for depreciation and business combinations)

	Method Assumptions		
Authors	**Income increasing**	**Income decreasing**	**Summary of results**
Comiskey (1971)	straight-line depreciation	accelerated depreciation	Demonstrated an average 24% EPS increase for the 11 steel companies that switched to straight-line from accelerated depreciation
Dhalimal, Salamon, and Thakor (1982)	straight-line depreciation	accelerated depreciation	Management-controlled firms are more likely than the owner-controlled firms to use straight-line depreciation
Dharan and Mascarenhas (1992)	straight-line depreciation	units-of-production depreciation	Changes in environmental factors can motivate managers to try to improve earnings
Salamon and Kopel (1993)	FIFO, straight-line depreciation	LIFO, accelerated depreciation	Smaller firms tend to use income-increasing methods; several industry-specific effects
Cullinan and Knoblett (1994)	FIFO, straight-line depreciation	LIFO, accelerated depreciation	Larger firms tend to use income-decreasing methods; size variable not significant after controlling for unionization variable
Jaenicke (1962)	pooling of interests	purchase accounting	Purchase would have reduced many common ratios 80-90% in the one firm followed for 14 years in 29 acquisitions
Davis (1990)	pooling of interests	purchase accounting	High leverage firms more likely to use purchase accounting; positive cumulative abnormal returns (CARs) for firms using purchase accounting

Table 2.1 Summary of Accounting Methods literature (Panel C - Methods involving capitalization vs. expensing)

	Method	Assumptions	
Authors	**Income increasing**	**Income decreasing**	**Summary of results**
O'Donnel (1965)	flow-through ITC	deferred ITC	Firms using flow-through method have lower p/e ratios; investors view flow-through-based income as being overstated (i.e., lower quality)
Bowen, Noreen, and Lacey (1981)	capitalized interest	expensed interest	Firms closer to debt constraints and larger firms more likely to capitalize interest
Daley and Vigeland (1983)	capitalized R&D	expensed R&D	Firms that capitalize R&D are more likely to have higher debt levels, have more public debt, be closer to dividend restrictions, and be smaller
Ghicas (1990)	benefit-allocation method for pensions	cost-allocation method for pensions	Actuarial assumptions (especially interest rates) made by firms are more likely to change before a firm changes from the cost-allocation to the benefit-allocation method for pension accounting
Johnson and Ramanan (1988)	successful efforts accounting for oil	full-cost accounting for oil	Firms using full-cost method had higher debt levels and larger capital expenditures before and at the date of adoption

Table 2.1 Summary of Accounting Methods literature (Panel D - Combinations of methods)

	Method Assumptions		
Authors	**Income increasing**	**Income decreasing**	**Summary of results**
Simpson (1969)	pooling of interests, flow-through ITC	purchase accounting, deferred ITC	After computing "corrected" income, classified firms as C or L; C firms have higher return on equity, lower debt-equity, and larger size
Healy (1985)	FIFO, straight-line depreciation, pooling of interests	LIFO, accelerated depreciation, purchase accounting	No significant results
Hagerman and Zmijewski (1979)	FIFO, straight-line depreciation, flow-through ITC, amortization period for prior service costs of greater than 30 years	LIFO, accelerated depreciation, deferred ITC, short amortization period for prior service costs	Firms using accelerated depreciation tend to be larger and have higher average risk (proxied as the beta of the firm's stock
Lilien, Mellman, and Pastena (1988)	FIFO, straight-line depreciation, flow-through ITC	LIFO, accelerated depreciation, deferred ITC	Firms with greater 10-year market return are less likely to make income-increasing accounting changes
Press and Weintrop (1990)	FIFO, straight-line depreciation, flow-through ITC	LIFO, accelerated depreciation, deferred ITC	Limited effects of the debt covenant hypothesis, which shows that firms closer to debt covenant violations will be more likely to choose income-increasing accounting methods
Liberty and Zimmerman (1986)	various	various	No evidence of firms using income-decreasing methods during union negotiations
Schwartz (1982)	various	various	Firms facing bankruptcy have more than double the income-increasing changes than non-bankruptcy firms

2.2.1 Inventory Costing Methods

The FIFO/LIFO question is one of the most obvious areas of discussion when considering the effects of an accounting method choice on a firm's quality of earnings. Because inventory represents such a large percentage of the assets on the typical balance sheet of a manufacturing or merchandising company, and because the cost of the inventory sold is one of the largest single expense items on the typical income statement of manufacturing and merchandising companies, researchers and analysts have had a heightened interest in how inventory method decisions affect a company's earnings quality. For that reason, the FIFO/LIFO question has been considered in many studies from a wide variety of perspectives over different time periods and industries.

In one of the earlier considerations of the FIFO/LIFO question, Holdren (1964) found that the current ratio is not significantly different for firms using different inventory costing methods, but the inventory turnover ratio is significantly different for firms using FIFO and firms using LIFO. While a firm's current ratio and inventory turnover rate are not directly linked in the present research to the firm's earnings quality, the calculations may be useful to investors in making more subjective assessments of the quality of the firm's earnings.

Hunt (1985) found significant differences for financing restrictions and percentage of management ownership for firms using different methods for the valuation of inventories. Niehaus (1989) gives a good summary of the FIFO/LIFO accounting research literature and reports some interesting results from his own research related to the effects of managerial ownership on the firm's choice of inventory valuation methods. Implicit in his analysis, as in all the research cited here, is the assumption that FIFO increases a firm's reported earnings and LIFO decreases reported earnings. This assumption is only true, of course, when a company is purchasing inventory that is subject to some amount of inflation. He finds that the probability of a firm's using LIFO initially decreases as managerial ownership increases; beyond a certain point, however, the probability of a firm's using LIFO increases as managerial ownership increases. Niehaus explains his results as a motivation of managers to report higher earnings as their ownership increases (the "discretion" phase); at some point, however, managers will have a greater motivation to report lower earnings to avoid public outcry, etc. (the "alignment" phase).

If the quality of a firm's earnings is affected by the firm's choice of inventory methods, then deliberate choices by management can affect investors' ability to interpret the company's financial situation. Both of these research studies demonstrate the effect that the level of management ownership of companies can have on how the managers choose to report earnings. The present research will attempt to gain a clearer understanding of the relationship of between inventory method choices and quality of earnings.

Lee and Hsieh (1985) looked at industry effects of firms using FIFO or LIFO and reported that knowing a firm's two-digit SIC code can help classify up to 86% of inventory choices. Lee and Petruzzi (1989) report that firms that adopt LIFO face less uncertainty than non-adopters in future tax savings related to LIFO. Frankel and Trezevant (1994) report that firms using LIFO, especially those in higher tax brackets, appear to purchase extra inventory at year-end (presumably to keep from depleting LIFO inventory reserves). Hughes, Schwartz, and Thakor (1994) utilize a theoretical model that suggests that higher quality firms will use FIFO and that a switch to LIFO will precede increases in debt levels.

The research reviewed above appears to have conflicting views of the effect of inventory choices on earnings quality. They agree, however, that the effects of FIFO are generally to increase reported earnings and the use of LIFO will decrease reported earnings. A specific example of the typical assumptions related to FIFO and LIFO comes from Dopuch and Pincus (1988). They suggest that "firms remain on FIFO because they fear their security prices will be adversely affected when they report lower earnings under LIFO." Dopuch and Pincus found that firms using LIFO tend to be larger and more capital intensive, and have greater inventory turnover rates; firms using FIFO, on the other hand, tend to show larger growth rates. The research showed no difference in debt/equity ratios among the sample firms. In their research we see, stated explicitly, the assumption made by most researchers, analysts, and investors -- a firm's use of FIFO results in larger earnings, and a firm's use of LIFO results in smaller earnings.

As stated earlier, the assumptions related to most FIFO and LIFO studies include, at least implicitly, that prices are increasing (i.e., inflation). Most researchers agree that decreasing prices would reverse the analysis, such that firms employing LIFO would actually report greater earnings. In rare circumstances, however, even increasing prices may not give the expected results. Suojanen (1957) showed that, in one particular instance (i.e., copper-producing companies in the mid-1950s), a combination of rapid inflation, high levels of demand, and already depleted LIFO inventory reserves caused firms to report significantly larger amounts of income and income tax. He suggests that the inventory prices in the industry were artificially inflated for many companies, primarily because of the firms' use of LIFO instead of FIFO.

All of the research described above is related to a firm's inventory method choice, and points out the effects that a deliberate choice by a firm's management can have on the quality of that firm's earnings. While the results of the research vary, the studies all demonstrate the need to explore more fully the relationship between inventory method choice and earnings quality.

2.2.2 Depreciation Methods

Researchers have also either explicitly or implicitly considered a company's depreciation policies in their analyses of the quality of the firm's earnings. The overriding consensus is that straight-line depreciation is an income-increasing method and all accelerated methods are income decreasing. For example, Comiskey (1971) examined the market reaction to a switch from straight-line to accelerated depreciation. He studied 11 steel companies in 1968 that had changed methods in that year and reported that four of the 11 firms were able to prevent a decline in EPS from 1967 to 1968 simply by changing to a different depreciation method. Dhalimal, Salamon, and Smith (1982) report that management-controlled firms are more likely than the owner-controlled firms to use straight-line depreciation.

Dharan and Mascarenhas (1992) examined 30 publicly traded firms in the oil and gas contract drilling industry during a period when many of the firms switched from straight-line depreciation to the units-of-production method. They determined that the industry had undergone a significant change in its production-investment environment, and they conclude that "the firms in the industry may change to accounting methods that better reflect the changed economic reality." In other words, Dharan and Mascarenhas believe that the managers change methods to show accurately the financial position of their firms, rather than to manipulate income.

2.2.3 Combinations of Inventory Choice and Depreciation Choice

The choices of inventory and depreciation methods seem to be the most commonly tested accounting method decisions. Several studies have considered the individual and the joint effects of these two choices. Salamon and Kopel (1993) found that firms using the income-increasing methods, whether FIFO or straight-line depreciation or both methods, were significantly smaller in size than the firms using LIFO and/or accelerated depreciation.

Cullinan and Knoblett (1994) found similar results with their sample, showing that larger firms are more likely to use income-decreasing inventory and depreciation methods. They also looked at firms that used a mixture of income-decreasing and income-increasing methods, but found no significant results related to these "mixed" firms. They were also interested in the effects of unionization on the choice of accounting methods, and found that the reported size effect became non-significant after controlling for their unionization variable.

2.2.4 Other Method Choices

As shown previously, other researchers make assumptions about the effects of various choices of accounting methods on a firm's reported earnings. Although the most common assumptions relate to a firm's choice of inventory or depreciation methods (as shown in the preceding paragraphs), researchers also have made assumptions for the treatment of the purchase vs. pooling decision (Jaenicke, 1962, and Davis, 1990), investment tax credits (O'Donnel, 1965), interest capitalization (Bowen, et al., 1981), research and development cost capitalization (Daley and Vigeland, 1983), pension accounting (Ghicas, 1990), oil reserve accounting (Johnson and Ramanan, 1988), and other individual accounting methods or combinations of methods (Simpson, 1969; Healy, 1985; Hagerman and Zmijewski, 1979; Lilien, Mellman, and Pastena, 1988; Press and Weintrop, 1990; Liberty and Zimmerman, 1986; Schwartz, 1982). All of the choices made by managers in the selection of accounting methods will affect the amount of earnings reported by the managers' firms. Because managers have the ability to affect the amount of reported income, they also can affect, by their accounting method choices, the quality of their firms' earnings as reported to financial statement users.

Researchers almost universally accept the above dichotomy. Nonetheless, the underlying assumptions may not hold for all industries or over all years, although few researchers make any attempt to control for this possibility[7]. For example, with the increased emphasis on just-in-time inventory control and the resulting relatively small inventory levels, it is likely that the LIFO/FIFO differences will be minimized in many industries. Obviously, if assumptions are made about the effect of accounting methods on reported income but are not tested, the possibility exists that any results obtained may be misguided. It is possible, for example, that inconclusive results from the expansive positive accounting theory literature may stem from a failure of the foundational assumptions in the research efforts.

2.3 Theories and Definition of Earnings Quality

As noted earlier, few researchers have attempted to formalize a theory of accounting method choice. The following discussion is therefore not a summary of existing formal theory, but rather reflects an accumulation of ideas from various studies on how accounting methods can affect the ability of investors to use reported financial data in predicting future financial information.

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[7] Ransom (1985), discussed later, did switch the LIFO-FIFO assumptions for firms in the electronics industry as one test of the robustness of his results. He shows no switch-related changes in his ultimate conclusions.

2.3.1 Conservative Methods Theory

By far the most common theory of what constitutes high earnings quality relates to whether investors view reported earnings as conservatively stated (the *conservative methods* theory). The principle of conservatism is a pervasive concept in modern accounting theory, and is probably a carryover from the days when banks were the primary users of firms' financial statements. Conservatism reflects the idea that, given two equally likely outcomes, a firm should use the accounting method that results in smaller reported income or smaller reported net assets. That is, if an estimate must err, it should err on the side of being too careful (conservative). Quite possibly, the accounting concept of conservatism has crossed into the financial analysis arena. For example, Donnelly (1990; as quoted in Revsine et al., 1999) implies in his *Wall Street Journal* column that conservative accounting is necessary when he states that "[l]ow quality means the bottom line is padded with paper gains – such as the profit-fattening effect of inflation on a company's reported inventory values, or gains produced by 'underdepreciation,' when a company doesn't write off plant and equipment as fast as their real value is falling." Some investors apparently feel that companies should be allowed only one method of accounting for any given transaction -- the method that produces the smallest figure for income and/or net assets.

A cursory review of most recent financial statement analysis textbooks shows that the authors usually consider high quality earnings to be closely tied to the use of conservative accounting principles in the determination of income (e.g., LIFO) and the valuation of assets (e.g., immediate write-off of intangibles). For example, Wild, Bernstein, and Subramanyam (2001) state that "[t]he quality of conservatively determined earnings is perceived higher because they are less likely to overstate current and future performance expectations compared with those determined in an aggressive manner" (p. 143). Hawkins (1998) states that high-quality earnings result from "[a] consistent conservative accounting policy that results in a prudent measurement of the company's financial condition and net income" (p. 174). White, et al. (1998) list fifteen "indicators of high earnings quality"; the entire list describes conservative accounting methods (p. 956).

Pincus (1993) compared earnings response coefficients (ERCs) of firms using different portfolios of accounting methods. After collecting data for four accounting method choices (only three of which are used in the analyses), he found the mean ERC of conservative portfolio firms (mean ERC = 0.96) to be significantly larger than the mean ERC of liberal portfolio firms (mean ERC = 0.29). His results are inconclusive, however, because of the extremely small number of firms (eight) in his "conservative portfolio" sample.

Dharan and Lev (1993) hint that by using liberal accounting methods, companies cause investors' perception of quality to decrease. Even after controlling for the immediate income effects of accounting changes, they found smaller earnings response coefficients and r-squareds for firms that implement income-increasing accounting changes, and suggest that investors' valuations reflect concern for reduced quality of earnings.

Comiskey (1971) concluded his research regarding the effects of changing depreciation policies by stating that "[t]he particular set of accounting alternatives can be thought of as adding a unique 'quality dimension' to the earnings. In general, *the more conservative the accounting alternatives the higher the 'quality' of earnings* and vice versa." (emphasis mine) Comiskey reported that firms changing from accelerated methods (considered conservative) to straight-line depreciation had significantly sharper price-earnings decreases than the no-change group (which showed increases in price-earnings statistics) over the 1967-68 time period.

Hagerman and Zmijewski (1979) state that accelerated depreciation is an income-decreasing method (i.e., conservative), just as LIFO, ITC flow-through accounting, and the voluntary amortization of past pension costs. They found significant differences between firms using straight-line and accelerated depreciation methods for the size and risk variables they used. Their results show that larger firms and firms with higher systematic risk (proxied by the capital asset pricing model, or CAPM, beta) tend to use straight-line depreciation more to reduce reported profits. According to Hagerman and Zmijewski, the decision of managers to choose an income-decreasing accounting method may be an attempt to counter arguments of a need for tighter regulation or a possible divestiture, arguments calling for greater social responsibility, or arguments for higher taxes.

Dhaliwal, et al. (1982) suggest that a switch to straight-line depreciation will lead to materially larger amounts of earnings and equity (i.e., book value) in future years. Their theoretical framework includes the assumption that company managers are concerned with the amount and timing of compensation. If those managers own a large share of the company's equity, these "management controlled" firms will be inclined toward income-increasing accounting methods. In fact, in their study, they found that management-controlled firms are more likely to select straight-line depreciation than those firms with a relatively small level of management ownership.

To summarize, the conservative methods theory implies that investors can predict future earnings and book values more accurately for firms using conservative accounting methods.

2.3.2 Liberal Methods Theory

Another commonly cited characteristic of high quality earnings is that the earnings should not fluctuate significantly from year to year. Revsine et al. (1999), in a discussion of the merits of using accrual-based vs. cash-based accounting in forecasting future cash flows, state that “accrual accounting produces an earnings number that smoothes out the unevenness or ‘lumpiness’ in year-to-year cash flows, and it provides an estimate of sustainable ‘annualized’ long-run future free cash flows.” (p. 216). This purported characteristic of high quality earnings has spawned a large stream of capital markets research exploring the possibility that managers take deliberate steps to "smooth" earnings to give the appearance of higher quality firm earnings. Given this definition of earnings quality and the managers' desire to smooth earnings, it could be argued that firms using only liberal accounting methods may actually have higher quality (i.e., *smoother*) earnings than those that use a hodge-podge of conservative and aggressive methods.

As an example of the early income smoothing literature, Hepworth (1953) describes several motivations that managers might have for showing smoother earnings. First, our progressive income tax system makes smoothing a tax saving mechanism. Firms are better off to have a smooth income stream than to have "spikes" of income in some years that would be subject to a much higher tax rate. Second, smoother income may affect a firm's relationship with investors and employees. Smooth earnings may indicate a stable dividend policy, and sharp increases in reported profits may cause employees to want a share of the "excessive" profits in the form of significant pay raises. Third, if most firms in the economy show a stream of relatively smooth earnings, the market will be less likely to become overly optimistic or pessimistic. Hepworth (1953) also describes several methods of smoothing reported earnings. He includes in his list the possibility that a firm's choice of accounting methods can affect the smoothness of the firm's reported earnings.

At least in the choice of depreciation methods, Barefield & Comisky (1971) show that firms using straight-line depreciation have smoother earnings than firms using accelerated methods of depreciation. Campbell (1951) provides a summary of the chief arguments for and against the use of accelerated depreciation. He explains, for example, that, as an asset ages, repair costs will likely increase. If a company uses an accelerated depreciation method (with depreciation expense starting with a large amount and ending with a small amount) at the same time repair costs increase, the firm's total cost of the asset will be relatively level over the asset's useful life. It appears that the effects of depreciation on earnings may depend on a specific definition of what is included in the cost of a given capital asset.

O'Donnel (1965, 1968) investigated income effects over time on electric utility firms that changed depreciation methods for tax purposes. He reports that firms using accelerated depreciation that includes an immediate tax-related increase in income are viewed as having lower quality earnings than similar firms that either show the tax consequences as a deferred tax liability or use straight-line depreciation. O'Donnel concludes that the market views the additional earnings from the tax savings as temporary, and therefore of lower quality. While this study does not present the findings in the framework of the liberal methods theory as discussed here, it does present evidence that firms using so-called conservative accounting methods (e.g., accelerated depreciation) may be viewed as having lower earnings quality; conversely, firms using straight-line depreciation were viewed as having higher quality earnings.

Hughes, Schwartz, and Thakor (1994) present a model that hypothesizes that managers communicate private information about future cash flows through the choice of inventory method and capital structure. They suggest that higher quality *firms* will use FIFO. While high quality firms and high quality earnings are not identical, it is difficult to separate the two concepts. Although little research supports the liberal methods theory, it is one possible explanation of the quality of reported earnings.

2.3.3 Mixed Methods Theory

As discussed earlier, most analysts subscribe to the conservative methods theory. Several of these analysts, however, admit that *ultra*-conservative accounting policies can lead to *lower* quality earnings, at least over a longer time horizon. For example, firms that take excessively large write-offs in one year (i.e., "take a bath") will show greater-than-normal earnings in all future years. In recent years, these large write-offs have often been the result of companies' restructuring charges. *Business Week* (1998) reports that "the number of companies taking restructuring charges jumped from 96 in 1995 to 230 in 1997." Therefore, what is considered to be a conservative approach currently can actually be a liberal approach over an extended future period.

Wild, Bernstein, and Subramanyam (2001), cited earlier as favoring the conservative methods theory of earnings quality, also state that "excessive conservatism, while contributing temporarily to earnings quality, reduces the reliability and relevance of earnings in the longer run. Examining the accounting principles selected can provide clues to management's propensities and attitudes" (p. 143). Siegel (1982) points out that liberal and ultra-conservative policies both have negative effects on earnings quality (chart, p. 106). Additionally, the Commission on Auditor's Responsibilities (1978), sponsored by the American Institute of Certified Public Accountants, suggests that financial statement users may be misled about a firm's liquidity or quality of earnings if the firm uses all extreme (i.e., all conservative or all liberal) accounting methods.

These views are the basis of the mixed methods theory. According to the theory, firms using a mix of accounting methods will have higher quality earnings (because they do not use strictly liberal or strictly conservative policies, which would cause the financial statements as a whole to be too liberal or ultra-conservative), thus allowing investors to predict future earnings and book values more precisely.

2.3.4 Consistent Methods Theory

Another view of the earnings quality question is that managers of mixed portfolio firms have more opportunity to "manipulate" earnings either deliberately or due to the counter-balancing effects of the various accounting methods employed (e.g., greater income due to the method of inventory valuation offset by smaller income due to the method of depreciation). Firms that consistently use conservative (liberal) methods, on the other hand, will generally show smaller (greater) income, which will not be offset among the various accounting methods. Investors may perceive additional uncertainty in the estimation of future earnings (and the related cash flows) due to the offsetting effects of accounting methods in the mixed portfolio firms. Both the conservative and liberal firms are theoretically "at the extremes" of the small vs. large reported income levels, and thus have less opportunity to manipulate income.[8]

More to the point, if a firm uses a so-called ultra-conservative portfolio of accounting methods, investors may have less difficulty in estimating future earnings and book values. This possibility arises because investors will know that the managers can manipulate future earnings in only one (primary) direction -- upward -- and that earnings are not likely to be unexpectedly smaller in the future than the already "low" reported current earnings. The apparent bias has actually almost completely truncated one aspect of the noise inherent in any accounting system for investors attempting to predict future accounting variables. Pincus (1993, p. 228) states that the "choice of conservative sets of accounting methods leads one to have stronger priors that (cumulative) earnings approximate the lower bound on the earnings levels that could have been reported." A

[8] In a completely unrelated but interesting study of the ability of subjects to distinguish loud vs. soft tones, Melara and Mounts (1994) conclude that "[u]ncertainty was low . . . because subjects could focus on the end points of the range . . . treating them as anchors that describe the stimulus set." Applying this conclusion to the present discussion, investors may treat portfolios of "extreme" accounting method choices as descriptive of the outer bounds (i.e., "anchors") of a firm's true earnings.

similar analysis would show that firms using a primarily liberal portfolio of accounting methods have reduced one part of the noise (or uncertainty) for investors -- earnings are unlikely to be greater than expected in future years. These arguments form the basis for the consistent methods theory.

Bushman and Indjejikian (1993) present an analytical model in which biased accounting (i.e., conservative or liberal) will be demanded when managers engage in more than one activity and the firm uses a reward system based on management stewardship over the firm's resources. They show that, in some situations, an *unbiased* accounting system may actually produce redundant information that is not useful in making financial decisions.

Another view, expressed by Gordon (1964), is that the primary criterion in the selection of accounting principles should be the "*minimization of stockholder bias in extrapolating past income to estimate future income*" (emphasis his). This view can be reconciled to the Bushman-Indjejikian (1993) model if it is assumed that, by deliberately creating bias in the financial statements (i.e., by using "extreme" or consistent methods), a firm can reduce the bias that investors must personally overcome in evaluating the financial statements.

Ransom (1985) used an option-pricing model to test the variability of share prices around earnings announcement dates and assumed that larger variability indicates greater information content. He grouped sample firms based on the combination, or portfolio, of the accounting methods used by the firms. He characterized firms that use extreme portfolios of accounting methods (i.e., all conservative methods or all liberal methods) as following "consistent choices in terms of their effects on income." Ransom showed that isolated accounting methods (i.e., not combinations) indicate little information content. But his results also indicate that combinations of accounting methods relate significantly to information content measures. Specifically, Ransom (1985) advances an information content measure that is narrowly larger for a combination of conservative methods than for a combination of liberal methods. More interesting, however, is that when the portfolio of methods consistently increases or decreases reported income, his information content measure is large; on the other hand, for portfolios where the methods tend to offset each other in their effects on reported income, the measure is significantly smaller (p<.02).

Ransom (1985) also performed tests to ascertain whether accounting method portfolios are simply proxies for firm size or the company's use of leverage. Based on results of additional regressions, he reports that "there is no reason to conclude that size and leverage are driving the reported results." He concludes that firms consistently using income-increasing or income-decreasing methods may report income figures that are "less ambiguous than those provided by an inconsistent set of methods."[9]

Pincus (1993) states in footnote 30 that he compared "reinforcing" (i.e., consistent methods) firms to those firms with a mixed set of methods and found no significant difference in earnings response coefficients between the two groups. Because of the small number of accounting method choices he examined, however, his results may not discriminate between conservative/liberal (consistent) and mixed firms adequately. Had he examined a wider variety of choices available to managers, he may have found significant differences between the two groups of firms. Additionally, because of the small number of conservative method firms and his reinforcing/mixed dichotomy (which resulted in a nearly 50/50 split), his "reinforcing" portfolio consisted almost completely of liberal methods firms (336 of 344 firms, or about 98% of the consistent firms).

Finally, Penman (1991) demonstrates that, for firms with a price-to-book ratio equal to one (i.e., the firms use neither ultra-conservative nor liberal accounting methods), investors view any abnormal return on equity (ROE) as indicating purely transitory earnings. For firms with a price-to-book ratio not equal to one (i.e., the firms use a consistent portfolio of accounting methods), however, he shows that investors view reported earnings as relatively persistent (i.e., any abnormal ROE indicates that currently reported *earnings* are more closely related to future earnings than are book values). To summarize, investors should be better able to use currently reported earnings to predict future earnings if firms use consistent portfolios of accounting methods.

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[9] McNichols (1985) discusses several potential problems with Ransom's (1985) work: (1) lack of theoretical motivation for the results, (2) no tests to validate assumptions, (3) equal weighting of methods may cause misclassification of consistent vs. inconsistent, (4) limited control for potentially correlated variables (e.g., leverage), and (5) the option-pricing methodology limits the availability of sample firms. Each of these issues is addressed in the present study.

2.3.5 Summary of Theories

Several underdeveloped theories are available to help assess which accounting system characteristics are correlated most closely with higher quality earnings. Most researchers and analysts assume implicitly that conservative accounting practices guarantee higher earnings quality. With a slight modification on the conservative methods theory, other analysts essentially agree but exclude "extremely" conservative practices, leaning more toward the mixed methods theory. More unusual is the theory proposed, perhaps unintentionally, that more liberal methods of accounting may produce smoother earnings, and therefore may contribute to higher earnings quality.

Finally, the consistent methods theory argues that firms using portfolios of extremely conservative or extremely liberal accounting policies (and therefore, having a consistent effect on reported income) allow investors to reduce one direction of uncertainty (downside uncertainty for conservative, upside uncertainty for liberal) in their prediction of future earnings and book values. The consistent methods theory, then, argues that by reducing noise (or uncertainty), the use of extreme methods of accounting will result in assessments of higher earnings quality in the marketplace.

2.3.6 Definition of Earnings Quality

There is apparently no universally accepted definition of earnings quality; however, many agree in principle as to what should be included in the definition, even if using different terminology. Using the Feltham and Ohlson (1995) model as a basis, I define earnings quality as the relative ability of investors to predict future expected abnormal earnings based on currently reported accounting variables. This is the same definition Lipe (1990) used for the *predictability* of earnings when he showed that greater earnings predictability apparently leads to larger earnings response coefficients in regressions of unexpected stock returns on unexpected earnings[10].

[10] For more on earnings response coefficients, see Beaver, Lambert, and Morse (1980); Beaver, Lambert, and Ryan (1987); Kormendi and Lipe (1987); Collins and Kothari (1989); Freeman and Tse (1992); Ali and Zarowin (1992); Imhoff and Lobo (1992); and Kothari and Sloan (1992).

Bricker et al. (1995) studied analysts' views of annual reports and showed that high quality earnings are associated with short-term earnings predictability. Lev (1989) states that "the quality of earnings . . . will be determined by the contribution of earnings to the prediction of investors' returns: the higher the predictive contribution of earnings and other financial variables, the higher their quality." Also in this context, Imhoff and Lobo (1992) discuss the effects of earnings uncertainty, defining earnings uncertainty as the opposite of earnings predictability. Based on their theory development and results, they conclude that earnings uncertainty is strongly related to noise[11] in the earnings signal, further suggesting that greater *ex ante* earnings uncertainty signals low quality earnings.

Lev (1983) also equates this definition (of earnings quality) with *earnings variability* in his discussion of the economic factors that relate to earnings. Lev and Thiagarajan (1993) consistently equate earnings quality to the persistence (or permanence) of an earnings time series, a research stream made popular by Kormendi and Lipe (1987). Taken together, the definition of earnings quality used here is equivalent to previous researchers' use of predictability, persistence, permanence, uncertainty, and variability (the last two in the negative).

This discussion leads to a second hypothesis. If a firm's choice of accounting methods affects the ability of investors to predict future abnormal earnings, then tests should be able to determine which combinations of accounting methods produce the highest quality of earnings. The hypothesis related to this question is actually the null and the alternative for all four of the theories stated above:

H_{O2}: A firm’s choice of an accounting method portfolio has no effect on the quality of the firm’s reported earnings.

H_{A2}: A firm’s choice of an accounting method portfolio directly affects the quality of the firm’s reported earnings.

[11] Imhoff and Lobo (1992) separated uncertainty into two components: "fundamental uncertainty," or uncertainty about a firm's future cash flows, and "noise," or uncertainty caused by the process generating the earnings signal. They conclude that noise carries no information content in the relationship of earnings and stock prices.

2.4 Potential Confounding Effects

Previously described tests will help to distinguish whether investors can predict future earnings better for firms that use conservative or liberal accounting methods. It could also be true, however, that other differences among the sample firms could be driving (or confusing) any results obtained. For example, a firm's use of leverage, the size of the firm, and expected earnings growth are all possible variables that could confound the tests of earnings quality. The following paragraphs explain in more detail some of these potential confounding variables.

2.4.1 Return on Equity

Feltham and Ohlson (1995) and Lundholm (1995) show that firms using conservative accounting methods will have a relatively smaller book value of assets offset by larger expected future earnings. Based on the Feltham-Ohlson model, they predict that firms using conservative accounting methods will tend to have a higher return on equity than similar firms using liberal methods. Years before Feltham and Ohlson formalized their model, Simpson (1969) computed a "corrected" income for a random sample of companies based on a theoretically best accounting method and compared the corrected income to the firms' reported income. He classified firms with reported income less than corrected income as conservative firms and those with reported income greater than corrected income as liberal firms. He then computed the return on common equity and found that the conservative firms had a significantly larger return on equity than the liberal firms.

For the present study, data have been collected, return on equity computed for each firm-year, and the Feltham-Ohlson model used to check the predictions of Feltham and Ohlson (1995) and Lundholm (1995) and to confirm the results reported by Simpson (1969). Tests are based on the following hypothesis (stated in the null and alternative forms):

H_{O3}: A firm's choice of accounting methods has no effect on the firm's return on equity.

H_{A3}: Firms that choose conservative accounting methods will have a larger average return on equity than firms that choose liberal accounting methods.

2.4.2 Size and Leverage

Watts and Zimmerman's (1986) positive accounting theory predicts that larger firms choose income-decreasing (i.e., conservative) accounting methods to avoid potential negative political repercussions. The theory also predicts that firms with larger debt loads tend to use income-increasing accounting methods to keep from violating restrictive debt covenants.

Even before Watts and Zimmerman (1986), studies addressed the size and leverage issues as they related to the choice of accounting methods, although rarely was a cohesive theory found to explain how companies chose their methods. For example, Simpson (1969) found that conservative-method firms had significantly smaller debt-to-equity ratios (as a proxy for leverage) and significantly larger sales (as a proxy for size) than similar liberal-method firms.

To make sure that size and leverage are not driving any results obtained in the present research effort, relevant information was collected about the sample firms related to their size (e.g., net sales or total assets) and use of debt financing (e.g., debt-to-equity ratios), leading to the following null (followed by the alternative) hypotheses:

H_{O4}: A firm's choice of accounting methods will not be affected by the size of the firm.

H_{A4}: Large firms and small firms will differ in their choices of accounting methods.

H_{O5}: A firm's choice of accounting methods will not be affected by the firm's relative level of debt.

H_{A5}: Firms employing large amounts of debt will differ in their choices of accounting methods from firms employing small amounts of debt.

2.4.3 Investment Opportunity Sets and Growth

One stream of literature looks at the relationship between a firm's existing asset base (i.e., its investment opportunity set, or "IOS") and its growth potential. Researchers have used Tobin's *q* and other growth measures to examine this IOS-growth relationship. For example, Harikumar and Harter (1995) report that Tobin's *q* is a fairly strong proxy (somewhat better than the MV/BV ratio) for persistence of a firm's future earnings. That is, they found that *q* provides information about the profitability of future growth opportunities.

The earnings growth issue could have a potentially confounding effect in the current research effort. Firms have differing levels of anticipated growth due to their management's responses to investment opportunities; firms also have differing levels of [growth in] expected abnormal earnings due to their choices of accounting methods. To make sure that the two types of "growth" are not confused (i.e., to control for economic growth in earnings), one set of tests separated firms based on expected growth in earnings before making other comparisons.

2.5 Summary of Hypotheses

This chapter has presented a review of the relevant accounting and finance literature and has developed a series of hypotheses to test. The first hypothesis is drawn from the analysis of the Feltham-Ohlson model. Succeeding hypotheses relate to the effects that a firm's choice of accounting methods has on earnings quality, return on equity, size, and debt levels. The hypotheses are summarized here, all in the null form:

H_{O1}: The BV/MV ratio is unable to distinguish among firms using generally conservative accounting methods, generally liberal accounting methods, or combinations of accounting methods.

H_{O2}: A firm’s choice of an accounting method portfolio has no effect on the quality of the firm’s reported earnings.

H_{O3}: A firm's choice of accounting methods has no effect on the firm's return on equity.

H_{O4}: A firm's choice of accounting methods will not be affected by the size of the firm.

H_{O5}: A firm's choice of accounting methods will not be affected by the firm's relative level of debt.

The Feltham-Ohlson model utilizes the earnings and book values of firms as the basis for determining a firm's market value. One useful comparison is the BV/MV ratio, which compares a firm's recorded net assets to investors' idea of the value of the firm. According to the Feltham-Ohlson model, firms that use predominantly conservative accounting methods will have relatively smaller BV/MV ratios than firms that use less conservative methods. This proposition is applied to test the first hypothesis, and tests related to this hypothesis comprise the first of two major portions of the research design. If the model is indeed correct, the results will show that a firm's choice of accounting methods will be related to the firm's BV/MV ratio.

Financial analysts regularly attempt to forecast firms' future earnings streams. A common theme among related research is whether any particular factors affect the analysts' ability to predict earnings. It is assumed for the current study that when analysts can more easily predict a firm's earnings based on prior years' earnings, the firm has a higher quality of earnings. Conversely, if various factors in the company's reporting system are associated with a poor job of evaluating future earnings, the firm has a lower quality of earnings. More specifically, it could be assumed that firms using predominantly conservative, predominantly liberal, a mix of conservative and liberal, or a consistent set of accounting methods may have a higher earnings quality. The second hypothesis explores whether a firm's choice of a portfolio of accounting methods has any effect on the firm's earnings quality.

The Feltham-Ohlson model has led researchers to conclude that firms that use conservative accounting methods will exhibit larger relative values of the return-on-equity ratio. Because firms using conservative accounting should have smaller BV/MV ratios, it is predicted that they will also have larger ROE calculations. The third hypothesis seeks to confirm or deny this assumption.

Positive accounting theory posits that a firm's size and relative level of debt financing will affect the firm's choice of accounting methods. The final two hypotheses are used as a test to see if firm size or levels of debt drive any of the results for individual firms. If firms differ significantly in size or in their use of leverage when compared based on the accounting methods employed, then positive accounting theory will be supported.

CHAPTER 3 RESEARCH DESIGN

This chapter presents the research methodology used to examine the hypotheses stated in Chapter 2. Section 1 presents the methodology related to the first stage of the research, the test of previous assumptions used in the literature. Section 2 presents the methodology related to the second stage of the research, the test of which accounting method portfolios provide the highest quality of earnings. Section 3 summarizes the tests performed.

3.1 Test of Assumptions Used in Prior Research

The first question answered is whether the assumptions regarding conservative and liberal accounting methods were valid when used in prior research. Based on Feltham and Ohlson's (1995) model, a firm with a small BV/MV ratio is either using conservative accounting or the market believes the firm's growth prospects (i.e., future earnings) are greater than average.

3.1.1 Selection of Companies

The sample was drawn from microfiche forms available at the Virginia Tech and University of Georgia libraries. The population of forms available at the two libraries included all companies covered by Disclosure, Inc. (most large, publicly traded companies) for the period of time under review (generally 1985-1992, or eight years). The libraries maintain the forms in several file cabinet drawers. All selections were made without replacement, but were checked for particular characteristics before being included in the final sample. If the company was a NYSE firm with a December 31 fiscal year end, the company became part of the sample. The process continued until just over 200 companies were identified. Due to the way the two libraries organize the files, the sample is not based on a random number table, but nonetheless appears to be (based on tests discussed below) a representative sample of the population of firms available. The sample size was limited to about 200 because of the large amount of hand-collected data from annual reports and the Value Line Investment Survey, as described below. At this point, no data collection, other than collecting the company names, had occurred.

3.1.2 Accounting Method Portfolios

Next each company's annual reports for the 1985-1992 period were reviewed, and the accounting methods employed by each company recorded. Most of these reports were on the microfiche in the drawers, but the Lexis/Nexis online database also provided annual reports for many companies. In any given year, annual report data were not available for all 200 companies. Some of this attrition was due to mergers, bankruptcies, companies going private, etc., and some of the attrition was due to missing years in the Disclosure, Inc. microfiche files and the Lexis/Nexis database. There is no indication that the missing data resulted in any kind of systematic bias in the test results presented below.

The data collection process catalogued information related to each firm management's choice of accounting methods in the following areas: depreciation of fixed assets, inventory cost flow, investment tax credits, capitalized interest, tax provisions, use of tax havens, pension liabilities, amortization of intangibles, long-lived lease agreements, and purchases of other companies. A "scorecard" approach[12] placed each firm-year into a group as either a conservative (C), liberal (L), or mixed (M) portfolio firm-year. Conservative-portfolio firms are those firms that use predominantly conservative accounting methods, as discussed in Chapter 2 above; liberal-portfolio firms are those that use predominantly liberal accounting methods; mixed-portfolio firms are those that use similar proportions of conservative and liberal accounting methods.

[12] Hawkins (1986) used a scheme in his recommended solution to Case 9-1, based on a scorecard approach used by a Wall Street investment firm to develop a preliminary estimate of the value of a firm's securities. Under this approach, a firm receives one "penalty point" for each liberal accounting method used. A liberal method is one that is normally considered to increase reported income or otherwise to increase book value (i.e., net assets).

To be specific, after the accounting method choices for each of the sample companies were cataloged, each liberal method used by the firm received one "penalty point." After the assignment of penalty points to each firm in each year (i.e., for each firm-year), the range of points among all firms-years was from zero to five points. Firm-years were partitioned into three strata after combining firm-years with zero or one penalty point, firm-years with two or three penalty points, and firm-years with four or five penalty points.[13] The firm-years in the first group (zero or one penalty point) generally use conservative accounting methods, the firm-years in the third group (four or five penalty points) generally use liberal accounting methods, and the remaining firm-years (in the middle group; two or three penalty points) use a more evenly proportioned combination of conservative and liberal methods. Based on these groupings of C (i.e., Conservative), M (i.e., Mixed), and L (i.e., Liberal) firm-years, a standard one way analysis of variance (ANOVA) helped to explain differences among the firm-years with respect to the BV/MV ratio and other relevant variables.

3.1.3 Book Values, Market Values, and Other Variables

The Standard and Poor's Compustat database provided year-end book value, market value, total assets, total long-term debt, and sales for all companies covered by Compustat (which includes the sample firm-years) for 1985-1994. Based on the numbers collected from Compustat, the book-value-to-market-value (BV/MV) ratio and the debt (i.e., total liabilities divided by total assets) ratio were computed for each company in each year. These variables were used in several tests, as discussed below, including tests to see if the sample is representative of the overall population.

Ou and Penman (1993) divided firms into 20 ranked portfolios based on each firm's price-to-book ratio (the reciprocal of the BV/MV ratio described here) and recomputed the ratios for the appropriate firms for each of the next 15 years. They report that although the mean price-to-book ratios of portfolios tend to converge toward some

[13] For the sample, the "points" variable changed in an average of 14.7% of the firms each year with the smallest change from 1985-1986 (8.7% of sample firms) and the largest change from 1987-1988 (21.0% of sample firms).

common mean, permanent differences in the ratios are evident as far out as 15 years from the formation of the portfolios. Ou and Penman (1993) report a nearly monotonic decrease from the high-ratio portfolio to the low-ratio portfolio in all years reported, a Spearman correlation between portfolio rank and portfolio median price-to-book ratio of 0.91 after 15 years, and a minimum Spearman correlation of 0.85 (in year 9) for all years reported. For purposes of the present research, this indicates that BV/MV ratios tend to be relatively stable over time: high BV/MV ratio firms usually maintain higher BV/MV ratios, and low BV/MV ratio firms usually maintain lower BV/MV ratios, even over extended time periods.[14] That is, the BV/MV ratio computed from past data also appears to be a good predictor of *future* conservatism.

The BV/MV ratios for each firm-year in the sample were calculated from Compustat data. Then, the firm-years were sorted from smallest to largest BV/MV ratio and divided into three equal-sized groups. The third of the firm-years with the smallest BV/MV ratios were classified into the first group. The third of the firm-years with average, and the third of the firm-years with the largest BV/MV ratios, were classified into the second and third groups, respectively. The tests also considered the effects of estimated earnings growth on the results. In the growth tests, the firm-years were sorted based on estimated growth rates for earnings per share (as estimated by the Value Line Investment Survey, or VLIS hereafter) and divided into equal-sized low, medium, and high-growth groups. Each growth group was then sorted based on BV/MV ratios and divided into three equal-sized groups based on relative BV/MV ratios. Thus, one ninth of the firms were categorized into each of the cells created by the cross of growth groups and BV/MV ratio groups.

If past research has been correct in assuming which methods are conservative or liberal, the results will show that firms employing conservative methods have a low BV/MV ratio. That is, in the group composed of the firm-years with the lowest BV/MV ratios, the firms should also be using generally conservative accounting methods in those

[14] Ou and Penman (1993) also suggest that, after using the price-to-book ratio analysis, analysts will report the apparently systematic conservative bias existing in most accounting systems in use today. In the median price-to-book ratio *portfolios*, the mean price-to-book ratio was greater than one (see Ou and Penman's Table 4).

years. The results should also show that firms employing liberal methods have high BV/MV ratios and firms employing a mix of conservative and liberal methods have average BV/MV ratios. One test of the relationship used the proportions in the BV/MV ratio classification (i.e., manipulated to be 1/3 because of the equal-sized groups) as the *expected* proportions in a χ^2 (chi-squared) analysis. To complete the comparison, the *method* classification (i.e., conservative, mixed, liberal) proportions became the *actual* proportions in the χ^2 analysis. With perfect correlation, the proportions in the *method* classification would also be split evenly in each BV/MV ratio group. The χ^2 analysis estimated the degree of non-conformity in the relationship. If the three groups had not been statistically different, then the results would suggest that past researchers made poor assumptions; non-conformity in the relationship, however, would provide support for the assumptions made by earlier researchers.

A standard analysis of variance (ANOVA) test served as an additional method of determining whether firms using different portfolios of accounting methods differ in their BV/MV ratio calculations. These tests compared mean BV/MV ratios for the conservative-, mixed-, and liberal-method firm-years and made pairwise comparisons, when appropriate, to determine whether certain groups of firms tended to have different BV/MV ratios.

Both the χ^2 analysis and the ANOVA yielded evidence for or against the assumptions utilized by prior researchers. Studies have implicitly assumed that if a firm uses a conservative accounting method (LIFO, for example), then the firm will show comparatively smaller earnings and smaller amounts of net assets. Most of these studies have provided very little support for their underlying assumptions other than anecdotal evidence or contrived mathematical examples. The tests described here should provide insight into these conservative-method vs. liberal-method assumptions based on actual methods firms employ and the associated earnings and net asset calculations. Two separate but similar tests checked for robustness of any results obtained using the firm-years in the sample.

3.2 Tests of Earnings Quality

The second question addressed herein is whether the choice of accounting methods affects the quality of reported earnings (i.e., the ability to predict future earnings). Assuming that the Feltham-Ohlson model can distinguish between firms with conservative or liberal accounting systems via the BV/MV ratio relationship, several tests can help explain the existing theories as to what type of portfolio (of accounting methods) produces the highest quality of earnings. Even if the model is not successful at identifying accounting systems, however, the catalog of actual methods used by the sample firms each year would allow a test of the ability of analysts to predict earnings for companies that use different portfolios of accounting methods. Using the same sample companies from the above analysis, I collected both actual and estimated (1) book value per share, (2) earnings per share, and (3) earnings growth rates from VLIS, plus closing year-end market prices and number of outstanding shares of common stock from Compustat. As before, an additional test divided the firm-years into groups based on expected earnings growth rates as a test of the effects of growth on the ability of analysts to predict future earnings.

3.2.1 Unexpected Earnings Tests

One test of the earnings quality of different accounting method portfolios compared unexpected earnings, a proxy for the quality of earnings, among the accounting method groups. Value Line reports estimates of earnings per share, book value per share, and several other variables over a one-year (short-term), two-year (mid-term), and three-to-five-year (long-term) forecast horizon for each firm it follows. Feltham and Ohlson (1995) define *normal earnings* (NE) of a firm as a given return (equal to the firm's cost of equity capital) on the firm's beginning book value, the *reported earnings* (RE) as earnings from continuing operations as reported by the firm (per VLIS in the current study), and *abnormal earnings* (AE) as the difference between the firm's reported earnings and the calculated normal earnings. That is,

RE = earnings from continuing operations as reported by the firm
NE = cost of equity capital x beginning-of-year book value
AE = reported earnings – normal earnings = RE - NE

Bernard (1995) used VLIS-reported (i.e., *ex post*) data and computed actual abnormal earnings. He also calculated a forecasted abnormal earnings figure in advance of each year utilizing the VLIS-forecasted earnings and book values. He further defined *unexpected earnings* (UE) as the difference between the *actual* abnormal earnings and the forecasted abnormal earnings for each firm for each year in the sample period.[15] Thus, he calculated unexpected earnings as follows:

UE = actual abnormal earnings - forecasted abnormal earnings

$$UE_{itl} = (AEPS_{it} - r_e\, ABV_{it}) - (FEPS_{itl} - r_e\, FBV_{itl})$$

where
UE_{itl} = unexpected abnormal earnings for firm *i* at time *t* with lag *l*
$AEPS_{it}$ = actual earnings per share reported by VLIS for firm *i* at time *t*
ABV_{it} = actual beginning-of-year book value reported by VL for firm *i* at time *t*
$FEPS_{it}$ = VLIS-forecasted earnings per share for firm *i* for time *t* with lag *l*
FBV_{it} = VLIS-forecasted beginning-of-year book value for firm *i* for time *t* with lag *l*
r_e = assumed cost of equity capital

Each of these calculations produced an unscaled dollar amount of estimation error for the VLIS analysts. Although the amounts are not scaled directly (e.g., using beginning-of-year stock price), they are indirectly scaled because of the use of earnings *per share* in the calculations instead of earnings in total. Results of additional tests that considered other potential influences of firm size are reported below.

Bernard (1995) arrived at four separate computations of UE for each firm-year – a one-year, two-year, three-year, and four-year forecast horizon. Although VLIS makes forecasts for a one-year, two-year, and three-to-five-year horizon, Bernard called the longer-term forecast a four-year forecast and interpolated to get an estimate for the three-year forecast. Bernard also varied the cost of capital (part of the calculation for normal earnings) from 10% to 15% in his calculations, but used the same cost of capital for each firm-year comprising a given year. For the present study, a different cost of equity capital was estimated for each firm-year utilizing the well-known capital asset pricing

[15] Another test used a standard definition of unexpected earnings from the ERC literature – unexpected earnings is defined as the change in earnings from one year to the next. Still another test defined unexpected earnings as the difference between an analyst's forecast EPS and the actual (reported) EPS. The results of the tests from these

model (CAPM) and using a different risk-free rate, market return, and firm-year-specific beta for each year in the sample.

That is,

$$r_e = r_f + \beta\ [E(r_m) - r_f]$$

where

r_e = return on equity or the cost of equity capital
r_f = return on a risk free asset (i.e., short-term government bond return)
β = covariance of a firm's stock price with the market as a whole as reported by VLIS
r_m = return on the market as a whole, defined as the return on the S&P 500 index for each year

Using the short-term, mid-term, and long-term Value Line Investment Survey forecasts, a separate unexpected earnings amount was computed for each firm-year in the forecast period. For example, for each sample firm with actual abnormal earnings calculated for 1990, a short-term estimate (i.e., one-year-ahead), a mid-term estimate (i.e., two-year-ahead), and a long-term estimate (three-year-ahead) of forecasted abnormal earnings and unexpected earnings were computed for 1989, 1988, and 1987, respectively. Therefore, subject to the time frame of 1985-1994, the overall analysis used three separate computations of unexpected earnings for each firm-year.

An ANOVA was used to test the hypothesis that the mean unexpected earnings (UE) are equal for the conservative method, mixed method, and liberal method groups. Overall tests of differences showed whether the choice of accounting method portfolios affects the ability of investors to predict future earnings and book values (i.e., unexpected earnings). Detailed tests of differences helped answer the question of whether a conservative, liberal, mixed, or consistent portfolio of accounting methods provides the highest quality of earnings.

If the conservative methods theory holds, the results should show significantly smaller means in UE among the conservative groups (i.e., small BV/MV ratio or small penalty-point groups) as compared to the mixed or liberal groups (i.e., with medium or large BV/MV ratios or larger penalty-point totals). The smaller mean errors would indicate that investors can predict future accounting variables with more precision and less uncertainty for firms using generally conservative accounting methods.

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alternative definitions of unexpected earnings were compared to the original results as reported below.

The same analysis should also hold for the liberal methods theory and the mixed methods theory. That is, the group with the smallest means in UE would be the group with the highest quality of earnings. Again, the smaller mean errors would be indicative of investors' ability to predict more accurately and with less uncertainty for the mixed and liberal groups (respectively). If the consistent methods theory holds, the results should show insignificant differences between the small and large BV/MV ratio groups in terms of means of UE; however, both small and large BV/MV ratio groups should show significantly smaller means than the medium BV/MV ratio group (i.e., the mixed method firm-years). That is, the income for both conservative and liberal method firms would be easier to predict than for firms using a combination of conservative and liberal methods.

3.2.2 Return on Equity, Size, Leverage, and Industry Membership Tests

Data collection also included information related to each firm-year's beginning-of-year common equity and each firm-year’s income (before extraordinary gains or losses) to compute the return on equity (ROE), each firm-year's net sales and beginning-of-year total assets as proxies for the firm's size, each firm-year's total long-term debt to compute the debt-to-equity ratio, and each firm-year’s 1-digit SIC code. Based on these financial statement elements and computations, the mean ROE ratio, the mean size, the mean debt-to-equity ratio, and industry membership for each of the groups were compared using standard ANOVA procedures. Previous accounting literature, particularly positive accounting theory, assumes that size, debt levels, and other elements drive a firm's choice of accounting methods. As discussed above, the Feltham-Ohlson model predicts that firms using conservative accounting methods will have greater computed ROE, but the model makes no predictions as to the size, leverage, or industry membership of firms. The ANOVA tests were designed to provide insight into whether or not size, debt levels, and industry effects are driving any results obtained.

3.3 Summary of Research Design and Implementation

This research is designed to answer two major research questions. First, past authors have made specific assumptions as to how a firm's particular choice of accounting methods will affect the firm's net income. The current research explores whether these previous assumptions were well-founded by utilizing a χ^2 analysis and a standard analysis of variance test, both of which compare firms based on the firms' portfolio of in-place accounting methods and the firms' calculated BV/MV ratios.

Second, this research expands on previous studies that looked at the quality of firms' earnings. With earnings quality defined as the ability of analysts to predict future earnings accurately, the research compares forecast errors among firms that use generally conservative, generally liberal, or a mix of accounting methods to find significant differences. Any apparent differences are generally caused by investors' ability to better predict earnings for those firms with a particular kind of currently employed accounting methods.

CHAPTER 4 RESULTS

This chapter contains a discussion of the results of the tests conducted to analyze the collected data. The first section provides descriptive statistics, primarily related to the BV/MV ratio, but also for several other financial statement elements. The second section presents the results that explain the differences in the BV/MV ratios of firms employing different accounting methods. In the third section, the results of tests designed to detect the ability of analysts to forecast future earnings for firms using different portfolios of accounting methods are discussed; for these tests, differences in firms' growth rates in each year are first ignored, then included. The fourth section presents the results that explain the differences in return on equity calculations for firms using different accounting methods. The fifth section reports on some tests of the robustness of the results from earlier sections dealing with alternate proxies for several of the variables used in many of the tests, alternative definitions of forecast errors, and possible confounding variables.

4.1 Tests related to BV/MV ratios

4.1.1 Descriptive statistics

Standard and Poors' Compustat was the source for most of the data related to financial statement elements. I collected the book value and market value of each firm in Compustat's main company file for the years 1985-1994. Book value was computed from Compustat data items Total Common Equity (#60) plus Total Preferred Equity (#130), and the market value was computed from Compustat data items Market Price per Common Share (#24) times Number of Common Shares (#25), with all values drawn from the relevant December 31 data for each year. The BV/MV ratio represents the calculation of BV divided by MV. Panel A of Table 4.1 lists the mean BV/MV ratio for the entire Compustat population for each year and for the ten-year period in total.

The year with the largest mean BV/MV ratio for the population was 1990 (1.218) and the year with the smallest BV/MV ratio was 1993 (0.728), with an average for the ten years of 0.834. The number of firm-years included in the calculations increased steadily from 1985 (1,641 firm years) to 1994 (3,236 firm years) with an average of 2,220 firm years for each year in the period.

As noted in Panel B to Table 4.1, the sample for this research had an overall mean BV/MV ratio for the ten years of 0.713. As for individual years, the largest mean BV/MV ratio was computed for 1990 (0.939), and the smallest BV/MV ratio occurred in 1993 (0.568), the same large/small combination of years shown earlier for the population's mean BV/MV ratio. The number of available firms in the sample ranged from 138 to 152, with an average of 144 firms per year in the sample period. The number of firms in the sample represented approximately 6.5% of the Compustat population through the period of 1985-1994 (maximum of 8.8% of the Compustat population in 1985; minimum of 4.7% of the Compustat population in 1994).

The median BV/MV ratios followed the same general pattern as the population's mean BV/MV ratios, with the largest median BV/MV ratio in 1990 (0.866) and the second-smallest median BV/MV ratio in 1993 (0.607; smallest median BV/MV ratio of 0.594 in 1992). In comparing the distributions of the mean BV/MV ratio and the median BV/MV ratio for the ten-year time period, it is obvious that the population mean in each year (especially in 1990 and 1991) is skewed by a few large BV/MV ratio outliers (population coefficient of skewness = 36.4), whereas the sample is not skewed as significantly (sample coefficient of skewness = 5.1). This demonstrates that the population is heavily influenced by some significant, large BV/MV ratios that could seriously affect the validity of any conclusions drawn from the results of tests of the sample. The sample is also apparently somewhat affected by several large BV/MV ratios, but not nearly to the extent of the population. Mathematically speaking, large outliers will affect the mean BV/MV ratio to a greater extent than a similar quantity of small outliers (BV/MV ratios much less than 1, for example).

Table 4.1 (Panel A) Summary of annual BV/MV ratios for the Compustat population with annual report information available

Year	*Number of firm-years*	*Mean BV/MV ratio (unadjusted)*	*Mean BV/MV ratio (max = 30)*	*Mean BV/MV ratio (max = 5)*	*Number of firm-years BV/MV > 5*
1985	1,641	0.766	0.766	0.753	5 (0.30%)
1986	1,767	0.752	0.752	0.731	1 (0.06%)
1987	1,892	0.886	0.886	0.865	8 (0.42%)
1988	1,985	0.815	0.815	0.805	3 (0.15%)
1989	2,050	0.767	0.767	0.765	5 (0.24%)
1990	2,109	1.218	1.186	1.108	41 (1.94%)
1991	2,219	0.883	0.883	0.857	23 (1.04%)
1992	2,330	0.792	0.770	0.733	12 (0.52%)
1993	2,970	0.728	0.721	0.699	8 (0.27%)
1994	3,236	0.784	0.784	0.772	7 (0.22%)
Average all years	**2,220**	**0.834**	**0.828**	**0.804**	**11 (0.50%)**

Table 4.1 (Panel B) Summary of annual BV/MV ratios for the Compustat population and for sample companies with annual report information available

Year	*Population Mean BV/MV ratio (max = 5)*	*Population Median BV/MV ratio*	*Sample Mean BV/MV ratio*	*Population # firm-years*	*Sample # firm-years*	*Sample firms as a % of Population*
1985	0.753	0.674	0.680	1,641	144	8.8%
1986	0.731	0.647	0.639	1,767	145	8.2%
1987	0.865	0.766	0.735	1,892	145	7.7%
1988	0.805	0.707	0.724	1,985	143	7.2%
1989	0.765	0.661	0.679	2,050	138	6.7%
1990	1.108	0.866	0.939	2,109	139	6.6%
1991	0.857	0.670	0.772	2,219	144	6.5%
1992	0.733	0.594	0.635	2,330	142	6.1%
1993	0.699	0.607	0.568	2,970	152	5.1%
1994	0.772	0.690	0.614	3,236	152	4.7%
Average all years	**0.804**	**0.678**	**0.713**	**2,220**	**144**	**6.5%**

Explanations of variables and calculations for Table 4.1

BV: Computed from Compustat data items Total Common Equity (#60) plus Total Preferred Equity (#130); Total Common Equity could not be equal to or less than zero

MV: Computed from Compustat data items Market Price per Common Share (#24) times Number of Common Shares (#25); Market Price and Number of Shares could not be equal to or less than zero

BV/MV ratio: Represents the calculation of BV divided by MV

Number of firm-years: The number of firm-years on the Compustat file for the year that met the BV/MV ratio calculation criteria shown above for either the population (Panel A and Panel B) or the sample (Panel B)

Mean BV/MV ratio: The average BV/MV ratio for all firm-years on the Compustat file

unadjusted: no adjustment made for BV/MV ratio outliers

max = 30: for firm-years with BV/MV greater than 30, originally calculated BV/MV replaced with 30

max = 5: for firm-years with BV/MV greater than 5, originally calculated BV/MV replaced with 5

Median BV/MV ratio: Of the acceptable BV/MV ratios, the middle value when sorted from smallest to largest (computed as the average of the two middle values for an even number of ratios)

Number of firm-years BV/MV > 5: The number of firm-years (percentage) on the Compustat file for the year that had calculated BV/MV ratios greater than 5, and for which the originally calculated BV/MV was replaced with 5

Sample mean BV/MV ratio: The average BV/MV ratios for each year for the firm-years in the sample

Sample firms as a % of population firms: the number of sample firms as a percentage of the number of Compustat firms in a given year

In a normally distributed population, the calculated mean and median will be essentially equal. In the presence of outliers in the population, however, the median will be less affected than the mean by outliers. Therefore, the population *median* in the present research should be less affected by outliers. A comparison of the sample *mean* to the population *median* in each year shows that the sample mean is extremely close to the population median in all years (sample mean greater than population median in six years; sample mean less than population median in four years; average difference of -0.010). Evidently, in this comparison the sample and the population are very similar as far as the distribution of BV/MV ratios. This would indicate that any conclusions drawn from the sample test could be meaningfully extrapolated to the population.

<u>*4.1.2 Adjustments related to outliers*</u>

Additional tests to determine the effects of the large BV/MV outliers in the population use a maximum BV/MV ratio of 30 or of 5. Initially, for any calculation that resulted in a BV/MV ratio greater than 30, the calculated amount was replaced with 30. Then, as a further test, a maximum BV/MV ratio was constrained to a value of 5. There were only four firm-years with a BV/MV ratio greater than 30; one in 1990, two in 1992, and one in 1993. The number of firm-years with BV/MV ratios greater than 5 averaged 0.50% of the total number of firm-years, with a range of 0.06% in 1986 to 1.94% in 1990. That is, almost two percent of the Compustat population had a calculated BV/MV ratio greater than 5 in 1990, and those observations could have a material effect on the calculation of the mean BV/MV ratio. More precisely for 1990, the average for the 41 firms (1.94% of the total firms) with the largest BV/MV ratio was 10.780, while the average BV/MV ratio for the remaining 2068 firms (98.06% of the firms) was 1.108. While 1990 was the year most affected by the large BV/MV ratio outliers, all years in the sample period were affected to some extent. All remaining results shown in the present research incorporate a maximum BV/MV ratio of 5 to reduce the effects of the outliers.

Using the adjusted ratios (i.e., allowing a maximum BV/MV ratio of 5), the mean BV/MV ratio for the Compustat population ranges from 0.699 (1993) to 1.108 (1990), with an average for the 1985-1994 period of 0.804. As stated earlier, the mean BV/MV ratios of the companies in the sample range from 0.568 (1993) to 0.939 (1990), with an average of 0.713. Without exception, the population mean BV/MV ratio is greater than the sample mean BV/MV ratio in each year (minimum difference of 0.074 in 1985; maximum difference of 0.167 in 1990). Taking all observations into account, the population has a larger BV/MV ratio than the sample firm-years in total and for each individual year. Related to the earlier discussion, this consistent difference still appears to be driven by a number of large BV/MV outliers in the population (including the data points set at a maximum of 5 for the BV/MV ratio).

Additional alternative tests (i.e. alternatives to setting the maximum BV/MV ratios to 5) utilized trimmed means for the population by sorting the BV/MV ratios and dropping the largest 1% and smallest 1% of observations. The resulting distribution was no longer heavily positively skewed (coefficient of skewness of 1.7), and the mean BV/MV ratio of the population was closer to the sample mean (population mean BV/MV ratio of 0.773). Because the mean BV/MV ratio decreased from 0.804 to 0.773 when similar quantities of both large and small extremes were dropped, it appears that the population is affected by large BV/MV ratio outliers to a much greater extent than the sample is affected. This is also illustrated by the decrease in the coefficient of skewness for the population from 36.4 to 1.7 by trimming the 1% largest and 1% smallest BV/MV ratios.

The population appears to be fairly normally distributed, with outliers in both ends of the distribution. As an equal number of outliers are dropped from each end of the distribution (i.e., as trimmed means are considered), the apparent skewness of the population becomes almost non-existent. The fact that the coefficient of skewness is so large at the beginning of the tests seems to be driven by the fact that large BV/MV ratio outliers affect the mean to a much greater extent than the small BV/MV ratio outliers.

In another test of the representative nature of the sample, the population data were sorted from the smallest to the largest BV/MV ratio, and the mean BV/MV ratios for the population and sample compared across various segments of the population. When the population is split in half and the sample and population means are compared (Table 4.2, Panel A), the smaller BV/MV ratios have a sample mean (0.422) that is significantly larger than the population mean (.409) with $p<0.01$; for the larger BV/MV ratios, the sample mean (1.115) is significantly smaller than the population mean (1.270) with

$p<0.01$. Further investigation of quintiles (Table 4.2, Panel B) and deciles (Table 4.2, Panel C) of the population reveals that the differences between the sample and the population are mostly related to the extreme tails of the distribution. Also, as expected, the specific data points in the sample are not as extreme as the most extreme data points in the overall population.

As shown in the tables, there is a statistically significant difference between the sample and the population for the smallest BV/MV ratios, but the magnitude of the difference is relatively small (approximately 0.03 in the smallest BV/MV decile). For the largest BV/MV ratios, there is a weakly significant difference, but the magnitude of the difference is much larger (approximately 0.51 in the largest BV/MV decile). Once again, this indicates that most of the difference in overall means for the Compustat population and the sample is driven by large BV/MV outliers in the population. A review of the actual data points shows that, of the largest one hundred BV/MV ratios, only four are part of the sample (with a mean ratio for the four of 6.84) and the other 96 are not in the sample (with a mean ratio of 11.86). That is, the data points in one extreme of the distribution (i.e., the large BV/MV ratio end of the distribution) do not affect the sample mean to the same extent that they affect the population mean. Evidently, a few extremely large data points in the population are skewing the population mean for the BV/MV ratio calculation; however, in the sample, a similarly large effect of the extreme data points was not detected.

To summarize, the mean BV/MV ratio for the Compustat population appears to be strongly influenced by outliers, especially the large BV/MV ratio outliers. Additional tests that take advantage of specific steps to reduce the influence of these large outliers show that the firm-years in the sample are representative of the Compustat population with respect to the BV/MV ratio. It appears that results derived from tests of the sample can be generalized to the Compustat population, except for those observations with very large and very small mean BV/MV ratios.

Table 4.2 (Panel A): Comparison of BV/MV ratios by halves

BV/MV Ratio	*Population Mean*	*Sample Mean*	*F statistic*	*P-value*
Total	0.804	0.713	26.67	<0.01
Smallest Half	0.409	0.422	6.77	<0.01
Largest Half	1.270	1.115	6.83	<0.01

Table 4.2 (Panel B): Comparison of BV/MV ratios by quintiles

	BV/MV Quintile	*Population Mean*	*Sample Mean*	*F statistic*	*P-value*
Smallest	1	0.231	0.263	52.15	<0.01
	2	0.477	0.472	3.26	0.07
	3	0.679	0.671	7.22	<0.01
	4	0.916	0.912	0.53	0.47
Largest	5	1.886	1.603	3.51	0.06

Table 4.2 (Panel C): Comparison of BV/MV ratios by deciles

	BV/MV Decile	*Population Mean*	*Sample Mean*	*F statistic*	*P-value*
Smallest	1	0.156	0.184	34.28	<0.01
	2	0.310	0.316	9.62	<0.01
	3	0.424	0.420	3.51	0.06
	4	0.530	0.530	0.01	0.93
	5	0.629	0.626	1.76	0.18
	6	0.729	0.728	0.06	0.81
	7	0.841	0.842	0.04	0.83
	8	0.990	0.983	3.11	0.08
	9	1.229	1.224	0.31	0.58
Largest	10	2.538	2.023	2.98	0.08

<u>Explanation of calculations for Table 4.2</u>

The population was sorted from the smallest to the largest BV/MV ratio and divided into equal-sized groups -- one-half (Panel A), one-fifth (Panel B), or one-tenth in each group (Panel C). The endpoints of each group became the "boundaries" for the sample BV/MV ratios as well. In each of the groups, the mean BV/MV ratio was computed for both the population and the sample, and F-statistics were calculated for the comparison of the population groups and the related sample groups.

4.1.3 Comparison of other related variables

Table 4.3 compares several other variables for differences between the Compustat population and the sample. The companies in the sample had significantly larger BV (mean = 1267.63), MV (mean = 3012.04), long-term debt (LTD mean = 868.57), LTD/TA (debt ratio mean = 0.203), and Sales (3560.80) than the Compustat population for BV (mean = 821.22), MV (mean = 1451.28), LTD (mean = 610.60), LTD/TA (mean = 0.188), and Sales (mean = 1852.38), respectively. For Total Assets (TA), the population mean over the ten-year time period is 4099.05 (in thousands) and the sample mean is 4080.06; these two mean values are not statistically different.

It is interesting to note the inter-relationships of the assets, long-term debt (part of the total liabilities), and book value (equal to the owners' equity of the firm). As shown, the total assets of the population and the sample are not statistically different. Considering the other side of the accounting equation (i.e., liabilities and owners equity), however, the population and sample show significantly different results. Also, because the long-term debt is significantly larger for the sample firms, the debt ratio (LTD/TA) is significantly larger for the sample firms, as shown in Table 4.3.

The overriding conclusion from these comparisons is that the sample firm-years tend to be larger than the average firm-year in the Compustat population based on every measure of size except total assets. Separate tests (results not reported) using the log (SALES) as a proxy for size yielded similar results. These results appear to be due to the comparison of an all-NYSE sample to a Compustat population that also includes many non-NYSE firms. Because of the listing requirements of the NYSE, firms that are listed on the exchange are generally larger-than-average firms; therefore, the all-NYSE sample appears to be representative more of the larger firms covered by Compustat than of the smaller firms. Also, while the difference in the debt ratio (LTD/TA) is statistically greater in the sample than the population, the magnitude of the difference (0.203 - 0.188 = 0.015) is relatively small. It appears that any results derived from tests of the sample have primary significance in evaluating the largest firms, especially those listed on the NYSE. The results may still have limited usefulness in describing all population firms, but the results as applied to smaller firms will of necessity not be as predictive.

Table 4.3: Comparison of other variables

(dollar amounts in millions)

Variable	*Population Mean*	*Sample Mean*	*F statistic*	*P-value*
BV	$ 821.22	$1,267.63	61.12	<0.01
MV	$1,451.28	$3,012.04	197.27	<0.01
TA	$4,099.05	$4,080.06	0.00	0.96
LTD	$ 610.63	$ 868.57	14.56	<0.01
LTD/TA	0.188	0.203	15.30	<0.01
Sales	$1,852.38	$3,560.80	131.70	<0.01

Explanations of variables and calculations for Table 4.3

BV: Total Common Equity plus Total Preferred Equity
MV: Market Price per Common Share times Number of Common Shares
TA: Total Assets
LTD: Total Long-term Debt
LTD/TA: Computed as Total Long-term Debt divided by Total Assets
Sales: Net Sales

4.2 BV/MV ratio differences among firms

For each firm-year, tests were performed to assess if low BV/MV ratios are more likely for firms using conservative accounting choices, as can be inferred from the Feltham-Ohlson model. As stated above, firm-years sorted based on BV/MV ratios were divided into three equal-sized groups. Within each group, the firm-years were further divided into three groups (i.e., conservative, mixed, liberal) based on the firm's choice of accounting methods. Table 4.4 (Panel A) reports the actual number of firm-years (percentage of column) that were in each of the Ratio/Method crosstab categories.

Of the 1426 available observations, 475 firm-years fell into a low BV/MV ratio group, 476 firm-years into a medium BV/MV ratio group, and 475 firm-years into a high BV/MV ratio group. If there were no correlation between a firm's BV/MV ratio and the firm's choice of accounting methods, there would be approximately the same number of conservative-method firms with low BV/MV ratios, medium BV/MV ratios, and high BV/MV ratios. The same expectation would hold for the mixed-method and liberal method firms. As shown further in Table 4.4, of the 175 conservative-method firm-years, 95 (54.3%; i.e., more than the expected 33.3%) were from the low BV/MV ratio group, 49 (28.0%; i.e., about the same as expected) were from the medium BV/MV ratio group, and only 31 (17.7%; i.e., fewer than the expected 33.3%) were from the high BV/MV ratio group. Of the 242 liberal-method firm-years, 37 (15.3%; i.e., fewer than expected) were from the low BV/MV ratio group, 83 (34.3%; i.e., about the same as expected) were from the medium BV/MV ratio group, and 122 (50.4%; i.e., more than expected) were from the high BV/MV ratio group. For the firm-years with mixed portfolios of accounting methods, the differences from expected results were minor: 343 (34.0%) firm-years, 344 (34.1%) firm-years, and 322 (31.9%) firm-years in the low, medium, and high BV/MV ratio groups, respectively.

The χ^2 test compares the actual cell sizes to the expected cell sizes (all equal in this test) to determine whether the actual results are significantly different from expected results. The χ^2 test also confirms whether the accounting method classifications (i.e., conservative, mixed, and liberal) resulted in equal-sized groups among the BV/MV ratio categories. The critical value at the 0.01 level for each cell is 11.345. As shown in Table 4.4 (Panel B), the χ^2 test results show a significant difference (χ^2 variable = 83.20, $p<0.01$) in groups for the Ratio vs. Method classification comparisons. The decomposed χ^2 variable (equal to 83.20, as shown), indicates that the differences attributable to the low BV/MV ratio group represent 56.3% (46.85/83.20) of the overall χ^2 number, and the differences attributable to the high BV/MV ratio group represent another 41.6% (34.62/83.20) of the overall χ^2 number. Note also the decomposition based on the conservative, mixed, and liberal categories: the differences attributable to the conservative firms represent 45.0% (37.42/83.20) of the overall χ^2 number, and the differences attributable to the liberal firms represent another 54.0% (44.90/83.20) of the χ^2 number. That is, the medium BV/MV ratio group adds almost nothing to the strength of the χ^2 results, and the mixed-method firms also do not contribute significantly to the results of the χ^2 test.

The individual cell results demonstrate that firms using a portfolio of conservative accounting methods are (significantly) likely to have a low BV/MV ratio (χ^2 = 23.12) and are (significantly) unlikely to have a high BV/MV ratio (χ^2 = 12.78). Similarly, firms using liberal accounting methods are likely to have a high BV/MV ratio (χ^2 = 21.25) and are unlikely to have a low BV/MV ratio (χ^2 = 23.59). For firms using a mixture of conservative and liberal accounting, there are no significant differences among the low BV/MV ratio, medium BV/MV ratio, and the high BV/MV ratio groups (maximum χ^2 = 0.59). Stated more simply, for the sample firms, 54.3% of the conservative-method firms had a relatively low BV/MV ratio, 28.0% had medium BV/MV ratios, and only 17.7% had high BV/MV ratios. Also, 50.4% of the liberal-method firms had a high BV/MV ratio, 34.3% had a medium BV/MV ratio, and only 15.3% of the firms had a low BV/MV ratio. For the mixed-methods group, the dispersion was approximately one-third in each of the BV/MV ratio levels.16

The results shown here lend strong support to the inference drawn from the Feltham-Ohlson model that low BV/MV firms use conservative accounting practices. Additionally, the model implies the converse -- that high BV/MV firms use liberal accounting practices. Consistent with the trend of BV/MV ratios and their relationship to the accounting methods employed, firms using a mixture of conservative and liberal methods were just as likely to have low, medium, or high BV/MV ratios.

Other tests of the BV/MV ratio differences included standard ANOVA tests. As with the χ^2 tests, the overall ANOVA results for the sample (Panel A of Table 4.5) indicate that there is a statistical difference between at least two of the groups ($F=23.58$, $p<0.01$). The mean BV/MV ratios of the three groups are as follows: mean of the C group = 0.516, mean of the M group = 0.688, mean of the L group = 0.843. The p-values for the pairwise comparisons of C vs. L and M vs. L (Panel B of Table 4.5) indicate that the differences in these mean BV/MV ratios are all strongly significant ($p<0.01$ in both pairwise comparisons).

16 These tests do not control for growth differences. Further tests, with results reported below, show whether the results shown here are primarily driven by growth factors.

Table 4.4 (Panel A) Number of firm-years in each BV/MV ratio vs. accounting method portfolio cell

	Conservative	Mixed	Liberal	# firm-years
Low BV/MV ratio	95 (54.3%)	343 (34.0%)	37 (15.3%)	**475**
Medium BV/MV ratio	49 (28.0%)	344 (34.1%)	83 (34.3%)	**476**
High BV/MV ratio	31 (17.7%)	322 (31.9%)	122 (50.4%)	**475**
Total firm-years	**175**	**1009**	**242**	**1426**

Table 4.4 (Panel B) χ^2 test results – Individual cell χ^2 statistics

	Conservative	Mixed	Liberal	Total χ^2
Low BV/MV ratio	23.12*	0.14	23.59*	**46.85**
Medium BV/MV ratio	1.52	0.15	0.06	**1.73**
High BV/MV ratio	12.78*	0.59	21.25*	**34.62**
Total χ^2	**37.42**	**0.88**	**44.90**	**83.20**

* significant at $p<0.01$

Explanation of calculations for Table 4.4

Table 4.4 (Panel A) shows the number of firm-years (percentage of column) that were actually in each category.

Table 4.4 (Panel B) shows the results of the χ^2 test, which compares the actual cell sizes to the expected cell sizes (manipulated to be equal in this test) to determine whether the actual results are significantly different from expected results. The critical value (at 0.01 level) for each cell is 11.345; the overall $\chi^2 = 83.20$*

Table 4.5 (Panel A) Overall comparisons of BV and MV among Conservative, Mixed, and Liberal groups

Variable	*F Statistic*	*p-value*
BV/MV ratio	23.58	<0.01
BV	2.53	0.08
MV	5.75	<0.01

Table 4.5 (Panel B) Pairwise comparisons of BV and MV among Conservative, Mixed, and Liberal groups

	C vs. L		*M vs. L*	
Variable	*t statistic*	*p-value*	*t statistic*	*p-value*
BV/MV ratio	-6.84	<0.01	-4.48	<0.01
BV	1.95	0.05	0.22	0.82
MV	2.83	<0.01	3.17	<0.01

Although generally not as interesting for later analysis, both the Sheffe test and the Bonferroni test show significant differences between the BV/MV ratio means for all pairwise comparisons (not just the two comparisons shown in Table 4.5, Panel B) at a 95% confidence level.

Implications of the Feltham-Ohlson model suggest that firms using conservative accounting methods should report smaller earnings, thereby leading to smaller reported equity, hence smaller book value, as compared to firms using liberal accounting methods. In efficient markets, the market values of these conservative-method companies should not be affected. If the book values of the conservative-method firms are smaller and the market values are similar to liberal-method firms, then the BV/MV ratios of firms using conservative accounting methods will also be smaller. The results reported here appear to confirm this implication drawn from the Feltham-Ohlson model – firms using conservative accounting methods tend to have lower BV/MV ratios than firms using liberal accounting methods. Of course, this does not imply that all firms with low BV/MV ratios will be found to use only conservative accounting methods, or conversely, that all firms using conservative accounting methods will have low BV/MV ratios. Neither does this imply that firms with a low BV/MV ratio have lower quality earnings, considering the definition of earnings quality being used. The overriding conclusion is that there is a strong correlation (or even a direct link, according to the model) between a firm's choice of accounting methods and the firm's calculated BV/MV ratio.

Based on the results of the χ^2 tests and the ANOVA tests, there are overall differences among the BV/MV ratio groups depending on whether the firms use conservative (C), mixed (M), or liberal (L) accounting methods. Examination of the individual cell results reveals that C firm-years are more likely to have low BV/MV ratios and L firm-years are more likely to have high BV/MV ratios. It also appears that there is no significant difference in what type of accounting methods the firm-years in the middle BV/MV ratio group use. As was just discussed, the implications of the Feltham-Ohlson model are that firms using conservative accounting methods will have smaller BV/MV ratios than firms not using those methods. These assumptions were originally only derived in a theoretical or mathematical setting. The results shown here, however, indicate that for a sample of the companies followed by Compustat, the Feltham-Ohlson assumption is valid. The logical conclusion is that the theoretical model holds up to practical tests of the basic assumptions.

The differences in the BV/MV ratio reported above are further explored by examining the components of the BV/MV ratio for information about the composition of those differences, as shown in Table 4.5 (Panel B). In the sample the C group has a (weakly) significantly larger mean BV (mean = 1948.7) than the L group (mean = 1425.41, p=0.051), and the M and L groups have statistically equal means (p=0.82). Thus, it appears that the firms in the sample that choose to use conservative accounting methods tend to be larger firms, on average. This result is consistent with Watts and Zimmerman's (1986) prediction that larger firms will choose income-decreasing (i.e., conservative) accounting methods in an attempt to reduce public scrutiny.

In the MV comparisons, the mean market values of the C (mean = 4138.5), M (mean = 3740.51), and L (mean = 2058.17) groups show large differences. For both the C vs. L and the M vs. L comparisons, the L mean is significantly smaller (p<0.01 for both comparisons). These results indicate that a firm using liberal accounting methods will have a lower valuation placed on the firm by the market than a similar firm using less liberal methods. While not conclusive, this would seem to indicate that the market is in no way "fooled" by the larger reported earnings of the liberal method firms. Alternatively, this result could just be another manifestation of the size difference between C and L firm-years demonstrated with the BV comparisons.

Tests using the Sheffe comparison method demonstrate that for the BV variable, no pairwise comparisons are significant at a 95% confidence level; for the MV variable, the C vs. L and M vs. L comparisons are significant, but the C vs. M comparison is insignificant at the 95% confidence level. The results of these multiple comparison tests are consistent with what was shown earlier (recall that the C vs. L comparison of the BV variable was weakly significant at p=0.051). When C or L firm-years are compared to M firm-years, the M mean is not significantly different for the BV variable, but the M mean is significantly different from the L mean for the MV variable. If firm-size were driving the results related to the BV comparisons, one would expect firm-size also to dominate the results related to the MV comparison. These results do not support this possibility;

therefore, it seems more likely that liberal-method firms are partially penalized by the market.

The (weakly significant) larger relative BV for the C group would by itself tend to cause the BV/MV ratio to be larger for the C group, and the larger relative MV for the L group would by itself tend to cause the BV/MV to be smaller for the L group -- exactly the opposite of the findings reported earlier. That is, the differences in BV and MV among the three groups would tend to introduce a bias against significant findings related to the BV/MV ratio. From a purely mathematical perspective, if the BV/MV ratios of conservative method firm-years are less than the BV/MV ratios of liberal method firm-years (as predicted by the Feltham-Ohlson model and as reported above), and if the BV of conservative method firm-years is greater than the BV of liberal method firm-years (i.e., conservative method firm-years are larger, as reported above), then it must follow that the MV of the conservative method firm-years must be *much* larger than the MV of the liberal method firm-years (also reported above).

4.3 Tests related to unexpected earnings

4.3.1 Basic tests (no consideration of growth rates)

The second major test was designed to test the quality of earnings for firm-years using different portfolios of accounting methods. As a proxy for quality of earnings, I used a measure of the error involved in analysts' (specifically, Value Line Investment Survey's) computation of earnings per share (EPS) for the companies the analyst follows. As discussed earlier, the unexpected earnings for each company for each year were computed and these "errors" compared among the three groups of companies (i.e., C, M, and L). These errors were partitioned into three groups – one related to one year, or short-term, forecasts (UEPSST); one related to two-year, or medium-term, forecasts (UEPSMT); and one related to three-to-five-year, or long-term, forecasts (UEPSLT). Although the details of statistical significance are discussed below, it is nearly always true that the VLIS forecast error is smallest for the C firm-years, in the middle for the M firm-years, and largest for the L firm-years (both in total and taking growth rates into account).

The short-term prediction error (UEPSST) data in Table 4.6 (Panel A) show that VLIS analysts predicted more accurately for C firm-years (mean UEPSST=$0.189) than for M firm-years (mean UEPSST=$0.644) and more accurately for M firm-years than for L firm-years (mean UEPSST=$0.846); however, the differences are not statistically significant among the three groups (F=1.902, p=0.15). These results indicate that analysts' predictions are not affected (for short-term forecasts, at least) by a firm's choice of accounting methods.

Consider the overall tests of the medium-term errors shown in Panel B of Table 4.6. Note from Panel A the strongly significant overall differences (F=24.894, p<0.01). For the medium-term error variable, the mean UEPSMT was $0.498 for the C group, $0.793 for the M group, and $1.618 for the L group. The differences between the C and L means and between the M and L means are strongly significant (p<0.01). These results indicate that over a two-year (i.e., medium-term) forecast horizon, the VLIS analysts have a smaller earnings prediction error when they are predicting earnings for firms using conservative or mixed portfolios of accounting methods than when the analysts predict earnings for firms using primarily liberal accounting methods. It is interesting to note that the medium-term prediction error for the liberal-methods firm-years is more than twice the size of the prediction error for mixed-methods firm-years and more than three times the size of the prediction error for conservative-methods firm-years. Multiple comparison tests (i.e., Sheffe) produced the same results – the C vs. L and M vs. L differences are significant while the C vs. M differences are insignificant at a 95% confidence level.

For the long-term errors, the mean UEPSLT was $1.200 for the C group, $1.420 for the M group, and $2.116 for the L group, resulting in strongly significant overall differences (F=9.811, p<0.01). Again, the C vs. L and the M vs. L pairwise comparisons are strongly significant (p<0.01). Based on these results, it appears that for a 3-to-5-year (i.e., long-term) forecast horizon, the VLIS analysts are more accurate at predicting earnings for conservative and mixed method firm-years than for liberal method firm-years. In the comparison of conservative-method and mixed-method firm-years, however, there is no statistically significant difference between the ability of analysts to predict future earnings over the long-term (based on the Sheffe multiple comparison statistic for a 95% confidence level).

Next, notice the trend of VLIS forecast errors as the forecast horizon lengthens. For C firms the mean error increases from $0.189 to $0.498 to $1.200 as the forecast horizon increases from short term (UEPSST) to medium term (UEPSMT) to long term (UEPSLT). Similarly, for M firms the mean error increases from $0.644 to $0.793 to $1.420, and for L firms the mean error increases from $0.846 to $1.618 to $2.116 as the horizon lengthens. Thus, for all three categories of firms (i.e., C, M, and L), the forecast errors are smaller for the UEPSST variable than for the UEPSMT variable, and the UEPSMT error is smaller than the UEPSLT error. These results indicate that the farther the forecast horizon is extended, the more difficulty analysts have in predicting earnings for any firm, regardless of the accounting methods the firm uses – an obvious and expected conclusion.

Another perspective of the across-time ability of analysts to predict financial variables is shown in Panel C of Table 4.6. In percentages (but not amounts), the *difference* in the forecast errors for firm-years using liberal methods and firm-years using conservative methods is greater for short-term forecasts than for medium-term forecasts. For short-term forecasts, the absolute difference between C and L firm-years is $0.657 ($0.846-$0.189), which represents 78% ($0.657/$0.846) of the L forecast error and 348% ($0.657/$0.189) of the C forecast error. For medium-term forecasts, the absolute difference between C and L firm-years is $1.120 ($1.618-$0.498), which represents 69% ($1.120/$1.618) of the L forecast error and 225% ($1.120/$0.498) of the C forecast error. Similarly, the difference in the forecast errors between firm-years using liberal methods and firm-years using conservative methods is greater for the medium-term forecasts than for the long-term forecasts in both amounts and percentages. For long-term forecasts, the absolute difference between conservative and liberal firm-years is $0.916 ($2.116-$1.200), which represents 43% ($0.916/$2.116) of the liberal forecast error and 76% ($0.916/$1.200) of the conservative forecast error.

Table 4.6 (Panel A) Overall comparisons of forecast errors in C, M, and L firms

Variable	*C mean*	*C #*	*M mean*	*M #*	*L mean*	*L #*	*F statistic*	*p-value*
UEPSST	$0.189	120	$0.644	751	$0.846	205	1.902	0.15
UEPSMT	$0.498	121	$0.793	752	$1.618	205	24.894	<0.01
UEPSLT	$1.200	121	$1.420	752	$2.116	205	9.811	<0.01

Table 4.6 (Panel B) Pairwise comparisons of forecast errors in C, M, and L

	C vs. L		*M vs. L*	
Variable	*t statistic*	*p-value*	*t statistic*	*p-value*
UEPSST	N/A*	N/A*	N/A*	N/A*
UEPSMT	-5.964	<0.01	-6.394	<0.01
UEPSLT	-3.677	<0.01	-4.065	<0.01

* N/A means "not applicable" and is included any time the initial comparison showed no *overall* differences (in this case, for UEPSST)

Table 4.6 (Panel C) Comparison of differences in C and L firms in amounts and percentages over different forecast horizons

Variable	C mean	L mean	Difference	Difference As a % of L	Difference As a % of C
UEPSST	$0.189	$0.846	$0.657	78%	348%
UEPSMT	$0.498	$1.618	$1.120	69%	225%
UEPSLT	$1.200	$2.116	$0.916	43%	76%

<u>Explanation of Table 4.6 variables</u>

UEPSST: Unexpected earnings over a one-year (i.e., short-term) forecast horizon
UEPSMT: Unexpected earnings over a two-year (i.e., medium-term) forecast horizon
UEPSLT: Unexpected earnings over a three-to-five-year (i.e., long-term) forecast horizon

Unexpected earnings is defined here as the absolute value of the difference between expected abnormal earnings and actual abnormal earnings. Because of the *absolute value* calculation, all numbers shown are positive numbers.

Abnormal earnings is defined as the difference between actual earnings per share and a return on the firm-year's beginning-of-year book value.

These computations demonstrate a "closing of the gap" in terms of forecast errors between C, M, and L firm-years. As shown earlier, VLIS analysts have significantly more trouble estimating earnings for L firms than for C and M firms. These additional results, however, show that while the differences are still statistically significant, the differences are decreasing as the forecast horizon lengthens. As shown above, for example, the difference in forecast errors between L and C firms for short-, medium-, and long-term horizons represents 78% of the short-term forecast error for L firms, 69% of the medium-term forecast error for L firms, and 43% of the long-term forecast error for L firms, respectively. Additional research would be necessary, and new data sources found, to explore forecast errors for time periods extending past the three-to-five-year horizon (but considered long term in the present research) used by the VLIS analysts. Such research would be necessary to determine if the "gap" between forecast errors for C and L firms would continue to decrease further if the forecast horizon were extended to ten years, for example, and to determine whether the analysts would ever become equally successful (or more precisely, *unsuccessful*) at predicting the liberal method firms' earnings as they were at predicting the conservative method firms' earnings.

To summarize the results reported above, it appears to be generally true that analysts are more successful at predicting future earnings for firms that use conservative accounting methods or a mixed portfolio of accounting methods than they are at predicting future earnings for firms using liberal accounting methods. The results also support the idea that, regardless of the types of accounting methods employed by firms, analysts have more difficulty predicting future earnings as the forecast horizon lengthens. Finally, over the time periods covered by the present research, the difference in forecast errors between C and L firms decreases in percentage terms as the forecast horizon is extended.

4.3.2 Growth considerations

As discussed above regarding the Feltham-Ohlson model, a company's growth rate should have an effect on the results of the model, such that it is appropriate to investigate the effects of earnings growth on the ability of the model to predict. This was accomplished by first sorting firm-years based on the VLIS estimate of earnings growth as reported for each company. The VLIS estimate is a rate of expected earnings growth over the following five years. Then, after sorting the firm-years based on growth, the sample was divided into five equal-sized groups (the growth groups) and ANOVA tests run for each of the unexpected earnings variables. The bottom portion of Panel A of Table 4.7 shows the mean growth rates for the five growth groups: first group (1.34%), second group (8.20%), third group (12.03%), fourth group (15.30%), and fifth group (22.72%).

The overall difference ($p<0.01$) among C, M, and L firm-years for the low-growth group is significant for the short-term variable UEPSST. More specifically, the L firm-years' earnings estimation errors are significantly larger than both the C firm-years and the M firm-years ($p<0.01$ for both pairwise comparisons). In the third and fourth growth groups (i.e., middle and next-to-highest), overall differences are weakly significant ($p=0.05$ and $p=0.10$, respectively). Pairwise comparisons give results similar to those in the low-growth group, except not nearly so strong. For the middle growth group, the C mean error is significantly smaller than the L mean error ($p=0.02$), and the M mean error is [weakly] significantly smaller than the L mean error ($p=0.06$). The C vs. L comparison in the fourth growth group also yields significant differences ($p=0.03$), but the M vs. L comparison shows that the mean errors are statistically equivalent.

As discussed earlier, in the tests of short-term forecast errors where growth was not considered, there are no statistically significant differences in analysts' ability to forecast earnings for conservative-, mixed-, and liberal-method firm-years. As noted in the above results, however, if we also separate the firm-years based on expected future growth in earnings (i.e., in addition to C, M, and L groups), it appears that analysts do forecast more accurately for low-growth C and M firm-years; that is, analysts are more successful at predicting short-term earnings when expected growth of the firms is low, thus not confusing the prediction of future earnings and book values with the prediction of growth.

Table 4.7 (Panel A) Overall comparisons of forecast errors in C, M, and L among various growth groups (based on growth in VLIS-estimated earnings)

Variable		*C mean*	*C #*	*M mean*	*M #*	*L mean*	*L #*	*Overall p-value*
UEPSST								
Low growth	1	$0.244	20	$0.380	149	$1.028	45	<0.01
	2	0.162	20	0.829	150	0.514	45	0.67
	3	0.203	30	0.471	149	0.858	38	0.05
	4	0.149	30	0.568	148	0.928	39	0.10
High growth	5	0.201	20	0.959	155	0.925	38	0.83
All groups		**$0.189**	**120**	**$0.644**	**751**	**$0.846**	**205**	**0.15**
UEPSMT								
Low growth	1	$1.192	19	$0.650	152	$1.911	45	<0.01
	2	0.316	22	0.903	148	0.983	45	0.09
	3	0.441	30	0.801	146	1.532	38	<0.01
	4	0.306	29	0.847	148	1.830	39	<0.01
High growth	5	0.409	21	0.764	158	1.890	38	<0.01
All groups		**$0.498**	**121**	**$0.793**	**752**	**$1.618**	**205**	**<0.01**
UEPSLT								
Low growth	1	$1.879	19	$1.157	153	$2.364	45	<0.01
	2	0.805	22	1.549	147	1.130	46	0.08
	3	1.203	30	1.475	150	1.931	37	0.21
	4	0.882	29	1.523	146	2.822	39	0.03
High growth	5	1.432	21	1.404	156	2.473	38	<0.01
All groups		**$1.200**	**121**	**$1.420**	**752**	**$2.116**	**205**	**<0.01**

The mean growth rate of the five growth groups (based on growth in estimated earnings, per VLIS) is as follows:

Group	1	2	3	4	5
Mean growth rate	1.34%	8.20%	12.03%	15.30%	22.72%

Table 4.7 (Panel A - continued) Pairwise comparisons of forecast errors in C, M, and L among various growth groups (based on growth in VLIS-estimated earnings)*

		C vs. L		*M vs. L*	
Variable		*t statistic*	*p-value*	*t statistic*	*p-value*
UEPSST					
Low growth	1	-2.856	<0.01	-3.727	<0.01
	2	N/A	N/A	N/A	N/A
	3	-2.359	0.02	-1.876	0.06
	4	-2.172	0.03	-1.356	0.18
High growth	5	N/A	N/A	N/A	N/A
All groups		**N/A**	**N/A**	**N/A**	**N/A**
UEPSMT					
Low growth	1	-1.327	0.19	-3.752	<0.01
	2	-2.097	0.04	-0.385	0.70
	3	-3.284	<0.01	-2.953	<0.01
	4	-3.053	<0.01	-2.681	<0.01
High growth	5	-3.932	<0.01	-4.499	<0.01
All groups		**-5.964**	**<0.01**	**-6.394**	**<0.01**
UEPSLT					
Low growth	1	-0.836	0.40	-3.357	<0.01
	2	-0.754	0.45	1.497	0.14
	3	N/A	N/A	N/A	N/A
	4	-2.489	0.01	-2.266	0.02
High growth	5	-2.184	0.03	-3.370	<0.01
All groups		**-3.677**	**<0.01**	**-4.065**	**<0.01**

*** N/A means "not applicable" and is included any time the initial comparison showed no *overall* differences.**

Table 4.7 (Panel B) Overall comparisons of forecast errors in C, M, and L among various growth groups (based on past 10 years of growth in earnings)

Variable		*C mean*	*C #*	*M mean*	*M #*	*L mean*	*L #*	*Overall p-value*
UEPSST								
Low growth	1	$0.042	5	$0.492	148	$0.687	65	0.27
	2	0.263	22	0.526	146	0.729	46	0.27
	3	0.135	27	0.452	143	0.690	43	0.02
	4	0.270	21	1.220	165	1.070	29	0.80
High growth	5	0.164	45	0.458	149	1.567	22	<0.01
All groups		**$0.189**	**120**	**$0.644**	**751**	**$0.846**	**205**	**0.15**
UEPSMT								
Low growth	1	$0.124	5	$0.797	146	$1.338	65	0.04
	2	0.506	22	0.707	49	1.437	47	<0.01
	3	0.311	28	0.796	143	1.338	43	<0.01
	4	1.098	21	0.904	165	1.851	29	0.05
High growth	5	0.372	45	0.747	148	3.137	21	<0.01
All groups		**$0.498**	**121**	**$0.793**	**752**	**$1.618**	**205**	**<0.01**
UEPSLT								
Low growth	1	$0.393	4	$1.367	148	$1.829	65	0.12
	2	1.302	21	1.223	146	1.777	47	0.10
	3	0.823	28	1.399	143	1.747	43	0.10
	4	1.972	21	1.622	166	2.251	29	0.35
High growth	5	1.102	47	1.459	149	4.331	21	<0.01
All groups		**$1.200**	**121**	**$1.420**	**752**	**$2.116**	**205**	**<0.01**

The mean growth rate of the five growth groups (based on past 10 years of growth in earnings, per VLIS) is as follows:

Group	1	2	3	4	5
Mean growth rate	-4.47%	2.04%	6.21%	10.69%	19.09%

Table 4.7 (Panel B - continued) Pairwise comparisons of forecast errors in C, M, and L among various growth groups (based on past 10 years of growth in earnings)*

		C vs. L		*M vs. L*	
Variable		*t statistic*	*p-value*	*t statistic*	*p-value*
UEPSST					
Low growth	1	N/A	N/A	N/A	N/A
	2	N/A	N/A	N/A	N/A
	3	-2.777	<0.01	-1.679	0.09
	4	N/A	N/A	N/A	N/A
High growth	5	-3.723	<0.01	-3.353	<0.01
All groups		**N/A**	**N/A**	**N/A**	**N/A**
UEPSMT					
Low growth	1	-1.643	0.10	-2.278	0.02
	2	-3.100	<0.01	-3.753	<0.01
	3	-3.046	<0.01	-2.244	0.03
	4	-1.379	0.17	-2.469	0.01
High growth	5	-5.379	<0.01	-5.270	<0.01
All groups		**-5.964**	**<0.01**	**-6.394**	**<0.01**
UEPSLT					
Low growth	1	N/A	N/A	N/A	N/A
	2	N/A	N/A	N/A	N/A
	3	N/A	N/A	N/A	N/A
	4	N/A	N/A	N/A	N/A
High growth	5	-4.091	<0.01	-4.096	<0.01
All groups		**-3.677**	**<0.01**	**-4.065**	**<0.01**

*** N/A means "not applicable" and is included any time the initial comparison showed no *overall* differences.**

The results for the medium-term variable (UEPSMT) are much stronger than the results from UEPSST. Generally, each growth group shows strongly significant differences in errors, with the exception of the second growth group, which shows only marginal significance (p=0.09). In the pairwise comparisons, most C vs. L and M vs. L comparisons are strongly significant, with the exceptions of the low-growth comparison for C vs. L and the second growth group comparison for M vs. L. The results taking earnings growth into consideration are similar to the overall results when growth for the UEPSMT variable was not considered. That is, analysts are better able to predict medium-term earnings for C and M firm-years than for L firm-years, and that prediction ability is fairly consistent across the different growth groups. Evidently, growth prospects are not confusing analysts in their predictions of medium-term earnings and book values.

For the long-term error variable (UEPSLT), the low growth and high growth groups show strongly significant differences (p<0.01), the fourth growth group shows significant differences (p=0.03), the second growth group shows weakly significant differences (p=0.08), and the middle growth group shows no significant differences (p=0.21). Generally, the only significant pairwise differences for the C vs. L and M vs. L comparisons are in the fourth and fifth growth groups (the two highest growth groups), with one exception: the M vs. L differences are strongly significant (p<0.01) in the low growth group. In tests reported earlier that did not consider the effects of earnings growth, analysts were more successful at predicting long-term earnings for C and M firm-years than for L firm-years. These results reported here, which include the effects of earnings growth, show that the differences in forecast ability are driven primarily by the high-growth firm-years for long-term forecasts. This is an interesting difference from the short-term forecasts, where analysts were more successful at predicting earnings for low-growth firm-years. Perhaps the presence of high growth expectations for the C firms is such an integral part of an analyst's long-term prediction of earnings and book values that the high growth actually improves the analyst's ability to forecast for the C firms.

In summary, when firm-years are analyzed based on estimated growth in earnings, analysts are more accurate at predicting earnings for C and M firm-years than they are at predicting earnings for L firm-years in low-growth short-term earnings forecasts, all medium-term earnings forecasts, and in high-growth long-term earnings forecasts (with exceptions noted above). Without the consideration of growth, analysts show no difference in short-term prediction ability for the various categories of firm-years.

One other interesting point from Panel A of Table 4.7 relates to the forecast ability of analysts over time. As shown earlier, and as expected, the forecast errors are smallest for UEPSST and largest for UEPSLT in overall comparisons and in comparisons among growth groups. For example, the mean forecast errors for C firms in the low-growth groups are \$0.244 for UEPSST, \$1.192 for UEPSMT, and \$1.879 for UEPSLT. This holds true for all comparisons among C, M, or L firms with one exception: in the high-growth group for the M firms, the mean forecast error is \$0.959 for UEPSST and \$0.764 for UEPSMT, or the opposite of what is expected. There is no apparent reason for this inconsistency.

Some financial analysts may use other measures of growth, both historic and estimated, to make predictions about a company's prospects. To the extent that analysts use different growth measures, their expectations (and errors) about the future of various companies' financial positions and results of operations may be more or less accurate. To test the effects on the reported results of a different proxy for growth for each company, each company's historic ten-year earnings growth rate (instead of the estimated earnings growth rate) was used for the sorting and dividing procedures in all tests. The results, shown in Panel B of Table 4.7, show some similarities and some important differences, illustrating that the investigation of an analyst's ability to predict earnings depends on the researcher's choice of growth rates.

One interesting result not directly related to the present research has to do with differences in historic growth rates among C, M, and L firm-years. Table 4.7 (Panel B) shows how many firm-years were in each growth category after the firm-years were sorted from smallest to largest growth rate (based on the firms' past ten years of earnings growth). Note that the C firm-years' distribution has relatively few firm-years in the low-growth group and a large number of firm-years in the high-growth groups; for L firm-years, the distribution has about triple the number of firm-years classified in the low-growth group as classified in the high-growth group; the M firm-years' distribution is flat. In fact, the mean historic growth rate for C firm-years of 11.52% is significantly larger ($p<0.01$) than the mean historic growth rate for M firm-years of 7.18% and the growth rate for L firm-years of 4.58%. Going back to the results shown in Panel A, we see that the forecast growth rate (in earnings) by VLIS is spread over the growth groups fairly evenly for C, M, and L firms-years.

For the short-term unexpected earnings variable (UEPSST), the differences in mean unexpected earnings are significant in the third and fifth (i.e., middle and highest) growth groups. In pairwise comparisons for these growth categories, the C firms-years have significantly smaller means than the L firm-years ($p<0.01$) in both the third and fifth groups. For the middle growth group, the M vs. L comparison is marginally significant ($p=0.09$). In the high-growth group, the M vs. L comparison is strongly significant ($p<0.01$). The overall comparisons for all other growth groups result in statistically insignificant differences.

For the medium-term error variable (UEPSMT), the results for errors based on historic growth rates instead of forecasted growth rates are similar to those reported previously. The differences are strongly significant ($p<0.01$) for the second, third, and fifth growth groups, while they are somewhat significant for the first and fourth growth groups ($p=0.04$ and $p=0.05$, respectively). Once again, the results are fairly consistent regardless of the amount of earnings growth demonstrated by the firms in the C, M, and L groups – in most pairwise comparisons, the differences are significant for the C vs. L and M vs. L comparisons (with some exceptions).

As discussed above, the overall comparison for the long-term forecast error variable (UEPSLT) without taking growth rates into account is strongly significant ($p<0.01$). Now consider the 10-year historic growth rate analysis in Panel B of Table 4.7. Note that the first four growth categories show no overall differences between C, M, and L firm-years. The entire results appear to be driven by the high-growth firm-years. One possible explanation for these results is that analysts can predict future earnings more accurately over a long-term horizon for C and M firm-years than for L firm-years in high growth situations. The idea that analysts can predict long-term results better for high-growth C and M firms than for L firms does merit some attention because of the similar results reported when the growth groups are divided based on estimated earnings growth rates rather than historic earnings growth rates. Another possible explanation of the results may stem from the significant differences in historic growth rates between C, M, and L firm-years, as reported in the previous paragraph.

To review, it is generally true that using the VLIS, analysts can predict future earnings variables more accurately in the medium-term and the long-term for C and M firm-years than for L firm-years both in overall comparisons and taking earnings growth into account. The growth rate tests also show that the choice of growth rates affects final results to a limited extent.

4.4 Return on equity tests

Earlier studies asserted that conservative firms should have larger computed return on equity (ROE) ratios. As reported in Table 4.8, sample firm-years using generally conservative accounting methods have a larger ROE than firm-years using a liberal portfolio of methods. The one-year-out forecasted mean ROE (FROEST) is 15.84% for C firm-years, 13.97% for M firm-years, and 12.09% for L firm-years. The two-year-out forecasted mean ROE (FROEMT) is 16.10% for C firm-years, 14.41% for M firm-years, and 12.42% for L firm-years. For the three-to-five-year forecast, the mean ROE (FROELT) is 16.90% for C firm-years, 15.89% for M firm-years, and 14.38% for L firm-years. The overall differences in these means are strongly significant ($p<0.01$), and all C vs. L and M vs. L pairwise comparisons result in strongly significant differences ($p<0.01$). These results also hold generally for all measures of actual ROE going out five years from the year under consideration (AROE1, AROE2, AROE3, AROE4, AROE5). The overall differences are all strongly significant ($p<0.01$), and most of the pairwise differences are also strongly significant. The exceptions to the strong level of significance are for the M vs. L comparison for the AROE3 ($p=0.11$), AROE4 ($p=0.05$), and AROE5 ($p=0.07$) variables. In conclusion, previous studies' predictions and findings related to ROE are confirmed in this sample. That is, firms using conservative accounting methods or a mix of accounting methods exhibit a higher average ROE than the L firms for both forecasted and historical measures of ROE over short-term, medium-term, and long-term horizons.

Sheffe and Bonferroni pairwise comparison tests generally confirm the results described above. For the FROEST and FROEMT variables, all pairwise comparisons were significant at the 95% confidence level. For the FROELT, AROE1, and AROE2 variables, the C vs. L and M vs. L comparisons are significant, while the C vs. M comparison is not significant. For the AROE3, AROE4, and AROE5 comparisons, the only pairwise comparison that was not significant was the M vs. L comparison (compare this to the results shown in Table 4.8 (Panel B).

These results once again indicate that both forecasted and actual ROE calculations are largest for conservative method firms and smallest for liberal method firms. For some of the variables, the mixed method firms are significantly different from both the conservative and liberal method firms; for the other variables, the mixed method firms are different from either the conservative method firms or the liberal method firms, but not both sets of firms. But in all comparisons, the direction of the differences is that the more conservative the portfolio of accounting firms, the larger the ROE, regardless of the particular measure of ROE.

Table 4.8 (Panel A) Overall comparisons of ROE calculations in C, M, and L groups

Variable	*C mean*	*C #*	*M mean*	*M #*	*L mean*	*L #*	*Overall p-value*
FROEST	15.84%	118	13.97%	702	12.09%	183	<0.01
FROEMT	16.10	120	14.41	736	12.42	196	<0.01
FROELT	16.90	120	15.89	747	14.38	202	<0.01
AROE1	15.96	120	14.07	691	11.85	177	<0.01
AROE2	16.70	121	13.95	686	11.76	172	<0.01
AROE3	17.48	96	13.72	597	12.44	160	<0.01
AROE4	17.52	75	13.60	503	11.91	146	<0.01
AROE5	17.69	59	13.26	408	11.52	127	<0.01

Table 4.8 (Panel B): Pairwise comparisons of C, M, and L firm-years for ROE calculations

	C vs. L		*M vs. L*	
Variable	*t statistic*	*p-value*	*t statistic*	*p-value*
FROEST	4.500	<0.01	3.206	<0.01
FROEMT	5.069	<0.01	3.962	<0.01
FROELT	4.511	<0.01	3.935	<0.01
AROE1	3.950	<0.01	3.000	<0.01
AROE2	4.637	<0.01	2.864	<0.01
AROE3	4.308	<0.01	1.588	0.11
AROE4	4.361	<0.01	1.988	0.05
AROE5	4.191	<0.01	1.828	0.07

Explanation of Table 4.8 variables

Note: All forecasted and actual ROE calculations are from Value Line Investment Survey.

FROEST is the one-year-ahead (i.e., short term) forecast ROE for each firm-year
FROEMT is the two-year-ahead (i.e., mid term) forecast ROE for each firm-year
FROELT is the three-to-five-year-ahead (i.e., long term) forecast ROE for each firm-year
AROE*x* is the actual ROE for each firm-year as reported over the following *x* years

4.5 Tests of model robustness

4.5.1 Alternative cost-of-capital proxies

To compute a company-specific cost of capital for each firm-year, several proxies were used: the average annual three-month U.S. Treasury bill rate (secondary market) for the risk-free rate; the annual return on the S&P 500 for the market return; and the Value Line Investment Survey calculation of beta for the specific risk of each company in the sample. These components were compared across the three types of firms (C, M, and L) to see if any systematic differences among firm-years could be driving the results reported above.

As stated above, the average annual three-month U.S. Treasury bill rate (secondary market) proxied for the risk-free rate. Because data were collected for each firm over a period of 10 years, a year-specific average risk-free rate was used in the calculation of firm-specific cost of capital numbers. Although there is no reason to expect differences in the risk-free rates (among C, M, and L firm-years) used to compute the cost of capital, existing differences could introduce a measurement bias in the results. In fact, comparisons of the risk-free rates among the three groups yield a statistically significant overall difference ($F=4.53$, $p=0.01$). The firm-years using conservative methods had a mean risk-free rate of 5.9% while the firm-years using liberal methods had a mean risk-free rate of 6.5%. The overall difference (0.6%), while statistically significant, was not very large. The difference is also a function of time -- all firms analyzed in a particular year used the same risk-free rate, so the difference between C and L firm-years depends partly on how many C or L firms were in each year. The tests described below test whether these differences affected the overall results.

Recall that the average return on the S&P 500 proxied for the market return. As expected, there is no statistical difference ($F=1.15$, $p=0.32$) among C, M, and L firm-years for the market return used to calculate firm-specific cost of capital numbers. The average betas of C, M, and L firm-years do differ significantly ($F=14.22$, $p<0.01$), however. Beta computed by VLIS proxied for beta-risk in the market model. In the sample, firm-years that reflect primarily conservative accounting methods have a mean beta of 0.99, firm-years that reflect a mixture of accounting methods have a mean beta of 1.08, and firm-years reflecting predominantly liberal accounting methods have a mean beta of 1.11. In pairwise comparisons, the mean beta of C firm-years is significantly less than the mean beta for L firm-years (p<0.01), and the difference between the mean beta for M and L firm-years is also significant (p=0.05), although small. The tests described below are designed to test whether the differences in calculated betas among firm-years are driving the overall results.

To test the robustness of the results to changes in the calculation of firm-specific cost of capital, several other proxies were substituted as the components in the cost of capital calculation. The results of each of those separate overall tests (summarized in Panel A of Table 4.9), substantially equivalent to the results reported earlier, were sometimes stronger, but rarely weaker. First, for the risk-free rate, rates on 10-year Treasury notes (10-year), 30-year Treasury notes (30-year), and AAA-rated corporate bonds (AAA) were used. Second, a constant market return of 10% (RM10) and 15% (RM15) was assumed for all firm-years. Third, a neutral beta (Beta = 1.00) was assumed for all firm-years. Fourth, constant cost of capital numbers of 10% (K10) and 15% (K15) were used in all firm-years instead of using a company-specific cost of capital. For each of these alternative proxies, unexpected earnings (UEPSST, UEPSMT, and UEPSLT) was recalculated for all firm-years in the sample.

As shown in Table 4.9, the results are qualitatively equivalent using the original proxies and each of the alternative proxies described in the preceding paragraph. In all tests, the overall differences in forecast errors were insignificant for short-term predictions (with probabilities ranging from p=0.11 to p=0.19) and highly significant for medium-term and long-term predictions (p<0.01 for all tests). In the pairwise comparisons listed in Panel B, the differences for UEPSMT and UEPSLT are strongly significant for all C vs. L and M vs. L differences using any of the alternative proxies. The two alternative proxies that resulted in the lowest significance in the pairwise comparisons were when the market return was set to 15% (the maximum rate employed) and when the constant cost of capital was set to 15% (again, the maximum rate employed).

Based on the preceding conclusions, it appears that the overall reported results of the tests are not significantly affected by (i.e., are robust to) the choice of proxies for (1) the risk-free rate, (2) a firm-year's market-model beta, (3) the calculated market return, or (4) separately computed cost-of-capital numbers for each firm-year. Regardless of the various proxies employed, the results lend strong support to the theory that firms applying liberal accounting methods will exhibit a lower quality of earnings; that is, analysts (and investors) should be able to predict future earnings more accurately for firms using a portfolio of generally conservative methods or a combination of conservative and liberal methods. It is also evident that the differences in risk-free rates and betas among the C, M, and L firm-years are not driving the original results. Even when the tests employ constant cost-of-capital numbers, the results change very little.

Table 4.9 (Panel A) Overall comparisons of unexpected earnings using alternative proxies

Variable	*C mean*	*C #*	*M mean*	*M #*	*L mean*	*L #*	*F statistic*	*p-value*
UEPSST								
original	$0.189	120	$0.644	751	$0.846	205	1.902	0.15
10-year	0.227	120	0.709	751	0.933	205	2.171	0.11
30-year	0.227	120	0.709	751	0.935	205	2.174	0.11
AAA	0.227	120	0.710	751	0.935	205	2.174	0.11
RM10	0.175	120	0.629	751	0.830	205	1.814	0.16
RM15	0.194	120	0.661	751	0.839	205	1.685	0.19
Beta 1.00	0.227	120	0.715	751	0.921	205	2.100	0.12
K10	0.174	120	0.626	751	0.825	205	1.793	0.17
K15	0.192	120	0.660	751	0.839	205	1.680	0.19
UEPSMT								
original	$0.498	121	$0.793	752	$1.618	205	24.894	<0.01
10-year	0.573	121	0.888	752	1.664	205	22.827	<0.01
30-year	0.573	121	0.889	752	1.665	205	22.847	<0.01
AAA	0.572	121	0.889	752	1.666	205	22.783	<0.01
RM10	0.473	121	0.759	752	1.591	205	24.390	<0.01
RM15	0.497	121	0.733	752	1.454	205	21.547	<0.01
Beta 1.00	0.574	121	0.893	752	1.661	205	21.855	<0.01
K10	0.464	121	0.756	752	1.604	205	25.237	<0.01
K15	0.482	121	0.733	752	1.506	205	23.833	<0.01
UEPSLT								
original	$1.200	121	$1.420	752	$2.116	205	9.811	<0.01
10-year	1.356	121	1.612	752	2.436	205	9.930	<0.01
30-year	1.355	121	1.615	752	2.439	205	9.972	<0.01
AAA	1.353	121	1.617	752	2.444	205	9.997	<0.01
RM10	1.037	121	1.337	752	2.230	205	18.019	<0.01
RM15	0.896	121	1.047	752	1.818	205	14.522	<0.01
Beta 1.00	1.336	121	1.560	752	2.263	205	8.188	<0.01
K10	1.020	121	1.324	752	2.248	205	19.164	<0.01
K15	0.851	121	1.023	752	1.857	205	17.332	<0.01

Explanation of terms for Table 4.9

original - results as shown in Table 4.6
10-year - results with risk-free rate equal to a return on 10-year Treasury notes
30-year - results with risk-free rate equal to a return on 30-year Treasury notes
AAA - results with risk-free rate equal to a return on AAA-rated corporate bonds
RM*xx* - results with market return equal to *xx* for all firm-years
Beta 1.00 - results with market beta equal to 1.00 for all firm-years
K*xx* - results with cost of equity capital equal to *xx* for all firm-years

Table 4.9 (Panel B) Pairwise comparisons of unexpected earnings using alternative proxies *

	C vs. L		*M vs. L*	
Variable	*t statistic*	*p-value*	*t statistic*	*p-value*
UEPSST	N/A	N/A	N/A	N/A
UEPSMT				
Original	-5.964	<0.01	-6.394	<0.01
10-year	-5.827	<0.01	-6.025	<0.01
30-year	-5.830	<0.01	-6.028	<0.01
AAA	-5.824	<0.01	-6.017	<0.01
RM10	-5.869	<0.01	-6.356	<0.01
RM15	-5.478	<0.01	-6.003	<0.01
Beta 1.00	-5.718	<0.01	-5.881	<0.01
K10	-5.972	<0.01	-6.463	<0.01
K15	-5.754	<0.01	-6.318	<0.01
UEPSLT				
original	-3.677	<0.01	-4.065	<0.01
10-year	-3.691	<0.01	-4.095	<0.01
30-year	-3.705	<0.01	-4.099	<0.01
AAA	-3.717	<0.01	-4.099	<0.01
RM10	-5.027	<0.01	-5.476	<0.01
RM15	-4.200	<0.01	-5.110	<0.01
Beta 1.00	-3.363	<0.01	-3.711	<0.01
K10	-5.164	<0.01	-5.663	<0.01
K15	-4.615	<0.01	-5.570	<0.01

*** N/A means "not applicable" and is included any time the initial comparison showed no *overall* differences.**

4.5.2 Alternative measures of forecast errors

Two alternative measures of unexpected earnings for short-term, medium-term, and long-term forecast horizons were used to test the robustness of the results reported earlier. Recall that the Feltham-Ohlson model uses forecast and actual EPS and BVS to estimate abnormal earnings. The associated forecast errors (UEPSST, UEPSMT, UEPSLT) are henceforth referred to as the "model" variables, and were calculated as follows:

$UEPS_{itl} = (AEPS_{it} - r_e\ ABV_{it}) - (FEPS_{itl} - r_e\ FBV_{itl})$

where
$UEPS_{itl}$ = unexpected abnormal earnings per share for firm *i* at time *t* with lag *l*
(*l* relates to the ST, MT, or LT forecast)
$AEPS_{it}$ = actual earnings per share reported by VL for firm *i* at time *t*
ABV_{it} = actual beginning-of-year book value reported by VL for firm *i* at time *t*
$FEPS_{it}$ = VL-forecasted earnings for firm *i* for time *t* with lag *l*
FBV_{it} = VL-forecasted beginning-of-year book value for firm *i* for time *t* with lag *l*
r_e = assumed cost of common equity capital

The first alternative set of forecast error variables is referred to as the "simple" errors. In computing these variables, each firm-year's book value and any anticipated return on that book value were ignored, and only the firm-year's earnings per share was used, as follows:

$SAEPS_{itl} = AEPS_{it} - FEPS_{itl}$

where
$SAEPS_{itl}$ = simple abnormal earnings for firm *i* at time *t* with lag *l*
$AEPS_{it}$ = actual earnings per share reported by VL for firm *i* at time *t*
$FEPS_{it}$ = VL-forecasted earnings for firm *i* for time *t* with lag *l*

For short-term (i.e., one year), medium-term (i.e., two years), and long-term (i.e., three or more years) forecast horizons, the VLIS firm-specific earnings forecasts are compared to the EPS reported for each firm-year in the relevant subsequent years. This set of simple forecast error variables (SAEPSST, SAEPSMT, SAEPSLT) still includes an element of the forecast ability of trained professionals, but the variables do not explicitly consider the effects of book values on any so-called "normal" level of earnings.

The second set of alternative forecast error variables, or the "naïve" errors, ignores any potential biases that analysts may incorporate into their forecasts. A "naïve" forecast error is the difference between the EPS reported for the current year and the EPS reported for the related subsequent year (i.e., one, two, and three years out), as follows:

$NAEPS_{itl} = \quad AEPS_{it} \; - \; AEPS_{i(t-1)}$

where
$NAEPS_{itl}$ = naïve abnormal earnings for firm *i* at time *t* with lag *l*
$AEPS_{it}$ = actual earnings per share reported by VL for firm *i* at time *t*
$AEPS_{i(t-1)}$ = actual earnings per share reported by VL for firm *i* at time *t-1*

Calculating these errors yielded three additional variables (NAEPSST, NAEPSMT, NAEPSLT) for each firm-year.

Table 4.10 reports comparisons of the mean errors among the C, M, and L firm-years to find any significant differences using the three sets of earnings forecast error variables. The overall results of these additional tests lead to several generalized conclusions. First, and probably most importantly, the mean differences in forecast errors are always smallest for C firm-years and largest for L firm-years, with M firm-years always falling somewhere in the middle. These differences are nearly always strongly significant for comparisons involving L firm-years. The differences are almost always insignificant, however, for comparisons of C and M firms.

These results lead to the strong conclusion that analysts do considerably worse at forecasting earnings for firms using liberal portfolios of accounting methods. This poorer forecast ability exists over short-term, medium-term, and long-term forecast horizons and does not appear to be driven by the definition of the forecast error. It may also be true that analysts do a better job of forecasting for firms using a conservative portfolio of accounting methods, but the differences shown in these results are not statistically significant (although they are consistent).

The second general result from these tests relates to the relative ability of analysts to predict earnings. Although not based on a statistical comparison, it is true that the mean forecast errors are smallest for the three model variables and largest for the three Naïve variables. Two exceptions to this general conclusion bear comment. First, the Naïve medium-term variable (NAEPSMT) for M firm-years "beats" the related simple variable (SAEPSMT); that is, the Naïve mean difference is smaller than the Simple mean difference. This exception is probably not an important finding – it is an anomaly related to firm-years not using either of the "extreme" portfolios of accounting methods, and it does not occur in short-term or long-term forecast horizons.

The second exception is potentially more embarrassing for the proponents of financial forecasting. In these results, the Naïve forecast errors are considerably smaller than the Simple forecast errors for all long-term forecasts. Putting that another way, if one desires a long-range forecast of a firm's EPS, a "forecast" equal to the current year's reported earnings (i.e., a random walk) is likely to be more accurate than an analyst's (here, VLIS) forecast. In support of the industry, however, it is also true that when analysts consider a firm's book value and a return on the book value in the calculation of unexpected earnings (as shown in the model variables), the analyst's forecasts are more accurate than the Naïve forecasts.

These results reflect a change in forecast accuracy over time. Brown et al. (1985) compared consensus and individual analysts' forecast errors to mechanical models of earnings predictions and also summarized prior research on the topic. They report that, in the research reviewed, consensus estimates are consistently more accurate than forecasts from individual analysts, which are consistently more accurate than any of several mechanical, or naïve, models. In the present research, Value Line Investment Survey underperforms the naïve model if EPS forecasts are considered apart from other forecast indicators (i.e., the Simple variables). The analysts at VLIS outperform the naïve model, however, when the VLIS forecast of book values and earnings (i.e., the Feltham-Ohlson model variables) are both considered.

We have seen the third overall result before. Generally, in the short-term, forecast error differences are insignificant. Only for the Naïve short-term forecast error variable (NAEPSST) do we see any statistically significant differences. Those differences are consistent with the other results shown above – forecast errors are larger for firms using liberal accounting methods.

Table 4.10 Summary of differences in EPS forecast errors in C, M, and L

Variable	*C mean*	*C #*	*M mean*	*M #*	*L mean*	*L #*	*Overall F-statistic*	*Overall p-value*
Model								
UEPSST	$0.189	120	$0.644	751	$0.846	205	1.902	0.15
UEPSMT	0.498	121	0.793	752	1.618	205	24.894	<0.01
UEPSLT	1.200	121	1.420	752	2.116	205	9.811	<0.01
Simple								
SAEPSST	$0.43	113	$0.87	726	$1.10	202	1.723	0.18
SAEPSMT	1.06	120	1.29	739	2.23	203	18.113	<0.01
SAEPSLT	2.82	121	3.00	752	4.00	205	9.38	<0.01
Naïve								
NAEPSST	$0.64	109	$0.89	660	$1.68	163	20.423	<0.01
NAEPSMT	1.11	109	1.19	663	2.56	163	27.604	<0.01
NAEPSLT	1.45	110	1.46	662	2.87	164	23.331	<0.01

Model variables: forecast errors derived from the Feltham and Ohlson model using actual and forecast EPS and BV
Simple variables: forecast errors calculated as the difference between the VLIS forecast EPS and the actual EPS
Naïve variables: forecast errors calculated as the difference between the prior year and current year EPS

Table 4.10 (continued) Pairwise comparisons of EPS forecast errors in C, M, and L

	C vs. L		*M vs. L*	
Variable	*t statistic*	*p-value*	*t statistic*	*p-value*
Model				
UEPSST	N/A	N/A	N/A	N/A
UEPSMT	-5.964	<0.01	-6.394	<0.01
UEPSLT	-3.677	<0.01	-4.065	<0.01
Simple				
SAEPSST	N/A	N/A	N/A	N/A
SAEPSMT	-4.834	<0.01	-5.628	<0.01
SAEPSLT	-3.34	<0.01	-4.124	<0.01
Naïve				
NAEPSST	-5.431	<0.01	-5.854	<0.01
NAEPSMT	-5.456	0.01	-7.249	<0.01
NAEPSLT	-4.788	0.01	-6.728	<0.01

*** N/A means "not applicable" and is included any time the initial comparison showed no *overall* differences.**

4.5.3 Analysis of actual EPS means

It is possible that the results described above – the larger mean forecast errors for L firm-years – may be caused by differences in reported and forecast earnings levels among the C, M, and L firm-years. For example, if analysts tend to forecast a higher level of earnings for L firm-years than for C firm-years (due in part to the alternative definitions of earnings being employed), we would expect, *ex ante*, that the forecast error amounts would also be larger for L firms. If this were the case, it could also be true that the relative error (i.e., as a percentage of the original forecast) may not be different for the C and L firm-years, even when the error amounts are significantly different. This possibility was tested by comparing the mean actual reported EPS (for one to five years) among the C, M, and L groups. Also, mean forecasts of EPS (for one to three years) among the three groups were computed and compared (Table 4.11).

For the Actual variables (AEPS1, AEPS2, AEPS3, AEPS4, AEPS5) some interesting results emerge. First, for all five variables, the mean EPS amounts for the C and L firm-years are generally not statistically different. The mean reported EPS is less for C firm-years than for L firm-years for AEPS 1 (2.36 vs. 2.71), AEPS2 (2.33 vs. 2.57), and for AEPS3 (2.52 vs. 2.58). On the other hand, the mean EPS is more for C firm-years than for L firm-years for AEPS4 (2.63 vs. 2.52) and AEPS5 (2.66 vs. 2.34). Of these differences, only the difference for AEPS1 is even marginally significant (t=1.527, p=0.06). Apparently, in spite of the differences in accounting that would appear to understate earnings for C firm-years and overstate earnings for L firm-years, the actual differences are minimal over a five-year time period.

The second result relates to the M firm-years' mean EPS over the five years. As noted above, C and L firm-years do not differ statistically; for all five variables, however, the mean actual EPS for M firm-years is less than the L group mean for three variables and less than the C group mean for the other two variables. That is, the mean for M firm-years is significantly (p<0.05) less than the L mean for AEPS1 (2.24 vs. 2.71), AEPS2 (2.19 vs. 2.57), and AEPS3 (2.18 vs. 2.58); the mean for M firm-years is significantly less than the C mean for AEPS4 (2.15 vs. 2.63) and AEPS5 (2.05 vs. 2.66). All of the other comparisons of M firm-years are in the same direction (i.e., the mean EPS for M firm-years is smaller) but generally are not significant.

I can only speculate at this point as to why firms using a mixture of conservative and liberal accounting methods would regularly report lower earnings than either the conservative-method or the liberal-method firms. For example, if we assume that C firms are typically stronger firms than either M or L firms (see next paragraph), and if we assume that L firms will normally show larger amounts for earnings because of the accounting methods employed, we could justify the results described here. It could also be true that managers of conservative-method firms have more opportunity to show growth in earnings over time. These are still speculations, however, and appear in some respects to require circular reasoning to justify the smaller means for M firm-years.

A third interesting result shown in Table 4.11 is the "progression" of the actual EPS through time for the three groups. It is expected that for growing firms, the mean EPS would increase from year to year regardless of the accounting methods used by the firms. Generally, the C firm-years met this expectation in that the mean EPS for the C firm-years increases over the five-year time period (AEPS1 = 2.36, AEPS5 = 2.66). On the other hand, both the M firm-years and the L firm-years showed decreasing earnings over the same time period (AEPS1 = 2.24 and AEPS5 = 2.05 for M firm-years; AEPS1 = 2.71 and AEPS5 = 2.34 for L firm-years). This could indicate that C firms are healthier firms financially than either the M or L firms, at least when financial health is measured using earnings growth. This may also imply that the EPS of L and M firms reaches some sort of "ceiling" and thereafter drops to the mean (i.e., reversion to the mean), consistent with previous discussions.

Turning our attention to the forecasts of EPS by analysts, we can also see some interesting differences. First, for all three groups of firm-years, forecasts increase over time. For C firm-years, the mean forecast increases from 2.64 for FEPS1 (i.e., expected earnings one year out) to 2.95 for FEPS2 (two year forecast) to 4.40 for FEPS3 (VLIS three-to-five year forecast). The increase for M firm-years is from 2.71 to 2.93 to 4.50 for the three variables, respectively, and the increase for L firm-years is from 2.82 to 3.33 to 5.14.

These results would not be at all surprising if we could assume that the average firm-year in the sample has positive growth prospects. What makes the results interesting is the comparison of the forecast increase over time with the pattern of reported EPS over the same time period. As noted in an earlier paragraph, the actual EPS for C firm-years did tend to increase over time; conversely, the actual EPS amounts for M and L firm-years decreased over the five-year time horizon. Putting this all together, the analysts predict average positive earnings growth over short-term, medium-term, and long-term forecast horizons for all categories of firms, but the firms that use a mixture of accounting methods or predominantly liberal accounting methods on average report a decrease in earnings over time.

From this comparison, two points can be reinforced. First, analysts seem to have a bias toward forecasting increasing earnings – they seem to be naturally optimistic about the prospects of firms they follow. Second, the analysts on average do a better job of predicting earnings for conservative firms than for mixed or liberal firms, but this result could be because the conservative firms behave as the analysts expect all firms to behave – conservative firms show increasing earnings over time.

Table 4.11 (Panel A) Overall comparisons of actual and forecast EPS in C, M, and L

Variable	*C mean*	*C #*	*M mean*	*M #*	*L mean*	*L #*	*Overall F-statistic*	*Overall p-value*
Actual								
AEPS1	2.36	119	2.24	743	2.71	203	4.524	0.01
AEPS2	2.33	119	2.19	737	2.57	201	2.964	0.05
AEPS3	2.52	96	2.18	640	2.58	186	3.514	0.03
AEPS4	2.63	77	2.15	542	2.52	167	3.407	0.03
AEPS5	2.66	62	2.05	446	2.34	146	3.309	0.04
Forecast								
FEPS1	2.64	119	2.71	743	2.82	200	0.121	0.89
FEPS2	2.95	120	2.93	746	3.33	201	2.783	0.06
FEPS3	4.40	120	4.50	747	5.14	202	4.302	0.01

Table 4.11 (Panel B) Pairwise comparisons of actual and forecast EPS in C, M, and L

	C vs. L		*M vs. L*	
Variable	*t statistic*	*p-value*	*t statistic*	*p-value*
Actual				
AEPS1	-1.527	0.06	-3.006	0.00
AEPS2	-1.068	0.29	-2.418	0.02
AEPS3	-0.230	0.82	-2.386	0.02
AEPS4	0.418	0.68	-2.039	0.04
AEPS5	1.109	0.27	-1.518	0.13
Forecast				
FEPS1	N/A	N/A	N/A	N/A
FEPS2	-1.560	0.12	-2.334	0.02
FEPS3	-2.234	0.03	-2.807	0.00

* N/A means "not applicable" and is included any time the initial comparison showed no *overall* differences.

<u>Description of variables for Table 4.11</u>

AEPS*x* – actual (reported) earnings per share *x* years after initial date
FEPS*x* – forecast earnings per share *x* years after initial date

4.5.4 Considerations of size and leverage

As noted earlier, previous research has shown that results of tests may sometimes be driven by the size of the firms involved in the study. To explore the possibility of size effects in the current research, a standard analysis of variance test was used to compare Sales and Total Assets (proxies for firm size) among the firms that use conservative, mixed, or liberal accounting methods.

As shown in Table 4.12 (all dollar amounts in millions), the mean level of Sales was \$3,797.84 for C firms, \$5,054.17 for M firms, and \$6,192.61 for L firms. Although the L firms have an average Sales figure of about 63% greater than the C firms, the difference is not statistically significant ($F=1.708$, $p=0.18$). The mean Total Assets was \$4,396.06 for C firms, \$5,957.33 for M firms, and \$6,705.42 for L firms. Again, the L firms had an average Total Assets about 53% greater than the C firms, but the difference was not statistically significant ($F=0.949$, $p=0.39$). Based on these results, there is no evidence to indicate a significant difference between the C, M, and L firms from the sample.

In studying the firm-size issue, several studies have used either the natural logarithm (i.e., log) of sales or the log of total assets as a proxy for the size of the firm. Using the log of these variables tends to reduce the influence of extreme outliers. As an additional test, means were computed for log (Sales) and log (Total Assets), and standard ANOVA tests were run to check for differences in means. As shown in Table 4.12, the means of both are significantly different among the firms using conservative, mixed, and liberal portfolios of accounting methods.

For the log (Sales) variable, the overall differences in means were significant ($F=17.28$, $p<0.01$). The mean log (Sales) was 7.38 for C firms, 7.69 for M firms, and 8.19 for L firms. Pairwise comparisons of the variable indicate that L firms are significantly larger than both M firms ($t=4.21$, $p<0.01$) and C firms ($t=5.13$, $p<0.01$). Similar tests of the log (Total Assets) variable also yield significant overall results ($F=14.32$, $p<0.01$). The mean log (Total Assets) was 7.45 for C firms, 7.78 for M firms, and 8.25 for L firms. Results of the pairwise comparisons were similar to what was shown before: the mean log (Total Assets) for the L firms is significantly larger than the mean for both the M firms ($t=4.73$, $p<0.01$) and the C firms ($t=5.58$, $p<0.01$).

These results indicate that when size is measured using the log (Sales) and log (Total Assets), the firms using generally liberal accounting methods are significantly larger than the firms using conservative accounting methods or a mixture of liberal and conservative accounting methods. Evidently, large outliers in the Sales and Total Assets variables (unadjusted) reduce the strength of the tests to detect differences in means.

These results potentially reduce the strength of the results found in the "quality of earnings" tests reported earlier. If L firms are significantly larger than both C and M firms, it could be that analysts' relative inability to forecast earnings for L firms is driven, not by the accounting principles used, but by the size of the firm. Analysts may have a more difficult time predicting future earnings for larger companies than for smaller companies. For example, larger firms may have more complicated accounting information systems, or the management of larger firms may have to deal with more complex accounting issues. Larger firms may also tend to participate in many industries, possibly using different principles among the business segments. This complexity may cause problems when analysts attempt to forecast future earnings and book values.

The results reported here are not inconsistent with this possibility. C and M firms tend to exhibit a higher quality of earnings and also tend to be smaller firms. So if firm size affects the ability of analysts to predict earnings, analysts will have more trouble predicting earnings for the larger L firms than for the smaller C or M firms. Related tests of possible covariates (shown later) were designed to explore this possibility further.

Applying positive accounting theory, researchers have tested the hypothesis that a firm's choice of accounting methods is influenced by the relative level of debt that the firm uses. Most often, this proposition is tested by comparing the debt ratio (LTD/TA) among firms using different accounting methods. The evidence of this influence was tested, as above, by dividing the sample into three groups based on the portfolio of accounting methods employed, and computing the mean LTD/TA for each group. As shown in Table 4.12, there is an overall difference in means among the firms (F=3.30, p=0.04). Additionally, pairwise comparisons show that the C firms, with a mean LTD/TA ratio of 17.8%, have a significantly smaller ratio than do the M firms (mean = 20.5%, t=1.94, p=0.05) or the L firms (mean = 22.4%, t=2.57, p=0.01). In separate comparisons of the LTD/TA by year (not shown), the pattern of C<M<L held in all years,

but with no statistically significant differences. The lack of significance appears to result from the low power when fewer observations are included in the year-by-year tests. The ratios ranged from a low of 10.4% (1987) to 18.8% (1992) for the C firms and from a low of 19.4% (1985) to 26.1% (1992) for the L firms. The ratios for the M firms averaged about 2% less than the L firms for the sample.

Apparently, C firms in the sample tend to have less debt in their capital structures than do the M or the L firms. In most previous studies greater debt levels were equated with higher levels of risk. If the assumption of higher risk is accurate, then it could be that analysts do better at predicting the future earnings for C firms because they have a less risky capital structure. Stating this another way, if debt levels are accurate proxies for risk levels, and if higher levels of risk cause analysts to be less accurate in forecasting earnings, then analysts will have more difficulty predicting financial statement amounts for firms that have a higher LTD/TA. That possibility calls into question what is actually driving the results shown above regarding the quality of earnings.

In the earnings quality results shown above, the analysts were generally more successful at predicting earnings for C and for M firms than they were at predicting earnings for L firms. The differences in analysts' ability to forecast earnings were not significant between C and M firms, however. In the comparisons of the LTD/TA, the C firms had significantly different means ratios than the M or the L firms, but the M and the L firms did not show significant differences. If the LTD/TA risk levels were driving the results, the M firms would either be more like the L firms in computations of earnings quality, or the M firms would be more like the C firms in computations of LTD/TA. As shown, however, the M firms are statistically equal to the C firms in earnings quality, but the M firms are statistically equal to the L firms in the debt levels. This paradox may indicate that the amount of debt a firm uses is not the primary driver of the firm's earnings quality, as defined here.

Table 4.12 (Panel A) Overall comparisons of size and leverage in C, M, and L

(All dollar amounts in millions)

Variable	*C mean*	*M mean*	*L mean*	*Overall F-statistic*	*Overall p-value*
Sales	$3,797.84	$5,054.17	$6,192.61	1.708	0.18
Assets	$4,393.06	$5,957.33	$6,705.42	0.949	0.39
log (Sales)	7.38	7.69	8.19	17.280	<0.01
log (Assets)	7.45	7.78	8.25	14.320	<0.01
LTD/TA	17.8%	20.5%	22.4%	3.300	0.04

Table 4.12 (Panel B) Pairwise comparisons of size and leverage in C, M, and L

	C vs. L		*M vs. L*	
Variable	*t statistic*	*p-value*	*t statistic*	*p-value*
Sales	N/A	N/A	N/A	N/A
Assets	N/A	N/A	N/A	N/A
log (Sales)	5.13	<0.01	4.21	<0.01
log (Assets)	5.58	<0.01	4.73	<0.01
LTD/TA	2.57	0.01	1.35	0.18

Description of variables for Table 4.12

Sales - total sales or revenues for a year as reported by each company

Assets - total year-end assets as reported by each company

log (Sales) - the calculated log of each company's total sales (as a means of reducing the effect of outliers)

log (Assets) - the calculated log of each company's total assets (as a means of reducing the effect of outliers)

LTD/TA - the debt ratio as a proxy for each company's use of leverage, calculated as the total long-term debt of a company divided by the company's total assets

* N/A means "not applicable" and is included any time the initial comparison showed no *overall* differences.

C represents firms that use predominantly conservative accounting methods.

M represents firms that use a mixture of conservative and liberal accounting methods.

L represents firms that use mainly liberal accounting methods.

As an additional test of the effects of firm size and leverage levels, several analysis of covariance (ANCOVA) tests were performed using various size and leverage variables as covariates, the classification of portfolios as the primary independent variable, and the unexpected abnormal earnings variables as the dependent variables in separate analyses. Each of the variables shown in Table 4.12 was used as a possible covariate in an ANCOVA test, both by itself and in tests with all the other possible covariates. Then, using the firm-years that had at least one covariate available for tests, a standard ANOVA test was performed (i.e., without the covariates) for comparison purposes.

Table 4.13 reports the results of the ANCOVA calculations for the three dependent variables – UEPSST, UEPSMT, and UEPSLT. For each dependent variable, the results of eight separate ANOVA/ANCOVA tests are shown: the *original* ANOVA results from Table 4.6, the ANOVA results using the firm-years for which data were available for at least one of the covariates (shown as *no cov*. in the table), the ANCOVA results using all five of the possible covariates (shown as *all cov*. in the table), and results from five separate ANCOVA tests using the five possible covariates (i.e., Sales, Assets, log of Sales, log of Assets, and LTD/TA).

The first line in Table 4.13 for each dependent variable is simply a reiteration of the results, previously discussed, shown in Table 4.6. Because not all of the firm-years had data available for each of the covariates, the first line will include some firm-years that will not show up in the ANCOVA tests. For that reason, the ANOVA tests were run again using only those firms with data available for at least one covariate, with the results shown in Table 4.13 on the second line for each dependent variable. That is, the second line provides a link between the earlier tests and the ANCOVA tests to follow.

Table 4.13: Analysis of covariance results
Panel A: Overall comparisons of forecast errors in C, M, and L considering possible covariates

Variable	*C (adj.) mean*	*C #*	*M (adj.) mean*	*M #*	*L (adj.) mean*	*L #*
UEPSST						
Table 4.6	$0.189	120	$0.644	751	$0.846	205
no cov.	0.204	104	0.773	595	0.965	148
all cov.	0.190	87	0.766	588	0.996	148
Sales	0.203	104	0.773	595	0.966	148
Assets	0.207	104	0.773	595	0.963	148
log(Sales)	0.183	104	0.770	595	0.991	148
log(Assets)	0.220	104	0.774	595	0.947	148
LTD/TA	0.258	87	0.770	588	0.943	148
UEPSMT						
Table 4.6	$0.498	121	$0.793	752	$1.618	205
no cov.	0.446	105	0.935	594	1.885	148
all cov.	0.547	88	0.941	587	1.818	148
Sales	0.469	105	0.936	594	1.866	148
Assets	0.466	105	0.934	594	1.875	148
log(Sales)	0.499	105	0.942	594	1.822	148
log(Assets)	0.496	105	0.941	594	1.828	148
LTD/TA	0.501	88	0.938	587	1.859	148
UEPSLT						
Table 4.6	$1.200	121	$1.420	752	$2.116	205
no cov.	1.116	105	1.740	595	2.831	148
all cov.	1.343	88	1.766	588	2.672	148
Sales	1.172	105	1.742	595	2.784	148
Assets	1.169	105	1.738	595	2.803	148
log(Sales)	1.266	105	1.759	595	2.648	148
log(Assets)	1.268	105	1.756	595	2.657	148
LTD/TA	1.209	88	1.753	588	2.804	148

Table 4.13: Analysis of covariance results
Panel B: Overall comparisons with covariates and pairwise comparisons

	C, M, and L		*Covariates*		*C vs. L*		*M vs. L*	
Variable	*Overall F-statistic*	*Overall p-value*	*Overall F-statistic*	*Overall p-value*	*t statistic*	*p-value*	*t statistic*	*p-value*
UEPSST								
Table 4.6	1.902	0.15	N/A	N/A	N/A	N/A	N/A	N/A
no cov.	1.770	0.17	N/A	N/A	N/A	N/A	N/A	N/A
all cov.	1.554	0.21	1.303	0.26	N/A	N/A	N/A	N/A
Sales	1.767	0.17	0.002	0.96	N/A	N/A	N/A	N/A
Assets	1.740	0.18	0.075	0.78	N/A	N/A	N/A	N/A
log(Sales)	1.901	0.15	0.325	0.57	N/A	N/A	N/A	N/A
log(Assets)	1.596	0.20	0.204	0.65	N/A	N/A	N/A	N/A
LTD/TA	1.120	0.30	1.933	0.16	N/A	N/A	N/A	N/A
UEPSMT								
Table 4.6	24.894	<0.01	N/A	N/A	-5.964	<0.01	-6.394	<0.01
no cov.	26.181	<0.01	N/A	N/A	-6.680	<0.01	-6.124	<0.01
all cov.	19.074	<0.01	4.208	<0.01	-5.409	<0.01	-5.521	<0.01
Sales	25.020	<0.01	9.450	<0.01	-6.507	<0.01	-6.023	<0.01
Assets	25.517	<0.01	9.433	<0.01	-6.563	<0.01	-6.090	<0.01
log(Sales)	21.557	<0.01	7.835	<0.01	-6.054	<0.01	-5.621	<0.01
log(Assets)	22.055	<0.01	7.767	<0.01	-6.115	<0.01	-5.687	<0.01
LTD/TA	22.442	<0.01	9.974	<0.01	-5.905	<0.01	-5.882	<0.01
UEPSLT								
Table 4.6	9.811	<0.01	N/A	N/A	-3.677	<0.01	-4.065	<0.01
no cov.	13.951	<0.01	N/A	N/A	-4.944	<0.01	-4.370	<0.01
all cov.	8.077	<0.01	7.040	<0.01	-3.540	<0.01	-3.573	<0.01
Sales	12.750	<0.01	22.556	<0.01	-4.698	<0.01	-4.225	<0.01
Assets	13.249	<0.01	25.384	<0.01	-4.774	<0.01	-4.327	<0.01
log(Sales)	9.026	<0.01	25.358	<0.01	-3.968	<0.01	-3.565	<0.01
log(Assets)	9.269	<0.01	28.670	<0.01	-4.007	<0.01	-3.627	<0.01
LTD/TA	11.540	<0.01	4.506	0.03	-4.291	<0.01	-4.157	<0.01

*** N/A means "not applicable" and is included any time the initial comparison showed no *overall* differences.**

Explanation of Table 4.13
Table 4.6 refers to the results shown in Table 4.6 with a full sample. **No Cov.** refers to the same statistical calculations as in Table 4.6 (i.e., standard ANOVA), but only with those firm-years that had data available for at least one of the covariates. **All Cov.** refers to the calculation of an ANCOVA with all the described covariates included in the analysis. **Sales, Assets, log(Sales), log(Assets),** and **LTD/TA** are the same variables as described in the previous table (Table 4.12), which are used as covariates in this analysis. The F-statistics and p-values are given for both the original variable (i.e., the classification variable) and for the effect of the covariate(s) on the relationship. For any situation where the overall comparison was statistically significant, pairwise comparisons of the C, M, and L groups were made, as shown in the table above.

The first two lines in Table 4.13 for each dependent variable provide a baseline for comparison of the covariance tests. The third line for each dependent variable reports the results of an ANCOVA that used all five of the variables shown in Table 4.12 as possible covariates. The final five lines for each dependent variable show the results from separate ANCOVA tests using each of the five variables as individual covariates.

Notice from Table 4.13 (Panel A) that the number of firm years decreases by about 20% from the first line to the second line for all three categories of firms (i.e., C, M, and L). For C firms there is another decrease in the number of firm years available for the LTD/TA comparisons, which also affects the number of firms available for the tests using all the covariance variables. The Table 4.13 (Panel B) results also include the mean unexpected earnings (or *adjusted* mean for covariance tests) for each classification of firm for the short-term, medium-term, and long-term unexpected earnings variables, and the related F-statistics and p-values for the comparison of the classification variables (C, M, and L). For the ANCOVA tests, the last two columns also include the F-statistics and p-values for the covariate variables in addition to the statistical significance of the classification variables.

Table 4.13 (Panel B) shows the results of pairwise comparisons for the ANOVA and ANCOVA tests. As shown in the table and discussed shortly, the overall tests for the UEPSST variable all showed insignificant differences among the variables, so the pairwise tests were not performed.

As shown in Table 4.13 (Panel B) for the UEPSST variable, the original ANOVA and the reduced-data-set ANOVA both resulted in insignificant differences (F=1.902, p=0.15 and F=1.770, p=0.17, respectively). The mean unexpected earnings for short-term predictions was \$0.204 for C firms, \$0.773 for M firms, and \$0.965 for L firms for the smaller data set. As seen in the table, the direction of the differences was the same as the original sample, and the level of significance (or in this case, *insignificance*) was also similar. The ANCOVA is designed to filter out the effect of covariates, thus giving a clearer picture of the effects of the main variable. In the case of the UEPSST variable, the five covariates individually and collectively have little effect on the relationship between the unexpected earnings variable and the choice of accounting methods. For example, if all covariates are included in the analysis, the mean unexpected earnings amounts are C=\$0.190, M=\$0.766, and L=\$0.996, which are not statistically different (F=1.554, p=0.21) from each other, and the covariates themselves are not statistically significant in the relationship (F=1.303, p=0.26). Using the variables as individual covariates produces similar results with log(sales) yielding results for the classification variable that are the closest to statistical significance (p=0.15), and LTD/TA giving results for the classification variable that are the furthest from statistical significance (p=0.30).

As already discussed in relation to Table 4.6, these results indicate that VLIS analysts were not (statistically speaking) more accurate at predicting short-term earnings for C, M, or L firms. Including possible covariates does not change those results in any qualitative way.

The results for the UEPSMT variable are an interesting extension of the earlier discussion. Originally, the mean for the categories of firms was C=\$0.498, M=\$0.793, and L=\$1.618, demonstrating significant differences (p<0.01) in the ability of analysts to predict medium-term earnings. Using the reduced data set, but with no consideration of covariates, the results are similar: C=\$0.446, M=\$0.935, and L=\$1.885, again showing significant differences (F=26.181, p<0.01). With all five covariates included, the adjusted means were calculated as C=\$0.547, M=\$0.941, and L=\$1.818. In this analysis, the method-related differences were still statistically significant (F=19.074, p<0.01), and the covariates also contributed in a significant way to the differences in means (F=4.208, p<0.01). In fact, as shown in Table 4.13 (Panel B), each of the covariates contributed on an individual basis to the ability of analysts to predict medium-term earnings (all contributions are significant with p<0.01). It should not be considered unlikely that all five of the covariates contribute information when considered individually – recall that the first four covariates are really just different proxies for firm size and the fifth is a proxy for a firm's use of leverage. For the current study, these results indicate that firm size and debt levels do affect the ability of analysts to predict financial variables, but that the firm's choice of accounting methods also significantly affects the results, even after controlling for the various covariates.

Next, consider the long-term prediction ability of analysts. In the original ANOVA tests, the mean UEPSLT calculations were C=$1.200, M=$1.420, and L=$2.116, which indicated significant differences in means (F=9.811, p<0.01). Using the reduced data set, the means were C=$1.116, M=$1.740, and L=$2.831, also indicating significant differences in means (F=13.951, p<0.01). To control for the effects of possible covariates, the ANCOVA was run with all five potential covariates, resulting in adjusted means of C=$1.343, M=$1.766, and L=$2.672. The covariates in total did explain some of the differences among C, M, and L firms, and those differences were statistically significant (F=7.040, p<0.01). At the same time, however, the differences in the prediction ability of analysts were significantly affected by the classification of the firms as C, M, or L (F=8.077, p<0.01). That is, the size and leverage variables helped in a significant way to explain the differences in prediction ability, and the classification variables contributed additional information regarding how well the financial variables were forecast. It is also clear from the results for each of the covariates considered separately that each one of the covariates (i.e., the four proxies for size and the one proxy for debt levels) contributes significant information. With the exception of the LTD/TA variable, which resulted in a significance level of p=0.03, each of the variables reached significance levels of p<0.01 when combined with the method classification variables.

The pairwise comparisons for the UEPSMT and UEPSLT variables yielded very little new or unusual information. The differences in means for both the UEPSMT variable and the UEPSLT variable were strongly significant (p<0.01) in all pairwise comparisons (i.e., for C vs. L, and for M vs. L) in the original comparison, in the reduced-data-set comparisons, and with each of the covariates considered in the analysis. Additionally, separate Sheffe and Bonferroni comparison tests (results not included in the tables) both show the M vs. L and C vs. L differences as significant at a 95% confidence level for all comparisons, but the tests show no significant differences for any of the C vs. M comparisons.

All of these results for the UEPSMT and UEPSLT variables lend additional strength to the results shown earlier, especially in regards to Table 4.6. That is, analysts generally are able to predict earnings better in the medium-term and in the long-term for C and M firms than for L firms. This result is strong whether covariates are included in the analysis or not. Although the size of a firm and the use of debt by a firm has significant influence on the analysts in predicting earnings, the simple classification of firms on the basis of which accounting methods are employed gives significant information about how well analysts will predict, at least in the medium-term and long-term. The mean differences were in the same direction for short-term prediction errors, but the statistical tests never reached strong significance levels.

4.5.5 Considerations of industry effects

It is possible that a company's membership in a particular industry may affect which accounting method the company chooses. This, in turn, may affect the results reported above. To consider the possible effects of industry membership on the results, 1-digit SIC codes were obtained for each firm-year. These SIC codes were used to categorize firms by industry. The industry variable (i.e., SIC) was then used as a covariate in the C, M, L comparison to see if the variable added anything to the relationship. Results of these tests are shown in Table 4.14.

As shown in Table 4.14, the SIC variable is significant as a covariate for the UEPSST variable, but not as a covariate for the UEPSMT or UEPSLT variables. The test indicates that the F-statistic for the SIC variable is 7.185 ($p<0.01$) when included with the UEPSST comparison, 0.004 ($p=0.953$) when included with the UEPSMT variable, and 0.000 ($p=0.989$) when included with the UEPSLT variable.

Table 4.14 Overall comparisons of forecast errors in C, M, and L considering industry membership

							C, M, and L		*Covariates*	
Variable	*C (adj.) mean*	*C #*	*M (adj.) mean*	*M #*	*L (adj.) mean*	*L #*	*Overall F-statistic*	*Overall p-value*	*Overall F-statistic*	*Overall p-value*
UEPSST										
Table 4.6	$0.189	120	$0.644	751	$0.846	205	1.902	0.15	N/A	N/A
SIC	0.241	120	0.874	751	1.123	205	3.162	0.04	7.185	<0.01
UEPSMT										
Table 4.6	$0.498	121	$0.793	752	$1.618	205	24.894	<0.01	N/A	N/A
SIC	0.863	121	1.129	751	1.998	205	21.998	<0.01	0.004	0.953
UEPSLT										
Table 4.6	$1.200	121	$1.420	752	$2.116	205	9.811	<0.01	N/A	N/A
SIC	1.989	121	2.101	752	2.883	205	6.250	<0.01	0.000	0.989

* N/A means "not applicable" and indicates that no covariates were included in the original ANOVA tests.

For the UEPSST comparison, the original comparison showed no significant differences in C, M, and L firms (F=1.902, p=0.15). The SIC variable not only is significant as a covariate, but also improves the model's ability to distinguish between C, M, and L firms at a statistically significant level (F=3.162, p=0.04). That is, industry composition appears to obscure the forecast of earnings; in a test that controls for industry membership, the analysts demonstrate a differential ability to predict earnings.

Pairwise comparisons for UEPSST with SIC used as a covariate indicate a significant difference between C and L firms (t=2.488, p=0.01) and an insignificant difference between M and L firms (t=1.033, p=0.15). Additionally, both the Sheffe and Bonferroni tests indicate (at a 95% confidence level) a difference in means for only the C vs. L comparison. Consistent with findings from previously reported tests, the analysts tend to predict better for C firms than for L firms. In this particular instance, the superior ability to predict for C firms over the short term is not clearly evident unless the confounding industry effects are controlled for, as in these tests.

For the UEPSMT variable and the UEPSLT variable, using SIC as a covariate evidently had no incremental usefulness. In the original comparison and in the tests with SIC, both UEPSMT and UEPSLT demonstrated significant differences in mean forecast errors. Additionally, the SIC covariate was not significant in either comparison (as shown above and in Table 4.14). Apparently, the original results were strong enough for medium-term and long-term forecasts that a consideration of industry membership did not add any significant information to the question of how well analysts forecast earnings.

Another set of tests was performed to explore the potential industry effects further. In these tests, the industry membership variable (i.e., SIC) was used as the factor in a standard ANOVA instead of the POINTS variable. Table 4.15 shows the mean forecast errors for each of the eight 1-digit SIC codes and the results of overall tests of differences.

For the UEPSST variable, the overall comparisons indicate significant differences among mean forecast errors ($F=4.038$, $p<0.01$); for the UEPSMT variable, the overall comparisons indicate significant differences among mean forecast errors ($F=2.713$, $p<0.01$); for the UEPSLT variable, the overall comparisons also indicate significant differences among mean forecast errors ($F=2.388$, $p=0.02$).

Because none of the pairwise comparisons is particularly important "on the face of it," Sheffe and Bonferroni tests were performed at a 95% confidence level to test for individual pairwise differences. For all three forecast error variables, the Sheffe tests reported no significant differences between means. The Bonferroni tests, however, indicated some differences between the largest means and a few of the other means. For the UEPSST variable, Bonferroni tests indicated a difference between the means for firms in SIC 8 and the means for firms in SIC 1, SIC 2, SIC 3, SIC 5, SIC 6, and SIC 7 (i.e., all other industries except SIC 4). Additionally, the means for firms in SIC 4 were significantly different from means for firms in SIC 2 and SIC 3. For the UEPSMT variable, the means for firms in SIC 4 were significantly different from the means for firms in SIC 2 and SIC 5; for the UEPSLT variable, the means for firms in SIC 4 were significantly different from the means for firms in SIC 5 and SIC 7.

Table 4.15 Overall comparisons of forecast errors by industry

Variable	*SIC mean*	*SIC #*	*Overall F-statistic*	*Overall p-value*
UEPSST			4.038	<0.01
1 Mineral & construction industries	0.721	61		
2 Manufacturing (food, apparel, etc.)	0.646	303		
3 Manufacturing (machinery, etc.)	0.740	456		
4 Transportation, communication, utilities	1.824	109		
5 Wholesale & retail trade	0.286	52		
6 Finance, insurance, real estate	1.069	54		
7 Services (various)	0.295	23		
8 Services (health, educational)	3.353	18		
UEPSMT			2.713	<0.01
1 Mineral & construction industries	1.081	60		
2 Manufacturing (food, apparel, etc.)	1.218	304		
3 Manufacturing (machinery, etc.)	1.295	457		
4 Transportation, communication, utilities	1.775	109		
5 Wholesale & retail trade	0.727	52		
6 Finance, insurance, real estate	1.418	54		
7 Services (various)	0.718	23		
8 Services (health, educational)	0.576	18		
UEPSLT			2.388	0.02
1 Mineral & construction industries	2.005	61		
2 Manufacturing (food, apparel, etc.)	2.145	304		
3 Manufacturing (machinery, etc.)	2.252	457		
4 Transportation, communication, utilities	3.021	109		
5 Wholesale & retail trade	1.630	52		
6 Finance, insurance, real estate	2.648	54		
7 Services (various)	1.164	23		
8 Services (health, educational)	1.335	18		

Industry group SIC 4 is composed of transportation, communication, and utility companies, all of which tend to be more tightly regulated by government agencies. For all three of the error variables, the means of the firms in SIC 4 differed from at least two other industries. It appears that analysts have a more difficult time forecasting earnings for these companies, possibly due to the uncertainties involved in a regulated environment. The purpose of this study, however, is not to attempt a theory development of why analysts are less successful at predicting earnings for regulated industries.

Industry group SIC 8 is composed of firms in the health services and education services businesses (after review of the specific firms from the sample included in the industry). At this point, the differences between this industry and other industries for the UEPSST variable remains a mystery. It is likely that the differences are merely an anomaly related to the relatively few firms in the category and analysts' exceptionally poor job of predicting for those few firms in the short-term.

The results related to industry membership lend some support to the idea that industry effects need to be considered in this type of research. The results are inconclusive, however, in terms of how the industry membership actually affects the results. Generally, the industry information did not change in any qualitative way the results reported from other tests.

4.5.6 Year-by-year analysis

It is possible to argue that because the original tests involve the same companies over several years, the statistical model is actually a "repeated measures" design. To explore this argument further, additional tests were run to test analysts' year-by-year prediction ability. For these tests, the companies were divided as before, but a separate analysis was run for each forecast year for each of the unexpected earnings variables (i.e., UEPSST, UEPSMT, UEPSLT). As shown in Table 4.16, the results often did not show statistically significant results, due in part to the relatively small number of firms in the C and L groups in any given year; however, in nearly every comparison (exceptions noted below), the mean unexpected earnings was the smallest for firms using conservative accounting methods and largest for firms using liberal accounting methods, a trend that was especially true for the short-term and medium-term predictions. These results confirm the results shown earlier, where firms were not divided by forecast year.

For the UEPSST variable, only the comparison for 1991 reached strong statistical significance ($p<0.01$); in addition, the 1992 comparison was weakly significant ($p=0.08$). For all years shown, the conservative-method firms showed a smaller mean unexpected earnings amount than the liberal-method firms. In the 1987 comparison, the mixed-method firms showed a larger mean unexpected earnings ($1.57) than the liberal-method firms ($1.08), a relatively unexpected result. At this point, it is impossible to know why the analysts had more trouble predicting the earnings for firms using a mixture of conservative and liberal accounting methods (or alternatively, why the analysts did especially well at predicting the liberal-method firms' earnings). The overall results of these tests, however, are consistent with what was shown earlier: analysts are more successful at predicting short-term earnings for conservative method firms than for liberal method firms, although the differences are not statistically significant.

For the UEPSMT variable, the 1990 and 1992 comparisons are significant at $p<0.01$, the 1987 and 1991 comparisons are significant at $p=0.02$, and the 1986 comparison is significant at $p=0.05$. The differences for the other years are not statistically significant. As with the short-term results, these results show that the mean prediction error is smallest for firms using conservative accounting methods and largest for firms using liberal methods. The only exception to the normal trend of comparisons was found in 1988: C firms had a larger mean unexpected earnings ($1.54) than either the M firms ($0.83) or the L firms ($1.00). In this particular instance, the source of the unexpectedly poor prediction ability for analysts for the C firms can be traced to the prediction errors for two of the fifteen C firms in that year. A more detailed study of the two firms – a study beyond the scope of this dissertation – might uncover what parts of the prediction process caused the significant problems for the VLIS experts. Generally, the results reported in the overall tests are confirmed here – analysts predict medium-term earnings more accurately for firms using conservative accounting methods, although the year-by-year differences are not always statistically significant.

The year-by-year results for the long-term variable, UEPSLT, are not as consistent as the results from the short-term and medium-term variables. Only the years

1990 and 1991 resulted in statistically significant differences in mean forecast errors. The results for the years 1985, 1988, and 1990 were consistent with the overall results reported earlier – conservative-method firms had the smallest mean forecast errors and liberal-method firms had the largest mean forecast errors. In each of the other years (1986, 1987, 1989, 1991, and 1992) there was at least one inconsistency in this pattern. For 1986, the mean forecast error for C firms ($1.93) was greater than the forecast error for either the M firms ($1.43) or the L firms ($1.67). For 1987, the anticipated order of errors was exactly reversed – C firms had the highest forecast error ($2.33), M firms were in the middle ($1.87), and L firms had the lowest forecast error ($1.82). Bear in mind that for 1986 and 1987 these differences were not anywhere near statistical significance ($p=0.61$ for 1986, $p=0.78$ for 1987), but the mean unexpected earnings do not follow the pattern seen in earlier overall tests. The three remaining inconsistencies affect only the comparisons of C and L with the M firms, not the C vs. L comparisons. For 1989, the mean forecast error for the L firms ($1.88) is smaller than the mean forecast error for the M firms ($2.09). For 1991, the mean forecast error for the C firms ($2.34) is larger than the mean forecast error for the M firms ($2.16). And in 1992, the mean forecast error for the C firms ($2.02) is greater than the mean forecast error for the M firms ($1.97). Again, it is difficult to know what caused these inconsistent results. However, only one of the inconsistent differences was statistically significant (1991, $p<0.01$), and that inconsistency was found between the C and M firms, not between the C and L firms. Although these results are not as strong as the overall results reported earlier, they generally confirm earlier conclusions that analysts can predict long-term earnings better for conservative-method firms than for liberal-method firms.

The results of these additional tests of analysts' forecasts are generally consistent with the original results reported earlier, demonstrating that the overall results hold up fairly well after dividing the data. The original tests showed that analysts are more successful at predicting earnings for C firms than for L firms, especially in the medium-term and long-term forecasts. In the year-by-year results, the analysts were more successful at predicting for C firms than for L firms in all years for the short-term forecasts, in all but one year for the medium-term forecasts, and in all but two years for the long-term forecasts. Although consistent with the overall results, these year-by-year tests rarely reached normal levels of statistical significance.

As an attempt to increase the number of firms in the C and L categories, another test divided the M firms into either a C or an L group depending on the original number of "penalty points" assigned to the firm. Recall from Chapter 2 that after the assignment of penalty points to each firm in each year, the range of points among all firms-years was from zero to five points. With this new test, firm-years were partitioned into two strata (instead of three) after combining firm-years with zero, one, or two penalty points and firm-years with three, four or five penalty points. The firm-years in the first group (zero, one, or two penalty points) use more conservative accounting methods, and the firm-years in the second group (three, four, or five penalty points) use more liberal accounting methods. Previous tests were designed to have a wider divergence in penalty points to highlight possible differences in the groups. The downside of the type of division used here is that the test will lose valuable information, now "buried" in the two groups. That is, the cell sizes will be larger, but the firm-years in each group will be less homogeneous. Based on these groupings of only C and L firm-years, another standard one way ANOVA helped to explain differences among the firm-years with respect to unexpected earnings.

The results of these tests are shown in Table 4.17. For the UEPSST variable the overall difference was statistically significant (p=0.03) with a mean forecast error of \$0.61 for the C firms and \$1.04 for the L firms. Only 1992 showed strong significance (p<0.01) in the year-by-year comparisons, with a mean forecast error of \$0.25 and \$0.81 for the C and L firms, respectively. For 1985, the mean forecast error was essentially equal for the two groups (\$0.77), but in every other year, the unexpected earnings for the C firms was less than the unexpected earnings for the L firms. However, in each of those other years the differences were never statistically significant. These results confirm results found in other tests and are actually stronger with the two-strata division (i.e., C and L) than the original tests with a three-strata division (i.e., C, M, and L); that is, the overall differences were significant in these tests but not in the original tests.

Table 4.16 Overall comparisons of forecast errors in C, M, and L considering year-by-year calculations

Variable	C (adj.) mean	C #	M (adj.) mean	M #	L (adj.) mean	L #	C, M, and L Overall F-statistic	C, M, and L Overall p-value
UEPSST								
1985	$0.40	11	$0.79	86	$0.83	41	0.953	0.39
1986	0.45	12	0.93	90	1.14	37	1.514	0.22
1987	0.20	11	1.57	97	1.08	27	0.226	0.80
1988	0.27	15	0.47	95	0.62	25	0.772	0.46
1989	0.30	13	0.82	98	1.16	20	1.218	0.30
1990	0.31	16	1.17	94	1.25	22	0.275	0.76
1991	0.53	19	0.73	97	1.99	18	6.443	<0.01
1992	0.24	23	0.44	94	1.12	15	2.623	0.08
overall	$0.34	120	$0.87	751	$1.09	205	2.335	0.10
UEPSMT								
1985	$0.80	11	$1.38	85	$1.99	41	2.353	0.10
1986	0.60	12	0.99	90	1.59	37	3.146	0.05
1987	0.38	11	0.93	98	1.55	27	3.910	0.02
1988	1.54	15	0.83	95	1.00	25	1.554	0.22
1989	0.49	13	1.03	98	1.53	20	1.934	0.15
1990	1.38	16	1.75	94	4.36	22	8.365	<0.01
1991	1.00	19	1.30	97	2.43	18	3.900	0.02
1992	0.57	24	0.84	94	2.14	15	5.835	<0.01
overall	$0.86	121	$1.13	751	$2.00	205	22.207	<0.01
UEPSLT								
1985	$1.54	11	$2.50	86	$2.84	41	0.989	0.37
1986	1.93	12	1.43	90	1.67	37	0.498	0.61
1987	2.33	11	1.87	98	1.82	27	0.248	0.78
1988	1.04	15	1.08	95	1.39	25	0.594	0.55
1989	0.96	13	2.09	98	1.88	20	1.298	0.28
1990	3.35	16	3.74	94	7.76	22	5.755	<0.01
1991	2.34	20	2.16	97	4.51	18	4.911	<0.01
1992	2.02	23	1.97	94	2.62	15	1.168	0.31
overall	$1.99	121	$2.10	752	$2.88	205	6.289	<0.01

For the UEPSMT variable, the overall comparison yielded a mean forecast error of \$1.05 for the C firms and \$1.44 for the L firms, a statistically significant difference ($p<0.01$). However, in the year-by-year tests, none of the differences were significant. For 1988, the mean forecast errors were \$0.97 for the C firms and \$0.92 for the L firms, inconsistent with previous findings, but not significant ($p=0.83$). In all other years, the unexpected earnings were smaller for the C firms and larger for the L firms (but not significantly different). Once again, these tests confirm the results of earlier tests – analysts appear to be more successful at predicting earnings for firms using more conservative accounting methods over medium-term forecast horizons.

For the UEPSLT variable the overall tests resulted in a mean forecast error of \$2.07 for the C firms and \$2.37 for the L firms ($p=0.09$). Not only are the overall differences insignificant, but also in each of the yearly tests the differences are insignificant. Also, comparing the differences in mean unexpected earnings for 1985 (C=\$2.53, L=\$2.52), 1987 (C=\$1.98, L=\$1.85), and 1992 (C=\$2.08, L=\$2.01), note that the mean forecast error is larger for the C firms than for the L firms. The last two of these years (1987 and 1992) were two of the years in which inconsistent results occurred in the three-strata results reported in Table 4.16

Table 4.17 Overall comparisons of forecast errors in C and L considering year-by-year calculations

Variable	*C (adj.) mean*	*C #*	*L (adj.) mean*	*L #*	*C, M, and L* Overall F-statistic	*C, M, and L* Overall p-value
UEPSST						
1985	$0.77	44	$0.77	94	0.003	0.96
1986	0.86	49	0.99	90	0.351	0.55
1987	0.96	50	1.60	85	0.275	0.60
1988	0.35	62	0.58	73	2.365	0.13
1989	0.63	63	1.00	68	1.777	0.18
1990	0.66	59	1.41	73	0.925	0.34
1991	0.67	67	1.08	67	2.553	0.11
1992	0.25	78	0.81	54	6.871	<0.01
overall	$0.61	472	$1.04	604	5.031	0.03
UEPSMT						
1985	$1.36	43	$1.58	94	0.389	0.53
1986	0.80	49	1.29	90	3.658	0.06
1987	0.79	51	1.14	85	2.362	0.13
1988	0.97	62	0.92	73	0.037	0.85
1989	0.83	63	1.25	68	2.567	0.11
1990	1.76	59	2.45	73	1.829	0.18
1991	1.21	67	1.62	67	1.862	0.17
1992	0.75	79	1.21	54	2.836	0.09
overall	$1.05	473	$1.44	604	12.142	<0.01
UEPSLT						
1985	$2.53	44	$2.52	94	0.000	0.98
1986	1.36	49	1.63	90	0.640	0.43
1987	1.98	51	1.85	85	0.117	0.73
1988	1.00	62	1.24	73	1.190	0.28
1989	1.68	63	2.19	68	1.518	0.22
1990	3.74	59	4.86	73	1.415	0.24
1991	2.19	68	2.81	67	1.403	0.24
1992	2.08	78	2.01	54	0.077	0.78
overall	$2.07	474	$2.37	604	2.881	0.09

CHAPTER 5 REVIEW OF FINDINGS, IMPLICATIONS, LIMITATIONS, AND CONTRIBUTIONS

This chapter contains four major sections. The first section includes a review of the major results of the research as reported in the previous chapter. The second section includes a discussion of the implications of the current research for future research efforts. The third section provides examples of several limitations, and the last section suggests several contributions of the current research, and the Feltham-Ohlson model in general, to the body of accounting literature.

5.1 Review of results

Several major findings were discussed in the previous chapter. The first group of tests was designed to determine if the sample firms were representative of the firms in the Compustat population that they purportedly represented. Results of tests showed that the sample firms were indeed representative of mainly the larger firms covered by Compustat, probably due to the requirement of the sample selection process that the firms be traded on the New York Stock Exchange (NYSE).

The second group of tests was designed to determine whether the BV/MV ratio was in any way related to the choice of accounting methods employed by firms. Based on results of χ^2 and ANOVA tests, there are differences in the BV/MV ratio of firms, depending on whether the firms use conservative, mixed, or liberal accounting methods. Examination of the results reveals that C firms are more likely to have low BV/MV ratios (and are very unlikely to have high BV/MV ratios), and L firms are more likely to have high BV/MV ratios (and are very unlikely to have low BV/MV ratios). There is no significant difference in the type of accounting methods the firms in the middle BV/MV ratio group use, however.

The third group of tests was designed to explore the quality of earnings issue. Test results demonstrated that financial analysts are less accurate at predicting earnings for liberal-method firms than for conservative-method or mixed-method firms over medium-term and long-term forecast horizons. The direction of the results was also true for short-term forecasts, but the tests never demonstrated statistical significance.

Analysts' mean forecast errors of earnings and book values were also consistently smaller for conservative-method firms, but the tests never reached a level of statistical significance.

When the basic tests were modified to include the expected growth in earnings for sample firms, the short-term prediction error differences became significant for low-growth firms. For the medium-term forecasts, results were not much different regardless of the growth group considered. In the long-term prediction tests, results considering growth indicated that primarily high-growth firms drove the basic results. That is, over short-term forecast horizons analysts can predict better for low-growth, conservative-method firms than for low-growth, liberal-method firms; over the long-term forecast horizons analysts can predict better for high-growth, conservative-method firms than for high-growth, liberal-method firms; and over the medium-term forecast horizon analysts can generally predict better for conservative firms than for liberal firms in all growth groups.

When variables related to the firm size or the firm's debt levels were included as covariates in the analysis, the results were qualitatively equivalent to earlier tests. The tests also showed that a firm's size and use of leverage do affect analysts' ability to predict earnings; it is easier for an analyst to predict financial variables for smaller firms (in the NYSE-based sample) and for firms using relatively less debt.

A fourth test was designed to explore the differences in firms' return on equity (ROE), depending on the choice of accounting methods. As indicated in previous literature, my tests show that firms using conservative accounting methods exhibit a larger average ROE than the mixed-method or liberal-method firms for short-term, medium-term, and long-term forecasts of ROE and for one-year, two-year, three-year, four-year, and five-year historical measures of ROE (i.e., based on reported financial variables in financial statements).

Other tests were designed to test the robustness of the previously reported results to alternative proxies for key variables. The tests varied the definition of the risk-free rate, firm-specific beta, market returns, and the cost of capital for individual firms without any significant change in the results. Additionally, alternative proxies for the calculation of unexpected earnings (the quality of earnings variable) generally yielded similar results.

Tests were performed to consider the effects of industry membership, as well. For a short-term forecast horizon, a consideration of industry membership does appear to help analysts make more accurate predictions for conservative-method firms. In the medium-term and long-term forecast horizons, however, the industry effects did not appear to change the results in any significant way. Other tests also indicated that analysts might have more difficulty predicting earnings for firms in regulated industries.

Another comparison test of reported and forecast earnings for different groups of firms yielded some interesting results, as well. First, analysts seem to have a bias toward forecasting increasing earnings. Second, among the sample firms, conservative-method firms show increasing earnings over time, while mixed-method and liberal-method firms show decreasing earnings over time. Analysts tend to predict increasing earnings for all firms, but on average, only the conservative-method firms actually show increasing earnings.

5.2 Implications

The implications of this research fall into two categories. First, the tests show that the Feltham-Ohlson model implies an effect of accounting methods on the BV/MV ratio. The results of one set of tests demonstrate that firms using a portfolio of conservative accounting methods are likely to have a low BV/MV ratio and unlikely to have a high BV/MV ratio. Similarly, firms that use a portfolio of liberal accounting methods are likely to have a high BV/MV ratio and are unlikely to have a low BV/MV ratio. Those firms that utilize a mixture of conservative and liberal accounting methods show low, medium, and high BV/MV ratios in approximately equal proportions. Related ANOVA tests show a significant difference between the mean BV/MV ratios for firms using generally conservative and firms using generally liberal accounting methods.

Of course, these results in no way imply that all firms with low BV/MV ratios will be found to use conservative accounting methods. It is also impossible to conclude that all firms using conservative accounting methods will have a low BV/MV ratio. The

Feltham-Ohlson model shows theoretically a direct link between a firm's choice of accounting methods and the resulting calculation of the BV/MV ratio. The results of the tests reported above indicate that for a sample of the companies followed by Standard and Poor's Compustat, there is a strong correlation between accounting method choice and the BV/MV ratio. The logical conclusion is that the practical tests of the basic assumptions of the Feltham-Ohlson model support the theoretical model.

Because a firm's accounting method choices affect the calculation of the BV/MV ratio, by implication, those studying the effects of accounting method choice may find useful alternatives to previous research approaches. For example, instead of segregating firms based on specific accounting methods employed, analysts and researchers might find it useful to segregate firms based on relative levels of the BV/MV ratio. It might also be true that refinements of the approach used in the current research will uncover additional correlations between the BV/MV ratio and other variables (e.g., unusual accruals, etc.) that might indicate the conservative/liberal leaning of a company's management.

Prior research is based on assumptions about how specific accounting methods increase or decrease earnings (e.g., the assumption that the use of LIFO usually decreases earnings), usually without testing the assumptions or allowing for a different set of assumptions. The results reported herein support the use of these assumptions about how specific accounting methods tend to affect earnings, but point out that the relationship has some exceptions (i.e., there is not a perfect correlation). Future research must consider the effects of accounting method choices and how those choices affect the calculation of earnings.

The second set of conclusions to draw from the current research relates to the ability of financial analysts (and by extension, average investors) to predict earnings for firms. The overall conclusion drawn from the results is that analysts are better able to predict unexpected earnings for firms that apply a portfolio of generally conservative accounting methods than for firms that use a portfolio of generally liberal accounting methods. These results are robust to the choice of proxies for the calculation of unexpected earnings, and the results hold regardless of whether growth is included in the analysis of the companies. The differences are magnified for longer-term predictions of unexpected earnings. Based on the definition of earnings quality employed herein, the conservative-method companies have a higher quality of earnings, on the whole, than do otherwise similar liberal-method companies.

Future research can address more precise differences in results if firms are categorized into those that use conservative, mixed, and liberal accounting methods. Also, knowledge of the relationship between a firm's BV/MV ratio and the firm's chosen accounting methods may allow future researchers to simplify the initial data-gathering stage of any research effort.

5.3 Limitations

The major limitation of this research is the limited sample size, made necessary by the amount of data that had to be collected by hand: several of the data sources (e.g., actual annual reports, paper-based Value Line Investment Survey) are not in digital form for the entire sample period. Using 200 randomly selected firms and collecting data from ten years of financial statements should have resulted in sufficient data to find significant results, however. In addition, accounting method information was gleaned from Compustat, where available, to test on a limited basis the model's assertion that the BV/MV ratio is related to a firm's use of conservative or liberal accounting methods.

Another limitation is that, as in prior related research, the scorecard approach assumes that each accounting method has the same "weight" as any other method as far as determining whether a company uses conservative, liberal, or mixed accounting method portfolios. Because of the lack of a cohesive theory in this area of accounting research, any weighting method would, of necessity, be arbitrary. A third limitation, occurring in the second stage of the research, was the use of the BV/MV ratio as a proxy for the firm's choice of conservative, liberal, or mixed accounting method portfolios. To the extent that this assumption is invalid, the tests are biased toward finding no significant differences.

5.4 Contributions

This study adds to the growing body of research using the Feltham-Ohlson model as a basis. Although still in relative infancy, the model allows a straightforward framework for investigating the usefulness of accounting information. The model was used to confirm the logic behind the assumptions used in many earlier research efforts. Specifically, assuming that the Feltham-Ohlson model describes the conservative vs. liberal analysis, if the hypothesized relationship does not hold, Feltham and Ohlson's model would either confirm or deny that past studies of income manipulation made accurate assumptions regarding which accounting methods "always" increased or reduced reported income. The analysis of the relationship between the model's predictions and past researchers' assumptions should also benefit future research efforts. Assuming the relationship does indeed hold, future researchers may be able to use the simple BV/MV calculation, after controlling for expected growth in future earnings, as a proxy for the level of conservatism a firm has embedded in its accounting system. Instead of cataloging individual accounting method choices employed by firms, researchers might be able to spend more time analyzing differential effects of accounting method choices. For example, future positive accounting theory research could be much simpler in the initial data-gathering stages.

This research also adds to the ongoing discussion on earnings quality. Although researchers have explored the question of earnings quality from many perspectives, the Feltham-Ohlson model allows a fresh approach that can yield significant insights into what types of accounting information are most useful to investors when making predictions of a firm’s future earnings and book values.

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