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THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

MEASUREMENT ALTERNATIVES FOR EARNINGS, TOTAL ASSETS, AND TOTAL LIABILITIES: The value-relevance of adjusting financial statement summary measures by a comprehensive financial reporting analysis

A Dissertation

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

Doctor of Philosophy

By

J. Scott Whisenant
Norman, Oklahoma
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MEASUREMENT ALTERNATIVES FOR EARNINGS, TOTAL ASSETS, AND TOTAL LIABILITIES: The value-relevance of adjusting financial statement summary measures by a comprehensive financial reporting analysis

A Dissertation APPROVED FOR THE
SCHOOL OF ACCOUNTING IN THE
COLLEGE OF BUSINESS ADMINISTRATION

BY

G. Lee Willinger

Frances Ayres

Uday Chandra

Nandkumar Nayar

Zhen Zhu

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ABSTRACT

This thesis tests whether investors consider alternative forms of financial reporting than financial statement representations (e.g., information on operating leases or disclosures of the fair market value of pension plan assets) to be value-relevant. In this study, alternative disclosures are *conditioned on* and also *aggregated with* their related *GAAP-based summary measures* (i.e., financial statement representations of assets, liabilities, and earnings) to investigate their usefulness as joint inputs into the market value of common equity. The thesis predicts that the data from alternative disclosures, individually and in aggregation with *GAAP-based summary measures* (i.e., financial statement representations of assets, liabilities, and earnings), are informative to investors' assessment of equity values. If the results of the empirical tests on *each* alternative disclosure support the thesis, this suggests that investors find that alternative disclosure value-relevant and incrementally informative to *GAAP-based summary measures*. If the results of the empirical tests using *aggregated alternative disclosures and GAAP-based summary measures* support the thesis, this suggests that adjusted financial statement representations of assets, liabilities, and earnings better reflect the data generating process in common equity values than do reported GAAP-based summary measures.

In addition to providing empirical evidence on the value-relevance of each alternative disclosure and adjusted summary measures, this study tests the question of valuation equivalency between recognized and disclosed (but unrecognized) data. Thus, the empirical evidence offers insight into the value-relevance and valuation-role of a broader set of financial disclosures provided by managers than offered by financial statement representations. The importance of these research questions is evident from the increasing range of financial disclosure choices available to managers. For example, in 1980

the Securities and Exchange Commission (SEC) encouraged managers to disclose financial data about future events, descriptions of liquidity, detail on capital resources, and the impact of inflation in the Management Discussion & Analysis (MD&A) report. Also, alternative disclosure choices are available as an option to reporting in financial statements. For example, in 1995 the FASB promulgated SFAS No. 123 that allows disclosure in footnotes of economic events relating to stock-based compensation *expense* instead of mandatory recognition in financial statements although the stock-based compensation expense meets the recognition criteria established by the FASB.

To operationalize the alternative disclosures into financial statement adjustments for GAAP-based summary measures, this study uses the pedagogy in financial statement analysis texts. The data of interest to this study are required financial disclosures under Regulations S-X and S-K of the Securities Exchange Act of 1934. For example, the data sources include notes to financial statements, supplementary schedules provided under SEC mandate, and other financial data that contain explanatory information about financial statement representations. That is, the alternative disclosures of interest to this study are disclosures that describe financial statement representations (e.g., explanatory information on inventory accounting practices), offer information that has not met GAAP-based recognition criteria (e.g., operating lease disclosures), or provide disaggregated information on financial statement representations.

The results of this study's empirical tests on the value-relevance of alternative disclosures *conditioned on* GAAP-based information are consistent with the predictions on four of the five asset adjustments, three of the four liability adjustments, and the three types of adjustments to earnings. This suggests that most of the alternative disclosures, as operationalized in this thesis, are incrementally informative to GAAP-based summary information on firms' resources, obligations, and performance. For the tests of the aggregation process to describe alternative summary financial signals, the empirical results support the prediction that summary measures of resources and

obligations better reflect the data generating process in equity values using either an asset-and-liability-based or Feltham-Ohlson valuation model than do reported measures of resources and obligations. However, for an earnings-based valuation model, the results do not support the prediction that adjusted earnings better reflects the data generating process in market values (or returns) than does reported earnings.

A secondary research question of interest to this thesis is that of differential valuation by investors between recognized versus alternatively disclosed financial data. These results offer inconsistent evidence on this question. Although similarities are occasionally evident, more often the alternative disclosures (as operationalized in this study) are valued differently from GAAP-based representations. However, several limitations of the present design and the research design of other studies that investigate the value-relevance of alternative and GAAP-based financial reporting warrant mentioning. Measurement error in the reporting of alternative forms of disclosures or the operationalization process used to quantify alternative disclosures can induce differences in valuation or create sufficient noise to mask how investors use the data. Also, the proposed adjustments and the methods of operationalizing the alternative disclosures are not meant to be exhaustive attempts to explain the way each adjustment might be done by investors. Nevertheless, this research is meant to add to the small body of research that quantifies off-financial-statement information and examines the value-relevance to stock prices of each and as aggregated with financial statement representations. To that end, this study contributes initial empirical evidence on how investors apparently perceive alternative financial reporting disclosures and impound those alternative disclosures into firms' common equity values.

CHAPTER 1

Introduction

As many attributes of a firm's environment and its management's actions are not directly observable to its stakeholders, managers have incentives to provide financial disclosures to communicate information that might be used for investment, credit, and monitoring decisions (e.g., Jensen and Meckling [1976]).[1] Stakeholders use observables from financial disclosures presumed to be influenced by a firm's environment and its management's actions to make inferences about unobservables that are of ultimate interest (e.g., investors' interest in the distribution functions of securities future payoffs). Thus, financial disclosures and each of its subsets are types of sample evidence on which inferences about a firm's production, investment, and financing can be based to assess firm value. Observed values of financial statement representations and those provided in alternative forms of financial disclosures (e.g., notes to the financial statements or data in supplementary schedules) are among those observables that can be used for this purpose.

This study tests whether investors consider alternative forms of financial disclosures to be value-relevant when *conditioned on* and also *aggregated with* their related *GAAP-based summary measures* (i.e., financial statement representations of assets, liabilities, and earnings) to investigate their usefulness as joint inputs into determining equilibrium equity values. The thesis predicts that the data from alternative disclosures, individually and in aggregation with *GAAP-based summary*

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[1]The Financial Accounting Standards Board (FASB) defines financial reporting as . . . *not only financial statements but also other means of communicating information that relates, directly or indirectly, to the information provided by the accounting system - that is, information about an enterprise's resources, obligations, earnings, etc.* [Statement of Financial Accounting Concepts (SFAC) No. 1, 1978, ¶7]. Although financial reporting regulators draw . . . *no clear distinction between financial reporting and financial statements and leave extremely broad the scope of financial reporting* [FASB, SFAC No. 1, 1978, ¶5], they state that . . . *other means of financial reporting, such as management discussion and analysis, add information to that in the financial statements* [SFAC No. 5, 1984, ¶7b].

measures (i.e., financial statement representations of assets, liabilities, and earnings), are informative to investors' assessment of equity values. In support of this thesis *vis-a-vis* a pedagogical perspective, authors of financial statement analysis textbooks often suggest using alternative disclosures to adjust the representations in financial statements. For example Palepu, Bernard, and Healy [1996, 3-1] suggests that . . . *by evaluating the appropriateness of the firm's accounting policies and estimates, analysts can assess the degree of distortion in a firm's accounting numbers* . . . and . . . *"undo" any accounting distortions* . . . resulting from intentional or unintentional manipulation of financial statement information.[2] In this study, I use broader set of financial disclosures than financial statement representations since a failure to consider the informativeness of alternative financial disclosures (e.g., operating leases obligations, pension plan assets, or OPEB data) that might be used to adjust or restate financial statement data is likely to understate (or perhaps overstate) the impact that financial statement data have on equity values.

Also suggesting that financial statement representations and alternative disclosures be used during security analysis, Benjamin Graham and David Dodd view the analysis of financial reporting disclosures as a valuation activity that subsumes financial statement analysis. They suggest that financial reporting analysis plays a fundamental role in maintaining stock market efficiency. As a costly activity, they believe financial analysis in a competitive environment offers rewards consistent with its costs.[3] That is, investors are expected to invest in financial reporting analysis to determine whether security prices differ from their intrinsic values (known only in an environment with perfect information) as financial reporting data enter the market. Thus, financial reporting and each of its

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[2]Most related textbooks suggest adjustments to financial statement representations. White, Sondhi, and Fried [1994, v] states that . . . *good financial analysis requires the analyst to understand how financial statements are generated in order to separate the economic process that generates the numbers from the accounting process that (sometimes) obscures it.* Gibson [1995], Bernstein [1993], Stickney [1993], Fridson [1991], Cottle, Murray, and Block [1988], Foster [1986], and Lev [1974] offer similar pedagogical guidance.

[3]In Graham, Dodd, and Cottle [1962] and Cottle, Murray, and Block [1988]; the authors revise the classic security analysis of Graham and Dodd. In that revision, the authors define financial statement analysis a . . . *major activity of security analysis. This analysis includes two steps: First, the financial statements must be adjusted to reflect an analysts's viewpoint, that is, the analyst changes the published numbers, eliminates some assets and liabilities, creates new ones, alters the allocation of expenses to time periods, and, in effect, creates a new set of financial statements* [133].

subsets are types of sample evidence on which inferences about a firm's production, investment, and financing can be based to assess firm value.

Therefore, the objective of this thesis is to test the value-relevance of financial disclosures by considering financial statement representations ***and*** other forms of financial reporting as joint inputs into those unobservables of interest to one set of financial reporting users: investors.[4] The goal is to yield insight into the informativeness of financial statement representations and alternatively disclosed financial data along two dimensions. First, data in alternative financial disclosures are operationalized to investigate whether each disclosure adds information beyond GAAP-based summary measures of firm performance, resources, and obligations (i.e., earnings, assets, and liabilities, respectively). Second, the operationalized disclosures are combined with their related GAAP-based summary measures to investigate whether the aggregated data better reflects the data generating process in firm values than the GAAP-based summary data.[5] The latter highlights the main objective of this study.

This study adds empirical evidence to recent empirical evidence (e.g., Lev and Sougiannis [1996]; Jennings, Simko, and Thompson [1996]; and Lev and Thiagarajan [1993]) that suggest firms' stakeholders restate financial statement summary measures.[6] For investors, the incentives to

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[4] *Investor* is used throughout this thesis to represent, not only an investor that uses financial reporting disclosures (regardless of the source) to make his/her own investment decisions, but also that investor's or other investors' agents that use financial reporting disclosures when providing investment advice.

[5] As an example of a similar aggregation process, managers aggregate account balances into summary measures shown in financial statement representations. This practice implicitly assumes that the information is initially informative and secondarily that the aggregation process does not yield less useful information to users. The adjustment and aggregation process involves, not only determining the set of financial statement adjustments that are useful to investors, but also the form that the adjustments will take so that they can be aggregated to produce adjusted summary measures. This thesis places a linear restriction on the adjustments which demands that a more useful summary measure not only be informative, but also be of a form that information lost through aggregation and from the imposed linear restriction do not dominate their informativeness. This additional structure on the adjustments in the present study biases in favor of the null hypothesis that tests the informativeness of aggregated summary measures against the informativeness of accounting summary measures.

[6] Dawson, Neupert, and Stickney [1980] assesses the benefits of restating financial statements prepared using alternative accounting methods. They adjust financial statement information of ninety-six large firms so that all are converted to a FIFO cost flow assumption, convert firms to accelerated depreciation, consolidate wholly-owned subsidiaries, record pension obligations as liabilities, and eliminate deferred tax accounting effects on the balance sheet. They show that the correlations between financial ratios and both reported and restated net income are the same. Thus, they conclude that the high degree of correlations suggests that restatements are not worth the effort. However, their adjustments

restate GAAP-based summary measures might exist from either the current state of financial reporting regulation that allows increasing off-financial-statement disclosures (inducing more noise in GAAP-based summary measures) or greater demands by other stakeholders on the aggregation process that produces GAAP-based summary measures (leading to less precision).

Using the present research design, the results on the incremental value-relevance of each alternative disclosure, conditioned on their related GAAP-based information, are consistent with the predictions on four of the five asset adjustments (intangible capital from R&D and advertising, depreciation adjustment to accelerated depreciation, and pension plan assets, and OPEB plan assets), three of the four liability adjustments (operating leases obligations, loss contingencies, and pension plan obligations), and the three types of adjustments to earnings (cost of goods sold adjustment related to the choice of cost-flow, depreciation expense related to an acceleration of depreciation charges, and a combined adjustment to other expenses for amortization of intangible capital and restatement of pension cost).[7] However, the main objective is to test the value-relevance of adjusted summary measures compared with the value-relevance of reported summary measures. Using an asset-and-liability or a Feltham-Ohlson [1985] based valuation model, the results suggest that adjusted measures of firms' resources and obligations better reflect the data generating process in

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did not result from a comprehensive analysis of the firm and its industry (as analysts almost certainly do), and focused on only large firms shown to a broader and more closely followed financial reporting set of data. Additionally, high correlations between financial ratios (that may or may not map onto firm value) and two state-and-time-dependent measures of earnings do not offer definitive evidence that investor do not (on average) restate GAAP-based summary measures for valuing common equity.

[7]Although earnings does not appear to be restated by investors in the present sample evidence, the result might occur due to a noisy operationalization process of those adjustments to earnings or a single-period time effect. That is, the informativeness of adjustments produced from disclosures of multi-period data to assets and liabilities removes a significant amount of the noise and bias in reported assets and liabilities. Yet, earnings and its components are less noisy or biased since each is measured approximately over one annual reporting period. Thus, the restatement process fails to remove a significant amount of noise or bias in the reported data.

equity values than do GAAP-based summary measures. Using an earnings-based valuation model, the empirical evidence does not support the same prediction for adjusted earnings.[8]

A secondary research question of interest to this thesis is that of differential valuation by investors between recognized and alternatively disclosed financial data. The results from the empirical tests on differential valuation of recognized and alternatively disclosed data offer inconsistent evidence. Although similarities are occasionally evident (e.g., the costs of goods sold adjustment yields similar signals of firms' resources to those of GAAP-based disclosures), more often the alternative disclosures (as operationalized in this study) were valued differently from GAAP-based representations. Although no directional prediction is made by the present thesis, the evidence suggests that alternative disclosures are less valued than related GAAP-based disclosures in those case where differential valuation exists.

These results offer suppliers of financial information insight into how alternative financial disclosures related to earnings, assets, and liabilities are used as joint inputs into the valuation process of common equity.[9] Additionally, the results suggest that alternative disclosures may be used to improve contracting efficiency in a variety of contracting contexts among firms' stakeholders. Assuming the benefits exceed the costs of altering contracts, contracting efficiency can be improved if more precise signals of financial reporting summary measures (observables) are used as signals of firms' actual values or changes thereof (unobservables) on which stakeholders contract. Also, the auditing profession is likely to be interested in the evidence from this study that suggests alternative disclosures might be used by investors to restate GAAP-based assets and liabilities. For example, standard-setters for the auditing profession may need to consider the impact

[8]Although not as predicted in the present thesis, the results on the earnings-based model for returns are consistent with the results of Collins, Kothari, Shanken, and Sloan [1994]. They show that the noise in earnings is uncorrelated with returns, yet offer evidence that earnings lack of timeliness is a considerable detractor to the low contemporaneous earnings-return association.

[9]Todd Johnson, Research Manager at the FASB, calls for more research on disclosure issues. Specifically, he calls for research efforts that provide insight on the measurement and informativeness of financial reporting disclosures in addition to financial statement representations (Johnson [1992]).

that alternative disclosures have on audit risk and materiality levels while both planning the audit and evaluating the financial statements taken as a whole.

However, several limitations of the present design warrant mentioning. Measurement error in the reporting of alternative forms of disclosures or the operationalization process used to quantify alternative disclosures can induce differences in valuation or induce sufficient noise to mask how investors use that data. Furthermore, the level of investors' usefulness of financial disclosures is assumed to be associated with its level of association to the variations in equity values and returns. Finally, the proposed adjustments and the methods of operationalizing the alternative disclosures are not meant to be exhaustive attempts to explain the way each adjustment might be done by investors. Instead, this research is meant to add to the small body of research that quantifies off-financial-statement information and examines the value-relevance to stock prices of each and when aggregated with financial statement representations. To that end, this study contributes initial empirical evidence on how one set of users appears to perceive (via a utilitarian approach) alternative financial disclosures that relate to a firm's performance during a period as a proxy for future earnings, to its economic resources, and to its expected obligations.

1.1 An Overview of Thesis

In general, this study examines the value-relevance of proposed (hereafter, *candidate*) adjustments to GAAP-based summary measures across three different valuation models (i.e., those based on earnings, asset-and-liability, and a Feltham-Ohlson [1995] framework). The research design uses Vuong's [1989] likelihood ratio test to investigate whether *adjusted* summary measures are more useful than *reported* summary measures offered by financial statements for explaining the variation in equity values. The competing models are (1) reported earnings against adjusted earnings, (2) reported assets and liabilities against adjusted assets and liabilities, and (3) reported assets and book value against alternatively adjusted measures of both.

The thesis predicts that alternative disclosures (e.g., information on inventory valuation or the choice of depreciation method for capital assets) are useful for explaining firms' equity values *conditioned on* each alternative disclosure's related GAAP-based summary measure: total assets, total liabilities, or earnings. The data of interest to this study, defined as ***alternative financial reporting disclosures*** throughout, are disclosures required under Regulations S-X and S-K of the Securities Exchange Act of 1934.[10] That is, the data sources are notes to financial statements, supplementary schedules provided under SEC reporting requirements, or other financial disclosures that contain explanatory information about financial statement representations (e.g., contained in the MD&A report). Prior research has not resolved the question of whether market agents use alternative disclosures to obtain more precise summary measures of earnings, resources, or obligations. Therefore, the main objective of this study is to provide sample evidence on this research question and provide additional evidence the body of research that shows that stock prices at least partially reflect the information in alternative disclosures (e.g., Landsman [1986], Harris and Ohlson [1987], and Barth [1991]).

Also, the present study adds insight into how one stakeholder group values *recognized* versus *alternatively disclosed* financial disclosures.[11] Prior research does not support the presumption that recognition and disclosure of financial data are equivalently useful to investors valuation of common equity, nor does it refute that presumption (see Bernard and Schipper [1994]).[12] Yet, as financial

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[10] *Regulation S-X* identifies the specific financial statements that must be filed with the SEC and the basic rules to be followed in the preparation and certification of those financial statements. *Regulation S-K* identifies the requirements for non-financial- statement disclosures that are required in annual reports.

[11] Throughout this study, a *financial statement representation* implies a communication of economic events that are recognized in financial statements by a firm's managers and an *alternative financial reporting disclosure* implies a reporting practice that either discusses the accounting procedures used by a firm's managers, discloses information on economic events that have not met GAAP-based recognition criteria, or reports information mandated by regulatory agencies in a form other than a financial statement representation. Nevertheless, the present author recognizes and agrees with the FASB's assertion that footnotes are an integral part of the financial statements.

[12] Bernard and Schipper [1994, 2-3] states that based on their discussions with, and writings of, practicing professionals, they conclude that accounting practitioners . . . *see recognition and disclosure as distinctly different, both conceptually and in their consequences.* However, Bernard and Schipper note that the common research design by academic accountants is to treat . . . *the distinction between recognition and disclosure as unimportant.*

reporting regulators distinguish between recognition and alternative disclosure, they implicitly signal that the distinction between the financial signals is meaningful to the decision-making of investors and creditors. Inherent in the first of the four recognition criteria (a *similar definition* to that of a financial statement element) in SFAC No. 5 is a suggestion that unless an item meets the definition of an asset, liability, or change in equity value (*vis-a-vis* the definition of a component of comprehensive income) the item does not qualify for financial statement recognition.[13]

Accordingly, some alternative financial disclosures (e.g., pension obligations for plans that can be terminated at the discretion of firms' managers) might be viewed as signals of economic events that are dissimilar to financial statement representations (other legal obligations) and differential valuation might be expected. However, other alternative disclosures might simply communicate the effects of an accounting choice (e.g., the LIFO reserve disclosure resulting from the choice of cost-flow for inventory) to its related financial statement representation. In that case, equivalency of valuation might be expected. Thus, a second, but important, objective of this study is to test the equivalency of recognized and alternatively disclosed financial reporting data.

Yet, the main objective of this study is to test the prediction that alternative financial disclosures are useful to investors since investors believe financial statement representations are incomplete and/or distorted (i.e., biased or noisy) signals of firm value. Investors are expected to find that alternative disclosures are a source of either new information about firm value or useful information to reduce the bias or noise in financial statement representations.[14] For example, distortions in

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[13]The FASB issued Statements of Financial Accounting Concepts (SFAC) No. 1 *Objective of Financial Statements by Business Enterprises*, No. 2 *Qualitative Characteristics of Accounting Information*, and No. 5 *Recognition and Measurement in Financial Statements of Business Enterprises* to ... *set forth objectives and fundamental that will be the basis for development of financial accounting and reporting standards* [SFAC No.2]. For example, differential valuation might be expected when one considers the four criteria suggested in SFAC No. 5 that describe fundamental criteria for accounting recognition (i.e., the four criteria are similar definition, measurability, relevance, and reliability).

[14]Bias and noise typify the inadequacies usually attributable to financial statement representations. The intuition is that any distortion relative to the true underlying cash flows of the firm is generally undesirable to investors. The distortions in financial statement information are usually characterized as either signals that are *biased* relative to the expected value of a firm or represent *noisy* signals of firm value.

financial statement summary measures can result from biased choices of accounting methods, untimely recognition criteria, or constraining GAAP-based conventions.

However, Patell [1989] suggests that management manipulation as a source of error might not be manipulation *per se.* Instead, the resulting financial reporting information may be disclosure and measurement practices that *speak to other markets.* He describes accounting measurements as . . . *equilibrium phenomena that arise from tradeoffs and compromises that equate marginal utilities across agents and across markets* [1989, 200]. Nevertheless, he suggests that it is still appropriate for accounting researchers to investigate how securities traders correct for these tradeoffs and compromises. Recognizing the potential for multiple descriptions of the phenomenon that lead to the measurement practices used by managers, the present thesis neither rejects the importance of alternative uses of accounting numbers nor seeks to establish the social desirability of an alternative to GAAP. Instead, the present research design uses a utilitarian benchmark for assessing the role played by alternative disclosures as investors assess firm performance, resources, and obligations.

1.2 Background on Financial Reporting Disclosures

A discussion of financial reporting disclosures and regulatory environment should consider the use of financial reporting data (despite its source) by investors. Financial data are obtained by investors via financial statement representations, alternatively reported disclosures as mandated by regulators, voluntary disclosures made by managers, and also information sources via information transfers between comparable firms and macroeconomic data. Absent making judgments over the value of financial reporting regulation, this study considers the potential information offered by financial statements and alternative disclosures forms as outcomes from not only the current regulatory environment, but also from managers' incentives to reveal financial data voluntarily. The present thesis is silent on the desirability of having a regulated financial reporting environment. Instead, the outputs of the financial reporting system in the present sample evidence are considered potential

sources of information from which investors find useful information to impound into stock prices.[15] Yet, the question of how investors might perceive information offered by a financial statement representation compared with alternative disclosures is important to the present thesis.

However, it is unclear whether financial reporting regulators agree that capital markets are efficient with respect to publicly available information offered by financial statements and by alternative disclosures (i.e., semi-strong form efficiency in Fama [1970]). This view of market efficiency suggests that the substance rather than the form of a disclosure is more important. Whereas, the FASB and its predecessors have traditionally held the responsibility for issuing accounting standards, the SEC has generally performed the role of issuing disclosure standards.[16] With the FASB having implicit authority to establish financial statement recognition criteria, the SEC has generally mandated additional financial disclosures and rarely changed the recognition criteria adopted by the FASB. Accordingly, the FASB has established restrictive criteria for financial statement recognition and seems to share the belief that the form and the substance of the disclosure will influence the reliability of the signal. Implicit in this belief is that the establishment of strict recognition criteria is necessary because absent an event's formal recognition into financial statements, its signal would not be fully reflected in stock prices. Thus, the previously mentioned distinction between recognition and disclosure is not likely to go unnoticed by financial statement users.

One solution is to establish strict criteria for formal recognition of economic events into financial statements. If consistent with the underlying economics of the event being measured and communicated, strict guidelines would offer investors a signaling feature to its recognition versus

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[15]A price-orientation is chosen for the present thesis although future research might consider the criticism of Rubenstein [1975] against price-oriented market efficiency in favor of a volume or trading-oriented definition of market efficiency. The tests of the latter are deferred to further research regarding investors' uses of alternative disclosures in those cases where price changes are and are not evident.

[16]The FASB's responsibility for issuing accounting standards derives its authority from the SEC. In fact, private sector standard-setting was not established until the SEC issued Accounting Series Release 150 in 1973. ASR 150 officially sanctioned accounting standards of the FASB as the basis for statutory reports filed with the SEC.

disclosure choice. Therefore, investors would obtain financial information that has distinct characteristics based on its source allowing its informativeness to be appropriately impounded into stock prices via a discount or perhaps a premium due to its placement. However, the distinction that exists in contemporaneous financial reporting practices does not result from strict adherence to recognition or disclosure criteria.

For example, SFAS No. 123, *Accounting for Stock-based Compensation*, began as an exposure draft that mandated recognition of expense for incentive stock options at the date of the grant. However, the final accounting standard does not require recognition, but instead allows disclosure in footnotes. The rationale for the change was not based on distinct recognition criteria, but was instead supported because . . . *the nature of the debate threatened the future of the accounting standards setting in the private sector* [FASB, SFAS No. 123, ¶60]. The FASB went on to say that the . . . *Board continues to believe that financial statements would be more relevant and representationally faithful if the estimated fair value of employee stock options was included in determining an entity's net income* [FASB, SFAS No. 123, ¶61]. Therefore, the distinction may not be clear to current investors.

Also, alternative disclosures are often used to explain financial statement representations that result from a choice of a specific accounting procedure. No distinction is suggested by the FASB regarding the communication of this economic event. Ignoring the potential (second-order) signaling effects of an accounting choice or disclosure, the data in alternative disclosures again may have no clear distinction to investors compared with its related financial statement data.[17] In some cases, investors might perceive the resulting financial statement representation as a weaker signal of intrinsic value or change in value than the related alternatively disclosed data. Thus, investors might

[17]Some examples of another problem are also worth of mentioning. Recognition may be a choice by managers and signal managers attempts to mask economic events such as poor operating results (e.g., see Barth [1994] and Hand [1989]).

use data in alternative disclosures as a complement or perhaps an alternative to financial statement representations.

Livingstone [1967] was one of the first accounting researchers to examine how users respond to different accounting methods chosen by managers. In the electric utilities industry where return on investment is an important statistic for determining rate changes, Livingstone finds that some governmental agencies respond differently to a variation of accounting methods used by firms. Since the selection of an accounting method can affect the agencies' decisions on electrical rates, he focused his research on a period in which companies could use a variety of accounting methods for reporting inter-period allocation of tax and thus influence its periodic profits via the choice of accounting method. He finds that governmental agencies accustomed to uniform practices use unadjusted rates of return while governmental agencies that previously considered the effects of alternative accounting procedures on after-tax profits use adjusted figures. Thus, once the users of financial statement information learned to recognize and adjust for alternative accounting choices, they continue to do so in future periods for other changes in accounting choice. It is likely that investors use similarly informed strategy when impounding information into stock prices that results from increasing alternative financial reporting disclosures that offer new information about financial statement representations or firm value.

Other research adds insight into how investor use both recognized and alternatively disclosed data. Imhoff, Lipe, and Wright [1993] regress stock returns onto a recognized item and an alternatively disclosed item to test the coefficients for valuation differences. They show that both a recognized and disclosed item significantly contribute to the explanation of the variation in stock returns and the valuation implications are not significantly different.[18] Evidence from experimental data in an investment setting also provides insight into how users view recognized versus disclosed data. Harper, Mister, and Strawser [1987] find that subjects in their investment setting respond

[18]Ely [1995] examines a cross-section of firms and confirms the results of the Imhoff, Lipe, and Wright [1993] industry analysis.

differently to footnote disclosures compared with their response to data formally recognized in financial statements of the same information. However, the results may be artifacts of the ambiguity in the questions since some subjects also removed accounts payable from the numerator of a debt/equity ratio.[19]

Thus, the evidence from experimental evidence suggests that placement in a footnote versus recognition sometimes affects how subjects use of the data. The results suggest that users discount the informativeness of alternatively disclosed data. The discounting might be attributed to perceived shortcomings in alternative disclosures' reliability and relevance compared with those same qualities of financial statement representations. However, the evidence appears more convincing from archival data in an investment setting. That evidence suggests that users impound recognized and alternatively disclosed data that measure similar economic events into stock prices without discounting for the placement in a footnote in support of the equal usefulness argument.

Contributing to that area of research, the present thesis uses the market value of equity of the firm to investigate the degree to which GAAP-based summary measures are adjusted by investors using alternatively disclosed financial reporting data. The research design places a linear restriction on the adjustments which demands that a more useful summary measure that results not only be informative, but also be of a form that information lost through aggregation and from the imposed linear restriction does not dominate their informativeness (thus biasing in favor of the null hypothesis). Also, the present thesis assumes that a range of factors affecting reported and adjusted summary measures exists in the public domain and that investors have acted upon those sources by the end of each estimation period of interest.

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[19]Also, not supporting statements made by the FASB that expects differences between informed and uninformed users, they find no significant differences in responses across those subjects. In SFAS No. 87, the FASB [1985, ¶116] suggests that footnote disclosure is not an adequate substitution for recognition, suggested if the two are equally useful, not because of where the information is presentation, but due to the impairment of financial statements' usefulness and integrity each time a qualifying item for recognition is alternatively disclosed. However, they state that the . . . *equal usefulness argument may be valid for some sophisticated users*, but not for others.

Furthermore, it is assumed that investors implicitly assess the value of firms' economic resources, obligations, and changes in equity. Although many alternatives exist for these summary measures, GAAP-based specifications are assumed to be one set of those alternatives used by investors to set equilibrium equity values. The restatement of GAAP-based summary measures using the candidate adjustments in this thesis is another. Thus, the primary question asks which of the two alternatives of representing summary statistics about firms' economic resources, obligations, and firm performance is closer to that amount assessed.

1.3 Organization of the Thesis

The thesis is organized as follows. Chapter 2 briefly reviews the results of prior financial reporting research and describes the three valuation models. In Chapter 3 the candidate adjustments chosen to test the research questions of the thesis are described. Chapter 4 develops the research hypotheses. In Chapter 5 the research design, sample selection issues, and variable measurement process are explained. Chapter 6 provides descriptive data on the sample, candidate adjustments, and presents the primary results of the empirical tests. The chapter also discusses diagnostic procedures and other sensitivity analyses done throughout.

Finally, Chapter 7 summarize the results of the empirical evidence on the thesis. Additionally, Appendices A-D, Tables, and Bibliography follow Chapter 7. The Appendices A-D discuss the LIFO effect on earnings, Vuong's [1989] likelihood ratio statistic, tests for omitted variables bias, and an alternative regression procedure used in this study, respectively.

1.4 Contributions of the Thesis

The results of this thesis contribute in three ways to the understanding of how investors use financial reporting disclosures *vis-a-vis* a process of financial reporting analysis.

- First, this thesis contributes to a broader understanding of financial reporting by assessing the usefulness of various financial statement adjustments that equity investors might use to *correct* detractors in reported financial statement numbers. This thesis investigates variables that are often ignored by capital markets researchers when assessing the abilities of firms' earnings, assets, and liabilities to explain stock prices and returns. The results of empirical tests of the value-relevance of alternative disclosures conditioned on GAAP-based information are consistent with the predictions on four of the five asset adjustments (intangible capital, depreciation, and also pension and OPEB plan assets), three of the four liability adjustments (operating leases, contingencies, and pension obligations), and the three types of adjustments to earnings (cost of goods sold, depreciation expense, and other expenses).

- Second, this thesis adds evidence to the small body of accounting research that investigates the association between equity values and information disclosed, but not recognized, in financial statements that might be used by investors to restate GAAP-based summary measures. This thesis lays the foundation for using multiple (unrecognized) disclosures that have incremental information beyond recognized financial statement items. For the tests of the aggregation process used by investors of summary financial signals, the empirical results support the prediction that summary measures of resources and obligations better reflect the data generating process in equity values than do reported measures of resources and obligations.

- Third, this thesis offers evidence to the research agenda that attempts to explain and predict accounting practice via the impact of a comprehensive set of financial reporting disclosures. From a normative perspective, the results of this thesis could assist economic modeling that posits a relation between generic financial variables (e.g., earnings and book value) and market values.

CHAPTER 2

The Role of Financial Reporting Analysis

The search for relevant information in financial disclosures likely begins with an assessment of the quality of the information offered by financial statement representations. The quality of financial statement representations as signals of firm value influences the perceived informativeness of additional forms of reporting. For example, investors might find the information contained in a footnote disclosure on inventory reporting practices of a firm as more or less informative depending on whether managers *appropriately* (i.e., in the investor's eye) reflect the cost-flow of that firm's inventory. Thus, the usefulness of the systematic properties of financial statement data depends on those systems that generate the financial statement representations.

Investors can improve their understanding of the structure of the system generating accounting numbers by careful analysis of the assertions made by management in financial statement representations and related forms of alternative disclosures. Investigation into both the assertions embodied in financial statement representations and those in alternative financial disclosures is similar to an auditor's challenge of obtaining and evaluating competent evidential matter about the fairness of the set of financial statement information on which an opinion is rendered. Just as auditors gather evidence to express an opinion on the financial statements, investors obtain evidence on management's assertions by considering the information contained in both financial statement representations and alternative disclosures that relate to the existence, completeness, valuation, rights, and obligation assertions made by management.

2.1 Prior Financial Statement Analysis Research

Hoskins, Hughes, and Ricks [1986] finds that some alternative financial disclosures released concurrently with the announcement of annual earnings have incremental information content for explaining the variation in stock returns. They show that disclosures of dividend changes, prospective comments by officers, and prospective operating data that describe good news on shipments and bad news on order backlogs offer incremental information content to unexpected earnings. However, they state that . . . *future studies of market reactions may need to control for such disclosures* . . . and that the *significant remaining unusual price variations indicated by* (their) *binomial tests, suggest that further research on the information content of disclosures concurrent with earnings is warranted.*

Nevertheless, the research designs of most (financial statement analysis) studies that investigate how capital market participants use financial statement data fail to consider alternative sources of financial information. The studies typically use the articulation of the financial statement information via alternative combinations of financial statement data (e.g., ratio analysis using variables such as return on assets) as sample evidence. For example, in a purely statistical approach to uncovering value-drivers in financial statement representations, Ou and Penman [1989, hereafter OP] uses financial statement data to produce various ratios in obtaining a predictive summary measure of future earnings. That is, OP investigates *hidden* value-drivers in financial statement data via financial ratios.[20] From their mechanical approach to fundamental financial statement analysis, they show that the relation between their earnings predictor and future stock returns captures much of the *contemporaneous* association between earnings and stock returns documented in Ball and Brown [1968]. However, there are several reasons (e.g., omitted/correlated variables problems that

[20]Ou and Penman [1993, 2] states that their previous suggestion that their (*Pr*) indicator proxies as a summary value measure is . . . *misleading. The indicator is a diagnostic (to detect future earnings changes) but not a value measure.*

lead to faulty inferences) to be skeptical of their resulting *model* that employs only financial statement data.

Contributing to the evidence on fundamental financial statement analysis, Lev and Thiagarajan [1993, hereafter LT] shows that a fundamental (*quality of earnings*) score is more effective in capturing the permanent component of earnings than a time-series persistence measure. LT deviates from the mechanical methodology in OP that simply allows statistical models to select value-drivers in financial statement data. Instead, they select predictive variables based on those claimed to be used by financial analysts. They find signals that are important determinants in explaining the variation in abnormal returns that suggests that those variables offered by financial analysts are value-relevant even when conditioned on earnings.[21] Thus, the LT results link the present thesis to most fundamental financial statement research as their sample evidence included variables, not only constructed from related financial statement data, but also some alternatively disclosed data (e.g., the order backlog of a firm disclosed in the MD&A report). This study extends this research by considering the valuation role of alternative disclosures about financial statement representations concerning investors' determination of the market value of equity common equity.

2.1.1 The Valuation Effects of Assets and Liabilities

The literature that examines the valuation effects of assets and liabilities provides insights into whether a firm is valued by investors using measures of its resources and obligations. Landsman [1986] uses an asset-and-liability-based valuation model where the unobservables are the market values of assets and liabilities. He compares the estimated coefficients on the variables of interest to their theoretically predetermined values. Recently, other researchers have used a similar valuation

[21]The fundamental score in Lev and Thiagarajan [1993] ranges from one (highest quality) to five (lowest quality) and has an appealing property since it can be estimated on a timely basis (e.g., quarterly or annually) instead of requiring a long and sometimes unstable time-series process. In their study, they include variables that offer signals of future growth, profitability, and *quality* of earnings. They find that varying economic and industry conditions have the predicted influence on the included variables.

model where a firm's equity at time t equals its assets minus liabilities at time t (Barth and McNichols [1994]; Barth [1991, 1994]; Barth, Beaver, and Stinson [1991]; and Beaver, Eger, Ryan, and Wolfson [1989]). If the variables chosen to represent assets and liabilities equal the amounts implicit in equity values, the use of this type of valuation model implies coefficients on assets and liabilities equal one and minus one.

To evaluate the differences between the economic signals used by investors and that variable specified in each valuation equation, Brown [1967], Bowen [1981], and Barth [1991] offer evidence on differential valuation of accounting alternatives. These studies investigate which specifications of economic resources and obligations are the best proxies for those economic variables as assessed by investors. The criteria in Bowen [1981] include closeness of coefficient estimates to predicted magnitudes, number of estimated coefficients possessing the predicted signs, number of significant t-statistics, and a measure of goodness-of-fit. The present study uses similar statistical and economic rationale to test whether alternative financial reporting disclosures yield more value-relevant summary measures of a firm's resources and obligations than do GAAP-based (and unadjusted) summary measures.

2.1.2 The Information Content of Earnings

The literature that analyzes the relation between earnings and stock returns was developed directly from Ball and Brown [1968, hereafter BB] and assumes that the efficient market hypothesis is generally descriptive. BB finds that earnings are more successful than a cash flow measure (earnings less depreciation) in predicting the sign of annual stock returns although only 10-15% of the market reaction takes place in the month that earnings is announced by a firm's managers.[22] However, the

[22]Beaver [1968] approaches the valuation question of earnings by examining trading levels and price changes of common stock in the weeks surrounding the earnings announcement. He finds that the absolute values of the price changes and the level of trading are significantly higher during the announcement than in any other week. Also, Niederhoffer [1971], May [1971], and many others show that earnings is used by investors to assess firm value.

debate over properly measured earnings has a long history in accounting research (Paton [1922], Canning [1929], Edwards and Bell [1961], Chambers [1966], and Sterling [1970]).

Beaver, Lambert, and Morse [1980, hereafter BLM] revitalized the debate by introducing a *properly measured earnings variable* called ***ungarbled earnings*** in their model of the relation between price and earnings where price is proportional to expected ungarbled earnings.[23] BLM shows that prices act as if investors believe the process that generates earnings is a compound process where the first process (ungarbled earnings) is linked to prices and appears to exhibit a lagged response to the information reflected in prices (i.e., prices lead earnings). The second process (a *garbling* term or measurement error) reflects the effects of events on earnings that have no impact on contemporaneous security prices. Dechow [1994] investigates the question of the value-relevance of the accrual process to earnings and documents that earnings is a superior summary measure of firm performance. She shows the role of accruals in mitigating temporary mismatching problems in cash flows. These studies offer substantial evidence on the incremental information of accruals that yield earnings from cash flows, yet do not provide direct evidence on whether the role of these accruals is *to mitigate timing and mismatching problems* in cash flows to produce a more useful summary measure of firm performance.[24]

2.1.3 The Feltham-Ohlson Valuation Model

Building on the earlier contributions of Preinreich [1938], Edwards and Bell [1961], Peasnell [1981, 1982], and Ohlson [1989a, 1989b, 1990, 1991]; the Feltham and Ohlson [1995, hereafter FO] valuation approach exhibits a desirable property of capturing a firm's common equity value from

[23]BLM shows that the market value of equity shares is proportional to expected ungarbled earnings (denoted as x_t). They denote stock price by P_t and the factor of the proportionality by ρ: $P_t = \rho\ E_t(x_{t+k})$, $k \geq 1$. Under the assumption that ungarbled earnings follows an IMA (1,1) process, the time-series of expected ungarbled earnings is equal to the time-series of expected permanent earnings, except for a growth parameter that depends on dividend payout.

[24]However, yet to be answered is the question of whether alternative disclosures can further mitigate the timing and mismatching problems in GAAP earnings. In the current financial reporting environment, a role of additional forms of financial reporting might be to provide an information system that is a cost-effective compromise between the current recognition criteria and a more ambitious practice of full recognition.

operating activities yet remains independent of financing and investment activities (Feltham and Ohlson [1994a, 1994b]). The FO valuation approach explains equity valuation completely in terms of accounting numbers and defines firm equity as its book value plus discounted expected future earnings in excess of a normal or expected return on book value. Feltham and Ohlson [1995] shows that the market value of common equity is equal to book value plus discounted expected future earnings in excess of a normal return on book value.[25]

An analysis of the FO valuation model highlights the potential gains to investors of conducting a comprehensive financial reporting analysis. In the model, an investor's calculation of future abnormal earnings is influenced by two factors. The first factor determines whether book value is a reliable measure of firm value. That is, book value is expected to be a reliable measure on which market agents base required return calculations and use as a fundamental valuation signal (i.e., an intercept in the FO valuation model). However, biased accounting practices and noise in accounting measurement choices create an additional transitory component that affects the intercept and the slope coefficient in the FO valuation model.[26]

A second factor in the FO valuation model determines the persistence in economic rents and allows investors to assess the flow component of the model - abnormal earnings. This factor is independent of the process of adjusting beginning of the period book value. That is, the second factor assesses how return on equity (ROE) deviates from its required ROE given a reliably

[25]Peasnell [1982] shows that accounting manipulations do not affect value implications of the model ***assuming***: (1) an infinite horizon forecast for future returns on equity (ROEs) and (2) clean surplus accounting. That is, Peasnell shows that the effects of accounting manipulations will unravel given a long enough time period. However, since expecting future ROEs to be forecast over finite horizons is reasonable (with error), investors benefit from financial reporting disclosures that offer more timely and precise information when calculating the present value of expected abnormal earnings. For example, FO shows that investors benefit from financial disclosures that improve their ability to reconcile a firm's book and market values.

[26]Imhoff and Lee [1995] discusses the measurement error in book value resulting from biased accounting procedures and provide evidence that in an industry with significant growth opportunities the results of the FO valuation model are improved by capitalizing an unrecognized asset.

measured book value or basis of capital.[27] To improve their ability to assess abnormal and expected earnings, investors might demand alternative financial reporting data that allow them to predict more accurately future earnings and book value over their finite horizon of interest.[28] This demand for information could enable investors to reconcile differences between book and market values of the firm and obtain more precise measures of abnormal earnings.

[27]Ohlson [1995] further assumes that the unconditional mean of the information sources other than abnormal earnings is equal to zero and suggests that this variable follows an auto-regressive process. The assumption may not be realistic if information sources other than abnormal earnings can bypass the accounting system over the relevant forecasting horizon for an investor.

[28]Bernard [1994] shows that forecasts of abnormal earnings and book value over relatively short horizons may be sufficient to describe firm value. Although, he notes that biases in accounting practices increase the *sufficient* horizon necessary to describe firm value.

CHAPTER 3

The Proposed Adjustments and Testable Predictions

The systematic properties of financial statement representations do not depend entirely on the characteristics of firms' production-investment and financing decisions. They also depend on the managers' choices of accounting techniques, disclosure rules enacted by regulators, and the latitude afforded managers in selecting accounting techniques and disclosure rules. Arrow [1985] suggests that managers have an advantage of *hidden information* over a firm's current and prospective investors.[29] That is, debt and equity investors monitor the actions of a firm's managers and allocate their investment resources by evaluating incomplete information.[30] Therefore, stakeholders might demand alternative financial disclosures to meet their specific information needs so as to remove perceived distortions or noise in financial statement representations.

Another reason that financial reporting is not perfect and may require adjustments to improve its informativeness is that an economic event and its related accounting entry do not correspond precisely. For example, the results of some managerial activities are not, partially or in whole, reflected in financial statement representations during the period the economic event occurs, such

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[29]Arrow [1985] classifies other forms of informational advantages as *hidden actions*. These involve actions that cannot be accurately observed or inferred by others. It is impossible to condition contracts on these types of actions. Additionally, Ross [1978] shows that information maps onto equilibrium market value when investors make probability assessments, *based on incomplete information*, of the payoffs on a firm's fundamental assets.

[30]Although Jensen and Meckling [1976] shows that the price protection of investors with rational expectations creates an incentive for managers to contract for monitoring activities that restrict their own abilities to undertake value-reducing actions (e.g., overconsumption of perquisites, shirking, or stealing), bias in financial reporting remains as managers equate their marginal rates of substitution between wealth and nonpecuniary benefits. Also, noise in financial reporting remains due to the inherent limitations in a GAAP-based (or any other for that matter where standardized regulatory practices dictate reporting choices) reporting system.

as the recognition of gain or loss from discontinued operations or on sale of assets.[31] Other economic events either fail to receive accounting recognition or get measured with error. For example, managers might structure lease contracts to avoid balance sheet recognition of lease obligations, or estimate asset lives or residual values with either intentional or unintentional error. Additionally, generally accepted accounting principles permit different forms of accounting recognition by a firm's managers for an economic event.[32]

Therefore, the present study builds on prior research by (1) showing the role of a proposed set of adjustments to financial statement representations in mitigating temporary or permanent mismatching problems in earnings, assets, and liabilities when used by investors to assess firm values, and (2) testing of the superiority of *adjusted* summary measures compared with those reported in financial statements.[33] In the present study, investors are expected to adjust financial statement representations (FSR) using the complementary set (FSR^c) to financial statement representations (FSR) contained in the complete set of financial disclosures (FD). Although Barth, Beaver, and Stinson [1991]; Barth [1994, 1991]; and Tse [1990] show the value-relevance of individual elements contained in FSR^c, few studies specify models using *multiple* elements contained

[31]In some regulatory environments (e.g., Australia, New Zealand, and the United Kingdom), financial reporting regulators permit either a incremental or decremental asset revaluation in the period of the economic event. In the United States, the Financial Accounting Standards Board enacted SFAS No. 121 [FASB, 1995] that requires recognition of the change in a long-lived asset value when its carrying value exceeds its fair value.

[32]From the perspective of financial reporting users, uniform accounting standards might restrict managers' abilities to distort financial disclosures, thereby offering more credible information. However, rigid accounting standards could also restrict managers' portfolio of disclosure choices in their efforts to signal proprietary information. Yet, in one extreme, rigid standards might induce managers to expend resources in an effort to structure business transactions that achieve desired *accounting results*.

[33]Fama and Jensen [1983] shows that the price protection of investors encourages contracting parties to use the most efficient procedures that lead to the highest firm value. Also, Healy [1985] and Smith and Warner [1979] shows that accounting numbers fulfill a role in the monitoring process, yet few studies investigate the roles those additional financial reporting disclosures perform as an instrument for efficient contracting between a firm's stakeholders. Accordingly, the present sample evidence can be used to investigate whether alternative financial reporting disclosures are used in a contracting role. For example, if investors adjust financial statement representations for (perceived) bias and noise using the information offered by alternative disclosures, then supply of additional forms of financial reporting disclosures are the outcome of efficient contracting. Otherwise, an arbitrage opportunity exists by simply repackaging a firm's contracts. However, these tests are deferred to future research in this area.

in FSR^c in addition to element of FSR. Thus, the hypothesis tests for the present study are generally of the form (stated in the alternative),

H_a: ***Adjusted financial statement summary measures using elements contained in FD are more value-relevant than those elements contained in FSR.***

If the results support the alternative hypothesis, then restated financial statement information about the summary measures of a firm appears to reflect more accurately those measures assessed by investors when valuing the firm. If the evidence does not lead to a rejection of the null hypothesis, then the results imply those alternative disclosures offer, on average, noise to investors' assessments of future earnings, and also contemporaneous signals of economic resources and obligations when conditioned on being provided financial statement representations.[34]

3.1 Candidate Adjustments

Most textbooks in financial statement analysis suggest adjustments to financial statement representations. For example, Cottle, Murray, and Block [1988, 137] suggests in the revised edition of Graham and Dodd's classic fundamental analysis text that the security analyst is . . . *able to capture a more faithful picture of reality by adding to or adjusting this information in ways not permitted by accounting rules*. The present thesis posits potential adjustments that investors might use to construct alternative summary measures to those in financial statements.[35] However, one obvious limitation to the present thesis is that the candidate adjustments, individually or in whole, may be not used by investors, yet others are.

Therefore, the operationalization processes in this study test the value-relevance of those candidate adjustments most often discussed in financial statement analysis textbooks and practitioner-oriented publications. The thesis predicts that seven areas of financial statement

[34]A lack of rejection of the null might suggest that the operationalized restatement process of alternative financial reporting disclosures is/are not consistent with the restatement process used by investors.

[35]Many of the proposed adjustments result from the insight in White, Sondhi, and Fried [1994] and Stickney [1993], as well as other texts on financial statement analysis.

representations are likely to be adjusted by investors using the data in alternative disclosures. The seven areas include: inventory, intangible capital resulting from advertising and research expenditures, depreciation, contingencies, pensions, and other postretirement benefits. The following sections describe the operationalization process of alternative disclosures relating to these seven areas.

3.1.1 Inventory Choice and Valuation Assertion

Accounting Research Bulletin No. 43 states that the . . . *major objective of accounting for inventories is the proper determination of income through the process of matching appropriate costs against revenues* [APB, 1953, ch. 4, ¶3]. However, the choice is not that simple for a manager since IRS Regulations require that the same method of inventory accounting used for taxes be used for financial reporting. Thus, managers are likely to consider the impact of their inventory cost flow choice on the contracting costs to the firm.[36]

Therefore, as inventory cost flow assumptions articulate simultaneously onto the balance sheet and income statement, this study predicts that investors adjust the results of the cost flow choice by a firm's managers to reduce a potential distortion in one of the financial statement summary items: assets and earnings (i.e., dependent upon the choice of cost flow and changes in factor input prices). The thesis predicts that investors obtain a better signal of future earnings *vis-a-vis* an adjustment to contemporaneous earnings and obtain a better valuation of the economic resources of a firm *vis-a-vis* an adjustment to assets. For example, consider the choice of a LIFO cost flow in a period of changing factor input prices. The cost of recent purchases flows through to cost of good sold (COGS), yet old costs remain on the balance sheet. Here, the informativeness of ***earnings*** as a

[36]Hagerman and Zmijewski [1981] shows that managers consider the effects of inventory cost-flow choice on firms' contracting and political costs.

signal for future earnings is improved at the sake of a less informative measure of current resources - *assets*.[37]

When a LIFO method is used, the present thesis predicts that investors search for a current cost signal for reported inventory. They could simply adjust the LIFO inventory levels by adding the information offered in a financial reporting disclosure mandated by the SEC: the *LIFO Reserve*. This signal is available to investors since the LIFO reserve, usually disclosed in the notes to the financial statements, is the difference between the disclosed LIFO inventory level and an *as-if* first-in-first-out (FIFO) level.[38]

For example, the following adjustment, $Inventory^{as\ if\ FIFO} = Inventory^{LIFO} + (LIFO\ Reserve)$, would increase inventory by the LIFO reserve level. However, a price elasticity problem of input and output prices can exist. The price elasticity problem shown in Guenther and Trombley [1994] and Jennings, Simko, and Thompson [1996, hereafter JST] exists when the differential price change between a firm's input and output markets (i.e., a quasi-price elasticity of output prices with respect to input price) is not proportional. Although, these studies show the level of the LIFO reserve is a significant variable for explaining the variation in common equity values, the LIFO reserve exhibits a negative association to a firm's equity value. The negative association is counterintuitive if one expects the LIFO reserve to measure the economic difference between LIFO and FIFO inventory disclosures.

JST suggests that a negative association results from a firm's inability to adjust output prices fully when input prices change. Their results offer evidence that any potential increase in the informativeness of balance sheets due to recognizing the LIFO Reserve as a component of inventory

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[37]The theoretical argument about which method (i.e., LIFO, FIFO, or WAC) provides the best economic measure of earnings or assets is maintained for firms experiencing either declining or rising input prices. However, the direction of the bias in the reported data is reversed dependent on the direction of input price changes. For example, LIFO closing inventory is understated (overstated) for firms experiencing rising (declining) input prices.

[38]Using the definition of alternative financial reporting disclosures in the present study, the *LIFO Reserve* is an example of a disclosure that offers additional explanatory information about financial statement representations.

is more than offset by the loss of information that occurs when the levels of LIFO Reserve and LIFO inventory are aggregated. However, the loss of information resulting from firms' inability to pass on input price changes is greatest for those firms with low correlations between its annual (LIFO) gross profit ratio and the year-end level of the Consumer Price Index (CPI).[39]

Thus, this study uses the information in a firm's disclosure of its LIFO Reserve as an adjustment to total assets of the firm for those firms above the median correlation between gross profit ratio and the level of a better industry-specific measure of changes in price - the Producers' Price Index (PPI). The March edition of the United States Department of Labor publication, *Producers' Price Index, Finished Goods (PPI)*, is used as the source of the fiscal year-end (FYE) rate (denoted *r*). The USDL data are available three months after the close of the fiscal year for calendar year-end firms. The availability of the PPI data coincides with the month of interest to the present thesis when the dependent variables of equity prices are obtained and returns are cumulated.[40]

To adjust LIFO inventory levels to ***as-if-FIFO inventory*** in periods of changing prices, this thesis predicts that investors adjust inventory levels for those above the median correlation level as follows,

$$(Inventory)_{i,t}^{as\ if\ FIFO} = (Inventory)_{i,t}^{LIFO} + (LIFO\ Reserve)_{i,t}, \qquad (3.1)$$

where the independent variables, the level of total *Inventory* reported using LIFO and *LIFO Reserve*, are disclosed alternatively in the footnote to the financial statements. Thus, the first adjustment to

[39]JST [1996] shows differences, across the 16 years 1976 to 1991, between LIFO Reserve coefficients from regressing equity values on balance sheet components and LIFO Reserve levels for firms that appear to be more or less able to adjust output prices in response to input price changes. The above vs. below median correlation between the level of CPI and gross profit ratio is used to partition the JST sample. Those with the higher correlation are predicted and shown to be more able to pass on changes.

[40]The Producers' Price Index (*PPI*) of finished goods is an index that measures average changes in prices received by primary markets in the United States by producers of commodities at all stages of processing. The index is designed to measure pure price changes of all commodities produced in agriculture, forestry, fishing, mining, manufacturing, including all stages of crude, manufactured, and processed goods.

the GAAP-based summary measures of a firm's resources is made for those firms above the median correlation level between the gross profit ratio and PPI of the sample is,

$$A.1: \ (Inventory\ adjustment)_{i,t} = (LIFO\ Reserve)_{i,t}, \qquad (3.2)$$

where the LIFO reserve is obtained from alternative sources other than financial statement representations. For those below the median value, no adjustment is done.[41]

Although no asset adjustment is made if a firm does not report some inventory under the LIFO method or if the inventory level is below the median value of the ratio of the levels of gross profit to PPI, the cost flow choice of a firm's managers can also affect the ability of contemporaneous earnings to summarize firm performance and signal future earnings. As an example, consider the inventory cost flow choice by a manager of a FIFO method (or a standard costing system that approximates a FIFO cost flow) in a period of changing factor input prices. If input prices are rising (falling), the inventory level on the balance sheet more appropriately reflects current costs (i.e., compared with a LIFO method), yet cost of goods sold (COGS) provides an imprecise signal of firm performance measured with current costs. If an investor is interested in finding the best signal of future earnings via contemporaneous earnings, the holding gain or loss that results from changing prices should be removed.

In those cases where some inventory is reported under a FIFO method, the present study predicts that investors adjust FIFO earnings to ***as-if-LIFO earnings***, essentially removing the holding gain/loss from reported earnings. However, the calculation of that holding gain/loss suggests that investors find a signal of changing factor input prices without the benefit of a LIFO reserve disclosure to proxy for those effects. Investors might estimate the holding gain by either adjusting

[41]The JST sample consists of 16 years of data for 8,842 firm-years and compares LIFO and *as-if*-non-LIFO financial statement representations where sample firms must report at least a portion of the inventory under a LIFO methodology. However, JST notes the limiting assumption made by their research design where operating, investing, and financing decisions are assumed to be identical under the LIFO and non-LIFO regimes.

beginning inventory by a specific price index (e.g., from government statistics on changes in industry prices) or obtaining a price index from a firm's competitors that use the LIFO method.[42]

Using the present research design and sample evidence, the latter estimation procedure suffers from a data sufficiency problem (i.e., lack of sufficient number of competitors' data). However, both suffer from the price elasticity problem discussed previously. For the cost of goods sold adjustment to any reported FIFO inventory amounts, the problem exists since government statistics on price changes concentrate on changes in output prices (not factor input prices).[43] Noting the price elasticity problem and without a reasonable proxy for input price changes, this study uses data from government statistics to estimate the holding gain/loss that exists for non-LIFO cost flows.

The present study uses the PPI data to adjust COGS by removing the holding gain/loss in earnings as a proxy for changes in input prices. The data show base year changes for industry classifications. A 4-digit SIC level is used to obtain a more precise signal that proxies for changes in input prices. The rate of price change is calculated as follows, $r = \frac{(FYE\ price\ index)_t - (FYE\ price\ index)_{t-1}}{(FYE\ price\ index)_{t-1}}$. To adjust earnings to ***as-if-LIFO earnings***, this thesis predicts that investors adjust cost of goods sold,

$$(COGS)_{i,t}^{as\text{-}if\text{-}LIFO} = (COGS)_{i,t} + [(Inventory^{FIFO})_{i,t-1} * r_t] + [(Inventory^{WAC})_{i,t-1} * \frac{r_t}{2}], \qquad (3.3)$$

using industry price indexes (where r = change in a price index). For those firms reporting any of their inventory using the weighted-average-cost (WAC) method, this study adjusts the beginning WAC inventory level by multiplying its value by ½ of r.[44] In those cases where firms experience

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[42]An analysis of competitor firms' financial reporting disclosures could offer a price index that can be used to restate FIFO COGS to *as-if*-LIFO COGS as follows, $Competitors'\ Price\ Index = \frac{\Delta\ LIFO\ Reserve}{Beg\ FIFO\ Inv}$.

[43]Although statistical reports give data on commodity price changes or changes in prices at varying stages of the production process, the data is not consistently reported for distinct industry classifications. Changes in input prices with greater precision than general descriptions of industries (e.g., 2-digit SIC classifications) is not known to the present author.

[44]The complexity of the analysis is increased when firms report under more than one method, as often happens. However, the above analysis is maintained.

rising (declining) input prices and some inventory is reported under the FIFO and WAC methods, the price index will be positive (negative) and is predicted to adjust for the understatement (overstatement) of non-LIFO COGS. The second and third factors in Equation (3.3) sum to yield the first adjustment to a firm's earnings,

$$E.1: (COGS\ adjustment)_{i,t} = [(Inventory^{FIFO})_{i,t-1} * r_t] + [(Inventory^{WAC})_{i,t-1} * \frac{r_t}{2}], \quad (3.4)$$

Table 3.1 is provided to summarize the effects on assets and earnings of the adjustment process to inventory and COGS. For the adjustment to cost of goods sold in a period of either rising or declining factor input prices, the adjustment is expected to be negatively associated with equity values. For rising (declining) prices, a positive (negative) adjustment removes the holding gain (loss) in FIFO costs of goods sold and decreases (increases) earnings. In both cases, earnings is adjusted to remove the unsustainable holding-effect (i.e., either the gain or loss) from the FIFO method of cost flow choice. Thus, a more accurate reflection of future earnings is obtained via the cost of goods sold adjustment.

Additionally, one valuation model specified in the present study uses earnings and book value simultaneously as bases for equity valuation (i.e., Feltham-Ohlson valuation model). Therefore, in order not to violate the *clean surplus relation*, the Feltham-Ohlson valuation model is tested twice. First, the asset adjustment is made and the model is tested. Second, the earnings adjustment (i.e., COGS adjustment) is made and the model is again tested.

3.1.2 Research & Development and Advertising

The second adjustment considers whether investors capitalize a firm's outlays for advertising and research and development (R&D) thereby perceiving these investments as offering future economic benefits beyond the current period. Accounting standards and generally accepted procedures cause most managers to report these outlays as period costs. The rationale is that the future economic

benefits from advertising and R&D outlays are uncertain and difficult to measure. For example, due to the uncertainty related to R&D outlays, SFAS No. 2 requires that managers recognize the outlay as a period cost.[45] GAAP typically follows the same reporting practice for advertising expenditures using similar rationale. However, Hirschey [1982], Hirschey and Weygandt [1985, hereafter HW], and Bublitz and Ettredge [1989] find that expenditures for R&D and advertising are capitalized by equity investors.[46] These studies show that market agents typically assess advertising investments as short-lived (one-five years) and R&D investments as long-lived (five-ten years).

If investors capitalize the expenditures as intangible capital, then GAAP-based measures of firm performance and resources can exhibit substantial noise as bases for equity valuation. The noise in earnings and assets results from expensing a cost that market agents believe has future economic benefit. The practice of expensing as incurred is likely to cause an understatement of resources for those firms investing in advertising and R&D. Additionally, the practice can reduce the comparability of earnings across firms (e.g., Lev and Sougiannis [1996] provides evidence on the association between R&D investment and subsequent earnings). Therefore, this thesis uses a method similar to that developed by HW to find out the extent to which advertising and R&D have future economic benefits and to estimate their economic amortization rates.

First, capitalization rates are estimated using the prior year's valuation role that advertising and R&D intensity plays in explaining the difference (normalized by sales) between the market and net book values of firms' assets for each industry. The model is estimated using the relative excess methodology in Thomadakis [1977] as a substitute for Tobin's Q used in HW,

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[45]The uncertainty surrounding capitalization procedures is the major tenet behind regulators requiring that these outlays be treated as period costs. However, earnings management and increases in audit risk are additional factors often mentioned to encourage the practice of expensing as incurred.

[46]In a related study that examines the value-relevance of R&D, Lev and Sougiannis [1996] finds that adjustments to reported earnings and book values are value-relevant to investors using return and price based models. Their results suggest that the stock of R&D intangible capital does not appear to be fully reflected contemporaneously in stock returns. They conclude that market participants either underreact to R&D information or that subsequent returns are compensation for the added risk related to R&D investments.

$$\frac{MVE_{i,t} - BVTA_{i,t}}{Sales_{i,t}} = \alpha + \beta_1\left(\frac{AdvExp_{i,t}}{Sales_{i,t}}\right) + \beta_2\left(\frac{R\&DExp_{i,t}}{Sales_{i,t}}\right) + \beta_3 GR_{i,t} + e, \quad (3.5)$$

where β_1 and β_2 represent the capitalization rates by investors into the market value of the firm on the advertising (*AdvExp*) and R&D (*R&DExp*) outlays, respectively. *MVE* is equal to the market value of equity at the end of the third month after the current year, *BVTA* is the book value of tangible assets less the book value of liabilities, *Sales* is the net sales revenue, and *GR* is the average annual rate of change in sales over the five-year estimation period.[47]

Second, economic amortization rates are estimated using the following HW procedure,

$$\hat{\alpha}_{j,t} = \frac{1 + (growth\%)_{j,t} - [\beta_{j,t} * (growth\%)_{j,t}]}{\beta_{j,t}}, \quad (3.6)$$

where α_j denotes the amortization rates on the investments (i.e., j = *R&DExp or AdvExp*), *growth%* represents the annual rate of change or growth rate in the investment, β_j represents the coefficient from estimating Equation (3.5) that yields each capitalization rate (i.e., where β_1 and β_2 represent the capitalization rates of advertising and R&D expenditures, respectively), and firm and time subscripts are as previously defined. The capitalization rates are different for firms in either different industries or for firms in different years. For a firm in the same industry and same year, no difference results and produces fifteen capitalization and amortization rates for the three years of interest on the present sample evidence. Therefore, the HW procedure allows one to consider the

[47]The annual rate of change is estimated for the 1991 adjustment by, $GR = \sqrt[4]{Sales_{1990/1986}} - 1$. *GR* is estimated again for the adjustment in years 1992 and 1993 by rolling the five year period forward each year. To be consistent with HW, the present study constructed a four-firm concentration and included the residual concentration (orthogonal with respect to advertising and R&D intensity, and also the annual stock price beta measure of risk into the Equation (3.5). Yet, similarly to three of the four cases in HW and their main results, the four-firm concentration variable and beta offered no additional explanatory power. Thus, the results of tests using these two additional variables are not shown. Additionally, tangible assets is defined as plant and equipment, inventories, trade receivables, and investments in unconsolidated subsidiaries or other firms where no significant control exists.

valuation effects of current and prior years' investments in advertising/R&D by using the current year's expenditure.[48]

The process yields a capitalization rate on R&D and advertising expenditures that allows investors to adjust GAAP-based measures of firm resources using a firm's current period expenditure level. The second asset adjustment to a firm's assets is operationalized by,

$$A.2:\ (IC\ asset\ adjustment)_{j,i,t} = Outlay_{j,i,t}\left[\frac{(1 + growth\%_{j,i,t})}{(\alpha_{j,i,t} + growth\%_{j,i,t})}\right], \qquad (3.7)$$

to capitalize the investment in intangible capital, where *Outlay* is the GAAP-based expense for the period, and growth% is an annual rate of change in the investment inclusive of the current year. Additionally, this study predicts that investors adjust earnings to reflect the amortization charges for R&D and advertising investments that no longer have future economic benefit. That is, the economic effects of eroding the two intangible stocks of capital are expected to be considered as reductions of periodic earnings.

The second adjustment reduces earnings by the economic amortization *expense* given by $(Amortization\ charge)_{j,i,t} = \hat{\alpha}_{j,i,t} * IC_{j,i,t}$, where the subscript j again represents either R&D or advertising, and IC is the stock of intangible capital for the current year given by estimating Equation (3.7). Thus, the second adjustment to earnings is,

$$E.2:\ (IC\ amortization\ adjustment)_{j,i,t} = \hat{\alpha}_{j,i,t} * (IC)_{j,i,t}, \qquad (3.8)$$

where all variables are as defined previously. Through the estimation procedures shown in Equations (3.5), (3.6), and (3.7), an additional adjustment to add-back the cash outlay is not necessary. The capitalization process initiated by estimating Equation (3.5) and completed by estimating Equation (3.7) uses the valuation effects evidenced from the previous five years relative

[48]The result derives from the HW assumption of a constant and proportional relation between the current stock of intangible capital and the current expenditure level across all years. Although the assumption is suspect over long estimation periods, the results over the three year interval in the present study are not likely to be affected. The proportionality *(c)* is defined for the present study as: $\hat{c}_j = \partial(MVE-BVTA)/\partial(expenditure_j)/Sales$.

to the current estimation year and the rate of change in the expenditure inclusive of the current year's amount. Thus, the capitalized amount is amortized by estimating Equation (3.7) which allows the adjustment process to consider not only the erosion of the previous year's level of intangible capital but also the net effect of the erosion of intangible capital resulting from the current year's outlay and also the valuation effects of that cash outlay.

Therefore, the results of the R&D and advertising adjustments processes are expected to provide signals, when aggregated with other adjustments and financial statement representation, that better reflect those summary measures used by investors to value firm equity. Table 3.2 summarizes the effects of the advertising and R&D adjustment process on the GAAP-based summary measures. The present thesis predicts that the adjustment for intangible capital is positively associated with equity values. That is, the better reflection of a firm's economic resources is expected to be value-relevant and positively associated with the market value of equity. Alternatively, the amortization adjustment is an outflow of a firm's economic resources and is expected to be negatively associated with equity values.

3.1.3 Operating Lease Obligation

A third adjustment area considers off-balance sheet financing from operating leases. In the present thesis, equity investors are expected to *recognize* an operating lease commitment as a firm's obligation and capitalize its related leased asset. The prediction is supported by evidence from prior research on managers use of operating leases as a financing source and the results of Bowman [1980]. Bowman finds that investors use a debt-equity ratio adjusted for operating leases when assessing equity risk. Also, Imhoff and Thomas [1988] documents that managers systematically substituted operating leases for capital leases in response to SFAS No. 13 that mandated all capital assets be reported as assets and liabilities. Also, Imhoff, Lipe, and Wright [1991, hereafter ILW]

describes how failure to capitalize operating lease commitments can materially distort the risk and performance measures of a firm.

The information sources for the alternative disclosures on operating leases are managers' reporting practices according to the requirements of SFAS No. 13. That standard requires disclosure of rental expense (with appropriate classifications for minimum, contingent, and sublease rentals) for each period an income statement is presented. Also, future (minimum) lease payments for each of five succeeding fiscal years, and in the aggregate thereafter, must be disclosed. With this information, an investor can estimate the *off-balance-sheet* liability by discounting future minimum rental payments using a reasonable *discount rate* that is sometimes disclosed in the debt or operating lease footnote.

However, ILW documents that a simple heuristic of "eight times rent expense" outperforms discounted cash flow techniques. That is, the market appears to use a naive heuristic for estimating the debt equivalence of operating leases. Therefore, the present thesis predicts that investors adjust a firm's obligations as follows, $(Operating\ lease\ liability)_{i,t} = (Rent\ expense)_{i,t} * 8$, where rent expense is the current year amount and the factor of eight represents the (naive) heuristic. The unrecorded asset, which is more difficult to measure since additional variables must be assumed (e.g., life, economic depreciation rates, remaining years), can be estimated from ILW's [1991] asset capitalization table. The table allows for different levels of leased asset lives, marginal interest rates, and percentages of remaining years of life. The necessary detail to make estimates of these additional variables is not available to the present study. However, for most analyses and reasonable estimates of the factors, the estimate of the value of the leased asset is between 60% and 80% of the liability amount. Therefore, ILW suggests that 70% be used.

However, for the present study, where an asset-and-liability-based specification is employed to explain equity values, capitalizing any percentage of the estimated operating lease liability would yield explanatory variables that are linear combinations of one another. The resulting (perfect)

multicollinearity would produce a singular (and not invertible) data matrix. Yet, ignoring the lease asset would lead to a bias in the estimated coefficients on all included variables. Therefore, the net amounts of the liability and asset estimates are used in this study. The present thesis adjusts a firm's resources by the net of lease obligations and assets as follows, $(Net\ operating\ lease\ liability)_{i,t} = (Operating\ lease\ liability)_{i,t} * 30\%$. The first adjustment to a firm's summary measure of obligations is,

L.1: $(Net\ operating\ lease\ liability)_{i,t} = (Rent\ expense)_{i,t} * 2.4,$ (3.9)

where the net operating lease liability is determined using the above heuristic of eight times the rent expense and removing the approximated asset value of 70%. Table 3.3 summarizes the effects of adjusting a firm's total liabilities for operating lease disclosures.

3.1.4 Depreciation Choice

The choice of depreciation method also affects the ability of financial statement representations to measure a firm's economic resources. During the life of the capitalized asset, timing differences between economic and accounting values can result as managers choose among depreciation methods, and also estimate asset lives and salvage values. Their decisions may produce biased or unintentionally errant estimates of a firm's economic resources. Prior research offers insight into a potential bias of managers' reporting practices. Beaver and Dukes [1974] and Most [1984] find that market prices assign a more accelerated depreciation method to earnings than reported. Also, Bar-Yosef and Lustgarten [1994] finds that sum-of-years-digits (SYD) method better represents economic depreciation than does a straight-line (SL) method.

Additionally, since IRS Regulations do not require the same depreciation method for tax reporting as that used for financial reporting (as it requires in inventory valuation), many firms use

accelerated methods for tax purposes and straight-line for financial reporting.[49] The multiple practices are expected as managers attempt to minimize tax liabilities, as well as address possible concerns when earnings-based compensation plans exist, debt/equity ratios are high, or the firm faces political costs due to its size (see Zmijewski and Hagerman [1981, hereafter ZH]. As ZH and other studies suggest, managers choose accounting practices that are income increasing due to a variety competing hypotheses. Thus, a bias toward understating economic depreciation is likely (see also, Dhaliwal, Salamon, and Smith [1981] and Healy [1985]).

Brown, Soybel, and Stickney [1993, hereafter BSS] develops a methodology for converting both income statement and balance sheet amounts from straight-line to an accelerated method. BBS shows factor conversions for converting from straight-line to an accelerated depreciation given different average lives and growth rates. Compound growth rates in depreciation expense over the previous five years and the average total life of PP&E are necessary inputs for each year of the analysis. The conversion is consistent with the results of studies that show straight-line depreciation understates economic depreciation (on average) and suggest accelerated depreciation more closely approximates the uses of resources as signaled via earnings.

Therefore, investors are likely to restate financial statement representations to correct perceived distortions in accounting depreciation. Investors can restate financial statement representations using detailed information mandated by Regulations S-X and S-K of the Securities and Exchange Act of 1934. The information is contained in the required disclosures found in schedules V and VI of a firm's 10-K filings. However, the information in these alternative disclosures offers only limited attempts to reconcile economic and accounting depreciation. At best, attempts to reconcile the difference can remove some of the bias in managers' reporting practices (assuming one exists). At worst, any attempt at reconciling the difference simply adds noise to valuation models due to the

[49]More than 80% of U.S. firms in a sample of 600 firms annually sampled by the AICPA used straight-line depreciation from 1987 to 1989 [AICPA, *Accounting Trends and Techniques*, 1990].

complexity of adjusting asset categories across firms and industries. The third adjustment to a firm's earnings is,

$$E.3: (Depreciation\ adj.)_{i,t} = (BSS\ accel.\ depr.\ expense)_{i,t} - (SL\ depr.\ expense)_{i,t}, \quad (3.10)$$

where depreciation expense is restated based on estimated PP&E lives and growth rates. The adjustment is the difference between the (estimated) accelerated expense for the current year and the reported straight-line depreciation expense for the current year. As shown in BSS, the conversion approximates a restatement to a double-declining-balance method of depreciation expense. Additionally, the assets reported in the balance are adjusted to reflect better their economic value using a process that restates accumulated depreciation to *as-if* accelerated instead of as reported using the straight-line method. Again, the factor conversion uses PP&E lives and growth rates. The conversion (using the factors shown in BSS) approximates a restatement of PP&E to a double-declining-balance valuation assertion. The prediction that assets are adjusted by investors yields the third adjustment to a firm's reported summary measure of resources,

$$A.3: (A/D\ adjustment)_{i,t} = (BSS\ A/D)_{i,t} - (SL\ A/D)_{i,t}, \quad (3.11)$$

for those assets reported under the straight line method where *A/D* is accumulated depreciation. The conversion is available due to the systematic relation between straight-line depreciation and double-declining-balance method and depends on (1) the average total life of fixed tangible assets (measured by the dividing the average property, plant, and equipment gross values by the current year's depreciation expense) and (2) the growth rate in capital expenditures.

Table 3.4 summarizes the effects of the depreciation adjustment. One unique aspect to the asset adjustment is that a positive association with equity values is predicted. Since accumulated depreciation is a contra-asset on the balance sheet, an increase in the accumulated depreciation signals a reduction in the resources of the firm. As the contra-asset account balance increases, the

firm is signaling less resources available to the firm. For example, a firm's accumulated depreciation reported under a straight-line method in the early years or with an increasing asset base understates the erosion of the capital asset's value if investors believe that economic depreciation more closely approximates an accelerated method. As the adjustment reduces asset values, a positive association between the contra-asset account balance and equity values is expected.

Having proposed the previous adjustments to a firm's resources and earnings, the present thesis recognizes that depreciation charges represent (at best) an *ad hoc* writeoff of the cost of assets. However, this thesis is not simply proposing an adjustment from one *ad hoc* procedure to another. Instead, the information gains to investors are predicted to occur as investors attempt to remove a bias in reporting practices by managers. Consequently, adjusted assets and earnings (with their systematic biases removed) are predicted to reflect better those summary measures used as bases for equity valuation.

3.1.5 Contingencies

Occasionally, managers can report liabilities via alternative disclosures (e.g., footnotes or in the test of the MD&A report) if they assert that *either* the loss is not probable or the amount cannot be reasonably estimated.[50] SFAS No. 5 and the MD&A report mandated by the SEC require firm disclosures of loss contingencies that are not accrued by a charge to income. However, several factors would likely inhibit managers' desire to present the expected loss fairly or even a reasonable estimate of the loss. For example, pending litigation might restrict a manager's ability to signal asymmetric information about expected losses.

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[50]The FASB define a probable event as a *future event that is likely to occur* (SFAS 5, ¶3). Although this implies that recognition should occur if the probability of loss or asset impairment is greater than 50%, a manager can still assert that the liability cannot be reasonably estimated. Therefore, the probability of a loss can approach unity, yet recognition in the financial statement would not occur, and an alternative disclosure of the item in the footnotes would be allowed by GAAP.

Thus, the operationalization of both gain and loss contingencies face data problems.[51] Many contingencies are either not disclosed timely or not quantified when disclosed. Therefore, this adjustment is dependent on appropriate disclosures to quantify gain or loss contingencies that might affect firm value. For example, the American Institute of Certified Public Accountants annual survey of accounting practices followed in 600 annual reports, *Accounting Trends and Techniques* [AICPA, 1990], shows only three contingencies reported by at least one-third of the firms in the 1990 edition.[52]

This thesis predicts that equity investors are likely to use any available information about loss contingencies to adjust related summary items on the financial statements. That is, investors are expected to restate reported the GAAP-based measure to total liabilities using the information in disclosures of loss contingencies. The contingencies of interest to the present thesis are plaintiff and defendant litigation, environmental liabilities, possible tax assessments, commitments, and dividend payments in arrears. The following adjustment to a firm's total liabilities is predicted as investors capitalize the disclosure data with a firm's reported obligations as follows,

$$L.2: \ (Loss\ contingency\ adjustment)_{i,t} = (Capitalization\ of\ loss\ contingency)_{i,t}, \qquad (3.12)$$

to capitalize the level of the obligation for those items not recognized in the financial statements but described in alternative financial reporting disclosures. A critical assumption here is that no

[51]The ability of managers to recognize gain contingencies is usually not allowed until realization occurs. The FASB suggests that *care shall be exercised to avoid misleading implications* if gain contingencies are disclosed (ARB No. 50, ¶3). Thus, gain contingencies are rarely disclosed in practice. While issuing SFAS No. 5, the Board did not reconsider ARB with respect to gain contingencies. Consequently paragraphs 3 and 5 of ARB No. 50 continue in effect, although SFAS No. 5 supersedes the remainder of ARB No. 50 [FASB, 1975, SFAS No. 5, ¶17].

[52]In a study by the AICPA, the three contingencies that at least one-third of the sample-firms reported were, (1) a loss contingency due to litigation was reported by 391, (2) a loss contingency due to environment liabilities was reported by 170, and (3) a gain contingency due to unused net operating losses was reported by 152 of those sampled [AICPA, 1990]. However, since the NOL is recorded as a component of the deferred tax asset on a firm's financial statement, it is not a summary measure restatement candidate to the present study. Yet, alternative disclosures of plaintiff litigation are considered as restatement data to adjust total assets. However, for the current sample evidence, less than fifteen firms disclosed quantitative information on plaintiff litigations. Another alternative disclosures, the equity valuation account for long-term marketable securities (MES) could also be used to adjust assets, but less than twenty of the 355 firms in the current sample evidence disclose MES data in an equity valuation account.

disclosure signals no contingent liability. Of course, this is likely to be violated in practice since accounting regulators has established strict criteria for contingencies (gain or loss) to meet before disclosure and recognition are necessary. Recognizing this assumption, Table 3.5 summarizes the effects of the contingency adjustments on a firm's financial statement information.[53]

3.1.6 Pension Expense, Asset, and Liability

Pension disclosures offer investors information that can remove bias or noise in earnings, assets, as well as liabilities. The precise adjustments that equity investors might make from the information offered by pension disclosures depends on their assessment of two issues defining the relationship of a firm to its pension plan. The first issue addresses the measurement of the firm's liability (and related expense) to its employees. That is, investors determine the appropriate measure of the liability by choosing among the projected benefit obligation (PBO), the accumulated benefit obligation (ABO), or the vested benefit obligation (VBO). Offering evidence on the first issue, Barth [1991] finds that market participants appear to value pension obligations consistent with ABO disclosures in the pension footnote, except those firms that show the highest growth rates of future compensation. She also finds that market participants apparently believe that the plan value of assets disclosed in the pension footnote is a firm resource.

The second issue addresses the noise in pension cost reported in the current period resulting from the amortization and deferral of several factors related to pension obligations.[54] The resulting pension cost is a smoothed expense that includes delayed recognition of the differences between the

[53]The "no disclosure - no adjustment" assumption impacts the differential valuation tests by biasing toward rejection of the null that alternative disclosures of liabilities are valued equivalently to those represented on financial statements. However, the same assumption bases against rejection of the null that adjusted summary measures better reflect the data generating process in equity values than do GAAP-based summary measures (the main objective of this thesis). Yet, neither is suggested to be a desirable quality of research. Instead this research design is limited by the availability of data on contingencies. The results on the main objective of this thesis are unchanged in contingencies are not used.

[54]The return on plan assets is a example of one of the deferral items. Instead of using actual return on assets that are likely to fluctuate significantly from year to year, the FASB allows the difference between the actual and expected return on plan assets to be recognized on a delayed basis (SFAS 87, ¶121).

actual and expected return on plan assets, amortization of prior service cost, and an amortization of a transition asset or liability. Each factor can lead to significant differences between the (smoothed) reported pension cost and the non-smoothed pension cost.

Therefore, this study predicts that investors are more likely to use the non-smoothed pension cost as a measure of current period expense by removing the noise in the previously mentioned amortization and deferral items that affect pension cost as reported by managers.[55] Also, investors are predicted to view the pension obligation as a function of future compensation growth and the fair value of plan assets (if any) as an economic resource of the firm. Accordingly, the following adjustment process is done after an analysis of each firm's pension disclosures: (1) firms are separated into portfolios based on compensation growth rates where the highest quartile of firms' liabilities is adjusted to reflect the PBO and the lower three quartiles are adjusted to reflect the ABO as the fairest signal of pension obligation (as shown in Barth [1991]), (2) the fair value of plan assets is added to the other economic resources of the firm, and (3) the difference between reported (smoothed) pension cost and non-smoothed pension cost is removed (i.e., the predicted noise in the reported pension cost).

Although pension obligations are typically off-balance-sheet items, an exception occurs when companies are subject to the minimum liability provisions of SFAS No. 87.[56] If a firm is subject to

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[55]Managers might distort the pension information by *managing* other factors that impact pension cost and obligation. For example, managers' choices of discount rates, expected return on pension assets, and expected growth rates in employment costs can significantly effect the cost and reported obligation. Although investors are likely to anticipate such management of pension-related financial statement representations and desire that the effects be removed, the information necessary to restate pension cost or obligation level are usually not disclosed. In a few cases of the current sample evidence, managers disclosed the impact on cost and/or obligations for the potential impact of a percentage (usually a 1% change) change in their estimate relating to the above factors. As evidence of managerial influence on the disclosures or pension-related items, the discount rate (effectively a proxy for interest rate) varied in the current sample evidence from 7% to nearly 11% in one year for comparable domestic plans, although they should be identical across firms if the measurement date and jurisdiction are the same.

[56]SFAS No. 87 requires that a minimum liability be accrued when a firm's ABO exceeds the fair value of its plan assets (i.e., an underfunded plan). However, the accrual has little impact on pension cost since the standard allows managers to offset the accrual by directly charging stockholders' equity (after an allowance for deferred taxes) and capitalizing any remaining portion as an intangible pension asset. The amount charged to equity is the minimum liability less unamortized prior service cost and transition liability. The unamortized amounts are the pension intangibles. Each is questionable as having future economic benefit to a firm.

the minimum liability provisions, the firm is required to report the minimum liability as an obligation, but the offset is usually shown as a pension asset. For example, if a firm's ABO is $10 million and its plan assets are $3 million, then the plan is underfunded by $7 million. However, the accrual to recognize the liability of $7 million is offset by a pension (intangible) asset equal to the sum of the unamortized prior service cost and unamortized transition liability. These unamortized amounts (typically most of the amount yielding the minimum liability) result in an accounting entry that offsets the minimum liability by an almost equal pension asset, with a small portion typically being charged to stockholders' equity.

Consequently, the entry does not affect cash flows or income, and simply recognizes the minimum liability primarily by recognition of an intangible asset. In the case where a firm is subject to the minimum liability provisions, showing the entire obligation as a liability has essentially the same effect as removing the related pension asset, minimum liability, and charge to stockholders' equity. If investors perceive the required entry for firms subject to the minimum liability provisions as a cosmetic entry, then recording the level of ABO/PBO as the pension obligation and the fair value of plan assets as an economic resource for those firms is the necessary adjustment since an asset-and-liability-based valuation model is used in the present research design. If investors do not perceive the minimum liability entry as value-irrelevant entry, the following adjustments would simply add noise to a valuation model for firms subject to the minimum liability provisions.[57]

This thesis operationalizes the adjustments to assets, liabilities, and earnings as follows. A firm's assets and liabilities are adjusted as described above so that (1) the off-balance-sheet amount of the resources (pension plan assets, if any) is recorded and (2) the appropriate level of obligation (i.e., ABO for three lowest quartiles and PBO for the highest) is combined with the other liabilities of the firm.

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[57]In the present sample, approximately 40% of the firms are subject to the minimum liability provisions of SFAS No. 87.

The fourth adjustment to a firm's assets is,

$$A.4: (Pension\ asset\ adjustment)_{i,t} = (Pension\ Plan\ assets\ at\ fair\ market\ value)_{i,t}, \quad (3.13)$$

to record the fair value of pension plan assets as a resource of the firm. Also, the following adjustment to a firm's liabilities to record the appropriate pension obligation is made,

$$L.3: (Pension\ liability\ adjustment)_{i,t} = (ABO\ or\ PBO)_{i,t} - (\ Min.\ liab.\ accrual)_{i,t}, \quad (3.14)$$

to reflect either the level of ABO or PBO based on their expected rates of compensation increases less any accrued minimum liability under the provisions of SFAS NO. 87. To adjust the summary item in the income statement, investors are expected to adjust earnings by subtracting the non-smoothed pension cost (current period service cost component, interest cost component, and actual return on plan assets) and adding back the reported pension cost.

The effect of the adjustment to earnings is simply removing the elements in reported pension cost that are not contemporaneous economic events. The following adjustment to earnings removes the effects of those pension cost components other than service, interest, and actual return on plan assets. These other cost components result when a manager's choose to delay immediate recognition of the economic event and amortization the effects over future periods. The pension adjustment to earnings is,

$$E.4: (Pension\ cost\ adjustment)_{i,t} = (Service)_{i,t} + (Interest)_{i,t} - (ROA)_{i,t} - (Reported\ Cost)_{i,t}, \quad (3.15)$$

where the first three terms on the right side of Equation (3.15) represent those factors that make up non-smoothed pension cost (periodic service cost, interest cost, and actual return on plan assets).

Thus, the adjustment essentially adds back to (subtracts from) earnings the amounts for those amortization items that increase (decrease) reported pension cost. If the pension cost adjustment shown in Equation (3.15) is significantly different from zero in an earnings-based valuation model,

the result suggests that the other cost components (i.e., the aggregate effects of amortization items on periodic pension cost) may induce noise into the reported pension cost. The effect of removing these smoothing items by the adjustment in Equation (3.15) is predicted to be negatively associated with firm values. That is, adding back to (subtracting from) earnings the amounts value-irrelevant items previously subtracted from (added to) earnings leads to the negative association. Table 3.6 summarizes the effects of the pension adjustments.

3.1.7 Postretirement Expense, Asset, and Liability

In 1990, the FASB issued SFAS No. 106 providing new accounting guidelines for recognizing and disclosing the effects of other postemployment benefits (OPEB) other than pensions.[58] However, the FASB delayed the effective date of the standard until fiscal years after December 15, 1992. The statement requires companies to switch to accrual accounting for retiree health benefits and other (nonpension) postretirement benefits. Prior research suggests that investors believe that disclosures of OPEB obligations will affect firm values. Espahbodi, Strock, and Tehranian [1991] finds negative abnormal returns to firms that offer these benefits and have few current retirees or have high debt/equity ratios surrounding the regulatory discussions of OPEB and SFAS No. 106.

However, SFAS No. 106 has one of the longest transition periods allowed. The long transition period was probably allowed since the common practice of most firms was not to fund these obligations until due (pay-as-you-go), as well as the material impact of these obligations to some firms.[59] Nevertheless, most firms followed the practice of taking the charge to earnings in the year of implementation (typically 1992). However, some firms chose to adopt the standard prospectively

[58]SFAS No. 106, entitled *Employers' Accounting for Postretirement Benefits Other Than Pensions*, is sometimes referred to as *Other Postemployment Benefits* [FASB, 1990]. Thus, the OPEB acronym often used in reference to SFAS No. 106.

[59]General Motors adopted SFAS No. 106 in 1992 resulting in an after-tax charge of $20 billion. The charge effectively eliminated the book value shown in their previous year's financial statements, reducing it from $37 to $2 per share.

over the 20-year transition period by amortizing the obligation (and recording the related expense) over that period.

Thus, a firm's assets, liabilities, and earnings will not reflect the economic resources, obligations, and performance of a firm with postretirement expenses similarly to the problems associated with pension-related items, as well as the long transition period effects. If investors believe the related summary measures offer biased or noisy signals due to postretirement items, they are predicted to search for alternative disclosures (e.g., the postretirement expense footnote) to remove the distortions. Thus, this thesis predicts that investors are likely to adjust financial statement representations for two factors: (1) for those firms choosing immediate recognition in the year of adoption, an adjustment may be necessary to reconcile the pension liability on the balance sheet with the accumulated postemployment benefit obligations (APBO) disclosed in the pension footnote, or (2) for those firms choosing the transition method, an adjustment will be needed to record the APBO for the current year disclosed in the OPEB footnote as a firm obligation (less any amortized amount). That is, this present thesis predicts that investors respond to OPEB obligations similarly to pension obligations and find alternative disclosures to adjust liabilities for the APBO level, assets for the fair value of plan assets (if any), earnings by removing the effects of transition deferrals.

To reflect the obligation for OPEB to firms' employees, this thesis predicts that investors adjust a firm's summary measure of obligations by the following adjustment process,

$$L.4: \ (OPEB\ liability\ adj.)_{i,t} = (APBO\ obligation)_{i,t} - (accrued\ OPEB\ liab.)_{i,t}, \qquad (3.16)$$

after analyzing the choice of immediate or prospective recognition and any recognized OPEB liability. To reflect the fair value of any plan assets as an economic resource of a firm, this thesis predicts that investors adjust assets as follows,

$$A.5: \ (OPEB\ asset\ adjustment)_{i,t} = (OPEB\ plan\ assets\ at\ fair\ market\ value)_{i,t}, \qquad (3.17)$$

using the information available in the OPEB footnote to the annual report. Equation (3.17) yields the fifth adjustment to a firm's assets operationalized in the present study.

The periodic OPEB cost might also be adjusted by investors, particularly for those firms choosing the prospective adoption and amortizing the transition obligation over the allowed 20 years. As happens for pension-related cost, the OPEB cost is affected by other amortization items (e.g., unrecognized gains or losses) that do not reflect the OPEB cost for the current year. However, the OPEB disclosures in a firm's footnotes are typically more brief than the pension disclosures and data limitations over the sample firm-years of interest to this study do not provide a sufficient number of observations.[60]

[60]For example, investors might adjust the current period OPEB cost to remove the effects of amortization of delayed recognition items, as well as consider the effects of changes in plan assumptions that might distort the economic impact of OPEB obligations (in net income and related balance sheet representations).

CHAPTER 4

Testable Predictions

Debt and equity investors might contract with managers based on net cash flows since both groups are concerned with the ability of a firm to generate cash flows. However, cash flows suffer from timing problems that cause net cash flows to be a noisy measure of firm performance and can lead to suboptimal production-financing decisions. Dechow [1994] provides evidence that the accrual process mitigates some, but not all, timing problems in cash flows when investors monitor managerial actions or value a firm's security.[61] In the context of efficient contracting, Dechow shows that accruals enable earnings to reflect firm performance on a more timely basis than net cash flows. In the same way if investors adjust accounting numbers using the information offered by financial reporting disclosures, the supply of disclosures would be the outcome of efficient contracting. For example, alternative financial reporting disclosures could further mitigate the timing problem that remains in reported earnings by enabling investors to adjust financial statement representations to obtain more timely and value-relevant information. A role of additional forms of financial reporting might be to provide an information system that is an efficient compromise between the current recognition criteria and a more ambitious practice of full recognition as described in Black [1993].

Throughout the present study, the following valuation models (i.e., asset-and-liability-based, earnings-based, and the Feltham-Ohlson) are specified by increasingly aggregating financial statement book values and the variables resulting from operationalizing the data in alternative

[61]For example, a **timing problem** exists when a firm receives the benefit from a transaction in one period but the increase in firm assets occurs in another. The problem may result from recognition and measurement criteria defined as GAAP or can result from intentional or unintentional distortions in how managers communicate economic events.

financial reporting disclosures. The final level of aggregation for all three specifications of an equity valuation model compares the reported summary financial statement representations with those of their restated counterparts. The goal is to find which of the two (i.e., reported vs. restated summary variables) better represents the data generating process in firm value for each valuation model.

4.1 An Asset-and-Liability-Based Valuation Model

The variables of interest to the following predictions are measures of a firm's resources and obligations. The objective is to test the relation between a firm's market value of equity and information offered by financial reporting disclosures that may be value-relevant when assessing a firm's resources and obligations. In general, the market value of equity of a firm is equal to the sum of the market values of its assets and liabilities. The following relation helps initiate the discussion, $MVE = MVTA + MVTL$, where MVE is the market value of equity, $MVTA$ is the market value of total assets, and $MVTL$ is the market value of total liabilities (represented as negative amounts).

The relation provides the foundation for the analysis in Landsman [1986]. The variables are described by the following: $MVTA = \sum_{a=1}^{A} MVA_a$, and $MVTL = \sum_{l=1}^{L} MVL_l$, where the subscripts a and l represent the individual assets (MVA) and liabilities (MVL), respectively, of a firm. These are the assets and liabilities priced by market participants, including but not limited to those recognized on a firm's financial statements. This leads to the following relation tested in Hypothesis One,

$$MVE = \alpha_0 + \beta_0\, BVTA + \sum_{a=1}^{5} \beta_a\, adjA_a + \gamma_0\, BVTL + \sum_{l=1}^{4} \gamma_l\, adjL_l + u, \qquad (4.1)$$

where $BVTA$ and $BVTL$ are the book value of assets and liabilities for the current year, respectively. The candidate adjustments to assets and liabilities are $adjA$ and $adjL$ (i.e., a and l greater than zero). The five adjustments to assets are the proposed adjustments to better reflect the resources of the firm by adjusting inventory, intangible capital, accumulated depreciation, pension plan assets, and OPEB plan assets. The four adjustments to liabilities that are proposed to better reflect the liabilities of the

firm adjust for operating leases, contingencies, and pension obligations.[62] Also, MVE is the market value of a firm's common equity at the end of the third month following the end of the current year.[63] All hypotheses are stated in the alternative.

Hypothesis One: ***Alternative financial reporting disclosures are value-relevant to the market value of firm equity conditional on the book values of their related summary measures - reported assets and liabilities.***

The informativeness of each adjustment is determined by testing whether each coefficient (where $a >$ zero and $l >$ zero) in Equation (4.1) is different from zero.

An aggregated version of Equation (4.1) investigates the informativeness of signals of firms' resources and obligations by aggregating the seven candidate adjustments to assets and the four candidate adjustments to liabilities. These two summary variables of candidate adjustments are included in the model with the book values of total assets and liabilities. In this specification of the model, the valuation role of the (aggregated) candidate adjustments to assets and liabilities can be compared with their related financial statement information. If the (aggregated) adjustment variables to assets and liabilities are not equivalently valued by investors to those of reported total assets and liabilities, the results suggest that separate disclosure is preferred or that investors misprice some components.[64]

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[62]The asset-and-liability-based valuation model can be thought of as a disaggregated version of a valuation model is which market value depends on the book value of equity and alternative disclosures. Similar models have been used in studies of pension fund assets and liabilities (Landsman [1986] and Barth [1991]); holding gains and losses on investment securities held by banks (Barth [1994]); and environmental liabilities (Barth and McNichols [1994]).

[63]All variables of interest are considered stochastic. To simplify notation and exposition, the tilde (~) is omitted throughout when it can be done so without ambiguity. The variables for firm and time subscripts are also omitted, but are discussed later where necessary to highlight the results of empirical tests that are cross-sectional and those that are cross-sectional, time-series specifications. The sample evidence for the present study are 1,065 firm-years across three years (i.e., 355 firms) from five industries.

[64]Bernard and Schipper [1994] offers a detailed discussion of the difficulty involved in disentangling the results to tests of this research question. For example, measurement errors in either the operationalized or reported variables, as well as market inefficiencies in impounding either disclosures or recognized financial reporting information, might lead to rejection of valuation equivalency tests. Nevertheless, this thesis attempts to lay the groundwork on how market participants impound multiple disclosures of data conditional on related, recognized items and defers complete resolution of this question to additional evidence from experimental markets and capital markets research that characterize the errors-in-variables evident in both the dependent and independent variables used to value the market value of common equity.

Hypothesis One(a): ***Investors respond differently to aggregated disclosures of alternatively disclosed asset (liabilities) information than to reported assets (liabilities).***

The following relation shows the coefficients of interest,

$$MVE = \alpha_0 + \beta_1 BVTA + \beta_2 TadjA + \gamma_1 BVTL + \gamma_2 TadjL + e \ , \qquad (4.2)$$

where *TadjA* and *TadjL* are the aggregated adjustments to assets and liabilities, respectively. To investigate the differential valuation role of reported and candidate adjustments, a test of the hypothesis that coefficients β_1 and β_2 (and also γ_1 and γ_2) are equal is done. All other variables in Equation (4.2) are as previously defined. Absent any theoretical structure specifying which component is more valued under the alternative, the tests are two-sided. The tests for Hypothesis One(a) use the estimation results of Equation (4.2) and test, H_0: $\beta_1=\beta_2$, against H_1: $\beta_1 \neq \beta_2$ to obtain evidence on the equivalency of reported assets and adjustments to assets. The test of the equivalency of reported liabilities and adjustments to liabilities is performed by the same estimation and investigation of the following coefficients, H_0: $\gamma_1=\gamma_2$, against H_1: $\gamma_1 \neq \gamma_2$.

Finally, aggregated adjustments to assets and reported assets are combined to produce a summary measure of a firm's resources. Also, aggregated adjustments to liabilities and reported liabilities are combined to produce a summary measure of a firm's obligations. A model specifying the adjusted summary measure of resources and obligations is compared against a model specified with reported assets and reported liabilities to test whether the adjusted measures of resources and obligations better represent the data generating process in the market value of equity. This type of aggregation places additional structure on the informativeness of disclosures and leads to a bias against rejecting the null that a model using the operationalized adjustments and book values will better explain the variation in equity values than using only book values.

Hypothesis One (b): ***Adjusted summary measures of total assets and liabilities better explain the variation in equity values than reported summary measures.***

The following models are tested,

$$MVE = \alpha_0 + \delta_1 BVTA + \delta_2 BVTL + e \text{ , and} \quad (4.3)$$

$$MVE = \alpha_{0adj} + \delta_{1adj} BVTAadjA + \delta_{2adj} BVTLadjL + e_{adj} , \quad (4.4)$$

where *BVTAadjA* and *BVTLadjL* represent combined reported and adjusted assets, as well as combined reported and adjusted liabilities, respectively. To compare the adjusted R^2 of Equations (4.3) and (4.4), this study uses the likelihood ratio described in Vuong [1989]. The Vuong model selection test is used to test the directional prediction of the superiority of adjusted measures over reported measures in reflecting the data generating process in equity values. The statistic derived by Vuong tends in distribution to a standard normal random variable and, unlike other model selection tests, allows for a directional test. The prediction is that, of the two imperfect models, the model with adjusted assets and adjusted liabilities is closer to the true data generating process in the market value of equity.

The following briefly describe the Vuong likelihood ratio test. By considering the Kullback-Leibler [1951] Information Criterion (KLIC), which measures the distance between a given distribution and the true distribution, Vuong defines the *better* model as that model that is closest to the true distribution or has the minimum KLIC over the distributions in the model (Sawa [1978], Rule 2.1). The test for model selection is based on the likelihood ratio (LR) statistic. Vuong derives the asymptotic distribution of the LR statistic in cases whether or not the models are nested or misspecified. [65]

[65]Dechow [1994] uses the Vuong likelihood ratio test to evaluate which competing model (cash flows versus earnings) is closest to the data generating process in stock returns. Ramesh and Thiagarajan [1993] use the Vuong likelihood ratio test to evaluate whether permanent components of earnings estimated using Harvey's [1984] unobservable components approach is closer to the data generating process in stock returns than reported earnings. Also, Jennings, Simko, and Thompson [1996] use the Vuong test to examine the usefulness of LIFO and non-LIFO income statements. A more detailed description of Vuong's likelihood ration test for model selection is contained in Appendix B of the present study.

4.2 The Informativeness of Disclosures Conditional on Earnings

If one reason that financial reporting disclosures evolved is to provide more timely information demanded by investors, then adjusted earnings is, on average, expected to be a better signal for firm valuation than reported earnings over short intervals. The following hypotheses test the valuation-relevance of alternative financial reporting disclosures to explaining the variation in the market value of common equity conditioned on earnings, and alternative specifications of disaggregated earnings. For example, the first dissagregation of earnings is by its income statement component variables, allowing the present study to test the value-relevance of alternative financial reporting disclosures conditioned on the summary information offered by the income statement.

Hypothesis Two: ***Alternative financial reporting disclosures related to earnings are value-relevant to the market value of common equity conditioned on the contemporaneous components of earnings offered by the income statement.***

The following relations are estimated for tests of Hypothesis Two,

$$MVE = \alpha_0 + \beta_1 REV + \gamma_1 COGS + \delta_1 DEP + \eta_1 OEXP + e \text{ , and} \quad (4.5)$$

$$MVE = \alpha_0^{\cdot} + \beta_1 REV + \gamma_1 COGS + \gamma_2 COGSadj + \delta_1 DEP + \delta_2 DEPadj + \eta_1 OEXP + \eta_2 OEXPadj + e^{\cdot}, \quad (4.6)$$

where *REV* is revenue for the current year, *COGS* is cost of goods sold for the current year, *OEXP* is expense other than cost of goods sold for the current year (i.e., excluding the effects of non-recurring items, special items, extraordinary items, and discontinued operations), and the suffix *adj* represents the sum of the adjustments related to that component of earnings.[66]

The valuation role of the four candidate adjustments to earnings is evidenced by individually testing whether the three coefficients, (γ_2, δ_2, η_2) estimated in Equation (4.6), are significantly different from zero. For the two adjustments aggregated to obtain *OEXPadj*, the aggregation places

[66]The earnings capitalization model used in the present thesis can be thought of a disaggregated version of a simple (and in some cases, adjusted) earnings capitalization model. A similar model is used in Foster [1977]; Daley [1984]; Tse [1989]; and Jennings, Simko, and Thompson [1996]. Jennings, Simko, and Thompson report explanatory powers using reported revenues, cost of goods sold, and other expenses ranging from 66% to 83% in their sample period from 1976-1991.

additional structure on their informativeness. If the information content lost through aggregation of the alternative information dominates their incremental information content, the aggregated variable will not significantly explain any of the variation in the market value of equity.

The tests are one-sided with directional predictions depending on the direction of income increasing (+) or income decreasing (-) candidate adjustments under the assumption that more income is preferred by market participants. This assumption is supported by substantial empirical evidence in Ball and Brown [1968] and many others.

Hypothesis Two(a): ***Investors respond differently to alternatively disclosed data about firm performance than to financial statement representations of data about firm performance.***

Again, absent any theoretical structure specifying which component is more valued under the alternative, the tests are two-sided. The tests for Hypothesis Two(a) use the estimation results of Equation (4.6) to test the three questions of equivalent valuation: (1) H_0: $\gamma_1=\gamma_2$, against H_1: $\gamma_1\neq\gamma_2$ to test the equivalency of reported COGS and the adjustment to COGS, (2) H_0: $\delta_1=\delta_2$, against H_1: $\delta_1=\delta_2$ to test the equivalency of reported depreciation and the adjustment to depreciation, and (3) H_0: $\eta_1=\eta_2$, against H_1: $\eta_1\neq\eta_2$ to test the equivalency of reported other expenses and adjustments to other expenses.

Hypothesis Two (b) tests whether further aggregation produces a summary variable that better reflects the data generating process in the market value of common equity. The models are restated by combining the components of firm performance into measures of reported and restated earnings. These alternative specifications of Equations (4.5) and (4.6) yield slope coefficients on *RE* (i.e., reported earnings, equal to the sum of *REV*, *COGS*, *DEP*, and *OEXP*) known as an earnings response coefficient (*ERC*).[67]

[67]The *ERC* in the restated model is equal to $1/r$, where r is the (constant) expected rate of return and provides evidence on fundamental valuation using an accounting measure of firm performance (see Christie [1987]).

The models are restated as,

$$MVE = \alpha_0 + \beta_1 RE + e, \text{ and} \tag{4.8}$$

$$MVE = \alpha_0^a + \beta_1^a adjRE + e^a, \tag{4.9}$$

where *adjRE* is the sum of reported earnings and the candidate adjustments to earnings, and all other variables are as previously defined.

Hypothesis Two(b): ***A stronger association between contemporaneous adjusted earnings and the market value of equity exists than between contemporaneous reported earnings and the market value of equity.***

The model selection test for competing models that use either reported earnings or adjusted earnings is again Vuong's likelihood ratio test. The prediction is that, of the two imperfect models, the model with adjusted earnings is closer to the true data generating process in the market value of equity.

4.3 The Effect of Alternative Disclosures on Return-Earnings Relation

Lev [1989] suggests that the ability of equity investors' adjustments to improve the return-earnings relation depends on the variance of investors' adjustments to earnings. He defines the quality of earnings in terms of perceived deficiencies in reported earnings. This suggests that perceived deficiencies detract from the ability of reported earnings to predict future cash flows and investors would adjust reported earnings to obtain a better signal of the future cash flows of a firm.

Lev defines reported earnings as,

$$RE_t = \alpha\, CF_t + \epsilon_{1t} + \epsilon_{2t}, \tag{4.10}$$

where *RE* is reported earnings and *CF* is the unobserved cash flow. The perceived deficiencies are represented by decomposing the disturbance process on earnings into two error terms where earnings is assumed to represent a signal of future cash flows. The decomposed disturbance process has two errors: (1) ϵ_1, reflecting perceived deficiencies in reported earnings adjusted during financial

reporting analysis, and (2) ϵ_2, which is the remaining error term that reflects investors' inability to predict future cash flows of the firm perfectly. The coefficient α serves as a scale factor, and the following are assumed: $\epsilon_1 \sim N(0, \sigma^2_{\epsilon_1})$, $\epsilon_2 \sim N(0, \sigma^2_{\epsilon_2})$, and the $Cov(\epsilon_1, \epsilon_2) = 0$.

In Lev [1989], the following result is derived. That is, one can question the impact of investors' adjustments on the correlation between stock price revisions around earnings announcements and unexpected reported earnings. Lev derives that correlation as,

$$\rho = \frac{\sigma(RE_t)}{\sqrt{\sigma^2(RE_t) + \sigma^2(\epsilon_{1t})}}, \tag{4.11}$$

where ρ is the correlation between stock price revisions around earnings announcements and unexpected reported earnings and the other variables are as previously defined. Equation (4.11) shows that the quality of earnings is inversely related to ρ when the quality of earnings is defined as the variance of perceived deficiencies in reported earnings. Thus, the larger the variance of the candidate adjustments in the present study to reported earnings, the lower will be the coefficient of determination on the returns/reported earnings relation. *Ceteris paribus*, the goodness of fit of the returns/reported earnings relation is inversely related to how much dispersion in investors' adjustments.

Therefore, the hypothesis tests in this section examine the proposition that as aggregate adjustments made during the financial statement analysis process by investors exhibit an increasing variance, the goodness of fit of the returns/reported earnings relation decreases. As a proxy for the variance of investors' adjustments to earnings, the relative size of the (absolute value) of the adjustments to each firm's unexpected earnings is calculated. The size is considered without respect to the sign resulting in a more powerful test of the relative importance of investors' adjustments. The relative size is then partitioned into four portfolios. The portfolio with the smallest relative size of investors' adjustments is presumed to be the portfolio with the highest quality, and thus the portfolio with the highest correlation between stock price revisions around earnings announcements and

unexpected reported earnings. However, when the aggregate adjustments are the largest relative to unexpected earnings, that portfolio is expected to represent the lowest quality earnings.

Therefore, it is an empirical question whether a larger relative size of the adjustments made by investors to reported earnings ($\sigma^2_{\epsilon_1}$) suggests a lower explained variation in prices (or returns) compared with a smaller variance of adjustments. A partitioning of the sample into quartiles based on the size of the adjustments compared with unexpected earnings is used as a proxy for the variability of the adjustment process.

Hypothesis Three: ***The larger the absolute size of aggregate adjustments made by investors relative to unexpected earnings, the lower the contemporaneous association between unexpected earnings and returns.***

The test compares the explained variation across four portfolios. The portfolios are ranked by the absolute size of adjustments and the explanatory power of the four portfolios are tested. Vuong's likelihood ratio test is used to examine whether the three portfolios with higher relative size of adjustments outperform the portfolio with the lowest relative size of adjustments.

4.6 The Feltham-Ohlson Valuation Model

The development for the predictions in the previous hypotheses can be enriched by using a Feltham-Ohlson equity valuation model. The FO valuation approach explains equity valuation completely in terms of accounting numbers and defines firm equity as its book value plus discounted expected future earnings (over an infinite horizon) in excess of the expected return on book value. However, if one uses single-period representations of book value and earnings, the question of interest to this thesis is whether adjusted measures of either improve on the ability of contemporaneous information to explain equity values. Thus, the FO valuation model allows equity valuation to be described in terms of the present value of future earnings in excess of the cost of capital and book values (i.e., by invoking the clean-surplus relation).

The FO valuation model shows that firm value can be written as,

$$MVE_{it} = BV_{it} + \sum_{n=1}^{\infty} \frac{E\,[RE_{t+n} - (r_e)(BV_{t+n-1}) \mid Z_t\,]}{(1+r_f)^n}, \tag{4.12}$$

where the following are defined at ± time t: BV is book value of common equity, r_e is the cost of equity capital, r_f is the risk-free rate, and E[•] is an expected value operator conditioned at time t and information set Z.[68] All other variables are as previously defined. From Equation (4.12), firm value is represented as capital invested and future abnormal earnings.

However, by using $r_e = \frac{RE^*_{t+n}}{BV_{t+n-1}}$, the FO model can be rewritten as follows,

$$MVE_{it} = BV_{it} + \sum_{n=1}^{\infty} \frac{E\left(\frac{RE_{i,t+n}}{BV_{i,t+n-1}} - \frac{RE^*_{i,t+n}}{BV_{i,t+n-1}} \,\middle|\, Z_t \right)}{(1+r_f)^n}, \tag{4.13}$$

where the following term is added, RE*, which is equal to the required earnings necessary to yield expected return on equity condition on the cost of equity capital. The importance of investors' adjustments can be seen in the numerator of the second term in Equation (4.13) that represents the infinite stream of abnormal ROEs where (RE_t - RE_t^*) represents the abnormal earnings in the period.

That is, the determination of reported earnings considers whether deviations from the required earnings necessary to yield expected ROE based on the cost of equity capital results from economic events, the recognition choices available to and made by managers, or both. Therefore, it is an

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[68]Feltham and Ohlson [1995] shows that the assumption that the discount rate is equal to the risk-free rate can be relaxed to encompass risk averse investors and systematic risk. In that case, the expected value operator is replaced by a risk-adjusted expectation and the discounting by the risk-free rate is replaced by a risk-free discount factor between date t and date $t+i$ based on the information set at date t. Additionally, Abarbanell and Bernard [1995] find that allowing for intertemporal and firm-specific variation in the cost of equity capital has little effect on FO-based trading strategies. In the present study, the average one-year rate for certificates of deposit paid by major U.S. banks on primary new issues in excess of $1 million is used and obtained from the first Monday report at the beginning of the accumulation period as reported in the *Wall Street Journal*.

empirical question whether a model that uses adjusted measures of earnings and book value better reflects the data generating process in equity values than does a model using the reported measures. The question is interesting although Ohlson [1991, 1995] shows that earnings is not vulnerable to accounting manipulations in a multi-period setting where accounting biases are self-correcting and the present value of a series of abnormal earnings can show the contribution of wealth to a firm's capital (i.e., net book value).

However, when a single-period setting is tested as representative of the FO model, the above questions address the possibility that investors' adjustments to reported earnings and book values can explain more of the variation in equity values than using the reported values. The following model restated to show the impact of investors' adjustments is,

$$MVE_{it} = AdjBV_{it} + \sum_{n=1}^{\infty} \frac{E\,[AdjRE_{t+n} - (r_e)(AdjBV_{t+n-1}) \mid Z_t\,]}{(1+r_f)^n}, \qquad (4.14)$$

where *AdjBV* is equal to (*TadjA+BVTA)* less (*TadjL+BVTL*) and where *AdjRE* is equal to reported earnings plus the effects of the aggregate of investors' (predicted) adjustments to earnings. In a single-period setting, the creation of wealth (the present value of the second term in the above equation for a multiple-period setting) can be represented as the second term in the following equation,

$$MVE_{it} = (AdjBV_{i,t-1}) + [adjRE_{it} - (r_e)(AdjBV_{i,t-1})], \qquad (4.15)$$

where the stock of capital and reported earnings are adjusted for the predicted adjustment operationalized in the present study. Wealth is created when adjusted earnings exceeds the required earnings on beginning of the period adjusted book value of the firm. Thus, two specifications emerge and are tested for Hypothesis 4. The two use alternate specifications of the FO models. In one case, the reported values are used. In the other, adjusted values are used.

This leads to two competing models shown as,

$$MVE_{it} = (AdjBV_{i,t-1}) + [adjRE_{it} - (r_e)(AdjBV_{i,t-1})] \text{ , and} \quad (4.16)$$

$$MVE_{it} = (BV_{i,t-1}) + [RE_{it} - (r_e)(BV_{i,t-1})] \text{ ,} \quad (4.17)$$

where the specification in Equation (4.16) uses adjusted values and the specification in Equation (4.17) uses reported values. Abnormal earnings across each specification shows the creation of wealth that results when investors values the equity of firms using a single-period representation of an FO model. The creation of wealth can be alternatively represented as,

$$AE_{it} = adjRE_{it} - (r_e * adjBV_{i,t-1}) \text{ ,} \quad (4.18)$$

for the wealth created in excess of the required return for the specification that uses adjusted measures of book value and earnings, and

$$AE_{it} = RE_{it} - (r_e * BV_{i,t-1}) \text{ ,} \quad (4.19)$$

for the wealth created in excess of the required return for the specification that uses reported measures of book value and earnings.

Therefore, the test for Hypothesis Four has two specifications of the FO valuation model in a single-period setting that compete to explain more of the variation in equity values. These specifications offer the simplicity of using a contemporaneous financial reporting set of disclosures without the necessity of discounting. The two specifications that compete are single-period versions of Equations (4.12) and use the following as specifications as inputs used to calculate the first and second terms: (1) reported book values and reported earnings, and (2) adjusted book values and adjusted earnings.

Therefore, Hypothesis Four is examined by testing two competing models and is stated as,

Hypothesis Four: ***Adjustments to earnings and adjustments to book values shows a stronger association with the market value of equity than reported measures of earnings and book value using an FO valuation model.***

The tests are performed by regressing the market value of equity onto the competing specifications as represented by Equations (4.16) and (4.17) in a single-period representation. The Vuong statistic is used to test the directional prediction in Hypothesis Four.

CHAPTER 5

Research Design

Models of firm value in financial economics emphasize free cash flows. However, accounting researchers typically use different proxies for free cash flows. Under the assumption that accounting earnings is an empirical surrogate for free cash flows, a more informative signal about core earnings would influence price changes prior to and coincident with the release of annual reports.[69] Price changes before the public report result from private information acquisition of the corporate disclosures in the forthcoming report. If more timely sources are available, a change in the quality of the public disclosure might affect the demand for the more timely sources. Market participants who bear the cost of processing interim public and private signals about firm performance into private information are typically market experts (e.g., large shareholders or financial analysts) who follow a firm closely. Through their activities, price impounds opinions of a firm's performance.

5.1 Sample Selection

The methodology involves operationalizing detractors from information quality through a comprehensive analysis of the financial information disclosed in financial statement footnotes, supplementary schedules and footnotes to the annual report, and other Form 10-K filings. Financial reporting disclosures are obtained from two sources. The data are taken from *Compact dSEC*™ (i.e.,

[69]This assumption is logical given the articulation of assets and liabilities into earnings in the process of transforming cash basis income into accrual basis income. For a review see Beaver [1981, chapter 5], and Lev and Ohlson [1982].

Compact Disclosure prior to 1990) and Standard & Poor's *Compustat* database. The price and returns data are obtained from the Center for Research in Security Prices (CRSP) database. The sample consists of firms listed on the New York Stock Exchange, American Stock Exchange, and National Association Securities Dealers and Quotes. Accounting and market value data are necessary for years 1985 through 1993, although returns data are necessary only for the 1991-1993 years. The additional requirements on the accounting and market value data exist since the five-year compounded growth of advertising expenditures, research and development expenditures, and also the growth rates of property, plant and equipment are needed to examine valuation implications prior to the sample years.

All industries (defined by two-digit SIC codes using Standard & Poor's *Compustat* Service Industry classification codes) are examined for necessary financial disclosures price/returns availability. Five industries have sufficient data given the above and following restrictions on the sample-firms and are chosen for testing the predictions offered by this thesis.[70] Additionally, a restriction of the sample firms to five industries is done for two reasons. First, randomization across large samples of firms, where some disclose and others recognize the effects of economic events, suggests that those firms are comparable. This may not be the case as firms are likely to self-select into the *recognizers* and *disclosers* leading to two groups that are noncomparable. Specific industries are more likely to be comparable and self-select into similar practices of recognition versus disclosure. Second, only five industries offer a sufficient number of firms to perform the industry valuation procedures necessary for the adjustments relating to research and development, advertising, pensions, inventory, and depreciation.

Additionally, this practice is likely to approximate the practice used by practicing analysts. For example, Lev [1989, 183] states that . . . *(r)eal-life security analysis is overwhelmingly conducted*

[70]The screen for sufficient data is at least thirty firms. Although any choice can be labeled arbitrary, the choice of thirty firms in each year is chosen as a cutoff so that the design attempts to control for and achieve consistency of the estimators.

on an individual security level. Also, information from publications such as the *Institutional Investor* and its yearly All-American Team suggests that market agents follow firms within an industry, and perhaps have responsibility for only a few industries. Therefore, the comprehensive analysis conducted by market agents is expected to build on the synergistic effect of investigating comparable firms' future prospects. That is, the process benefits from comparisons and contrasts of financial disclosures for firms within an industry. Thus, the methodology used in the present study is likely to mirror practice.[71]

5.2 The Use of Prices to Infer Changes in Information Content

As the value of most goods has been accepted as a function of consumers' beliefs, preferences, and endowments, capital market researchers presume securities have value independent of consumer characteristics. Instead, intrinsic value is based uniquely on the characteristics of the firm that issues a security. If a security differs from its intrinsic value, then the security is not priced *as expected.* Fama [1970] formally states that a market is efficient with respect to an information set if the expected future price conditional on that information is equal, on average, to the actual future price. This implies that there exists a distribution of future prices and that market efficiency occurs when the expected price, conditioned on a set of informational inputs, is equal to the expected value of this distribution of future prices.

A rational-expectations equilibrium occurs when expectations are realized in a future period. A fully revealing equilibrium occurs when prices reveal all the private information held by individual investors. Yet, several problems exist with a fully revealing equilibrium. The cognitive capabilities of the uninformed investor need to be enormous to infer perfect information from prices. Also, a fully revealing equilibrium does not exist with costly information. Investors have no

[71] If one considers that accounting practices within an industry exhibit less variation than across industries, then the tests of differences are biased toward the null when compared with a sample from a cross-section of firms across all industries.

incentive to purchase costly information if it is immediately revealed in prices. However, Grossman and Stiglitz [1980] shows that the market is marginally inefficient to allow purchasers of information to obtain a reasonable return.

Under general conditions, decision-making behavior can be characterized as if the decision makers choose those acts that maximize expected utility. Security prices offer the present study a perspective on investor behavior since securities possess certain attributes valued by investors, such as claims to future dividends. Prices can be characterized as dependent upon investors' expectations regarding these attributes. In that spirit, Demski and Feltham [1994, 3-4] states, *(t)he relation between the price change at the report date and some measure of unanticipated earnings is generally held to be an indicator of the information contained in the earnings report that was not known by the market prior to the report date. The relation between price changes prior to the report date and some measure of unanticipated earnings is generally held to be an indicator of the information 'contained in' the earnings report learned by the market before the report date.*

5.3 Specifications of Price and Return Model

Gonedes and Dopuch [1974] expresses pessimism regarding the use of a price model as the functional form (price regressed on accounting variables of interest) in empirical accounting research. They prefer a return model (returns regressed on accounting variables of interest) derived primarily from the CAPM. Lev and Ohlson [1982] are more optimistic. They view a cross-sectional valuation approach (or price model) as equivalent to a return model. Christie [1987] also suggests that price and return models are equivalent since both are based on the present value of future cash flows. He states that the choice of the preferred specification should rest on econometric grounds. Additionally, he specifies a third type of valuation model, a first-differenced price model. Christie concludes that a first-differenced price model suffers less from heteroscedasticity or misspecification problems than either the price or return model. However, two critical assumptions exist for his

conclusion to hold. Earnings must follow a random walk and prices must not lead earnings. The validity of each assumption leads one to question the suggested dominance of the first-differenced approach over the price model.

Landsman and Magliolo [1988] develops examples that show the selection between a first-differenced and price models is situation specific, and suggest that when the omitted variable is not the same in both years, the coefficient bias may increase. Also, Kothari and Zimmerman [1995] examine the econometric problems of nonspherical disturbances resulting from data problems in price and return models. They conclude that for information content studies a price model typically yields a less biased slope estimate on the accounting variable of interest. However, they suggest the use of return **and** price models to yield more convincing evidence since the two functional forms often have competing strengths and weaknesses. Thus, the present design uses price and return models to test the value-relevance and incremental informativeness of alternative financial reporting disclosures.

Barth and Kallapur [1996] offers a remedy when cross-sectional scale differences among the sample of firms lead to heteroscedastic disturbances, as might be expected in Equations (5.1) and (4.2). They show that an effective solution is to include a scale proxy (e.g., number of common shares outstanding) as an independent variable and report inferences based on the estimates of the standard errors shown in White [1980]. This is particularly useful given the results of Kothari and Zimmerman [1995] that shows that a price model yields a less biased slope estimate than does a return model. Nevertheless, both models suggest that either earnings or adjusted earnings contains information about expected future earnings. Both are based on a standard valuation model in which price is the discounted present value of expected earnings, assumed to proxy for expected future cash flows. Also, since both price and return models are likely to have econometric problems, the results of tests on both forms will capture the strengths and weaknesses of the two. Thus, the inferences made will be enhanced by investigating both forms.

However, the return model offers two areas of concern to the present thesis. The functional form suggested by the return model suffers from an errors-in-variables bias. Brown, Griffin, Hagerman, and Zmijewski [1987] shows that the component in earnings, anticipated in an earlier period, is removed in a return model specification leaving only the surprise component of earnings. This type of errors-in-variable problem biases the slope coefficient on earnings toward zero. Second, the return model specification jointly tests the informativeness of the surprise, the form of the return generating model, and the return window chosen.[72] Evidence on the actual informativeness of the surprise is dependent on this thesis developing adequate proxies for expected earnings *and* expected adjusted earnings. Since both expectations are unobserved, errors in both or either might lead to a misrepresentation of the actual return-earnings associations. The lack of theoretical or institutional basis for an *optimal return window*, (e.g., see Collins and Kothari [1989]), and also a possible shift in the optimal return window when the independent variable (adjusted earnings) incorporates (by proposition) more timely information, suggests that the return model's weaknesses are likely to be particularly limiting using the present research design.

5.4 The Assumptions and Functional Form of the Regression Equations

The assumptions underlying each conditional model and the relation between them are as follows, where the form of the stochastic relations between stock price and the two measures of earnings are described as,

[72] An error in measuring the return variable (i.e., dependent variable) is very different than the errors-in-variables problem (typically referring to errors in measuring an independent variable). The error in measuring the dependent variable simply adds to the disturbance term. For example, an error in measuring the return variable of the form $(R_i=R_i^*-v_i)$ would lead to the following change in the classical normal linear regression of returns onto a measure of unexpected earnings, for example the equation would become $R_i^*=\alpha+\beta(UE_i)+e_i+v_i$. Although the measurement error in the dependent variable is captured in the disturbance term and might therefore suggest that this type of error is inconsequential, the error could induce heteroscedasticity in the resulting regression. Thus this type of error would reduce estimation efficiency, although the regression coefficients would be unbiased and consistent. The error in measuring the dependent variable is particularly troublesome if the deflator or scale factor chosen to improve the asymptotic efficiency does not proxy for v_i as shown in Haugen (1995).

$$M\tilde{V}E_{i,t}=\alpha+\beta\ \tilde{E}_{i,t}+\tilde{e}_{i,t}, \tag{5.1}$$

$$MVE_{i,t}=\alpha+\beta\ AE_{i,t}+e_{i,t}\ . \tag{5.2}$$

Also, $MVE_{i,t}$ is the market value of common equity for the ith firm in period t, $E_{i,t}$ is the reported earnings and $AE_{i,t}$ is adjusted earnings for the ith firm in period t, and $e_{i,t}$ is an unobservable stochastic component of security i's market value of equity that is independent of either E_t or AE_t. The coefficients α *and* β are the intercept and slope, respectively, and obtained by ordinary least squares regression of the linear relation.

The variables of interest are considered stochastic. The stochastic nature of the regression model implies that for every value of the independent variable (in this case, as a measure of firm performance) there is a whole probability distribution of values of the dependent variable (in this case, market value of equity). That is, the stochastic disturbance term imparts randomness to the dependent variable. Thus, the full specification of the regression model includes not only the form of the regression equation, but also a specification of the probability distribution of the disturbance and a determination of the values of the independent variable. The important properties of consistency and asymptotic normality are robust to stochastic regressors under the assumption that the regressor is independent of the disturbance. The lack of independence, but assumption of no contemporaneous correlation between the regressor and disturbance leads to results that hold only asymptotically. Yet, violations of both assumptions lead to inconsistent estimators and demand alternative methods of estimation to obtain consistent estimators. Where evident, the methodology will lead to alternative methods of estimation or control procedures to address the predictions of this thesis (discussed in Chapter 6).

CHAPTER 6

Estimation and Primary Results

As discussed in the previous chapters, the estimation procedures for several candidate adjustments require at least five years of data prior to the three years that the valuation models are tested. This chapter describes the sources of the alternative financial disclosures of interest and provides descriptive statistics from the operationalization of those data. Two models are used for the following analysis. An ordinary least squares model for both a year-by-year specification and a pooled, cross-sectional specification are the primary models test results discussed in this chapter.[73] Also, the results of Vuong's likelihood ratio test are shown for the pooled and year-by-year regression specifications.

Besides the results of the OLS regressions, the Vuong likelihood ratio test, and tests of valuation differences (i.e., tests of differences in related parameter estimates) are also discussed. The last results discussed in this chapter are the results of the quality of earnings predictions conditioned by the absolute and relative sizes of the adjustments to earnings, and the results of tests using the Feltham-Ohlson valuation model where adjustments are made to both income statement and balance sheet components. Chapter 7 discusses sensitivity and diagnostic tests.

The financial statement data are obtained from the following three Standard and Poor's 1994 databases, the *Primary*, *Supplementary*, and *Over-the-Counter Files* of the *Compustat* Annual industrial collection of financial, statistical, and market information. For the test years of interest

[73] Additionally, a SUR-FGLS model is estimated that assumes a first-order autoregressive error structure with contemporaneous correlation between cross-sections is used. The covariance matrix of the SUR-FGLS model is estimated by a two-stage procedure leading to the estimation of model regression parameters by GLS shown in Parks [1967]. The results from the SUR-FGLS are discussed in the following chapter and the model is described in detail in Appendix D.

to this study (i.e., 1991-1993) and the estimation years to examine market valuation (1986-1990), data are also obtained from *the Disclosure SEC Database* of *Compact dSEC*™ and 10-K disclosures (data available in some cases from *SEC File* using Form 10-K filing disclosures or *Lexis-Nexis* research databases).

The firms are required to have either monthly or daily returns available on the 1994 Center for Research in Security Prices (CRSP) stock databases. Firms are required to have accounting-related data for the eight-year period, 1986-1993. The five-year period, 1986-1990, is used to obtain estimates of growth, amortization, and capitalization rates for several variables necessary to estimate the candidate adjustments. However, the three annual periods, 1991-1993 are the test years of interest to this study.

6.1 Sample Data

The sample data consist of firms listed on the New York and American stock exchanges, and also those companies listed on the National Association of Securities Dealers Automated Quotations system (i.e., NASDAQ) with December fiscal year-ends and reporting inventory levels.[74] The measurement intervals for accounting-related data are annual representations obtained from firms' annual reports. Stock returns are CRSP buy-and-hold stock returns (inclusive of dividends) for each firm on the period beginning with the fourth month of the current year and ending with the third month after the close of the current fiscal year, less the CRSP value-weighted market index (inclusive of dividends) over the corresponding period.

Since the design of this study demands an industry grouping of the sample data, the first step in screening those firms that had available financial statement data or related disclosures over the eight-year period (1,731 firms). Thus, the research design groups firms according to similar products that

[74]Firms with December fiscal year-ends are examined so that reliable comparison across firms and time can be assumed, necessary for testing the differences of valuation of independent variables in the present research design.

assumes similar financing, operating, and production processes. Industries are determined by using Standard & Poor's (S&P) assignment to a principal industry using the information in the *1987 Standard Industrial Classification Manual* produced by the Executive Office of the President - Office of Management and Budget. S&P uses a pseudo-SIC classification to define industries for which SIC had no classifications. Industries are grouped along 2-digit classifications, as a 3-digit classification substantially restricts the sample data compared with the present sample evidence.

All firms in an industry are required to have necessary financial statement data items of interest to this study, equity prices, shares outstanding, and availability of stock returns data (only over the years of primary interest - 1991 to 1993). A critical limit of at least 30 firms is needed per industry. The 30 firm limit is chosen so that more consistent parameter estimates are obtained in the development of the candidate adjustments.[75] Twelve industries have at least 30 firms with available accounting-related and stock returns data (726 out of 1,731). Table 6.1 shows the results of the two-step sample selection process and describes the distribution of sample-years across the five industries. The sample consists of 1,065 firm-years and the firm-years are distributed in order by Machinery & Computer Hardware (SIC 35) with 297 firm-years, Chemicals & Pharmaceuticals (SIC 28) with 240 firm-years, Electrical & Electronics (SIC 36) with 228 firm-years, Scientific Equipment (SIC 38) with 192 firm-years, and Transportation Equipment (SIC 37) with 108 firm-years.

Table 6.1 shows the results of this first step to selecting the sample evidence, plus those firms with other than December fiscal year-ends.[76] The second step screens the twelve remaining industries by requiring that each industry have at least 30 firms with either advertising or research and development (R&D) expenditures. Advertising and R&D are obtained from the *Compustat* databases, the *Disclosure SEC Database* of *Compact dSEC*™, or the manually collected data from

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[75]Lev and Sougiannis [1996] uses a similar sample selection technique but require that each industry have at least twenty firms for each year (1975-1991). Yet, their sample includes the same five industries as used in the present study.

[76]The results of Tables 6.2 and 6.3 show that the final sample of December fiscal year-end firms is similar to the overall market of firms, as well as those firms not reporting on a calender year-end basis.

SEC File using Form 10-K filing disclosures. Of the twelve industries, five remain with the required number of firms to meet the second screen (355 firms out of 726). Tables 6.4, 6.5, and 6.6 present descriptive statistics by balance sheet, income statement, and statement of cash flow data, respectively, for the five industries.

The average size (in total assets and market capitalization) shown in Table 6.4, shows the asset capitalization and valuation differences among the industries. Table 6.4 also provides evidence that inventory and fixed assets are material components (on average) of each firm's balance sheet. Both inventory and fixed assets are balance sheet and income statement related variables of interest to this study. An examination of the income statement related data shown in Table 6.5 shows that the performance among the industries during 1991-1993 exhibits some variation. This should lead to less biased parameter estimates and more robust conclusions from the estimation procedures. Additionally, the average level of cost of goods sold is apparently a significant component to those firms in each industry. Table 6.6 shows that the cash flows from the various sources suggest different investment and origination of cash flows across the five industries. These differences between industry averages across the financial statement data shows that the 2-digit SIC industry classification scheme yields industry groupings that apparently have dissimilar asset mixes, capitalization structures, and market valuation effects of those components. Thus, the results are likely to be robust to an even broader cross-section of firms.

6.2 Candidate Adjustment Sources and Descriptions

Each adjustment is operationalized by using alternatively disclosed financial data. The alternative disclosures either provide additional explanatory information to financial statement representations, or provide information about firm performance, resources, and obligations not recognized in the financial statement representations. Thus, the three years of interest to this study (1991-1993) require a manual collection via alternative sources and operationalizing of data found in 1,065

footnotes, supplementary schedules in Form 10-Ks, and the MD&A reports. Each operationalization process and source of information is described below.

6.2.1 Data Sources and Results of Adjustment for Inventory Valuation/Cost Flow

Alternative disclosures of inventory information are found in the footnotes to the financial statements. The inventory information is typically in a self-titled footnote or included in the footnote describing significant accounting policies. Generally, the disclosure provides detail on inventory levels valued under the various methods of determining cost.[77] Also, the information on invasions of *LIFO* layers and *LIFO* reserve levels are found in these footnote disclosures. With this information, investors can adjust assets and earnings (via an adjustment to cost of goods sold) after considering the degree of distortion in the financial statement representations. The adjustment effects operationalized using these alternative disclosures, summarized in Table 3.1, show the adjustment related to inventory considers the cost-flow method chosen by a firm's managers to represent cost of goods sold and inventory, as well as the effect of changes in factor prices on those representations and ability to pass on factor input price changes. Tables 6.7 and 6.8 summarize the different inventory types used by firms in the five industries and show median levels of the factors that produce the final inventory/COGS adjustments to assets and earnings.

The adjustment to assets is made for those firms that report any of their inventory using the *LIFO* methodology. That is, the percentage of firms whose assets are adjusted by the first asset adjustment shown in Equation (3.1) is obtained by summing the *LIFO* only, *L/F*, and *F/L* categories. The percentage of firms in each industry affected by the adjustment to inventory are Chemicals (45%), Machinery & Computer (33%), Electrical (18%), Transportation (50%), and Scientific

[77] ARB No. 43 requires that the amounts at which inventories are state be supplemented by information which reveals for the various classifications of inventory items, the basis upon which their amounts are stated, and where practicable an indication of the method of determining the cost [ARB No. 43, ch. 3A, ¶9].

Equipment (16%). These percentages show the relative amounts of firms in each industry reporting at least some portion of their inventory/COGS under a LIFO method.

The asset adjustment is made for those firms that are above the median level of the ratio of the levels of the gross profit ratio to PPI. The resulting adjustment to assets ranges from a median value of $43.55 million for the Chemicals industry to $10.44 for the Scientific Equipment industry. This process leads to an asset adjustment for one-half of those firms reporting some inventory under a LIFO method (i.e., 165 of the 351 firms reporting some inventory under a LIFO method). From Table 6.8, the descriptive information shows a change in the LIFO reserve across all industries has a median value not greater than $1 million. This suggests that during the sample period of interest to this study that factor input prices were relatively stable.

Table 6.7 also summarizes the adjustment to earnings for those firms reporting inventory under a FIFO method or one that approximates a FIFO cost flow.[78] For the five industries, the earnings adjustment (via an adjustment to cost of goods sold) is expected on the following percentage of firms: Chemicals (94%), Machinery & Computer (97%), Electrical (99%), Transportation (94%), and Scientific Equipment (100%). The proxy for changes in factor input prices shows evidence of declining prices during the period 1991-1993 for all five industries. Therefore, the average adjustment, which is less than zero, is expected to remove the holding loss in cost of goods sold. That is, non-LIFO cost flows are overstated relative to current cost flows, and the adjustment removes that overstatement thereby providing a better signal of future earnings to investors.

The median values show evidence of small adjustments to reported earnings, with all five industry adjustments showing a median value of less than $1 million. However, the largest (in absolute values) adjustment (on average) for the earnings adjustment occurs in the Electrical industry, which decreases cost of goods sold an average amount of $5.22 million (with a range of $233.98 million). The smallest (in absolute values) adjustment occurs in the Transportation

[78]To adjust earnings to ***as if LIFO earnings***, this thesis predicts that investors adjust cost of goods sold using the restatement in Equation (3.2): $(COGS)_{i,t}^{as\ if\ LIFO} = (COGS)_{i,t} + [(Inventory^{FIFO})_{i,t-1} * r_t] + [(Inventory^{WAC})_{i,t-1} * \frac{r_t}{2}]$.

Equipment industry where the average decrease to cost of goods sold is $2.79 million (with a range of $103.77 million).

Both adjustments are evidence of the unique economic condition that exists in the years of interest to this study. Both adjustments capture the effects of declining prices (on average) in the five industries, suggesting an economic condition where factor input prices are declining over three years. However, several firms are in industries where the 4-digit PPI classification shows evidence of increasing factor input prices. For example, the change in the LIFO reserve and COGS adjustment variables are 46.4% correlated at highly significant levels (p-value < 0.0001). Additionally, the variables are 52.3% (16.1%) correlated when PPI changes offer evidence of declining (increasing) prices, both significant at conventional levels (*p-values* < 0.05). Thus, for changing factor input prices, the operationalized adjustment process for assets and earnings are consistent with the expected directions.

6.2.2 Data Sources and Adjustment Results for Intangible Capital (Advertising/R&D)

Alternative disclosures of the current period expenditure relating to advertising/R&D are usually found in the footnotes to the financial statements. The explanatory information might state the actual current period expenditure as well as prior periods, and also the method of accounting for either advertising/R&D outlays by the firm (e.g., it might state that the expenditure is charged to income during the year in which it is incurred). Additionally, in those cases where the amount is not stated in the footnote disclosure, the current period expenditure is sometimes a reported line item in at least one financial statement.

For the current sample, all financial statement sources (i.e., *Compustat*, the *Disclosure SEC Database* of *Compact dSEC*™, and Form 10-Ks collected data from *SEC File*) were examined to obtain information about not only the current period expenditure, but also the expenditure for the five-year period that precedes the first year tested in this study - 1991. The evidence of historical

valuation during the five-year period is used to estimate the economic capitalization and amortization rates for intangible capital related to advertising/R&D expenditures (as in Hirschey and Weygandt [1985, hereafter HW]). HW uses the growth rates in sales as one input to estimate the capitalization parameters, and the growth rates in advertising/R&D expenditures as factors to estimate the current year's stock of intangible capital as well as investors' economic amortization rates.[79]

Table 6.9 shows summary results of those firms in the sample for which capitalization of advertising and R&D outlays applies. The model in Equations (3.3) and (3.5) yields estimates of the capitalization rates and resulting intangible capital levels by investors of advertising (*AdvExp*) and R&D (*R&DExp*) investments, respectively. For example, the capitalization rates for advertising suggest the implied useful lives for these expenditures are one year for the Chemicals industry, three years for the Machinery & Computer and Electrical industries, and five years for the Transportation and Scientific Equipment industries.[80] Similarly, the results of estimating Equations (3.3) and (3.5) suggest implied useful lives of R&D investments from a high of 13.7 years for the Chemicals industry to a low of just over three years for the Electronics industry.[81] Although the results are generally consistent with those of prior studies, the implied lives are marginally longer than the

[79]The model is estimated using the relative excess methodology in Thomadakis [1977] as substitute for Tobin's *Q* used in the two-step approach by Hirschey and Weygandt [1985] and is shown in Equation (3.3) as:

$$\frac{MVE_{i,t} - BVTA_{i,t}}{Sales_{i,t}} = \alpha + \beta_1\left(\frac{AdvExp_{i,t}}{Sales_{i,t}}\right) + \beta_2\left(\frac{R\&DExp_{i,t}}{Sales_{i,t}}\right) + \beta_3 GR_{i,t} + e$$

, where β_1 and β_2 represent the capitalization rates of advertising (*AdvExp*) and R&D (*R&DExp*) investments made by the firm and recognized in the income statement as period expenses, respectively. The second step uses the growth rates in the expenditure levels (inclusive of the current year) to determine the stock of intangible capital and amortization rates for the current period.

[80]The implied lives are consistent with the evidence in Bublitz and Ettredge [1989] and Peles [1970] except that longer lives are implied for advertising in the Transportation and Scientific Equipment industries. This five-year implied life instead of previous studies' evidence of one to three years could be influenced by firms' increasing investment in brand awareness or corporate themes while expensing these outlays as advertising, the result of differences in differences in the design among the studies, or both.

[81]The implied useful lives are consistent across all industries to most of the results in Hirschey and Weygandt [1985] and Bublitz and Ettredge [1989]. However, the results of the present study suggest longer lives for the Chemicals (13 years) and Scientific Instruments (11 years) industries, whereas most studies offer evidence that the useful lives for these two industries range between seven and nine years for the Chemicals industry and five to seven years for the Scientific Instruments industry. Again, the differences likely result from either operationalization and estimation differences, or both.

evidence in some prior studies. However, the differences should not affect the asset-and-liability-based model, yet may induce noise in the earnings-based model.

Table 6.10 provides evidence of the estimation procedures from Equation (3.3) for one industry, Chemicals, to see more clearly the estimation procedures used in this study. Equation (3.3) is estimated each year to find the capitalization parameters that will be used for the current year's expenditure level. The variables used in the estimation are historical and result in current year capitalization parameters based on an underlying econometric relation assumed to continue at a similar proportional level. The next step uses the capitalization parameters, and evidence of growth rates in advertising/R&D expenditures, to estimate equation (3.5). The stock of intangible capital and economic amortization rates from Equation (3.4) yield the necessary variables to adjust a firm's resources and current period earnings. Also, Table 6.11 shows the capitalization and amortization rates for the other four industries.

6.2.3 Data Sources and Adjustment Results for Operating Leases

The data for the third adjustment is typically found in the footnotes to a firm's financial statements. The disclosures, often part of the commitment or contingency footnote, usually provide the current period rental expense charged to the current period. For the current sample, all financial statement sources (i.e., *Compustat,* the *Disclosure SEC Database* of *Compact dSEC*™ , and Form 10-Ks collected data from *SEC File*) were examined to obtain information about operating leases. The rent expense related to operating leases is charged to the current period without regard to the flow of the actual payment and is expected to represent a straight-line basis or another that is more representative of the time pattern in which the benefit of the leased property is derived (SFAS No. 13, ¶15, 1976). The rental expense is the variable of interest to the present design and is used to restate a firm's net resources. In the present thesis, equity investors are expected to *recognize* an

operating lease commitment as a firm's obligation and simultaneously capitalize the value of its related leased asset.

The present design uses the evidence from Imoff, Lipe, and Wright [1991] that shows a simple heuristic of a factor of eight applied to rent expense outperforms discounted cash flow techniques to estimate the obligation. Therefore, the present study predicts that investors adjust a firm's obligations by, $(Operating\ lease\ liability)_{i,t} = (Rent\ expense)_{i,t} * 8$. The value of the leased asset, more difficult to measure since additional variables must be assumed (e.g., life, economic depreciation rates, remaining years), can be estimated from ILW's asset capitalization table. For most analyses and reasonable estimates of the factors, the estimate of the value of the leased asset is between 60% and 80% of the liability amount.

However, for the present thesis, where an asset-and-liability-based specification is employed to explain equity values, capitalizing any percentage of the liability would produce explanatory variables that are linear combinations of one another. Therefore, the net amounts of the liability and asset estimates are used in this study.[82] Table 6.12 shows that most firms in each of the five industries finance its operations using operating leases. The adjustment related to these disclosures attempts to approximate investors' capitalization of these obligations, while netting the leased asset value against the estimated operating lease liability. The Chemicals and Transportation industries reported the highest levels of rental expense ($9.1 and $7.02 million median values, respectively), while the other three industries reported rental expense between $1 and $2 million. Since the capitalized liabilities and assets for each firm are a function of rental expense, the net lease obligations are distributed similarly to the current-year rental expense amounts. For the Chemicals and Transportation industries, the estimated net lease liability is $21.84 and $16.84, respectively.

[82]The present thesis adjusts a firm's resources by the net of lease obligations and assets as follows, $(Net\ operating\ lease\ liability)_{i,t} = (Operating\ lease\ liability)_{i,t} * 30\%$. The operationalization of the adjustment can be restated to: $(Net\ operating\ lease\ liability)_{i,t} = (RentExpense)_{i,t} * 2.4$, where the net operating lease liability is determined using the heuristic of eight times rent expense less the estimated asset value.

The other three industries (i.e., Electrical, Machinery & Computers, and Scientific Equipment) have estimated net obligations between $3.8 and $4.7 million.

6.2.4 Data Sources and Adjustment Results for Depreciation Disclosures

Disclosures on a firm's depreciation choices can be found in the footnotes to the financial statements, and also in alternative financial reporting disclosures mandated by Regulations S-X and S-K of the Securities and Exchange Act of 1934 - Schedules V and VI of the firm's 10-K filings. Whereas the footnote information typically offers aggregated information on depreciation expense and methods, the information in a firm's 10-K filing provides more detail on the components of property, plant, and equipment (PP&E), and also the component information on total depreciation expense and accumulated depreciation. For the current sample, all financial statement sources (i.e., *Compustat*, the *Disclosure SEC Database* of *Compact dSEC*™, and Form 10-Ks collected data from *SEC File*) were examined to obtain information about depreciation choices and the components reported under multiple methods (if not reported using only one method). Therefore, for those firms that disclosure component information, more precise estimates for the depreciation adjustment are obtained.

The present study uses a methodology shown in Brown, Soybel, and Stickney [1993, hereafter BSS] to convert both income statement and balance sheet amounts from straight-line to an accelerated method. BBS shows factor conversions for converting from straight-line to an accelerated depreciation given different average lives and growth rates. The greater detail of information offered in a firm's 10-K filing allows for fairly precise estimates of assets lives across the components of PP&E. Compound growth rates in depreciation expense over the previous five years and the average total life of PP&E are necessary inputs for each year of the analysis.

The result of operationalizing the disclosures on a firm's PP&E and depreciation method restates the current period depreciation expense to (approximately) an *as-if* double-declining-balance method

of depreciation expense. Additionally, the summary measure of total assets reported in the balance sheet is restated to reflect better the economic value of PP&E. The asset restatement process adjusts accumulated depreciation to *as-if* accelerated instead of as reported using the straight-line method.[83] The conversion is available due to the systematic relation between straight-line depreciation and double-declining-balance method and depends on (1) the average total life of fixed tangible assets (measured by dividing gross property, plant, and equipment by depreciation expense) and (2) the growth rate in capital expenditures.

Table 6.13 shows that most of the firms in the sample allocate depreciation charges for at least some component of PP&E under the straight-line method. The median values of reported financial statement data range from (gross) PP&E of $383.14 million in the Chemicals industry to $32.32 million in the Scientific Equipment industry. The operationalized disclosures produce two variables of interest to this study: (1) the difference in reported straight-line and estimated double-declining balance method of depreciation, and (2) the difference in reported straight-line and estimated double-declining balance accumulated depreciation amounts. The median depreciation differences across the industries are $4.32 million (Chemicals), $0.9 million (Machinery & Computers), $0.75 (Electrical), $2.78 (Transportation), and $0.5 million (Scientific Equipment). The median accumulated depreciation differences across the industries are $5.03 million (Chemicals), $0.09 million (Machinery & Computers), $0.16 (Electrical), $4.21 (Transportation), and $0.76 million (Scientific Equipment). Each difference is a function of both the estimated growth rate in PP&E and estimated life of PP&E. The growth rates (estimated lives) of PP&E ranged from median values of 10.4% in the Chemicals industry to 5.58% in the Transportation industry (15.2 years in the Chemicals industry to 10.86 in the Electrical industry).

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[83]The adjustments to earnings and assets, suggested in BSS, are used in this thesis. The adjustment to earnings is the difference between the estimated (accelerated) depreciation amount and that amount expensed in the current year using the factor conversion in BSS with input values of PP&E lives and growth rates. The earnings adjustment shown in Equation (3.8) is $(Depreciation\ adj.)_{i,t}$ = $(BSS\ accelerated\ depreciation)_{i,t}$ - $(SL\ depreciation)_{i,t}$, where depreciation expense is recalculated based on PP&E lives and growth rates. The present study predicts that assets are adjusted by investors as follows, $(A/D\ adjustment)_{i,t}$ = $(BSS\ A/D)_{i,t}$ - $(SL\ A/D)_{i,t}$, shown in Equation (3.9). The adjustment to assets is made for those PP&E components reported under the straight line method where *A/D* is accumulated depreciation.

6.2.5 Data Sources and Adjustment Results for Contingency Disclosures

Managers often report liabilities (and some potential gains) via alternative disclosures (e.g., footnotes or in the text of the MD&A report) if they assert that *either* the loss is not probable or the amount cannot be reasonably estimated. SFAS No. 5 and the MD&A report mandated by the SEC require firm disclosures of loss contingencies that are not accrued by a charge to income. For the current sample, all financial statement sources (i.e., *Compustat,* the *Disclosure SEC Database* of *Compact dSEC*™ , and Form 10-Ks collected data from *SEC File*) were examined to obtain information about gain and loss contingencies.

However, the operationalization of both gain and loss contingencies face data problems. Many contingencies are either not disclosed timely or not quantified when disclosed. Therefore, this adjustment is dependent on appropriate disclosures to quantify gain or loss contingencies that might affect firm value. In the current sample evidence, less than 15 firms disclosed quantitative information on plaintiff litigation awards (i.e., gain contingencies). The most often gain contingency disclosed was the potential effect of unexpired net operating loss carryforward. However, the carryforward is recorded as a component in the recognized deferred tax asset thereby investors' adjustment to the summary measure of total assets is unnecessary using the current research design.

The disclosures of potential loss contingencies of interest to the present study are defendant litigation, environmental liabilities, possible tax assessments, dividend payments in arrears, or guarantees (e.g., loan guarantees). Table 6.14 shows that only 14% (154 firm-years out of 1,065) of the firms disclosed quantitative information that can be used for the current study's operationalization process of these alternative financial reporting disclosures. The median values of loss contingencies across the industries are $27 million (Chemicals), $8.68 million (Machinery & Computers), $10.54 (Electrical), $61.91 (Transportation), and $3.70 million (Scientific Equipment).

6.2.6 Data Sources and Adjustment Results for Pension Disclosures

SFAS No. 87 is in effect for those years of interest to this study. The disclosure requirements for defined benefit pensions were expanded by this standard to provide more comprehensive and more current information than that recognized in financial statement representations. Since several factors that influence pension cost, assets, and obligations continue to receive delayed recognition in the financial statements and net presentation for those recognized, the disclosure requirements are extensive. Most firms disclose pension information in a footnote to the annual financial statements that separates under and overfunded plans, and also those plans in different international jurisdictions. For the current sample, all financial statement sources (i.e., *Compustat,* the *Disclosure SEC Database* of *Compact dSEC*™ , and Form 10-Ks collected data from *SEC File*) were examined to obtain information about a firm's pension resources, obligations, and cost components.

As discussed in Chapter 3, the asset and liability adjustments remove the offsetting feature of SFAS No. 87. The offsetting feature allows managers to net the contributed assets and liabilities of the plan even though the assets are still controlled by the firm and the liability has not been settled. Since substantial risks and rewards associated with both the plan assets and liabilities, investors are likely to use the gross amounts instead of the net when assessing firm values. To operationalize the adjustments to assets and liabilities, this study uses the results from prior research that finds that market participants appear to value pension obligations consistent with the level of accumulated benefit obligation (ABO), except those firms that show the highest growth rates of future compensation. For the firms expecting high growth rates in future compensation, market participants apparently believe the projected benefit obligation (PBO) more closely approximates the economic obligations of the firm than does the ABO.

Thus, a firm's liabilities related to pension obligations is adjusted to either the ABO or PBO level, dependent on the firm's expected growth rate in compensation, less the amount (if any) recorded under the minimum liability provisions of SFAS No. 87. The summary measure of a firm's

resources is adjusted by adding the fair market value of the pension plan assets (a required disclosure under SFAS No. 87). In the current sample, about 40% of the firms are subject to the minimum liability provisions of SFAS No. 87. However, due to the ability of managers to offset these obligations with plan resources and delay their recognition, the median values of the minimum liabilities are much lower than the ABO. For example, Table 6.15 shows the median values of those firms subject to the minimum liability provisions of SFAS No. 87 ranging from $20.49 million in the Chemicals industry to $3.17 million in the Electrical industry. However, the range across the five industries of the median value of the ABO is much higher. The ABO ranges from a median value of $376.35 million in the Chemicals industry to a median value of $26.31 million in the Machinery & Computer industry.[84]

The information on ABO, PBO, the FMV of plan assets, and expected growth rates in compensation found in the footnote disclosures are used to operationalize the adjustments to the summary measures of a firm's resources and obligations. Only 31% of the sample firms have disclosures on the FMV of plan assets contributed to fund pension obligations. These disclosures are used to restate total assets by adding the FMV of those plan assets. The adjustments to assets across the five industries are (in median values) $276.94 million (Chemicals), $22.18 million (Machinery & Computers), $40.21 (Electrical), $394.70 (Transportation), and $31.36 million (Scientific Equipment). The adjustment to a firm's liabilities results in adjustments across the five industries of (in median values) $364.47 million (Chemicals), $22.71 million (Machinery & Computers), $35.03 (Electrical), $117.16 (Transportation), and $394.70 million (Scientific Equipment). The median values of adjustments to assets and liabilities are not comparable since the firms with some contributions to plan assets is a subset of the total firms with defined benefit obligations.

[84] Although Table 6.15 shows median values, the Transportation industry had the highest average ABO, exceeding $1.229 billion.

In this study, a firm's earnings are adjusted for pension cost disclosures related to those items that qualify for delayed recognition and are amortized over future periods. The adjustment is expected to approximate investors' restatement of contemporaneous earnings used to predict future period core earnings. Since delayed recognition provisions increase future periods' pension expense calculations, this study restates earnings to remove those amortization items that qualified for delayed recognition under the provisions of SFAS No. 87. In the current sample, the restated pension cost is lower than the reported pension cost for the median values across the five industries. Table 6.15 shows that the amortization items (i.e., *Other Cost Components*) lower the reported pension cost by median values ranging from $2.36 million for the Chemical industry to $0.24 million for the Machinery & Computer industry. However, should the amortization items include deferrals of gains on plan assets, the restatement process can lead to higher amounts of pension cost than the amount reported. The net amount of the amortization items (i.e., the difference between reported and restated pension cost) is the adjustment to earnings for each firm.

6.2.7 Data Sources and Adjustment Results Related to OPEB Disclosures

For two of the three sample years (1992 and 1993), SFAS No. 106 was in effect and required disclosures related to postemployment benefits (OPEB) other than pensions are used to adjust summary measures of total assets and total liabilities. SFAS No. 106 allows managers up to a twenty-year transition period of delayed recognition or the effects can be immediately recognized as in the current financial statements (i.e., in the year of adoption of SFAS No. 106 the immediate recognition yields a charge against net income equal to the unfunded liability and is disclosed as an after-tax cumulative effect of a change in accounting principle).

This study predicts that investors will adjust financial statement summary measures similarly to the adjustments for pension disclosures. Detailed information is provided in the footnotes to the financial statements that describes the offsetting variables that produced the net liability recognition

and any delayed items. For the current sample, all financial statement sources (i.e., *Compustat,* the *Disclosure SEC Database* of *Compact dSEC*™, and Form 10-Ks collected data from *SEC File*) were examined to obtain information about postretirement information.

Table 6.16 provides evidence of the usual practice that led to the enactment of SFAS No. 106.[85] Firms disclosed the fair market value of plan assets for only 42 of the 240 (17%) firm-years. This suggests that the contributed amounts did not meet materiality thresholds for disclosure or that most of the OPEB plans are unfunded. Although not disclosed in Table 6.16, the 42 OPEB plans that are partially or wholly funded average $186.95 million while its related accumulated benefit obligation (APBO) is $1,175.81 million. Table 6.16 shows the number of firms that chose the immediate recognition of the OPEB liability. Only 13% of the firms chose to delay the transition obligation over future periods. Most firms opted for the disclosure as a change in accounting principle in the year of adoption, but left the obligations significantly unfunded.[86]

The median values shown in Table 6.16 for the liability adjustment (the excess of APBO over the accrued OPEB cost) across the five industries are $5.38 million (Chemicals), $1.58 million (Machinery & Computers), $9.36 (Electrical), $1.12 (Transportation), and $1.28 million (Scientific Equipment). Additionally, for 42 of the sample firm-years, total assets are adjusted by adding the FMV of OPEB plan assets and range from (in median values) to $1,366 million of the Machinery & Computer industry to $17 million for the Transportation industry.

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[85]The FASB stated in the summary to SFAS No. 106, (the statement)... *will significantly change the prevalent current practice of accounting for postretirement benefits on a pay-as-you-go (cash) basis by requiring accrual, during the years that the employee renders the necessary service*... [FASB, 1990, Summary].

[86]Even for firms choosing the immediate recognition of the OPEB obligation, similar items to those used to calculate pension cost may be amortized over future periods (e.g., unamortized gain or loss on plan assets, unrecognized prior service cost). Additionally, firms were unable to tax effect the transition liability under SFAS No. 96 and some delayed adoption until after enactment of SFAS No. 106 that allows managers to show the after-tax consequences of the cumulative effect of change in accounting principle instead of the pretax effect under SFAS No. 96 [FASB, SFAS Nos. 96 and 109; 1987 and 1992, respectively].

6.3 Primary Results

Hypotheses One and One(a) predict that the candidate adjustments to assets and liabilities are, individually and in the aggregate, significant variables for explaining the variation in equity values conditioned on reported balance sheet data. Additionally, Hypothesis One(b) predicts that restated summary measures of firms' resources and obligations will have a stronger association with market values relative to reported summary measures on the balance sheet over annual intervals. The three related hypotheses are tested by performing pooled regressions and year-by-year regressions. The determination of the stronger association with equity values between reported and restated summary measures uses Vuong's likelihood ratio test.

Table 6.17 provides descriptive information on those variables used in the asset-and-liability-based valuation model for the test period 1991-1993. The five adjustments to firms' resources are shown and range from capitalization of intangible capital of (on average) $1,271.52 million to the adjustment for OPEB plan assets of (on average) $10.39 million. The table also shows the range in the four adjustments to firms obligations. Those amounts range from $489.24 million to $14.35 million for the contingent liability adjustment. Also, Table 6.18 shows product moment and Spearman correlations of the variables used in the asset-and-liability-based valuation model.

6.3.1 An Asset-and-Liability-Based Valuation Model

The regression estimated for the prediction in Hypothesis One is,

$$MVE = \alpha_0 + \beta_0\, BVTA + \sum_{a=1}^{5} \beta_a\, adjA_a + \gamma_0\, BVTL + \sum_{l=1}^{4} \gamma_l\, adjL_l + u, \qquad (6.1)$$

where *MVE* is the market value of common equity at the end of the third month following the close of the current fiscal year, *BVTA* and *BVTL* are the book value of assets and liabilities for the current year, respectively. The candidate adjustments to assets and liabilities are *adjA* and *adjL* (where *a* and *l* are greater than zero) where each is operationalized from alternative financial disclosures of

the current year. There are five adjustments to assets (i.e., adjustments related to inventory, intangible capital, accumulated depreciation, pension assets, and OPEB assets) and four adjustments to liabilities (i.e., adjustments related to operation leases, contingencies, and also pension and OPEB obligations).

Table 6.19 presents the results of Hypothesis One. The model is estimated over the three years 1991-1993 with and without OPEB adjustments since OPEB disclosures are adjusted in years 1992 and 1993 only. The model is also estimated by pooling the observations for years 1992 and 1993 with OPEB obligations and offers the strongest evidence of the equity valuation role that all seven adjustments perform relative to balance sheet summary measures. As expected, in all three specifications shown in Table 6.19, the summary measures of GAAP-based assets and liabilities are significant and exhibit the expected signs consistent with their impact on firms' resources. As predicted the adjustments to firms' resources to capitalize the intangible capital effects of R&D/advertising expenditures, and the adjustment to pension plan and OPEB assets to capitalize the fair market value of those assets are significant in the 1992 to 1993 pooled estimation (as well as the 1991-1993 pooled estimation for all the mentioned adjustments except OPEB assets) and positively associated with equity values.

However, the adjustment to depreciation, although exhibiting a positive estimated coefficient, is significant in only two of the three years, as is the OPEB asset adjustment in only one of two years. The inventory adjustment to capitalize the LIFO reserve for firms showing the ability to pass price changes on to customers does not appear to explain any incremental variation in equity values conditioned on the other included variables. In total, these results support Hypothesis One for the asset adjustments to intangible capital and pension assets, yet offer weak support for the adjustments

to accumulated depreciation and OPEB plan assets. The results offer no support for capitalizing the LIFO reserve as operationalized in this study.[87]

Table 6.19 also presents the results of Hypothesis One for the four adjustments to firms' obligations. For the adjustments to firms' obligations, each adjustment other than the OPEB obligation adjustment is significantly different from zero in all three years and exhibits the predicted negative association to equity values. The OPEB adjustment for liabilities is not significantly different from zero in either specification when it is included as an explanatory variable. This may be due to the immediate recognition that most firms took in reporting the OPEB liability or due to market participants beliefs that the liability recognized, disclosed, and/or as operationalized in this study are noisy signals of firms' expected future outflows related to OPEB obligations. The results offer additional support for Hypothesis One for three adjustments to liabilities (i.e., operation leases, contingencies, and pensions), but offer no support that investors adjust firms' reported liabilities for OPEB obligations.[88]

Table 6.20 presents the results of year-by-year regressions for testing Hypothesis One. Since autocorrelated errors exist in the pooled sample, the year-by-year regression results test whether the results are driven by understated errors that often result from autocorrelated errors. In the year-by-year regressions, the results also support Hypothesis One for all asset adjustments except the inventory restatement. For the adjustments to liabilities, the year-by-year regressions offer support for Hypothesis One for all adjustments except the adjustment for OPEB obligations. These results

[87]These results are consistent with studies that find these alternative disclosures are value-relevant in studies investigating the individual effect that each has on stock prices (e.g., Jennings, Simko, and Thompson [1996]; Lev and Sougiannis [1996]; Most [1984]; and Barth [1991]).

[88]These results for the liability adjustments are consistent with studies that find these alternative disclosures are value-relevant (e.g., Imhoff, Lipe, and Wright [1995]; and Barth [1991]).

are consistent with the evidence from the pooled sample.[89] Also, all standard errors where tests of constant variances in the errors are rejected are based on White's [1980] consistent covariance matrix estimator. The resulting *t*-statistics and significance tests are also based on White's standard errors suggested by the consistent covariance matrix estimator.

Hypothesis One(a) predicts that when the adjustments used as explanatory variables for Hypothesis One are aggregated to form one adjustment variable for assets and one adjustment variable to liabilities, the resulting adjustment variables will significantly explain some variation in the market value of equity conditioned on reported assets and reported liabilities. Also, these estimation results allow a straightforward test of valuation differences between reported assets and assets resulting from operationalizing alternative disclosures, and similarly between reported liabilities and operationalized variables that related to obligations. The regression performed is,

$$MVE = \alpha_0 + \beta_1 BVTA + \beta_2 TadjA + \gamma_1 BVTL + \gamma_2 TadjL + e \ , \qquad (6.2)$$

where *TadjA* and *TadjL* are the aggregated adjustments to assets and liabilities, respectively.

Table 6.21 presents the results of tests of Hypothesis One(a) by first showing the results of the pooled sample estimation for tests of significance. All related asset and liability candidate adjustments are combined, although some loss of information is expected due to the aggregation of irrelevant adjustment variables shown in tests of Hypothesis One. Nevertheless, the information gained more than offsets the information lost due to the irrelevant variables and the potential negative effect of assuming linearity among the aggregated variables. Just as reported total assets and total liabilities significantly explain some variation in the market value of equity, the aggregated candidate adjustments to assets and liabilities are significantly different from zero and exhibit the

[89]Diagnostic tests and the procedures to control for their potential effects are discussed in Chapter 7. The results from those procedures to control for the effects of heteroscedastic and autocorrelated errors, and those procedures to address collinear independent variables and the influence of outliers leave the results from estimations using all observations qualitatively unchanged. That is, since many diagnostic procedures involve testing restricted versions of the full data matrix, estimates of the variances and covariance are expected to be different than from estimated the full sample. However, although this leads to quantitative differences, none of the diagnostic procedures change the basic tenor of the present results.

predicted signs consistent with the future resource flows. However, the explanatory power of the model is reduced from 84% to 82% due to the aggregation procedure.[90]

To investigate the differential valuation role of reported and candidate adjustments, a test of the hypothesis that coefficients β_1 and β_2 (and also γ_1 and γ_2) are equal is done. Absent any theoretical structure specifying which component is more valued under the alternative, the tests are two-sided. The tests for Hypothesis One(a) use the estimation results of Equation (4.2) and test, H_0: $\beta_1=\beta_2$, against H_1: $\beta_1\neq\beta_2$ to test the equivalency of adjustments to assets and reported assets. The test of the equivalency of adjustments to liabilities and reported liabilities is, H_0: $\gamma_1=\gamma_2$, against H_1: $\gamma_1\neq\gamma_2$. An examination of the parameter estimates for the pooled and year-by-year regressions shows that the reported assets are more highly valued by investors than are either the operationalized signals of firms' resources or obligations.[91] In the year-by-year regressions, the reported assets are significantly different from the GAAP-based total asset measure in all years, and the reported liabilities are significantly different from the GAAP-based total liability measure in years 1992 and 1993, but not in 1991.[92]

Apparently, using the operationalization process in this study relating to firms' disclosures of obligations, the results suggest that the alternative disclosures related to firms' obligations are valued similarly to GAAP-based summary measure of total obligations when the OPEB obligations are not considered. However, using the operationalization process in this study related to assets, the results

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[90]When those variables shown not to significantly explain the variation in equity values in tests of Hypothesis 1 are not aggregated with the other adjustment variables, the explanatory power of the model is 85% compared with 82% when all are aggregated.

[91]Several limitations of the present design and the research design of other studies that investigate the value-relevance of alternative and GAAP-based financial reporting disclosures warrant mentioning. Measurement error in the reporting of alternative forms of disclosures or the operationalization process used to quantify alternative disclosures can induce differences in valuation or induce sufficient noise to mask how investors use that data. Thus, the use of the operationalization process most often suggested by pedagogical texts in the areas of finance, accounting, and financial statement analysis is employed.

[92]An obvious explanation is that the inclusion of OPEB liabilities induces the valuation differences in years 1992 and 1993. However, when that adjustment is removed from the aggregation of adjustments to liabilities, significant valuation differences remain in 1993, yet are not evident in 1992.

consistently suggest alternative disclosures related to firms' resources are not valued similarly to GAAP-based summary measure of total assets.

The final test of related to the asset-and-liability-based valuation model uses a specification of Equation (6.2) that aggregates the adjustments to assets (liabilities) and reported assets (liabilities) to produce a summary measure of a firm's resources (obligations). The model that uses adjusted summary measure of resources and obligations is compared against a model specified with only reported assets and reported liabilities to test whether the adjusted measures of resources and obligations better represent the data generating process in the market value of equity. This type of aggregation places additional structure on the informativeness of disclosures and leads to a bias against rejecting the null that a model using adjusted book values will better explain the variation in equity values than using book values. The regressions that compete are,

$$MVE = \alpha_0 + \delta_1 BVTA + \delta_2 BVTL + e \text{ , and} \tag{6.3}$$

$$MVE = \alpha_{0adj} + \delta_{1adj} BVTAadjA + \delta_{2adj} BVTLadjL + e_{adj} , \tag{6.4}$$

where *BVTAadjA* and *BVTLadjL* represent combined reported and adjusted assets, as well as combined reported and adjusted liabilities, respectively. To compare the adjusted R^2 of Equations (6.3) and (6.4), this study uses Vuong's likelihood ratio test.

The prediction is that, of the two imperfect models, the model with adjusted assets and adjusted liabilities is closer to the true data generating process in the market value of equity. Table 6.22 shows the results of tests for the pooled sample for years 1991 to 1993, and year-by-year tests of the competing models. In all four specifications of the competing regressions, the Vuong *Z-statistic* is significantly negative suggesting that MODEL 1 (reported assets and reported liabilities) is rejected in favor of MODEL 2 (adjusted assets and adjusted liabilities). The directional tests are significant at a *p-value* of less than 10% in all four specifications, and below a *p-value* of 5% in three of those specifications (pooled, 1991, and 1992). These results support Hypothesis One(b) that predicts that

investors restate the summary measures of firms' resources and obligations when valuing common equity values.

6.3.2 The Informativeness of Disclosures Conditional on Earnings

Hypotheses Two, Two(a), and Two(b) test an additional valuation model similarly to the tests of the related hypotheses in Hypothesis One. The model is specified as an earnings-based valuation model using components of the income statement representation of earnings. Table 6.23 shows descriptive statistics for those variables used to estimate the earnings-based valuation models. The four adjustment variables range from (on average) $149.78 million for the erosion of intangible capital to $3.9 million to adjust cost of goods sold related to the cost-flow choice of the firm. Table 6.24 provides product moment and Spearman correlations for the earnings-based variables. Hypothesis Two tests the incremental information content of the operationalized disclosures conditional on disaggregated (reported) earnings by estimating,

$$MVE = \alpha_0 + \beta_1 REV + \gamma_1 COGS + \delta_1 DEP + \eta_1 OEXP + e \text{ , and} \quad (6.5)$$

$$MVE = \alpha_0^* + \beta_1 REV + \gamma_1 COGS + \gamma_2 COGSadj + \delta_1 DEP + \delta_2 DEPadj + \eta_1 OEXP + \eta_2 OEXPadj + e^*, \quad (6.6)$$

where *REV* is revenue for the current year, *COGS* is cost of goods sold for the current year, *OEXP* is expense other than cost of goods sold for the current year (i.e., excluding the effects of non-recurring items, special items, extraordinary items, and discontinued operations), and the suffix *adj* represents the sum of the adjustments related to that component of earnings.

The valuation role of the four candidate adjustments to earnings is evidenced by individually testing whether the three coefficients, (γ_2, δ_2, η_2) estimated in Equation (4.6.) are significantly different from zero. Table 6.25 shows the results of these tests. For the pooled sample, the candidate adjustments are significantly different from zero and exhibit the predicted negative association with equity values. In the year-by-year regressions, the adjustment variables are

significant in years 1991 and 1992, yet none are significantly different form zero in 1993 although all exhibit the predicted negative association. These results offer some evidence that these alternative disclosures are used in the sample period, but not in all years.[93]

Hypothesis Two(a) uses the estimation results of Equation (6.6) to test the three questions of equivalent valuation: (1) H_0: $\gamma_1=\gamma_2$, against H_1: $\gamma_1\neq\gamma_2$ to test the equivalency of reported COGS and the adjustment to COGS, (2) H_0: $\delta_1=\delta_2$, against H_1: $\delta_1=\delta_2$ to test the equivalency of reported depreciation and the adjustment to depreciation, and (3) H_0: $\eta_1=\eta_2$, againstH_1: $\eta_1\neq\eta_2$ to test the equivalency of reported other expenses and adjustments to other expenses. Table 6.26 shows that the reported cost of goods sold signal and its operationalized adjustment appear to be equivalently valued by investors, but the adjustments to depreciation and other expenses are significantly different from their GAAP-based disclosures. The results suggest two possibilities related to the depreciation and other expense adjustments. One, the operationalization process in this study may not be consistent with the operationalization process used by investors, or the disclosures are not equivalently valued to disclosures reported on the income statement. However, for the costs of goods sold adjustment, the present operationalization process yields similar signals of firms' resources to those of GAAP-based disclosures.

Hypothesis Two (b) tests whether further aggregation produces a summary variable that better reflects the data generating process in the market value of common equity. Models are restated by combining the components of firm performance into measures of reported and restated earnings. These alternative specifications of Equations (6.5) and (6.6) are,

$$MVE = \alpha_0 + \beta_1 RE + e, \text{ and} \tag{6.7}$$

$$MVE = \alpha_0^a + \beta_1^a adjRE + e^a, \tag{6.8}$$

[93] Although not significantly different from zero in 1993, when specified in a model not conditioned on the components of earnings, all earnings adjustment are significantly different from zero. Thus, for the sample evidence, the adjustments to earnings in 1993 had no significant valuation role when included with earnings in a valuation model, yet all three had the predicted sign.

where *adjRE* is the sum of reported earnings and the candidate adjustments to earnings. Again, the model selection test for competing models that use either reported earnings or adjusted earnings is the likelihood ratio test described in Vuong [1989]. The prediction is that, of the two imperfect models, the model with adjusted earnings is closer to the true data generating process in the market value of equity. Table 6.27 shows the results of tests for the pooled sample for years 1991 to 1993, and year-by-year tests of the competing models. If the Vuong *Z-statistic* is significantly negative, this suggests that MODEL 1 (reported earnings) is rejected in favor of MODEL 2 (adjusted earnings). However, in the four specifications of the competing regressions shown in Table 6.27, the Vuong *Z-statistic* is not significantly negative. The directional tests yield a *p-value* of 27% for the pooled sample, and a *p-value* of not less than 37.6% in any of the year-by-year specifications. These results fail to support Hypothesis Two(b) that predicts that investors restate the summary measures of a firm's performance offered by financial statement representations for those related alternative disclosures when valuing common equity value.

6.3.3 The Effect of Alternative Disclosures on Return-Earnings Relation

Hypothesis Three tests Lev's [1989] proposition that the ability of equity investors' adjustments to improve the return-earnings relation depends on the variance of investors' adjustments to earnings. That is, as the variance of the adjustments are higher the contemporaneous association between returns and unexpected earnings is expected to be lower. As a proxy for the variance of investors' adjustments to earnings, the relative size of the (absolute value) of the adjustments to each firm's unexpected earnings is calculated. The size is considered without respect to the sign resulting in a more powerful test of the relative importance of investors' adjustments. The relative size is then partitioned into four portfolios. The portfolio with the smallest relative size of investors' adjustments is presumed to be the portfolio with the highest quality, and thus the portfolio with the highest correlation between stock price revisions around earnings announcements and unexpected

reported earnings. However, when the aggregate adjustments are the largest relative to unexpected earnings, that portfolio is expected to represent the lowest quality earnings. Also, Hypothesis Three considers the informativeness of the adjustments to earnings to market-adjusted stock returns as an alternative specification to explaining the variation in the market values of firms. Hypothesis Three tests whether Lev's proposition that, as aggregate adjustments made during the financial statement analysis process are more dispersed, the correlation between unexpected earnings and returns decreases.

Lev defines the quality of earnings in terms of perceived deficiencies in reported earnings. This suggests that perceived deficiencies detract from the ability of reported earnings to predict future cash flows and investors would adjust reported earnings to obtain a better signal of the future cash flows of a firm. Lev shows reported earnings as,

$$RE_t = \alpha\ CF_t + \epsilon_{1t} + \epsilon_{2t}, \tag{6.10}$$

where *RE* is reported earnings and *CF* is the unobserved cash flow. The perceived deficiencies are represented by decomposing the disturbance process on earnings into two error terms where earnings is assumed to represent a signal of future cash flows. The decomposed disturbance process has two errors: (1) ϵ_1, reflecting perceived deficiencies in reported earnings adjusted during financial reporting analysis, and (2) ϵ_2, which is the remaining error term that reflects investors' inability to predict future cash flows of the firm perfectly. That is, the precision of earnings is affected by the sum of $1/\sigma^2_{\epsilon_1} + 1/\sigma^2_{\epsilon_2}$. The first factor is the variable of interest to Hypothesis Three (i.e., $1/\sigma^2_{\epsilon_1}$ or the precision of investors' adjustments).

Table 6.28 shows the results of tests after partitioning the sample evidence into quartiles based on the relative size of the absolute value of adjustments to unexpected earnings across the sample period of interest. The size of the adjustments to earnings is considered without respect to the sign resulting in a more powerful test of the relative importance of additional financial reporting

disclosures relating to earnings. The ranking process is a reasonable proxy to partitioning on the variance of investors' adjustments. Table 6.28 shows that the portfolio presumed to have the highest quality earnings (i.e., rank =1) has the lowest variance of investors' adjustments of 32.81. The variance of investors adjustments increases over 65,000 times between the lowest ranking and highest ranking portfolio. Additionally, the variances increase monotonically across all four of the portfolios consistent with the suggestion that a lower quality of earnings would have a higher variance of investors adjustments.

However, the results fail to support Lev's proposition. For the competing models, where Rank 1 is the quartile with the smallest relative adjustments is tested against the other three ranked portfolios; the Rank 2, 3, and 4 (i.e., the quartile with the largest relative adjustments) portfolios are not rejected in favor of the Rank 1 portfolio. Although the explanatory power of the model declines as the relative adjustment increase in size, the model with the smallest relative adjustments does explain a larger proportion of the variation in equity values than portfolios with larger relative adjustments in all years. Although not shown in Table 6.24, the sample was partitioned by adding the highest two ranking portfolios and testing that portfolio (i.e., all firms with rankings of 1 or 2) against the two lowest ranking portfolios (i.e., all firms with rankings 3 or 4). The Vuong likelihood ratio test again failed to reject the higher ranking in favor of the lower ranking portfolio.

6.3.4 The Feltham-Ohlson Valuation Model

Hypothesis Four tests a third valuation model to consider whether the suggested adjustments improve on its ability to reflect those variables used by investors to determine equilibrium equity values. Hypothesis Four tests the Feltham-Ohlson equity valuation model that describes equity valuation completely in terms of accounting numbers and defines firm equity as its book value plus discounted expected future earnings over an infinite horizon in excess of a normal or expected return on book value. Thus, Hypothesis Four tests models that use adjusted measures of earnings and book

values against an alternative specification that uses reported earnings and book values. The following FO valuation model, restated to consider the impact of investors' adjustments, is shown as,

$$MVE_{it} = AdjBV_{it} + \sum_{n=1}^{\infty} \frac{E\,[AdjE_{t+n} - (r_e)(AdjBV_{t+n-1}) \mid Z_t\,]}{(1+r_f)^n}, \qquad (6.11)$$

where *AdjBV* is equal to *(TadjA+BVTA)* less *(TadjL+BVTL)* and *AdjRE* is equal to reported earnings aggregated with the candidate adjustments suggested in this study. In a single-period setting, the creation of wealth (the present value of the second term in the above equation for a multiple-period setting) using adjusted measures of earnings and book value can be represented as,

$$MVE_{it} = (AdjBV_{i,t-1}) + [AdjRE_{it} - (r_e)(AdjBV_{i,t-1})], \qquad (6.12)$$

where all variables are as previously defined. Equation (6.12) differs from the theoretical model offered by Feltham-Ohlson [1995] by its single period representation and its use of adjusted accounting measures.

This leads to two competing models shown as,

$$MVE_{it} = (AdjBV_{i,t-1}) + [adjRE_{it} - (r_e)(AdjBV_{i,t-1})], \text{ and} \qquad (6.13)$$

$$MVE_{it} = (BV_{i,t-1}) + [RE_{it} - (r_e)(BV_{i,t-1})], \qquad (6.14)$$

where the specifications differ by their use of either adjusted GAAP-based summary measures or by those as reported on financial statements. Abnormal earnings across each specification shows the creation of wealth that results when one values a firm using a single-period representation of an FO model. The creation of wealth can be alternatively represented as,

$$AE_{it} = adjRE_{it} - (r_e * adjBV_{i,t-1}), \qquad (6.15)$$

for the wealth created in excess of the required return for the specification that uses adjusted measures of book value and earnings, and

$$AE_{it} = RE_{it} - (r_e * BV_{i,t-1}), \qquad (6.16)$$

for the wealth created in excess of the required return for the specification that uses reported measures of book value and earnings.

Table 6.29 shows the results of estimating the pooled sample for years 1992 and 1993. The observations for 1991 are needed to estimate the required returns for beginning stock of capital and are therefore excluded from the tests of the competing models. Of the 710 firms in the 1992 and 1993 sample, 34 firms are deleted due to negative values of either reported or adjusted book values. The negative values would force the required returns to be atheoretical since the stock of capital would be negative. The first model, FO 1 [shown in Equation (6.13)] competes against an alternative specification of the FO valuation model where both are shown in a single-period framework. The difference is that the FO 1 model uses adjusted measures, while the FO 2 model uses reported measures.

Table 6.29 shows that both specifications explain much of the variation in firm values. The specification using adjusted measures of book value and earnings explains 87.5% of the variation in the market values of the sample firms compared with 82.7% explained variation for the model that uses reported measures. The test for which of the two models better reflects the data generating process in equity values uses Vuong's likelihood ratio statistic. The specification in FO 1 that uses adjusted variables explains a significantly higher proportion of the variation in equity values as evidenced by the calculated Vuoung Z-statistic of 1.348, suggesting a p-value of approximately 0.09.[94]

These results reject the null statement in Hypothesis Four and suggest that investors use restated measures of book values and earnings to calculate the stock of value and abnormal earnings when market values are specified by a single-period FO model. Although accounting differences and timing problems caused by GAAP-based recognition criteria unravel over an infinite horizon, these results suggest investors adjust for some of these effects relative to a model-specification over a

[94]A significantly positive Z-statistic would indicate that model (i.e., FO 2 that uses reported measures of book values and earnings) is rejected in favor of model FO 1.

single period. The results are consistent with the results of those test results of Hypothesis One that suggest investors use the alternative disclosures of firms' resources and obligations to restate reported GAAP-based summary measures when assessing equity values.

6.4 Sensitivity Analyses and Diagnostic Procedures

Table 6.20 shows diagnostic statistics and procedures to address possible deficiencies in economic data that can lead to heteroscedastic and autocorrelated errors, and collinear independent variables obtained from balance sheet components. In those cases where heteroscedastic errors are apparent, White's [1980] consistent covariance matrix estimator is used to test significance levels. Also, for those cases where autocorrelated errors are suggested by the *d-statistic* shown in Durbin-Watson [1950], year-by-year regressions results are estimated and discussed throughout this study. As shown in Table 6.20, positive autocorrelation in the errors is evident throughout the pooled estimations that leads to confidence errors that are smaller that the true confidence intervals. Therefore, the year-by-year regression tests are likely to be more consistent with the actual significance levels than those of pooled estimation procedures in the present thesis.

Additionally, detection procedures for the effects of outliers on OLS residuals are performed. The procedures shown in Belsley, Kuh, and Welsch [1980, hereafter BKW], Welsch [1980], and Belsley [1991] are done to detect outliers and influential observations. BKW suggests that influential observations are those that appear to have a significant influence on parameter estimates (see also, Maddala [1992] for a thorough discussion). BKW suggests using DFFITS as a criterion for detection outliers and influential observations. DFFITS is a standardized measure of the difference in the fitted value of the dependent variable due to deleting each observation. They suggest that observations with large DFFITS should not be deleted, but instead should have their effect reduced similarly to the process shown in Welsch [1980]. The Welsch procedure, known as bounded influence estimation, can be approximated by a simple one-step process. Welsch suggests,

that where DFFITS > 0.34 exist, that their influence be reduced by weighting the observations by less than one. The bounded estimator is shown as, $\frac{0.340}{|DFFITS_i|}$, where the weight received is less than one when the DFFITS exceed 0.34.

For the asset-and-liability-based model tested in Hypothesis One, twenty-five observations are reweighted as the DFFITS value exceeded 0.34 and twenty-eight other observations were reweighted as their DFFITS value was less than -0.34. The estimation procedures of using the fifty-three reweighted observations had an explained variation of 85.7% and, although quantitative differences were evident compared with the unweighted estimation procedure, all variables were significant at conventional levels using White's [1980] standard errors as those significant in the unweighted estimation. As before, the adjustments to inventory and OPEB obligations were not significant at convention levels. Also, as done in many studies, the fifty-three observations are deleted and the regression is reestimated. Again, the tenor of the results is unchanged. Similar procedures are performed in each estimation procedure for all hypotheses tests, yet none suggest that outliers or influential observations are influencing the results shown in this study. Therefore, unweighted estimation results are discussed throughout.

Also, the asset-and-liability-based and earnings-based valuation models employ independent variables expected to be collinear. For example, the result of estimating the asset-and-liability-based shown in Table 6.18 suggests that the condition number that measures the sensitivity of the regression estimates to small changes in the data is not well-conditioned since it exceeds a value of thirty.[95] BKW suggests that suggested that condition numbers exceeding thirty suggest poorly-conditioned data. However, in the present study a simple solution is available to test the influence of collinear variables or the possible inflation of the variables standard errors for tests significance

[95]BKW define the condition number as the square root of the largest to the smallest eigenvalue of the matrix of explanatory variables. They suggest that the closer the condition number is to one, the better conditioned is the data. For condition numbers between 15 and 30, they suggest investigating the correlation among the independent variables or imposing parameter constraints. However, Maddala [1992] shows the inappropriateness of attempting to solve multicollinearity problems by focusing on the intercorrelations among independent variables.

and valuation differences.[96] The collinear relations are evident between asset and liability variables, and also revenues and cost of goods sold variables. Thus, simply netting the variables should remove the effects of collinear variables on the variation of in those variables.

The results of reestimating with netted variables for the asset-and-liability-based and earnings-based valuation models yields condition numbers that are less than ten in all cases. These low condition numbers suggest that the collinear relations are those netted during the reestimation procedure. The results are reexamined to determine if the netting procedure leads to significant independent variables on those shown to be not significantly different from zero without the netting process. However, as one would expect, the removal of the effects of the collinear variables that are not adjustment variables and subsequently revealed low condition number still do not suggest significance of those adjustment variables previously shown to be insignificant. Thus, the variations of the standard errors on the adjustment variables do not appear to have been inflated in the full estimation. Consequently, the results shown throughout are those that estimate the disaggregated book values and gross margin for the asset-and-liability-based and earnings-based valuation models, respectively.

Two final tests are performed on the adjustment process. The first test for omitted variables bias tests the role that omitted variables play in biasing the parameter estimates when using only reported values. Thus, this sensitivity test is not simply a diagnostic procedure, but is also a further test of the value-relevance of the adjustments to GAAP-based summary measures as operationalized in the present study. By considering the effects of using adjusted variables in valuation models compared with using reported variables, this test allows the present study to provide additional empirical evidence that not adjusting reported summary measures can lead to errors-in-variables problems.

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[96]A point worth mentioning here is that the explained variation in models is unaffected by multicollinearity. Instead the most undesirable consequence of multicollinearity is that the variances of the OLS estimates of the parameters of the collinear variables are quite large. The high variances arise in the presence of multicollinearity when the OLS estimating procedure is not given enough independent variation in a variable to calculate with confidence its effect that is has on the dependent variable.

The test used in the present study, and discussed in detail in Appendix D, uses a modified-Utts [1982] test. The bias is expected to be smaller for the regression equation that has adjusted assets and liabilities as regressors compared with the regression equation that uses reported assets and liabilities. The test procedure involves two least squares regressions for each specification of the model. For the specification using reported assets and liabilities, the two least squares regressions are based on (1) all observations and (2) only the half of the observations whose *leverage* is low.[97] The results of these two least squares regressions are compared against similar regression when adjusted assets and liabilities are the regressors. The analysis allows for specification tests to be performed between the two forms of the model. The results of the modified-Utts test between regressions using only reported summary measures and those regressions that use adjusted measures yield *F-statistics* that are significant for specifications of the asset-and-liability-based and the Feltham-Ohlson-based valuation models that employ only adjustments to book value. A significant F-statistic was not shown in tests that use an earning-based model. The significant test statistic (both significant at *p-values* of less than 10%) suggests that the omitted variables bias significantly influences the parameter estimate when using reported summary measures for asset-and-liability-based and the Feltham-Ohlson-based valuation models. Thus, additional evidence is offered that the adjustments to firms' resources and obligations are apparently useful to investors by suggesting econometric improvements in model specifications that use adjusted variables for resources and obligations.

A final test estimates an alternative model to an OLS regression model by considering nonspherical disturbances in the error components of the model. More detail of the procedure is offered in Appendix D, yet a brief discussion follows. As the classical assumptions of OLS errors

[97]Belsley, Kuh, and Welsch [1980] show that leverage is determined by the significance of its influence on the estimated regression coefficients and on the fitted value of the dependent variable. By convention, a value of the *i*th diagonal element of a matrix (i.e., *hat matrix* that projects the observed values of the dependent variable into the fitted values of the dependent variable) that exceeds twice its average is considered to indicate an influential observation, or leverage point.

are restrictive when using economic data as sample data (particularly when time-series and cross-sectional data are combined), this test estimates a model that allows the covariance matrix of disturbances to have a more general form. Homoscedasticity, uncorrelatedness in the cross-section, and autocorrelated disturbances are testable restrictions and are likely to exist in the panel data used in the present thesis. Thus, an alternative assumption about the covariance matrix for the unobservable random disturbance is examined by linking the system of equations for each sample firm by their respective disturbance. The seemingly unrelated regression model using a feasible generalized least squares (hereafter SUR-FGLS) estimator is shown in Parks [1967].

In general, the problem of violating the classical assumptions in the form of the general linear model leads to less efficient OLS estimators compared with GLS estimators, although the OLS estimates are unbiased. Therefore, parameter and variance estimates from pooled sample and SUR-FGLS models are compared and the resulting significance tests of the SUR-FGLS estimation might be considered more representative of the actual strength of the relation between the variable of interest and either market values of equity or security returns. However, reestimation using the SUR-FGLS model does not change the tenor the results previously discussed. Significant adjustment variables from the OLS procedure remain significantly different from zero in three and two year estimations, and those insignificant variables shown in the OLS estimation cannot be considered significantly different from zero in the SUR-FGLS specification. In only one case, did an adjustment variable appear to be significant in the SUR-FGLS estimation, but was not significant in the OLS estimation. That one case was the OPEB obligation variable for the pooled estimation of 1991 to 1993 observations. This sole support for the OPEB adjustment to liabilities offers some evidence that this adjustment has value-relevance, yet the conflicting evidence does not offer sufficient support for the present author to suggest that investors' adjust OPEB obligations similarly to the operationalization process in the present study.

CHAPTER 7

Summary and Concluding Remarks

This study hypothesizes that the role of alternative disclosures is to provide value-relevant information that either explains financial statement representations or provides information on economic events that are not met GAAP-based recognition criteria. The results support the prediction that the operationalization process in this study of alternative financial reporting disclosures leads to value-relevant variables when conditioned on their related financial statement representations. This study also predicts that adjusted summary measures represented on financial statements are adjusted by investors when assessing the market value of a firm's equity. The prediction is that the GAAP-based summary measures are adjusted by investors to yield more informative factors in alternative specifications of equity valuation models. The results support the prediction that assets and liabilities are restated in both an asset-and-liability-based valuation model and (weakly) a Feltham-Ohlson valuation model. The results do not support the predictions that GAAP-based earnings is restated by investors using the operationalization process in this study for models that test the variation in stock prices or returns.[98]

7.1 Concluding Remarks and Directions for Future Research

This study contributes to the broader understanding of financial reporting by assessing the usefulness of various financial statement adjustments that equity investors might use to *correct* detractors in

[98] Although not as predicted in the present thesis, the results on the earnings-based model for returns is consistent with the results of Collins, Kothari, Shanken, and Sloan [1994]. They show that the noise in earnings in uncorrelated with returns, yet offer evidence that earnings lack of timeliness is a considerable detractor to the low contemporaneous earnings-return association.

reported financial statement numbers. The results of empirical tests of the value-relevance of alternative disclosures conditioned on GAAP-based information are consistent with the predictions on four of the five asset adjustments (intangible capital, depreciation, and also pension and OPEB plan assets), three of the four liability adjustments (operating leases, contingencies, and pension obligations), and the three types of adjustments to earnings (cost of goods sold, depreciation expense, and other expenses). Thus, alternative financial reporting disclosures about assets, liabilities, and earnings appear to have information content and value-relevance to security prices.

Also, the results of tests of the aggregation process used by investors to obtain summary financial signals suggests that investors use alternative financial reporting disclosures about assets and liabilities to restate GAAP-based representations. However, for an earnings-based valuation model, the results do not support the prediction that investors adjust income statement representations by restating earnings even thought the results offer evidence that alternative disclosures are incrementally informative to reported earnings. The results on earnings can be explained either by a noisy operationalization process on earnings adjustments in the present study or an aggregate time-period effect on the noise and bias in assets and liabilities. That is, earnings and its components are less noisy or biased since each is measured over only one annual reporting period.

Also, the results offer inconsistent evidence on the differential valuation of alternative financial reporting disclosures and GAAP-based representations. Although similarities were evident (e.g., the costs of goods sold adjustment yields similar signals of firms' resources to those of GAAP-based disclosures), more often the alternative disclosures (as operationalized in this study) were valued differently from GAAP-based representations. Although not predicted, the results suggest that alternative disclosures, where value differently, are significantly less valued than related GAAP-based disclosures.

However, several limitations of the present design and the research design of other studies that investigate the value-relevance of alternative and GAAP-based financial reporting disclosures are worth noting. Measurement error in the reporting of alternative forms of disclosures or the operationalization process used to quantify alternative disclosures can induce differences in valuation or create sufficient noise to mask how investors use that data. Also, the proposed adjustments and the methods of operationalizing the alternative disclosures are not meant to be exhaustive attempts to explain the way each adjustment might be done by investors. Nevertheless, this research is meant to add to the small body of research that operationalizes off-financial-statement information and examines the value-relevance to stock prices of each and when aggregated with financial statement representations.

Building on these results, future research might consider the impact of alternative disclosures on equity risk by considering multiple disclosures outside of financial statement representations (see Ely [1995] for a study on one alternative disclosure). As the disclosure choices to managers expand, the data in these sources are likely to increasingly explain financial statement representations in greater detail or offer new information outside the set of information offered by financial statements. Therefore, future research might examine the impact that alternative disclosures have on future earnings, analysts' forecast errors, or stock returns. Additionally, this thesis sought to add evidence to the question of differential valuation of recognized versus disclosed financial data. The results suggest that differences exist as investors impound these disclosures. Future research might examine via an experimental design how users with different objective functions use the sources of data. As suggested by Patell [1989], the alternative sources may be less valued by one user group than related financial statement representations, yet another user group might value the information equally regardless of the placement of related financial data.

Finally, the results suggest that future research should consider financial statement representations and alternative financial reporting disclosures as joint inputs into the process used

by investors to determine equilibrium equity values. Although the present results did not show a restatement of earnings in an earnings-based valuation model, future research on the role of earnings in determining equity values and as a monitoring summary measure might investigate the role that alternative disclosures have on determining, not only future earnings, but also the assessment of equity risk. For example, Lev and Sougiannis [1996] shows that investors systematically misprice firm values or demand additional compensation for two items communicated as financial statements representations - advertising and R&D. It is likely that similar investigations of alternative disclosures will support either the mispricing or additional risk proposition in future research. In either case, both are interesting questions on how users demand and use financial reporting disclosures despite their source and assist financial reporting regulators attempts to control information flows between managers and its stakeholders.

APPENDIX A: The LIFO Effect on Earnings

Cost of goods sold can always be derived from the beginning of the period and end of the period inventory balances and purchases for the period. Therefore, to restate cost of goods sold to another method (e.g., as-if-FIFO presentation), one needs to restate the inventory balances since purchases are unaffected by the accounting method used. However, it can be shown that the adjustment from LIFO to FIFO cost of goods sold can be performed by simply using the information contained in the beginning and end of the period LIFO reserve levels.[99] Thus, the LIFO effect on COGS can be shown as follows.

First, represent COGS under FIFO and LIFO methods,

$$COGS^{FIFO} = [BI^{FIFO} + P - EI^{FIFO}], \quad (A.1)$$

$$COGS^{LIFO} = [BI^{LIFO} + P - EI^{LIFO}], \quad (A.2)$$

where *P* is purchases for the current period, and *BI* & *EI* are beginning & ending inventory levels reported in the financial statements, respectively. Then solve for *P* in the second equation and substitute that solution into the first equation. This yields,

$$COGS^{FIFO} = COGS^{LIFO} - [(EI^{FIFO} - EI^{LIFO}) - (BI^{FIFO} - BI^{LIFO})]. \quad (A.3)$$

The LIFO effect results since,

$$(\text{LIFO Reserve})^{ENDING} = (EI^{FIFO} - EI^{LIFO}), \quad (A.4)$$

$$(\text{LIFO Reserve})^{BEGINNING} = (EI^{FIFO} - EI^{LIFO}), \quad (A.5)$$

and yields the following result,

$$COGS^{FIFO} = COGS^{LIFO} - [(\text{LIFO Reserve})^{ENDING} - (\text{LIFO Reserve})^{BEGINNING}]. \quad (A.6)$$

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[99]Much of the LIFO effect on earnings is explained in greater detail in most financial statement analysis texts. However, the mathematical presentation above is shown in White, Sondhi, and Fried [1995, p. 345].

APPENDIX B: Vuong's Model Selection Test Statistic

A recent development in model selection techniques is Vuong [1989]. Vuong provides a statistical test to investigate which of two imperfect models better explains the dependent variable. The advantage of the Vuong test is that Vuong's test statistic allows both models to have explanatory power but provides direction concerning which of the two is closer to the true data generating process. Additionally, the tests are derived for cases of nested, nonnested, or overlapping models where one, both, or neither are misspecified.

Although Davidson and MacKinnon [1981] suggest a test where competing models can be combined into a single model yielding a J-test (for joint estimation), their test does not allow for a ranking of the models when the test rejects or accepts both of the competing models. Dechow [1994] faces similar problems in model selection between testing whether cash flows and earnings better reflect the data generating process in returns. If this thesis were only interested in determining if adjustments have incremental information content, a test of a significant coefficient(s) on the adjustment(s) of a hybrid model would suffice. However, this thesis also hypothesizes that the reason for additional forms of disclosures is so that better summary measures of a firm's performance, resources, and obligations emerge. This places additional structure on adjustments since they must not only be informative, but must also be of a form that any information lost through aggregation is not so large as to render the adjusted variables as poorer summary measures than those reported on financial statements.

The Vuong statistic relies on maximum likelihood estimation procedures and provides direction concerning which of the two models is closer to the true distribution (e.g., data generating process of market value of common equity). By considering the Kullback-Leibler [1951] Information

Criterion (KLIC), which measures the distance between a given distribution and the true distribution, Vuong defines the *better* model as that model that is closest to the true distribution or has the minimum KLIC over the distributions in the model (Sawa [1978], Rule 2.1). The test for model selection is based on the likelihood ratio (LR) statistic. Vuong derives the asymptotic distribution of the LR statistic in cases whether or not the models are nested or misspecified. He uses the result that minus twice the LR statistic has a limiting chi-square distribution under the null hypothesis.

The major drawback to maximum likelihood estimation is that to calculate maximum likelihood estimators the researcher must assume a specific distribution (e.g., normal or lognormal) for the error term. Typically a strong assumption is made of the specific distribution, a Gaussian white noise process [$\epsilon_t \sim$ *i.i.d.* $N(0,\sigma^2)$]. However, the maximum likelihood estimates that result will often be sensible for non-Gaussian processes as well (Hamilton [1994, 117]). Accordingly, this thesis does not purport to use an exact specification of the true model, but instead uses one that is parsimonious, plausible, and informative. The levels specification for the linear relation between market value of common equity and earnings meets these criteria (Barth and Kallapur [1996]).[100] Also, since the primary goal of this thesis is to assess the role that additional forms of financial disclosures have on firm value, a levels (or valuation) specification is the most appropriate.

The tests of the competing linear models using Vuong's model selection methodology capitalize on the knowledge that correctly specified least squares estimators are the same as those obtained under maximum likelihood estimation. The following levels model might be estimated to compare competing models using either reported earnings (RE) or adjusted earnings (AE),

$$MVE = \alpha + \beta\ (RE \text{ or } AE) + e\ , \qquad \text{(B.1)}$$

[100]Barth and Kallapur [1996] and Kothari and Zimmerman [1995] offer evidence on the superior economic results in a levels or price model specification, respectively. However, since the estimated equation in levels is expected to exhibit heteroscedastic disturbances, Equations 2.1 can be estimated with a scale variable that is the reciprocal number of common shares outstanding (i.e., the deflator in price models) added as an additional explanatory variables. Griliches [1972] and Barth and Kallapur [1996] offer empirical evidence on the choice between using a proxy for scale as a deflator or as an additional explanatory variable. Also, Maddala [1992] discusses how the improper use of deflators when a constant term exists in the original equation leads to suspect inferences.

where *MVE* is the market value of common equity, *RE* is reported earnings, and *AE* is adjusted earnings.[101]

The joint density function for reported earnings is,

$$f(MVE_1, \ldots, MVE_n) = \prod_{i=1}^{n} \sqrt{\frac{1}{2\pi\sigma_{RE}^2}}\, e^{\left[-\frac{1}{2\sigma_{RE}^2}(MVE_i - \alpha_{RE} - \beta_{RE}RE_i)^2\right]}, \tag{B.2}$$

which describes the likelihood function for Equation (B.1). The joint density function for adjusted earnings is identical, but *AE* replaces *RE* in Equation (B.2). The testing uses the convenience of maximizing the logarithm of the likelihood function instead of the likelihood function itself. The results are the same since both attain the maximum at the same point. The function is,

$$\log L_{RE} = -\frac{n}{2}\log(2\pi\sigma_{RE}^2) - \frac{1}{2\sigma_{RE}^2}\sum_{i=1}^{n}(MVE_i - \alpha_{RE} - \beta_{RE}RE_i)^2, \tag{B.3}$$

where the logarithm of the likelihood function for adjusted earnings is identical, but *AE* replaces *RE* in Equation (B.3). The test uses the result that if n denotes the sample size, then $\sqrt{n}$ times the LR statistic has an asymptotic distribution that tends to a standard normal random variable. The test statistic is,

$$Z = \frac{1}{\sqrt{n}}\frac{LR}{\hat{\omega}}, \tag{B.4}$$

where $\hat{\omega}$ is an estimate of the variance of the LR. The LR statistic is calculated by forming a likelihood ratio test that compares adjusted earnings (*AE*) to reported earnings (*RE*).

The LR statistic is,

$$LR = logarithm\left[\frac{L_{AE}}{L_{RE}}\right], \tag{B.5}$$

[101] Variables of interest are considered stochastic and the tilde (~) that typically denotes a stochastic variable is omitted throughout when it can be done without ambiguity. Also, subscripts representing n firms and t time periods are assumed.

where the log likelihood functions are shown in (B.3). An estimate of the variance of LR is shown in Vuong [1989, page 314]. The estimate is,

$$\hat{\omega}^2 \equiv \frac{1}{n}\sum_{i=1}^{n}\left(\frac{1}{2}\log\frac{RSS_{RE}}{n} - \frac{1}{2}\frac{RSS_{AE}}{n} + \frac{1}{2}\frac{e_{RE_i}^2}{\hat{\sigma}_{RE}^2} - \frac{1}{2}\frac{e_{AE_i}^2}{\hat{\sigma}_{AE}^2}\right) - \left(\frac{LR}{n}\right)^2, \qquad \text{(B.6)}$$

where *RSS* is the residual sum of squares from a least squares regression of the market values of equity on either adjusted or reported earnings. The ordinary least squares (OLS) errors are used since maximum likelihood estimators are the same as least squares estimators assuming *i.i.d.* disturbances. This equivalency is examined in this thesis and the sensitivity of the results to the use of least squares estimators is tested.

The test statistic shown in Equation (B.6) is directional between the two competing models. The model with adjusted earnings is predicted to reflect better the data generating process in equity than the model using reported earnings. If the Z-statistic is significantly positive, the test suggests that adjusted earnings is the better model.

APPENDIX C: Tests for Omitted Variables Bias

This study considers the effects of using adjusted variables in valuation models compared with using reported variables. First, closely related tests for incorrect functional form and tests for omitted variables are performed using distinctive features of Ramsey's [1969] regression specification error tests (RESET) and a variant of the RESET test to allow for a specified type of non-spherical disturbance. Generally, these types of specification errors exist in economic data and lead to estimators on the included regressors that are neither consistent nor efficient, and result in biased estimates of their variances.[102] Second, measurement error (errors-in-variables [EIV] problem) is likely to exist in reported accounting numbers compared with their theoretical counterparts. Typically, the EIV problem leads to an asymptotic bias of parameter estimates toward zero and a bias of the intercept away from zero. The adjustment process might result in variables that better measure the latent variables that earnings, assets, and liabilities attempt to proxy.

Also, the fundamental financial statement analysis process might produce value-relevant explanatory variables that reduce the specification error of the regression model when using reported accounting variables as explanatory variables. The consideration of the specification error is prudent since the consequences of committing the specification error of omitted variables leads to bias and inconsistency of the least squares estimators. The test proposed by Utts [1982] addresses the problem of omitted variables. The present thesis uses a modified-Utts test. The bias is expected to be smaller for the regression equation that has adjusted assets and liabilities as regressors compared with the regression equation that uses reported assets and liabilities.

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[102]The more formal definition of efficiency is meant. That is, an efficient estimator is the minimum variance unbiased estimator, where an estimator is efficient *iff* it is unbiased and has minimum variance among unbiased estimators. Even under the assumption that the included and omitted variables are orthogonal, the estimates of the variances of least squares estimators could be biased and valid inferences would be difficult, if not impossible, to make.

The test procedure involves two least squares regressions for each specification of the model. For the specification using reported assets and liabilities, the two least squares regressions are based on (1) all observations and (2) only the half of the observations whose *leverage* is low.[103] The results of these two least squares regressions are compared against similar regression when adjusted assets and liabilities are the regressors. The analysis allows for specification tests to be performed within and between the two forms of the model when using the above two-step procedure.

Formally, by letting SSE be the error sum of squares based on all observations and let SSE_{LoLev} be the error sum of squares based on the low leverage observations, then this study can perform specification analysis within the regression equation that uses reported assets and reported liabilities as regressors. Under H_0, the following equality holds,

$$E\left[\frac{SSE}{n-2}\right] = E\left[\frac{SSE_{LoLev}}{m-2}\right] = \sigma^2, \tag{C.1}$$

where n is the number of observations and m is the number of observations that represent the lower half whose leverage is low. Under the Under H_A, the following generally holds,

$$E\left[\frac{SSE}{n-2}\right] > E\left[\frac{SSE_{LoLev}}{m-2}\right] > \sigma^2, \tag{C.2}$$

and the appropriate test statistic and its distribution are,

$$\left(\frac{(SSE - SSE_{LLev})(m-2)}{(n-m)(SSE_{LLev})}\right) \sim F_{n-m,\,m-2}. \tag{C.3}$$

[103]Belsley, Kuh, and Welsch [1980] show that leverage is determined by the significance of its influence on the estimated regression coefficients and on the fitted value of the dependent variable. By convention, a value of the *i*th diagonal element of a matrix (i.e., *hat matrix* that projects the observed values of the dependent variable into the fitted values of the dependent variable) that exceeds twice its average is considered to indicate an influential observation, or leverage point.

This test can be viewed as a test of the restricted error sum of squares. The test can be performed within a regression equation, as above, or between regression equations where the estimates of the variance of the regression disturbances are compared.

APPENDIX D: SUR-FGLS Estimation Procedure

An alternative model is estimated so that the result of the analyses from an OLS regression model are complemented by considering nonspherical disturbances in the error components of the model. These common error structures violate the classical assumptions (i.e., no heteroscedasticity, no cross-sectional correlation, and no autocorrelation in the disturbances) of an OLS regression model. As the classical assumptions are restrictive when using economic data as sample data (particularly when time-series and cross-sectional data are combined), the research design in this study also estimates a model that allows the covariance matrix of disturbances to have a more general form.

Homoscedasticity, uncorrelatedness in the cross-section, and autocorrelated disturbances are testable restrictions and are likely to exist in the panel data used in the present thesis. Thus, an alternative assumption about the covariance matrix for the unobservable random disturbance is examined by linking the system of equations for each sample firm by their respective disturbance. The seemingly unrelated regression model utilizing feasible generalized least squares (hereafter SUR-FGLS) estimators is shown in Parks [1967]. Parks considers a first-order autoregressive model in which random errors u_{it} ; i = 1, 2, . . . , N and t = 1, 2, . . . , T, are heteroscedastic, contemporaneously correlated, and autocorrelated. Heteroscedasticity is a common problem in accounting research contexts where accounting data exhibit scale-related econometric problems (for example, see Christie [1987]). In addition, contemporaneous correlation of disturbances is likely in the present research design that focuses on firms in five industries.

For example, realizations of accounting data in financial statement representations and alternative disclosures for firms in the same industry are a function of both the economy as a whole and to factors that are specific to firms in the industry. Thus, expecting correlation of the

disturbances across firms is reasonable. Also in the design of the present thesis, the sample data consists of time series where autocorrelation in the disturbances across time is likely.

In general, the problem of violating the classical assumptions in the form of the general linear model leads to less efficient OLS estimators compared with GLS estimators, although are unbiased. Therefore, the parameter estimates from pooled sample and SUR-FGLS models are useful to the present study, and significance tests of the SUR-FGLS estimation are considered more representative of the actual strength of the relation between the variable of interest and either market values of equity or security returns.

The SUR-FGLS procedure used in this thesis and shown in Parks [1967] is a three-step approach. The procedure used by Parks follows a two-step procedure to estimate the covariance matrix for the vector of random errors (i.e., $E[uu'] = V$), yet a third step is added to estimate the parameter vector by a generalized least squares method. The first step in estimating V uses ordinary least squares estimation to obtain β_{OLS} by,

$$\hat{u} = y - X\hat{\beta}_{OLS}, \tag{D.1}$$

where a consistent estimator of the first-order autoregressive parameter is obtained by,

$$\hat{\rho}_i = \frac{\left(\sum_{t=2}^{T} \hat{u}_{it}\hat{u}_{i,t-1}\right)}{\left(\sum_{t=2}^{T} \hat{u}_{i,t-1}^2\right)}. \tag{D.2}$$

In the second step, the regression equations are reestimated using the transformed observations where the transformation uses the estimated values of *rho*. The new residuals are estimated and obtained using the estimated values of the autoregressive process in the second step. Finally, the third step uses the complete set of transformed observations to obtain the FGLS estimator.

Parks [1967] shows that both estimators will be asymptotically efficient with an asymptotic covariance matrix consistently estimated. Essentially, the autoregressive characteristic of the sample

data is removed by using a Prais-Winsten [1954] estimating procedures (see Greene [1993] and Judge, et al [1985] for a more complete discussion and description of the model specifications).

TABLES

TABLE 3.1
Summary of the Effects on *GAAP-based* Measures of Earnings and Assets for the Proposed Inventory Cost-flow and Valuation Adjustment [1]

$$A.1: \ (Inventory\ adjustment)_{i,t} = (LIFO\ Reserve)_{i,t}, \quad (3.2)$$

$$E.1: \ (COGS\ adjustment)_{i,t} = [(Inventory^{FIFO})_{i,t-1} * r_t] + [(Inventory^{WAC})_{i,t-1} * \frac{r_t}{2}], \quad (3.4)$$

Adjustment Effects				
GAAP Variable	Predicted Association with Prices or Returns	Adjustment Process for Disclosures of Inventory Under: FIFO	LIFO	WAC
Under rising prices				
Earnings	negative	$(BI^{FIFO} * r)$	none	$(BI^{FIFO} * [r/2])$
Assets	positive	none	*LIFO Reserve*	none
Under declining prices				
Earnings	negative	$(BI^{FIFO} * r)$	none	$(BI^{FIFO} * [r/2])$
Assets	positive	none	*LIFO Reserve*	none

[1] The table summarizes the effects of the adjustment related to a firm's choice of inventory cost flow and valuation assertion on GAAP-based measures of firm performance (earnings) and resources (assets) represented in financial statements. The effects on earnings and assets results from adding/subtracting to reported cost of goods sold (for the adjustment to earnings) and inventory (for the adjustment to assets). Essentially, three inventory reporting choices are possible and may be chosen individually or in combination: *first-in, first-out* (*FIFO*); *last-in, last-out* (*LIFO*); and *weighted average cost* (*WAC*).

The variables are (firm and time subscripts omitted): *BI* = beginning inventory for the current year; r = rate of change in prices for the current year; and *LIFO Reserve* = LIFO reserve for the current year. The rate of change in prices (r) is the percentage change in output price indexes for each industry expected to proxy for input price changes. The index is the producer price indexes (PPI) for the net output of (4-digit SIC codes) industries published by the United States Department of Labor. The March edition of the publication is the source of the fiscal year-end (FYE) rate for the previous year where the rate is calculated, $r = \frac{(FYE\ rate)_t - (FYE\ rate)_{t-1}}{(FYE\ rate)_{t-1}}$..

TABLE 3.2
Summary of the Effects on *GAAP-based* Measures of Earnings and Assets for the Proposed Intangible Capital Adjustment [1]

$$A.2:\ (IC\ asset\ adjustment)_{j,i,t} = Outlay_{j,i,t}\left[\frac{(1 + growth\%_{j,i,t})}{(\alpha_{j,i,t} + growth\%_{j,i,t})}\right], \quad (3.7)$$

$$E.2:\ (IC\ amortization\ charge)_{j,i,t} = \hat{\alpha}_{j,i,t} * (IC)_{j,i,t}, \quad (3.8)$$

Adjustment Effects			
GAAP Variable	Predicted Association with Prices or Returns	Adjustment Process on Disclosures of Outlays for: R&D	Advertising
Capitalization			
Assets	positive	$(Cap\ Rate)^{R\&D} * Outlay$	$(Cap\ Rate)^{ADV} *$ Outlay
Amortization			
Earnings	negative	$(Amort\ Rate)^{R\&D} * IC^{R\&D}$	$(Amort\ Rate)^{ADV} * IC^{ADV}$

[1] The table summarizes the effects of the adjustment related to a firm's investment in R&D and advertising (i.e., intangible capital).

The variables are (firm, time subscripts, and intangible capital superscripts omitted): *IC* = intangible capital for the current year; *Cap rate* = capitalization rate for investment in each form of intangible capital determined by the underlying econometric model for the current year; *Amort Rate* = amortization rate on stock of intangible capital for the current year; and *Outlay* = the GAAP-based expense recognized in the income statement or the current year. The market value of equity is the market value of a firm's common stock at the end of third month following the current year. Capitalization and amortization rates for R&D and advertising investments are determined by a method that considers R&D and advertising outlays as investments related to firms' intangible capital.

TABLE 3.3
Summary of the Adjustment Effects on *GAAP-based* Measures of Assets and Liabilities (and the net adjustment) for Capitalization of Operating Lease Obligation and Asset [1]

$$L.1: \ (Net\ operating\ lease\ liability)_{i,t} = (Rent\ expense)_{i,t} * 2.4, \quad (3.9)$$

Adjustment Effects		
GAAP Variable	Predicted Association with Prices	Adjustment Process
Liabilities	negative	(*rent expense*) * 8
Assets	positive	(estimate of *operating lease liability*) * 70%
net effect on Liabilities	negative	(*rent expense*) * 2.4

[1] The table summarizes the effects of the adjustment related to a firm's operating lease obligations. As the financing consequences of operating leases are not recognized items in a firm's balance sheet, the above adjustments summarize the capitalization of the operating lease liability and the related asset. The net liability is determined by multiplying the current year rent expense by a factor of eight and removing the approximated asset value of 70% of the lease liability, which produces the above adjustment.

The variables are (firm and time subscripts omitted): *rent expense* = GAAP-based rent expense for the current year (a required disclosure), and a net capitalization factor of 2.4 (where rent expense is multiplied by a naive heuristic of eight to approximate the total operating lease liability, and *operating lease liability* = 70% of the operating lease liability is used to approximate the economic resources of the firm related to the operating lease).

TABLE 3.4
Summary of the Adjustment Effects on *GAAP-based* Measures of Earnings and Assets for Converting Accounting Depreciation to Economic Depreciation [1]

$$E.3: (Depreciation\ adj.)_{i,t} = (BSS\ accel.\ depr.\ expense)_{i,t} - (SL\ depr.\ expense)_{i,t}, \quad (3.10)$$

$$A.3: (A/D\ adj.)_{i,t} = (BSS\ A/D)_{i,t} - (SL\ A/D)_{i,t}, \quad (3.11)$$

Adjustment Effects		
GAAP Variable	Predicted Association with Prices or Returns	Adjustment Process
Assets	positive	(*BSS Accum. Dep.*) - (*S/L Accum. Dep.*)
Earnings	negative	(*BSS Accel. Dep.*) - (*S/L Dep.*)

[1] The table summarizes the effects of the adjustment to a firm's depreciation expense and fixed asset capitalization levels if that firm uses a straight-line depreciation method to allocate the cost of property, plant, and equipment to the periods of use. The candidate adjustments are expected methods that investors use to remove overstatements in a firm's resources and year-end performance.

The variables are (firm and time subscripts omitted): *BSS Accum. Dep.* = factors for converting contra asset account balance to an accelerated amount using the factor conversion table in Brown, Soybel, and Stickney [1993], *S/L Accum. Dep.* = accumulated depreciation at end of the current year reported under the straight-line method, *BSS Accel. Dep.* = factors for converting straight-line depreciation to an accelerated depreciation expense using the factor conversion table in Brown, Soybel, and Stickney [1993], and *S/L Dep. Exp.* = straight-line depreciation expense for the current year.

TABLE 3.5
Summary of the Adjustment Effects on *GAAP-based* Measures of Liabilities for Contingency Disclosures[1]

L.2: $(Loss\ Contingency\ Adjustment)_{i,t} = (Capitalization\ of\ loss\ contingency)_{i,t}$, (3.12)

Adjustment Effects

GAAP Variable	Predicted Association with Prices	Adjustment Process	
		Gain Contingency	Loss Contingency
Liabilities	negative	none	+ *TVLC*

[1] The table summarizes the effects of the adjustment related to a firm's gain and loss contingencies.

The variable is (firm and time subscripts omitted): *TVLC* = total value of loss contingencies disclosed in alternative forms of financial reporting that have not met GAAP recognition criteria.

TABLE 3.6
Summary of the Effects on *GAAP-based* Measures of Earnings, Assets, and Liabilities for the Pension Adjustment Process [1]

$$\textit{E.4: } (\textit{Pension cost adjustment})_{i,t} = (\textit{Service})_{i,t} + (\textit{Interest})_{i,t} - (\textit{ROA})_{i,t} - (\textit{Reported Cost})_{i,t}, \quad (3.15)$$

$$\textit{A.4: } (\textit{Pension asset adjustment})_{i,t} = (\textit{Pension Plan assets at fair market value})_{i,t}, \quad (3.13)$$

$$\textit{L.3: } (\textit{Pension liability adjustment})_{i,t} = (\textit{ABO or PBO})_{i,t} - (\textit{Min. liab. accrual})_{i,t}, \quad (3.14)$$

Adjustment Effects

GAAP Variable	Predicted Association with Prices or Returns	Adjustment Process
Assets	positive	*Pension Plan Assets at Fair Value*
Liabilities	negative	*ABO/PBO*
Earnings	negative	*Service + Interest - Actual ROA - Reported Cost*

[1] The table summarizes the effects of the adjustment to a firm's assets, liabilities, and earnings for pension plan disclosures. The adjustments result from an analysis of firms' pension footnote disclosure in the annual report or 10-K filings. A firm's assets and liabilities are adjusted so that (1) the off-balance-sheet amount of the resources (pension plan assets, if any) is recorded and (2) the appropriate level of obligation (i.e., ABO for three lowest quartiles and PBO for the highest) is combined with the other liabilities of the firm. The adjustment to earnings adjusts the pension cost from a smoothed representation to a non-smoothed amount by removing the impact of transition and deferral items.

Th e variables are (firm and time subscripts omitted): *Pension Plan Assets at Fair Value* = the disclosed fair value of the pension plan assets for the current year, *ABO/PBO* = the adjustment to either the accumulated benefit obligation (ABO) or the projected benefit obligation (PBO) level at the end of the current year disclosed in the pension footnote. The nonsmoothed and restatement of costs associated with pension cost for the period are: *Service* = the present value of the benefits earned during the current year, *Interest* = a quasi-interest cost associated the passage of time obtained by multiplying the beginning of the current year PBO by the discount rate, *Actual ROA* = actual return on pension plan assets, and *Reported Cost* = the reported SFAS No. 87 pension cost for the current period.

TABLE 3.7
Summary of the Effects on *GAAP-based* Measures of Assets/Liabilities for the OPEB Adjustment [1]

A.5: $(OPEB\ asset\ adjustment)_{i,t} = (OPEB\ Plan\ assets\ at\ fair\ market\ value)_{i,t}$, (3.17)

L.4: $(OPEB\ liability\ adjustment)_{i,t} = (APBO\ obligation)_{i,t} - (accrued\ OPEB\ liab.)_{i,t}$, (3.16)

Adjustment Effects		
GAAP Variable	Predicted Association with Prices	Adjustment Process
Assets	positive	*OPEB Plan Assets at Fair Value*
Liabilities	negative	*APBO Obligation less any accrued amount*

[1] The table summarizes the effects of the adjustment to a firm's assets, and liabilities for other postretirement benefit plans (OPEB). The adjustments result from an analysis of a firm's OPEB footnote disclosure in the annual report or 10-K filings.

The variables are (firm and time subscripts omitted): *OPEB Plan Assets at Fair Value* = the disclosed fair value of the pension plan assets for the current year, and *APBO Obligation less any accrued amount* = the adjustment to the accumulated postretirement benefit obligation (APBO) level for the current year after considering the choice of implementation method and the recognized OPEB liability for the current year.

TABLE 6.1
Industry Distribution of Sample Firms for Years 1991-1993 [1]

Sample Industry Comparisons using Two-Digit SIC Classification

SIC Code	Industry (by 2-digit classification)	No. of firm-years	% of total firm-years	No. of firms
2800	Chemicals & Pharmaceuticals	240	22.54%	80
3500	Machinery & Computer Hardware	297	27.89%	99
3600	Electrical & Electronics	228	21.41%	76
3700	Transportation Vehicles	108	10.14%	36
3800	Scientific Equipment	192	18.03%	64
	TOTALS	1,065	100%	355

[1] The sample firms are classified into two-digit SIC groupings using Standard & Poor's *COMPUSTAT* Services (SPCS) industry classification codes that identify the principal products manufactured by or the major services provided by each company as the source of the industry classification. SPCS primarily uses standard industry classification (SIC) codes from the *1987 Standard Industrial Classification Manual* produced by the Executive Office of the President - Office of Management and Budget.

TABLE 6.2
Sample Selection (Step 1) [1]

Standard Industrial Classification (SIC) Codes					
#	SIC Codes	Industry (by 2-digit classification)	All Firms	FYR=12 [2] #	%
1	4900	Electric, Gas, & Sanitary Services	182	147	80.77%
2	3500	Industrial Machinery & Computers	172	99	57.56%
3	2800	Chemicals & Allied Products	122	80	65.57%
4	3600	Electrical & Related - Except Computers	157	76	48.41%
5	3800	Measuring Instruments & Related Products	145	64	44.14%
6	1300	Oil & Gas Extraction	86	60	69.77%
7	3700	Transportation Equipment	62	36	58.06%
8	4800	Communications	42	37	88.10%
9	3400	Fabricated Metal Products	54	33	61.11%
10	5000	Durable Goods - Wholesale Trade	56	32	57.14%
11	2700	Printing, Publishing, & Allied Products	44	31	70.45%
12	3300	Primary Metal Industries	46	31	67.39%
		Subtotal of firms in above 12 industries that cleared the first filter for sample selection	1,168	726	62.16%
		60 remaining industries: each < 30 firms of available data	1,560	1,005	64.42%
		TOTAL	2,728	1,731	63.45%

[1] Standard & Poor's COMPUSTAT Services (SPCS) defined industry classification codes that identify the principal products manufactured by or the major services provided by each company. The first step of the sample selection identifies those industries with at least 30 calender year-end firms that have available data on the 1994 Monthly CRSP (NYSE/AMEX/NASDAQ Combined) file and the 1994 (Full Coverage Annual) COMPUSTAT file for the years, 1986-1993

[2] Percentages are the relative amounts of December fiscal year-end firms in each industry. FYR denotes fiscal year where 12 implies a fiscal year-end in December.

TABLE 6.3
Sample Selection (Step 2) [1]

Standard Industrial Classification (SIC) Codes						
#	SIC Codes	Industry (by 2-digit classification)	All Firms [2] #	All Firms [2] %	FYR=12 [2] #	FYR=12 [2] %
1	3500	Industrial Machinery & Computers	172	6.31%	99	5.72%
2	3600	Electrical & Related - Except Computers	157	5.76%	76	4.39%
3	3800	Measuring Instruments & Related Products	145	5.32%	64	3.70%
4	2800	Chemicals & Allied Products	122	4.47%	80	4.62%
5	3700	Transportation Equipment	62	2.27%	36	2.08%
		Subtotal of firms in the 5 industries that cleared filters one and two for the sample selection	658	24.12%	355	20.51%
		67 remaining industries: each < 30 firms with Adv. and R&D Expense	2,070	75.88%	1,376	79.49%
		TOTALS	2,728	100%	1,731	100%

[1] Standard & Poor's COMPUSTAT Services (SPCS) defined industry classification codes that identify the principal products manufactured by or the major services provided by each company. The second step of the sample selection identifies those industries shown to have available data from the first filter (TABLE 6.1) for at least thirty firms and clearing the second filter: at least 30 firms also disclosing advertising and R&D expenditures. The advertising and R&D expenditures are obtained from either the 1994 (Full Coverage Annual) COMPUSTAT file or the (third quarter file) from The Disclosure SEC Database from Disclosure Incorporated for the years, 1986-1990.

[2] The percentages are the relative amount of total firms in each industry (and fiscal year-end classification) compared with all available firms. FYR denotes fiscal year where 12 implies a fiscal year-end in December.

TABLE 6.4
Descriptive (Balance Sheet Related) Statistics of Sample Firms for Years 1991-1993 [1]

BALANCE SHEET INFORMATION (average $ in millions)

	Chemicals & Drugs (SIC 28)	Mach. & Computer Hardware (SIC 35)	Electrical & Electronics (SIC 36)	Trans-portation Equip (SIC 37)	Scientific Equip (SIC 38)
Firm-years	240	297	228	108	192
Financial Statement Items					
Current assets (no inventory)	$ 899.95	$ 588.47	$ 1,524.64	$ 779.57	$ 477.59
Inventory	394.72	221.60	281.00	471.41	268.78
TOTAL S/T ASSETS	$ 1,294.67	$ 810.07	$ 1,805.64	$ 1,250.98	$ 746.37
Property, Plant, & Equip (net)	1,273.04	466.22	656.90	767.19	359.62
Other long-term assets	589.05	459.07	1,541.13	500.92	295.06
TOTAL L/T ASSETS	$ 1,862.09	$ 925.29	$ 2,198.03	$ 1,268.11	$ 654.68
TOTAL ASSETS	$ 3,156.76	$ 1,735.36	$ 4,003.67	$ 2,519.09	$ 1,401.05
Total S/T Liabilities	$ 883.21	$ 627.02	$ 2,118.41	$ 955.29	$ 513.14
Total L/T Liabilities	1,004.93	549.11	1,066.66	745.43	398.47
TOTAL LIABILITIES	$ 1,888.14	$ 1,176.13	$ 3,185.07	$ 1,700.72	$ 911.61
BV Preferred Stock	8.64	24.66	5.60	10.21	2.15
Total Common Equity	1,259.98	534.58	813.00	808.16	487.28
TOTAL SH EQUITY	$ 1,268.62	$ 559.23	$ 818.60	$ 818.37	$ 489.44
TOTAL EQUITIES	$ 3,156.76	$ 1,735.36	$ 4,003.67	$ 2,519.09	$ 1,401.05
Common Shares Outstanding	96.83	27.45	45.05	35.67	31.45
FYE Market Value Equity	$ 4,998.89	$ 900.88	$ 2,175.31	$ 1,536.24	$ 1,136.17
AVG Price Per Share	$ 51.63	$ 32.82	$ 48.28	$ 43.07	$ 36.13

[1] The table shows descriptive statistics for the sample evidence. The descriptive statistics relate to GAAP-based balance sheet information and related information on common equity shares outstanding and market values.

TABLE 6.5
Descriptive (Income Statement Related) Statistics of Sample Firms for Years 1991-1993 [1]

INCOME STATEMENT INFORMATION (average $ in millions)

	Chemicals & Drugs (SIC 28)	Mach. & Computer Hardware (SIC 35)	Electrical & Electronics (SIC 36)	Trans-portation Equip (SIC 37)	Scientific Equip (SIC 38)
Firm-years	240	297	228	108	192
Financial Statement Items					
Sales Revenue	$ 2,996.14	$ 1,476.07	$ 2,199.46	$3,163.62	$ 1,260.51
Cost of Goods Sold	1,585.49	874.47	1,463.00	2,466.51	704.11
Selling, Gen., & Admin.	854.21	422.38	332.08	425.65	371.51
Oper. Inc. before Dep./Int.	$ 556.44	$ 179.22	$ 404.38	$ 271.46	$ 184.89
Depreciation & Amortization	162.88	108.18	122.86	115.59	64.12
Interest Expense	61.26	42.39	58.89	58.89	34.14
OPERATING INCOME	$ 332.31	$ 28.65	$ 222.63	$ 96.98	$ 86.63
Net Nonoperating (gain)/loss	16.99	75.52	55.46	(10.53)	2.21
PRETAX INCOME	$ 315.32	$ (46.87)	$ 167.18	$ 107.51	$ 84.42
Income Tax Expense	102.80	1.61	39.79	39.79	32.98
INCOME before Extr/Disc	$ 212.52	$ (48.48)	$ 127.39	$ 67.72	$ 51.43
Extraordinary Items (gain)/loss	45.95	16.55	14.35	40.46	13.59
Discontinued Operations	(5.79)	0.20	(4.94)	(12.86)	(1.13)
NET INCOME	$ 172.36	$ (65.23)	$ 117.98	$ 40.11	$ 38.97
Preferred Dividends	$ 1.63	$ 1.87	$ 1.35	$ 1.63	$ 1.87
Minority Interest in Earnings	7.95	0.02	4.64	0.29	1.48
Net Income Avail to Common	$ 162.78	$ (67.12)	$ 111.99	$ 38.19	$ 35.62

[1] The table shows descriptive statistics for the sample evidence. These descriptive statistics relate to GAAP-based income statement information, preferred dividends, minority interest in earnings, and earnings available to common shareholders (i.e., after any minority interest and preferred dividends).

TABLE 6.6
Descriptive (Statement of Cash Flow Related) Statistics of Sample Firms for Years 1991-1993 [1]

STATEMENT OF CASH FLOWS INFORMATION (average $ in millions)

	Chemicals & Drugs (SIC 28)	Mach. & Computer Hardware (SIC 35)	Electrical & Electronics (SIC 36)	Trans-portation Equip (SIC 37)	Scientific Equip (SIC 38)
Firm-years	240	297	228	108	192
Financial Statement Items					
NET CASH FLOW FROM:					
Operating Activities	$ 395.95	$ 136.42	$ 251.60	$ 215.49	$ 120.76
Investing Activities	(216.44)	(102.62)	(310.52)	(149.36)	(101.21)
Financing Activities	(162.31)	(15.22)	67.66	(49.72)	(7.97)
Exchange Rate Effect	(2.80)	(6.95)	0.38	(2.42)	(1.43)
INCREASE OR (DECREASE) IN CASH	$ 14.40	$ 11.62	$ 9.13	$ 14.00	$ 10.14
Supplemental Data [2]					
Income Taxes Paid	$ 106.81	$ 28.21	$ 44.15	$ 62.17	$ 34.97
Interest Paid	$ 55.05	$ 53.47	$ 110.29	$ 50.04	$ 30.49

[1] The table shows descriptive statistics for sample evidence relating to GAAP-based Statement of Cash Flows by industry classification (two-digit SIC codes).

[2] The supplemental data on cash flows for income taxes and interest are required disclosures as mandated by SFAS No. 95.

TABLE 6.7
Descriptive Statistics on the Choice of Inventory Valuation Method for the Sample-Firms in Years 1991-1993[1]

Industries	Chemicals & Drugs (SIC 28)	Mach. & Computer Hardware (SIC 35)	Electrical & Electronics (SIC 36)	Trans-portation Equip (SIC 37)	Scientific Equip (SIC 38)
Total Firm-years	240	297	228	108	192
Inventory Valuation Method[2]	Firm-year counts by industry				
LIFO Only	15	9	3	6	0
LIFO Only (%)	6.25%	3.03%	1.32%	5.56%	0.00%
FIFO Only	100	152	130	33	132
LIFO Only (%)	41.67%	51.18%	57.02%	30.56%	68.75%
WAC Only	21	20	30	15	18
LIFO Only (%)	8.75%	6.73%	13.16%	13.89%	9.38%
L/F	60	58	27	25	19
L/F (%)	25.00%	19.53%	11.84%	23.15%	9.90%
F/L	33	30	12	23	11
F/L (%)	13.75%	10.10%	5.26%	21.30%	5.73%
Other	11	28	26	6	12
Other (%)	4.58%	9.43%	11.40%	5.56%	6.25%
TOTAL	240	297	228	108	192

[1] The table shows the inventory valuation method by firm-years within the five (2-digit SIC) industry classifications. The variable represented as a percentage below each firm-year count is the percentage of the total firm-years using that specific inventory valuation method within the industry.

[2] Three inventory valuation choices are widely used may be chosen individually or in combination: *first-in, first-out* (FIFO); *last-in, last-out* (LIFO); and *weighted average cost* (WAC). A fourth alternative, such as specific identification or standard costs, is also available. However, these other methods generally approximate a FIFO method. The *L/F* and *F/L* valuation method is a mixture of LIFO (L) and FIFO (F) where the first letter represents the valuation method used for a majority of the inventory. The *Other* classification represents the any other valuation method used of combinations not specifically shown.

TABLE 6.8
Descriptive Statistics on the Levels of Variables Used to Adjust GAAP-based Summary Measures for the Inventory Valuation Method Adjustment for the Sample-Firms in Years 1991-1993 [1]

Industries	Chemicals & Drugs (SIC 28)	Mach. & Computer Hardware (SIC 35)	Electrical & Electronics (SIC 36)	Trans-portation Equip (SIC 37)	Scientific Equip (SIC 38)
Firm-years	240	297	228	108	192
Mean Values					
FIFO Inventory	$ 226.39	$ 92.93	$ 142.32	$ 253.94	$ 212.09
LIFO Inventory	143.20	38.43	86.55	65.97	41.17
Other Inventory	25.12	90.24	52.12	151.50	15.52
TOTAL Inventory	$ 394.72	$ 221.60	$ 281.00	$ 471.41	$ 268.78
ASSET ADJUSTMENT Variables: median values					
ΔLIFO Reserve	$ (0.10)	$ (0.11)	$ (0.05)	$ (0.29)	$ (0.11)
LIFO Reserve	$ 43.55	$ 16.23	$ 25.12	$ 20.00	$ 10.44
COGS ADJUSTMENT Variables: median values					
Mean PPI Rate (%)	-1.26%	-1.28%	-2.32%	-1.92%	-1.28%
COGS Adj (< 0)	$ (0.92)	$ (0.23)	$ (0.43)	$ (0.89)	$ (0.23)
COGS Adj (> 0)	$ 0.64	$ 0.09	$ 0.03	$ 1.10	$ 0.08
COGS Adj	$ (0.20)	$ (0.17)	$ (0.37)	$ (0.56)	$ (0.15)

[1] The table shows the average level of inventory for the various classifications and the median values of the variables used to operationalize the inventory and earnings adjustments of interest to this thesis ($ amounts are in millions). It is predicted that investors use the adjustments to restate GAAP-based measures of assets and earnings (via COGS).

The variables are defined as (firm and time subscripts omitted): *LIFO Reserve* = LIFO reserve for the current year; and *PPI Rate* = rate of change in prices for the current year.

TABLE 6.9
Descriptive Statistics for Advertising and R&D Capitalization and Amortization for the Sample of Firms in Years 1991-1993 [1]

Variable	Chemicals & Drugs (SIC 28)	Machinery & Computer (SIC 35)	Electrical & Electronics (SIC 36)	Trans-portation (SIC 37)	Scientific Equip (SIC 38)
Total Firm-years	240	297	228	108	192
Adv. Expense Firm-years	138	153	141	45	102
Advertising Information: (median values with stated formats)					
Advertising Expense (AE)	$ 18.07	$ 1.28	$ 1.58	$ 2.09	$ 0.86
AE Growth Rate (%)	6.79%	3.22%	1.05%	-2.96%	6.88%
AE Adjustment Variables					
AE Amortization Rate (%)	100.00%	32.83%	30.99%	19.53%	20.33%
Implied Useful Life (in years)	1.0	3.0	3.2	5.1	4.9
Intangible Capital (ADV)	none	$ 4.16	$ 4.85	$ 15.12	$ 3.93
Amortization Charge (ADV)	none	$ 1.13	$ 1.36	$ 2.00	$ 0.66
R&D Adj. Firm-years	219	252	210	81	183
R&D Information: (median values with stated formats)					
R&D Expense (R&DE)	$ 28.34	$ 4.88	$ 5.39	$ 17.17	$ 5.74
R&DE Growth Rate (%)	9.58%	5.76%	7.59%	5.63%	10.41%
R&DE Adjustment Variables					
R&DE Amortization Rate (%)	7.31%	9.67%	31.03%	12.41%	8.90%
Implied Useful Life (in years)	13.67	10.3	3.2	8.1	11.2
Intangible Capital (R&D)	$ 349.30	$ 41.02	$ 15.53	$ 164.43	$ 86.13
Amortization Charge (R&D)	$ 24.18	$ 4.30	$ 3.87	$ 16.22	$ 7.23

[1] The table shows the median values of variables used for and resulting from adjusting advertising and R&D expense to reflect the future economic benefits of those expenditures and subsequent erosion of those benefits as an amortization charge ($ amounts in millions). Additionally, the implied useful lives of each intangible capital is shown, calculated as follows: (Amortization Rate / 100%). The variables are: *Advertising or R&D Expense (AE and R&DE, respectively)* = reported advertising or R&D expense for the current year, *Growth Rate* = five-year growth rate inclusive of the current year, *Amortization Rate* =the amortization rate on intangible capital for the current year, *Intangible Capital* = the end of the current year level, and *Amortization Charge* = the charge to earnings in the current year to account for the erosion of intangible capital.

TABLE 6.10
Estimation Results for Capitalization Rates of Intangible Investments for Firms in the Chemical and Pharmaceutical Industry (SIC code 28) [1]

$$\frac{MVE_j - BVTA_j}{Sales_j} = \alpha + \beta_1\left(\frac{AdvExp_j}{Sales_j}\right) + \beta_2\left(\frac{R\&DExp_j}{Sales_j}\right) + \beta_3 GR_j + e, \quad (3.3)$$

Year-by-Year Regressions

Year	α	β_1	β_2	β_3	$\bar{R}^2$	N
1991	1.37	1.48	**13.26**	**2.41**	0.59	77
t-statistic	0.01	0.30	**9.97**	**3.16**		
White's *t*	0.01	0.19	**10.47**	**2.59**		
1992	-18.23	0.72	**10.40**	**1.54**	0.54	77
t-statistic	-0.15	0.21	**8.04**	**3.41**		
White's *t*	-0.08	0.19	**5.96**	**2.10**		
1993	-40.69	1.08	**12.52**	**1.68**	0.46	77
t-statistic	-0.50	0.44	**10.10**	**1.88**		
White's *t*	-0.71	0.49	**8.15**	**1.84**		
Average Estimates	α	β_1	β_2	β_3		
Coefficients	-19.18	1.09	**12.06**	**1.88**	Average $\bar{R}^2 = 0.53$	
White's *t*-stat	-0.26	0.29	**8.19**	**2.18**		

[1] For each year, the table shows the coefficient estimates, *t*-statistics, adjusted R^2s, and number of observations estimated for Equation (3.3) in each year from 1991-1993, and the average of those estimates. Alternatively, the table shows *t*-statistics based on White's [1980] consistent covariance estimator. Coefficients (in bold) are significant at the 5% level for White's t-statistics greater than 1.67 using a one-tailed test.

The coefficients β_1 and β_2 represent equity investors' capitalization rates of advertising and R&D investments made by the firm, respectively. *MVE* = market value of firm's common stock at the end of the third month following end of current year, *BVTA* = book value of tangible assets less the book value of liabilities for the current year, *Sales* = net sales revenue for the current year, *AdvExp* = advertising expense for the current year, *R&DExp* = research and development expense for the current year, and *GR* = average annual rate of change in sales over the previous four years for firm *j* relative to the current year.

TABLE 6.11

Estimation Results for Capitalization Rates of Intangible Capital for Firms in the Machinery & Computers (SIC code 35), Electrical (SIC code 36), Transportation (SIC code 37), and Scientific Equipment (SIC code 38) Industries [1]

$$\frac{MVE_j - BVTA_j}{Sales_j} = \alpha + \beta_1\left(\frac{AdvExp_j}{Sales_j}\right) + \beta_2\left(\frac{R\&DExp_j}{Sales_j}\right) + \beta_3 GR_j + e, \quad (3.3)$$

Average Estimates for 1991-1993 Period

Year	α	β_1	β_2	β_3	$\bar{R}^2$	N
SIC code 35	**-1.05**	**3.25**	**8.21**	**1.62**	0.50	77
SIC code 36	0.17	**3.15**	**2.89**	**2.08**	0.17	91
SIC code 37 [2]	-0.69	**6.83**	**10.66**	**1.14**	0.16	93
SIC code 38	-0.77	**7.42**	**14.95**	**0.83**	0.14	61

[1] For each industry, the table shows the average coefficient estimates, adjusted R^2s, and number of observations estimated by Equation (3.3) for three years 1991-1993. Coefficients (in bold) are significant at the 5% level for t-statistics greater than 1.67 using a one-tailed test based on White's [1980] consistent covariance estimator.

The coefficients β_1 and β_2 represent equity investors' capitalization rates of advertising and R&D investments made by the firm, respectively. *MVE* = market value of a firm's common stock at the end of the third month following end of current year, *BVTA* = book value of tangible assets less the book value of liabilities for the current year, *Sales* = net sales revenue for the current year, *AdvExp* = advertising expense for the current year, *R&DExp* = research and development expense for the current year, and *GR* = average annual rate of change in sales over the previous four years for firm *j* at the end of the current year.

[2] The transportation industry has only 15 observations with advertising expense disclosures and 27 observations with R&D disclosures, with a total of 32 reporting at least one of these variables that yields intangible capital. However, since consistent estimators are unlikely due to the small-sample size, the transportation industry (SIC code 37) is estimated by combining its observations with those of the scientific equipment industry (SIC code 38) to determine capitalization and amortization parameter estimates. For all other industry estimates, no similar combinations are done.

TABLE 6.12
Descriptive Statistics of Variables Used to Adjust GAAP-based Summary Measures for Operating Lease Disclosures by the Sample Firms in Years 1991-1993 [1]

Industry	Chemicals & Drugs (SIC 28)	Mach. & Computer Hardware (SIC 35)	Electrical & Electronics (SIC 36)	Trans-portation Equip (SIC 37)	Scientific Equip (SIC 38)
Total Firm-years	240	297	228	108	192
Operating Lease Firm-years	209	245	190	90	173
Operating Lease Information (median values, $ amounts in millions)					
Rent Expense	$ 9.10	$ 1.94	$ 1.96	$ 7.02	$ 1.59
Capitalization Yields					
Operating Lease Liability	$ 72.80	$ 15.51	$ 15.68	$ 56.14	$ 12.72
Operating Lease Asset	$ 58.24	$ 12.41	$ 12.54	$ 44.91	$ 10.18
Net Operating Lease Obligation					
Net Lease Obligation	$ 21.84	$ 4.64	$ 4.70	$ 16.84	$ 3.82

[1] The table shows descriptive statistics for adjusting GAAP-based summary measures of total assets and liabilities by capitalizing a firm's financial disclosures of the operating lease obligations.

The variables resulting from the capitalization method in this thesis are: *Rent Expense* = disclosed rental expense for the current year; *Operating Lease Liability* = operating lease obligation obtained by increasing the current year rental expense by a factor of eight; *Operating Lease Asset* = operating lease asset value obtained by estimating its value at 70% of the estimated operating lease liability; and *Net Lease Obligation* = the estimated operating lease liability for the current year less the estimated value of the operating lease asset.

TABLE 6.13
Descriptive Statistics of Variables Used to Adjust GAAP-based Summary Measures for Asset Depreciation and Valuation Disclosures by the Sample Firms in Years 1991-1993 [1]

Industry	Chemicals & Drugs (SIC 28)	Mach. & Computers (SIC 35)	Electrical & Electronics (SIC 36)	Trans-portation (SIC 37)	Scientific Equip (SIC 38)
Total Firm-years	240	297	228	108	192
Straight-line only	194	239	174	78	150
Straight-line / Accelerated	36	49	14	22	33
Accelerated only	10	9	40	8	9
Information on Property, Plant, and Equipment (industry median values for firms allocating depreciation for some inventory under a straight-line method, $ amounts in millions)					
Financial Statement Data					
PP&E (gross)	$ 383.14	$ 53.83	$ 54.01	$ 174.08	$ 32.34
S-L Depreciation Expense	$ 25.77	$ 3.54	$ 4.69	$ 15.30	$ 2.71
S-L Accum. Depreciation	$ 166.48	$ 31.46	$ 29.90	$ 84.78	$ 13.59
Adjustment Variables					
Estimated PP&E Growth Rate	10.47%	6.24%	8.33%	5.58%	9.78%
Estimated PP&E Life (years)	15.20	12.82	10.86	13.07	11.46
Estimated DDB Dep. Expense	$ 34.79	$ 5.63	$ 5.62	$ 17.32	$ 3.29
(DDB less S-L) Dep. Expense	$ 4.32	$ 0.90	$ 0.75	$ 2.78	$ 0.50
DDB Accum. Depreciation	$ 210.20	$ 31.96	$ 28.14	$ 91.07	$ 17.61
(DDB less S-L) Accum. Dep.	$ 5.03	$ 0.09	$ 0.16	$ 4.21	$ 0.76

[1] The table shows descriptive statistics for adjusting GAAP-based summary measures for firms whose managers report asset valuation and period allocation of depreciation charges under the straight-line depreciation method for some or all PP&E. The alternative disclosures adjust assets and earnings to reflect an accelerated method that approximates an "as-if" double-declining balance method of depreciation and period allocation of depreciation charges.

The variables are defined as: *PP&E Growth Rate* = the growth rate in plant expenditures over the six-year period ending with the current year, *PP&E Life* = the estimated life of PP&E placed in service at the end of the current year, *PP&E (gross)* = the reported gross value of PP&E for the current year, *S-L Depreciation Expense* = the reported depreciation expense for the current year as calculated under a straight-line method of depreciation, *S-L Accum. Depreciation* = the reported contra-asset account to gross PP&E for the current year, *DDB Depreciation Expense* = the "as-if" depreciation expense for the current year, and *DDB Accum. Depreciation* = the "as-if" contra-asset account to gross PP&E for the current year.

TABLE 6.14
Descriptive Statistics of Variables Used to Adjust GAAP-based Summary Measure of Total Liabilities for Loss Contingencies by the Sample Firms in Years 1991-1993 [1]

Industry	Chemicals & Drugs (SIC 28)	Mach. & Computer Hardware (SIC 35)	Electrical & Electronics (SIC 36)	Trans-portation Equip (SIC 37)	Scientific Equip (SIC 38)
Total Firm-years	240	297	228	108	192
Information on Loss Contingencies Reported via Alternative Disclosures (median values, $ amounts in millions)					
Total Firm-years	33	58	37	13	13
Total Loss Contingencies	$ 27.00	$ 8.68	$ 10.54	$ 61.91	$ 3.70

[1] The table shows descriptive statistics for adjusting GAAP-based summary measure of total liabilities for loss contingencies disclosed alternatively to financial statement representations.

The variables are defined as: *Total Loss Contingencies* = the current year disclosures of loss contingencies disclosed alternatively to financial statement representations: the amounts include a firm's disclosure probable obligations at the end of the current year that have not met GAAP-based recognition criteria, commitments, and guarantees.

TABLE 6.15
Descriptive Statistics of Variables Used to Adjust GAAP-based Summary Measures for Pension Disclosures by the Sample Firms in Years 1991-1993 [1]

Industry	Chemicals & Drugs (SIC 28)	Mach. & Computer Hardware (SIC 35)	Electrical & Electronics (SIC 36)	Trans-portation Equip (SIC 37)	Scientific Equip (SIC 38)
Total Firm-years	240	297	228	108	192
Balance Sheet Accrual for Firms Subject to Minimum Liability Provision of SFAS No. 87, Period Cost of Pension Obligations, and Related Disclosures (median values, $ amounts in millions)					
B/S Pension Liab. (firm-yrs)	156	159	105	78	77
B/S Pension Liability	$ 20.49	$ 4.01	$ 3.17	$ 6.03	$ 11.54
I/S Pension Cost (firm-yrs)	156	159	105	78	77
I/S Pension Cost	$ 3.93	$ 0.50	$ 0.97	$ 1.13	$ 1.09
Alternative Disclosures Used to Operationalize Adjustment Variables (median values)					
ABO	$ 376.35	$ 26.31	$ 37.44	$ 105.25	$ 36.24
PBO	$ 439.17	$ 27.92	$ 51.47	$ 122.65	$ 46.31
Comp Rate of Inc. (%)	5.35%	5.50%	5.00%	5.00%	5.00%
Plan Liability less Min. Liab.	$ 364.47	$ 22.71	$ 35.03	$ 117.16	$ 40.55
Plan Assets (firm-yrs)	83	104	63	37	45
Plan Assets (FMV)	$ 276.94	$ 22.18	$ 40.21	$ 394.70	$ 31.36
New Pension Cost	$ 0.09	$ 0.10	$ 0.28	$ 0.06	$ 0.28
Other Cost Components	$ (2.36)	$ (0.24)	$ (0.63)	$ (0.35)	$ (0.87)

[1] The table shows descriptive statistics for adjusting GAAP-based summary measures of assets, liabilities, and earnings for pension information disclosed alternatively to financial statement representations.

The variables are: *B/S Pension Liability* = the amount accrued for the current year; *I/S Cost* = the pension cost for the current year as reported under SFAS No. 87; *ABO* = the accumulated benefit obligation for the current year; *PBO* = projected benefit obligation for the current year; *Plan Liability less Min. Liab.* = is the ABO less any accrued liability except for those in the top quartile of firms, ranked by future rates of compensation increase (in those cases, the PBO is used instead of the ABO); *Plan Assets* = the fair market value (FMV) of assets committed to fund pension obligations for the current year; *New Pension Cost* = the recalculated current period pension cost made up of service cost, interest cost, and the actual return on plan assets; and *Other Cost Components* = those sum of the deferral items allowed under SFAS No. 95 which include amortization effects of prior service cost, gains and losses on plan investments, and/or any transition liability.

TABLE 6.16
Descriptive Statistics of Variables Used to Adjust GAAP-based Summary Measures for OPEB Disclosures by the Sample Firms in Years 1992-1993 [1]

Industry	Chemicals & Drugs (SIC 28)	Mach. & Computer Hardware (SIC 35)	Electrical & Electronics (SIC 36)	Trans-portation Equip (SIC 37)	Scientific Equip (SIC 38)
Total Firm-years	240	297	228	108	192
OPEB Disclosure (firm-years)	73	70	34	38	25
Information on OPEB Plans from Alternative Disclosures					
Recognition Choices Across All Industries (delayed or immediate)					
Transition Method	4	10	8	6	4
Immediate Recognition	69	60	26	32	21
Financial Statement Data and Related Information from Alternative Disclosures by Industry (median values, $ amounts in millions)					
B/S OPEB Liability	$ 183.00	$ 27.28	$ 20.16	$ 79.13	$ 14.21
APBO	$ 192.40	$ 27.07	$ 24.55	$ 99.99	$ 14.77
OPEB Liability Adjustment	$ 5.38	$ 1.58	$ 9.36	$ 1.12	$ 1.28
OPEB Plan Assets (firm-yrs)	24	3	5	7	3
OPEB Plan Assets	$ 29.20	$ 1,366.00	$ 33.00	$ 17.00	$ 13.61

[1] The table shows descriptive statistics for adjusting GAAP-based summary measures of assets and liabilities for alternative disclosures of information relating to other postretirement benefit (OPEB) plans.

The variables are defined as (firm and time subscript omitted): *B/S OPEB Liability* = the accrued postretirement benefit cost as reported in accordance with SFAS No. 106; *APBO* = the accumulated postretirement benefit obligation for the current year that is disclosed alternatively to financial statement representations; *OPEB Liability Adjustment* = the adjustment to total liabilities for a firm that is calculated by APBO plus any unrecognized amortization items less the amount of the accrued postretirement benefit cost as reported in accordance with SFAS No. 106; and *OPEB Plan Assets* = the fair market value of assets contributed to fund OPEB obligations for the current year (this item is not recorded in financial statement representations and instead disclosed in the footnotes so that the offsetting variables are described that produced the net OPEB accrual to a firm's liabilities).

TABLE 6.17
Descriptive Sample Statistics for Balance Sheet Data and Related Candidate Adjustments for the Sample Period 1991-1993 [1]

Variables ($ in millions)	Mean	Std. Dev.	Skewness	Number ≠ 0	Minimum	Maximum
BVTA	$ 2,650.49	$ 12,547.00	$ 13.82	1,065	$ 1.00	$ 251,506.00
INV	31.18	163.76	9.61	259	0.00	2,143.00
IC	1,271.52	4,005.68	5.50	1,000	0.00	40,958.19
DEP	(104.76)	776.81	(8.92)	989	(10,073.30)	4,317.27
PENA	228.53	924.31	6.49	332	0.00	11,344.00
OPEBA	10.39	104.16	12.51	42	0.00	1,632.00
BVTL	1,772.18	10,559.22	15.70	1,065	0.09	225,682.00
OL	74.00	313.87	10.90	907	0.00	5,059.20
CONT	14.35	99.51	12.09	154	0.00	2,000.00
PENL	489.24	2,322.24	10.27	575	0.00	39,406.00
OPEBL	176.32	981.94	9.17	240	0.00	12,753.00

[1] For the three year period 1991-1993, the table provides descriptive statistics for the balance sheet items and related candidate adjustments. The variables are: *BVTA* = book value of total assets and *BVTL* = book value of total liabilities. The following variables are the candidate adjustments (all for the current year): INV = inventory asset, *IC* = intangible capital asset related to R&D and advertising, *DEP* = adjustment to accumulated depreciation, *PENA* = pension plan asset, *OPEBA* = OPEB plan assets, *OL* = operating lease net liability, *CONT* = contingent liability adjustment, *PENL* = pension plan obligation, and *OPEBL* = OPEB plan liability.

TABLE 6.18
Correlations Among Balance Sheet Data and Related Adjustments for the Period 1991-1993 [1]

Variable	BVTA	INV	IC	DEP	PENA	OPEBA	BVTL	OL	CONT	PENL	OPEBL
BVTA	-	0.63	0.47	-0.58	0.15	0.81	0.97	0.76	0.36	0.74	0.64
INV	0.48	-	0.27	-0.67	0.21	0.38	0.63	0.38	0.03	0.41	0.55
IC	0.81	0.39	-	-0.29	0.28	0.45	0.38	0.69	0.53	0.68	0.55
DEP	-0.38	-0.15	-0.31	-	-0.09	-0.35	-0.58	-0.36	0.12	-0.34	-0.46
PENA	0.40	0.33	0.25	-0.17	-	0.03	0.12	0.25	0.11	0.33	0.16
OPEBA	0.29	0.14	0.28	-0.16	0.10	-	0.78	0.86	0.53	0.82	0.71
BVTL	0.98	0.48	0.77	-0.38	0.41	0.29	-	0.70	0.30	0.68	0.60
OL	0.71	0.31	0.64	-0.30	0.29	0.23	0.73	-	0.64	0.89	0.74
CONT	0.25	0.04	0.17	0.06	0.13	0.10	0.26	0.17	-	0.70	0.50
PENL	0.70	0.58	0.51	-0.17	0.59	0.31	0.71	0.48	0.20	-	0.78
OPEBL	0.44	0.40	0.33	-0.13	0.34	0.42	0.46	0.29	0.16	0.56	-

[1] For the three year period 1991-1993, the table shows product moment correlations (in the upper-right triangle) and Spearman correlations (shown in the lower-left triangle). The variables are: *BVTA* = book value of total assets and *BVTL* = book value of total liabilities. The following variables are the candidate adjustments (all for the current year): INV = inventory asset, *IC* = intangible capital asset related to R&D and advertising, *DEP* = adjustment to accumulated depreciation, *PENA* = pension plan asset, *OPEBA* = OPEB plan assets, *OL* = operating lease net liability, *CONT* = contingent liability adjustment, *PENL* = pension plan obligation, and *OPEBL* = OPEB plan liability.

TABLE 6.19

Estimation Results for the Asset-and-Liability-Based Model with Candidate Adjustments [1]

$$MVE = \alpha_0 + \beta_0\, BVTA + \sum_{a=1}^{5} \beta_a\, AdjA_a + \gamma_0\, BVTL + \sum_{l=1}^{4} \gamma_l\, AdjL_l + u, \qquad (4.1)$$

or:

$$MVE_i = \alpha_0 + \beta_0 BVTA_i + \beta_1 INV_i + \beta_2 IC_i + \beta_3 DEP_i + \beta_4 PENA_i + \beta_5 OPEBA_i + \gamma_0 BVTL_i + \gamma_1 OL_i + \gamma_2 CONT_i + + \gamma_3 PENL_i + \gamma_4 OPEBL_i + u_i$$

	α	β_0	β_1	β_2	β_3	β_4	β_5	γ_0	γ_1	γ_2	γ_3	γ_4	$\bar{R}^2$
Pooled, cross-sectional regression (n=1,065): years 1991-1993, with all candidate adjustments													
Predicted sign		+	+	+	+	+	+	-	-	-	-	-	
estimate	212.42	2.30	-1.35	0.57	0.89	0.49	9.67	-2.08	-10.55	-2.62	-0.80	-1.94	0.84
std error	61.81	0.41	1.54	0.17	0.55	0.26	7.86	0.43	2.46	1.48	0.36	3.73	
White's t	3.44	5.65	-0.88	3.37	1.63	1.86	1.23	-4.86	-4.29	-1.77	-2.24	-0.52	
Pooled, cross-sectional regression (n=1,065): years 1991-1993, without OPEB variables													
estimate	173.05	2.37	-1.76	0.50	0.66	0.49		-2.13	-8.42	-4.59	-0.54		0.83
std error	61.57	0.41	1.56	0.16	0.55	0.22		0.44	2.49	1.48	0.34		
White's t	2.81	5.72	-1.13	3.18	1.21	2.24		-4.88	-3.38	-3.11	-1.58		
Pooled, cross-sectional regression (n=710): years 1992-1993, with all candidate adjustments													
estimate	106.88	2.85	0.46	0.36	0.89	0.68	16.19	-2.70	-9.08	-4.06	-1.19	-0.78	0.89
std error	64.76	0.35	1.50	0.15	0.49	0.33	9.38	0.38	2.55	2.48	0.36	3.83	
White's t	1.65	8.05	0.31	2.37	1.84	2.07	1.73	-7.14	-3.56	-1.64	-3.28	-0.20	
Average coefficients, number with predicted sign, and significant t-statistics for the three estimation procedures shown above													
	α	β_0	β_1	β_2	β_3	β_4	β_5	γ_0	γ_1	γ_2	γ_3	γ_4	
Predicted sign		+	+	+	+	+	+	-	-	-	-	-	
avg coef.	164.11	2.51	-0.88	0.48	0.82	0.55	8.62	-2.30	-9.35	-3.76	-0.84	-0.91	
pos coef.	3	3	1	3	3	3	2	0	0	0	0	0	
$t > 1.30$	3	3	0	3	2	3	1	0	0	0	0	0	
neg coef.	0	0	2	0	0	0	0	3	3	3	3	2	
$t < -1.30$	0	0	0	0	0	0	0	3	3	3	3	0	

[1] For each year, the table summarizes the coefficient estimates, White's [1980] standard errors, t-statistics based on White's consistent covariance estimators, and adjusted R^2 values for Equation (4.1) in years 1991-1993.

The variables are (all for the current year): *BVTA* = book value of total assets and *BVTL* = book value of total liabilities. The following variables are the candidate adjustments (all for the current year): INV = inventory asset, *IC* = intangible capital asset related to R&D and advertising, *DEP* = adjustment to accumulated depreciation, *PENA* = pension plan asset, *OPEBA* = OPEB plan assets, *OL* = operating lease net liability, *CONT* = contingent liability adjustment, *PENL* = pension plan obligation, and *OPEBL* = OPEB plan liability.

TABLE 6.20

Diagnostic Tests and Additional Statistics for the Pooled (cross-sectional) Estimation, and Results of Year-by-Year Regressions for Asset-and-Liability-Based Model [1]

$$MVE = \alpha_0 + \beta_0\, BVTA + \sum_{a=1}^{5} \beta_a\, AdjA_a + \gamma_0\, BVTL + \sum_{l=1}^{4} \gamma_l\, AdjL_l + u, \quad (4.1)$$

or:

$$MVE_t = \alpha_0 + \beta_0 BVTA_t + \beta_1 INV_t + \beta_2 IC_t + \beta_3 DEP_t + \beta_4 PENA_t + \beta_5 OPEBA_t + \gamma_0 BVTL_t + \gamma_1 OL_t + \gamma_2 CONT_t + + \gamma_3 PENL_t + \gamma_4 OPEBL_t + u_t$$

Pooled, cross-sectional regression (n=1,065): years 1991-1993, with all candidate adjustments

	α	β_0	β_1	β_2	β_3	β_4	β_5	γ_0	γ_1	γ_2	γ_3	γ_4	$\bar{R}^2$
Predicted sign		+	+	+	+	+	+	-	-	-	-	-	
estimate	212.42	2.30	-1.35	0.57	0.89	0.49	9.67	-2.08	-10.55	-2.62	-0.80	-1.94	0.84
t-stat	3.44	5.65	-0.88	3.37	1.63	1.86	1.23	-4.86	-4.29	-1.77	-2.24	-0.52	
partial r^2 in (%)	-	27.48	0.26	14.47	1.95	1.49	0.98	21.35	12.64	0.26	4.31	0.10	

MAX [scaled cond. index: $\tilde{\eta}_k$]= 58.34 White's $\hat{\chi}^2$ - statistic: 183.9, p-value=0.0001

Durbin-Watson statistic 1.065: where $\hat{\rho}$=0.468

Year-by-Year Regression (n=355)

	α	β_0	β_1	β_2	β_3	β_4	β_5	γ_0	γ_1	γ_2	γ_3	γ_4	$\bar{R}^2$
Predicted sign		+	+	+	+	+	+	-	-	-	-	-	
1991	60.39	2.55	-1.97	0.88	-0.18	-0.02		-2.26	-6.73	-25.49	-1.31		0.80
1992	44.68	3.26	-0.29	0.27	0.68	0.78	16.67	-3.18	-8.73	-4.04	-1.36	-2.44	0.86
1993	-7.98	3.28	3.81	0.26	1.01	0.27	16.09	-3.26	-4.13	1.00	-1.27	1.36	0.95

D-W statistics (1991): 2.041, (1992): 2.065, (1993): 2.003

Average coefficients from Year-by-Year Regression, number with predicted sign and significant t-statistics

Predicted sign		+	+	+	+	+	+	-	-	-	-	-	
avg coef	32.36	3.03	0.52	0.47	0.50	0.35	10.92	-2.90	-6.53	-9.51	-1.32	-0.97	
pos coef	2	3	1	3	2	2	2	0	0	1	0	1	
$t > 1.3$	0	3	1	3	2	2	2	0	0	0	0	0	
neg coef	1	0	2	0	1	1	0	3	3	2	3	1	
$t < -1.3$	0	0	0	0	0	0	0	3	3	2	3	0	

[1] For each year, the table summarizes the coefficient estimates, White's [1980] standard errors, *t*-statistics based on White's consistent covariance estimators, and adjusted R^2 values for Equation (4.1) in years 1991-1993, and for estimated each year.

The variables are (all for the current year): *BVTA* = book value of total assets and *BVTL* = book value of total liabilities. The following variables are the candidate adjustments (all for the current year): *INV* = inventory asset, *IC* = intangible capital asset related to R&D and advertising, *DEP* = adjustment to accumulated depreciation, *PENA* = pension plan asset, *OPEBA* = OPEB plan assets, *OL* = operating lease net liability, *CONT* = contingent liability adjustment, *PENL* = pension plan obligation, and *OPEBL* = OPEB plan liability. For the year-by-year regressions, the estimates in bold are significant at p-value = 0.10.

TABLE 6.21
Tests of Differential Valuation of Book Values and Aggregated Adjustment Variables Related to Firms' Resources and Obligations [1]

$$MVE = \alpha_0 + \beta_1 BVTA + \beta_2 TAdjA + \gamma_1 BVTL + \gamma_2 TAdjL + e, \quad (4.2)$$

Pooled, cross-sectional regression (n=1,065): years 1991-1993, with all candidate adjustments						
	α	β_1	β_2	γ_1	γ_2	$\bar{R}^2$
estimate	460.88	2.06	0.47	-1.8	-1.23	0.82
std error	76.70	0.41	0.13	0.44	0.31	
White's *t*	6.01	5.07	3.72	-4.12	-3.99	
Tests of Parameter Estimates			H_0: $\beta_1=\beta_2$		H_0: $\gamma_1=\gamma_2$	
χ^2 test: using White's [1980] estimator			10.89		2.08	
Probability > χ^2			0.0001		0.1492	
Parameter Estimates for Year-by-Year Regressions (n=355): with all candidate adjustments						
1991	7.05	1.96	0.75	-1.66	-1.98	0.75
1992	34.33	2.82	0.28	-2.63	-1.65	0.84
1993	-61.88	3.32	0.23	-3.19	-1.04	0.93
Tests of Parameter Estimates			H_0: $\beta_1=\beta_2$		H_0: $\gamma_1=\gamma_2$	
1991	χ^2 test: White's estimator		4.72		0.50	
	Probability > χ^2		0.0298		0.4806	
1992	χ^2 test: White's estimator		24.35		8.75	
	Probability > χ^2		0.0000		0.0031	
1993	χ^2 test: White's estimator		56.10		39.77	
	Probability > χ^2		0.0000		0.0000	

[1] For the pooled and year-by-year analyses, the table summarizes the coefficient estimates, White's [1980] standard errors and *t*-statistics based on White's consistent covariance estimator, and adjusted R^2 values for Equation (4.2).

The variables are (all for the current year): *MVE* = the market value of a firm's common stock at end of the third month following the end of the current year, *BVTA* = book value of total assets, and *BVTL* = book value of total liabilities. The following variables are the aggregate of related candidate adjustments (all for the current year): *TadjA* = total adjustments to assets for the current year and *TadjL* = total adjustments to liabilities for the current year. The table also shows the results of tests on the GAAP-based and adjustment parameters that are related. The tests use White's consistent covariance estimator as a correction to the mean squared error (denominator) and the numerator is the usual quadratic form of the estimators.

TABLE 6.22
Results of the Likelihood Ratio Test Developed by Vuong [1989] for Non-Nested Model Selection [1]

$$\text{MODEL 1: } MVE = \alpha_0 + \delta_1 BVTA + \delta_2 BVTL + e, \quad (4.3)$$

$$\text{MODEL 2: } MVE = \alpha_{0adj} + \delta_{1adj} BVTAadjA + \delta_{2adj} BVTLadjL + e_{adj}, \quad (4.4)$$

A Significant Negative Z-statistic Indicates that Model 1 is Rejected in Favor of Model 2

Pooled, cross-sectional regression (n=1,065): years 1991-1993, with all candidate adjustments

Comparison of Model 1 vs Model 2

	Model 1: $\bar{R}^2$	Model 2: $\bar{R}^2$	$\bar{R}^2$ Difference	Z-statistic	Prob > Z-stat
1991-1993	0.735	0.779	-0.0437	-1.666	0.048

Year-by-Year Results (n=355): with all candidate adjustments

Comparison of Model 1 vs Model 2

	Model 1: $\bar{R}^2$	Model 2: $\bar{R}^2$	$\bar{R}^2$ Difference	Z-statistic	Prob > Z-stat
1991	0.643	0.721	-0.0775	-2.673	0.004
1992	0.722	0.768	-0.0458	-1.358	0.087
1993	0.810	0.863	-0.0525	-2.061	0.020

[1] For the pooled and year-by-year analyses, the table shows the adjusted $\bar{R}$ values for Model 1 and Model 2 [i.e., Equations (4.3) and (4.4), respectively]. The table also shows their difference in explanatory power and the Z-statistic based on Vuong's [1989] likelihood ratio test for equivalence in explanatory power in nonnested models.

The variables are (all for the current year): *MVE* = market value of firm's common stock at the end of third month following end of current year, *BVTA* = book value of total assets, *BVTL* = book value of total liabilities, *BVTAadjA* = book value of total assets plus the total adjustments to assets for the current year and *BVTLadjL* = book value of total liabilities plus the total adjustments to liabilities for the current year.

TABLE 6.23
Descriptive Statistics for the Variables Used to Estimate the Earnings-based Valuation Model for the Sample Period 1991-1993 [1]

Variables ($ in millions)	Mean	Std. Dev.	Skewness	Number ≠ 0	Minimum	Maximum
REV	$ 2,105.76	$ 6,203.37	$ 6.33	1,065	$ 0.86	$ 64,792.00
COGS	1,291.43	3,921.67	6.30	1,065	0.70	43,586.00
DEPR	112.55	469.66	11.34	1,065	0.02	9,221.00
OTHEXP	608.56	1,936.01	8.33	1,065	0.00	30,229.00
INV-COGS	3.90	18.44	6.90	1,032	(49.92)	230.11
IC-Amort	149.78	464.71	5.42	970	0.00	5,083.00
DEPR Exp	56.03	360.51	12.21	1,012	(1,055.00)	6,576.98
PEN-Cost	22.66	185.06	13.33	547	(1,277.00)	4,092.00

[1] For the three year period 1991-1993, the table provides descriptive statistics for the balance sheet items and related candidate adjustments. The variables obtained from GAAP-based representation on financial statements are (for the current year): *REV* = net revenue, *COGS* = cost of goods sold, *DEPR* = depreciation expense, and *OTHEXP* = other expenses used to compute net income for the period excluding extraordinary items. The following variables are the candidate adjustments (all for the current year): *INV-COGS* = inventory adjustment, *IC-Amort* = amortization of intangible capital asset related to R&D and advertising, *DEP Exp*= adjustment to depreciation expense, and *PEN-Cost* = adjustment to pension cost.

TABLE 6.24
Correlations Among the Variables Used to Estimate the Earnings-based Valuation Model for the Sample Period 1991-1993 [1]

Variable	REV	COGS	DEP	OTHEXP	INV	IC	DEPR	PEN
REV	-	0.97	0.91	0.90	0.60	0.85	0.58	0.51
COGS	0.97	-	0.82	0.77	0.55	0.72	0.59	0.49
DEP	0.96	0.95	-	0.89	0.60	0.79	0.60	0.43
OTHEXP	0.96	0.92	0.95	-	0.63	0.94	0.43	0.51
INV	0.54	0.55	0.54	0.51	-	0.56	0.23	0.40
IC	0.78	0.74	0.82	0.83	0.42	-	0.37	0.42
DEPR	0.65	0.63	0.65	0.64	0.31	0.52	-	0.22
PEN	0.29	0.29	0.27	0.27	0.19	0.17	0.22	-

[1] For the three year period 1991-1993, the table shows product moment correlations (upper-right triangle) and Spearman correlations lower-left triangle. The variables obtained from GAAP-based representation on financial statements are (for the current year): *REV* = net revenue, *COGS* = cost of goods sold, *DEPR* = depreciation expense, and *OTHEXP* = other expenses used to compute net income for the period excluding extraordinary items. The following variables are the candidate adjustments (all for the current year): *INV* = inventory adjustment, *IC* = amortization of intangible capital asset related to R&D and advertising, *DEPR*= adjustment to depreciation expense, and *PEN* = adjustment to pension cost.

TABLE 6.25
Regression of the Market Value of Equity on Income Statement Components and Related Candidate Adjustments [1]

$$MVE = \alpha_0^* + \beta_1 REV + \gamma_1 COGS + \gamma_2 COGSadj + \delta_1 DEP + \delta_2 DEPadj + \eta_1 OEXP + \eta_2 OEXPadj + e^*, \quad (4.6)$$

Pooled, cross-sectional regression (n=1,065): years 1991-1993, with all candidate adjustments [2]												
	α	β_1	γ_1	γ_2	δ_1	δ_2	η_1	η_2	DW	CI	χ^2	$\bar{R}^2$
Predicted sign		+	-	-	-	-	-	-				
estimate	82.34	12.40	-11.77	-27.33	-19.11	-2.30	-10.44	-2.32	1.96	82.86	79.09	0.89
std error	63.67	1.25	1.25	13.41	2.29	0.77	1.42	1.02				
White's t	1.29	9.91	-9.41	-2.04	-8.33	-2.97	-7.36	-2.28				
Year-by-Year Regressions (n=355): with all candidate adjustments												
1991	203.12	12.98	-12.62	-34.20	-19.06	-2.47	-11.32	-1.64	1.98	91.37	113.71	0.89
White's t	2.75	5.09	-4.71	-1.70	-4.06	-1.49	-4.32	-1.51				
1992	70.49	13.36	-12.77	-14.20	-22.11	-3.57	-11.05	-4.00	2.00	99.63	62.87	0.92
White's t	1.12	7.57	-7.02	-1.76	-8.80	-4.44	-5.16	-1.81				
1993	18.69	13.65	-13.21	-3.45	-8.02	-1.39	-14.05	-0.29	2.08	85.10	80.25	0.94
White's t	0.19	8.31	-7.78	-0.11	-2.89	-1.02	-7.48	-0.17				

	α	β_1	γ_1	γ_2	δ_1	δ_2	η_1	η_2
Predicted sign		+	-	-	-	-	-	-
avg coef.	97.43	13.33	-12.87	-17.28	-16.40	-2.48	-12.14	-1.98
pos coef.	3	3	0	0	0	0	0	0
$t > 1.30$	1	3	0	0	0	0	0	0
neg coef.	0	0	3	3	3	3	3	3
$t < -1.30$	0	0	3	2	3	2	3	2

[1] For the pooled sample and year-by-year regressions, table shows the parameter estimates, standard errors and t-statistics based on White's [1980] consistent covariance estimators, and adjusted R^2 values for Equation (4.6) in years 1991-1993.

The variables are (all for the current year): *MVE* = market value of a firm's common equity at the end of the third month following the current year, and all of the following are for the current year: *REV* = net revenue ,*COGS* = reported cost of goods sold, *COGSadj* = adjustment to cost of goods sold to an *As-if LIFO* restatement, *DEP* = reported depreciation expense, *DEPadj* = adjustment to depreciation expense to restate *As-if Accelerated*, *OEXP* = reported expense other than depreciation and COGS included in income from continuing operations, and *OEXPadj* = adjustments to expenses other than the adjustments to depreciation and COGS for income from continuing operations.

[2] The diagnostic statistics shown are: *DW* = the Durbin-Watson *d*-statistic [1951], *CI* = the largest condition index, and the test statistic (χ^2) for heteroscedasticity using the usual covariance matrix and heteroscedasticity consistent covariance matrix.

TABLE 6.26
Tests of Differential Valuation of Income Statement Components and their Related Adjustment Variables [1]

$$MVE = \alpha_0^* + \beta_1 REV + \gamma_1 COGS + \gamma_2 COGSadj + \delta_1 DEP + \delta_2 DEPadj + \eta_1 OEXP + \eta_2 OEXPadj + e^*, \quad (4.6)$$

Pooled, cross-sectional regression (n=1,065): years 1991-1993, with all candidate adjustments								
	α	β_1	γ_1	γ_2	δ_1	δ_2	η_1	η_2
estimate	82.34	12.40	-11.77	-27.33	-19.11	-2.30	-10.44	-2.32
std error	63.67	1.25	1.25	13.41	2.29	0.77	1.42	1.02
Tests of Parameter Estimates				H_0: $\gamma_1=\gamma_2$		H_0: $\delta_1=\delta_2$		$_0$: $\eta_1=\eta$
χ^2 test: using White's [1980] estimator				1.26		62.71		25.02
Probability > χ^2				0.2622		0.0000		0.0000

Parameter Estimates for Year-by-Year Regressions (n=355): with all candidate adjustments								
	α	β_1	γ_1	γ_2	δ_1	δ_2	η_1	η_2
1991	203.12	12.98	-12.62	-34.20	-19.06	-2.47	-11.32	-1.64
1992	70.49	13.36	-12.77	-14.20	-22.11	-3.57	-11.05	-4.00
1993	18.69	13.65	-13.21	-3.45	-8.02	-1.39	-14.05	-0.29
Tests of Parameter Estimates				H_0: $\gamma_1=\gamma_2$		H_0: $\delta_1=\delta_2$		$_0$: $\eta_1=\eta$
1991	χ^2 test: White's estimator			0.94		12.50		13.46
	Probability > χ^2			0.3319		0.0004		0.0002
1992	χ^2 test: White's estimator			1.00		74.54		3.76
	Probability > χ^2			0.3169		0.0000		0.0526
1993	χ^2 test: White's estimator			0.09		15.91		51.88
	Probability > χ^2			0.7673		0.0001		0.0000

[1] For the pooled and year-by-year analyses, the table shows coefficient estimates for Equation (4.6). Also, the table shows the results of tests on the GAAP-based and adjustment parameters that are related income statement items. The tests use White's [1980] consistent covariance estimator as a correction to the mean squared error (denominator) and the numerator is the usual quadratic form of the estimators.

The variables are (all for the current year): *MVE* = market value of a firm's common equity at the end of the third month following the current year, and all of the following are for the current year: *REV* = net revenue , *COGS* = reported cost of goods sold, *COGSadj* = adjustment to cost of goods sold to an *As-if LIFO* restatement, *DEP* = reported depreciation expense, *DEPadj* = adjustment to depreciation expense to restate *As-if Accelerated*, *OEXP* = reported expense other than depreciation and COGS included in income from continuing operations, and *OEXPadj* = adjustments to expenses other than the adjustments to depreciation and COGS for income from continuing operations.

TABLE 6.27
Results of the Likelihood Ratio Test Developed by Vuong [1989] for Non-Nested Model Selection on the Earnings-based Models of Reported and Restated Earnings [1]

MODEL 1: $MVE = \alpha_0 + \beta_1 RE + e$, (4.8)

MODEL 2: $MVE = \alpha_0^a + \beta_1^a REadj + e^a$, (4.9)

A Significant Negative Z-statistic Indicates that Model 1 is Rejected in Favor of Model 2

Pooled, cross-sectional regression (n=1,065): years 1991-1993, with all candidate adjustments

Comparison of Model 1 vs Model 2

	Model 1: $\bar{R}^2$	Model 2: $\bar{R}^2$	$\bar{R}^2$ Difference	Z-statistic	Prob > Z-stat
1991-1993	0.781	0.803	-0.0222	-0.587	0.270

Year-by-Year Results (n=355): with all candidate adjustments

Comparison of Model 1 vs Model 2

	Model 1: $\bar{R}^2$	Model 2: $\bar{R}^2$	$\bar{R}^2$ Difference	Z-statistic	Prob > Z-stat
1991	0.832	0.825	0.0071	0.060	0.524
1992	0.747	0.797	-0.0498	-0.317	0.376
1993	0.792	0.798	-0.0062	-0.061	0.486

[1] For the pooled and year-by-year analyses, the table shows the adjusted R^2 values for Model 1 and Model 2 [i.e., Equations (4.8) and (4.9), respectively]. Also, the table shows the results of tests of the difference in explanatory power between the two models and the Z-statistic based on Vuong's [1989] likelihood ratio test for equivalence in explanatory power in nonnested models.

The variables are (all for the current year): *MVE* = market value of firm's common stock at the end of third month following end of current year, *RE* = reported GAAP-based earnings from continuing operations, and *REadj* = restated GAAP-based earnings using the candidate adjustment items related to income statement components.

TABLE 6.28
Tests of the (Relative) Size-Effect of the Total Adjustments to Unexpected Earnings on the Returns-Earnings Relation for 1991-1993 as a Test of Earnings Quality [1]

$$R_t = \alpha + \beta_1(RE)_t + e$$

A Significant Positive Z-statistic Indicates that Model 2 is Rejected in Favor of Model 1

Results for 1991-1993: with all candidate adjustments to earnings. Firms are ranked from the lowest relative adjustment (Rank=1) to the highest relative adjustment (Rank=4)

Comparison of Model 1 vs Model 2

Rank 1 vs Rank 2	Model 1: $\overline{R}^2$	Model 2: $\overline{R}^2$	$\overline{R}^2$ Difference	Z-statistic	Prob > Z-stat
1991-1993	0.220	0.156	0.0642	0.163	0.435
Rank 1 vs Rank 3					
1991-1993	0.220	0.052	0.1682	0.240	0.405
Rank 1 vs Rank 4					
1991-1993	0.220	0.042	0.1778	0.443	0.329

Parameter estimates for each ranked portfolio

	α	β_1	β_1 (t-stat)	F-value	$\sigma^2(\epsilon_1)$
Rank=1	2.01	0.77	8.69	75.48	32.81
Rank=2	2.00	0.66	7.08	50.08	214.82
Rank=3	1.91	0.38	3.94	15.54	18,696.51
Rank=4	2.64	0.73	3.55	12.62	2,158,609.00

[1] If the precision of earnings [i.e., $RE_t = \alpha\ CF_t + \epsilon_{1t} + \epsilon_{2t}$ from Equation (4.10)] is affected by the sum of $1/\sigma^2_{\epsilon_1} + 1/\sigma^2_{\epsilon_2}$, then $1/\sigma^2_{\epsilon_1}$ (i.e., the precision of investors' adjustments to earnings) is tested to determine its effect on the returns-earnings relation. Four portfolios are formed based on the ranking of the relative size of the adjustments compared with unexpected earnings for each firm. For the years shown (1991-1993), the table shows the adjusted R^2 values for model 1 and model 2 [i.e., either 1 vs 2, 1 vs 3, or 1 vs 4, respectively]. Also, the table shows the results of tests of the difference in explanatory power between the two models and the Z-statistic based on Vuong's [1989] likelihood ratio test for equivalence in explanatory power in nonnested models. The relative size of the adjustments is obtained by summing the absolute value of all candidate adjustments to earnings divided by the absolute value of unexpected earnings. The t-statistics are based on OLS standard errors.

The variables are: R = the stock return adjusted for the CRSP value-weighted index for firm i calculated over time t, where t begins in the fourth month of the current year and ends with the third month following the current year, and RE = reported earnings before extraordinary items for the current year. All variables are scaled by beginning of the accumulation period price.

TABLE 6.29
Results of the Likelihood Ratio Test Comparing Which Representation of the Feltham-Ohlson Valuation Model Shows a Stronger Association with Stock Prices [1]

$$\text{FO 1: } MVE_{it} = (AdjBV_{i,t-1}) + [adjRE_{it} - (r_e)(AdjBV_{i,t-1})] , \quad (4.16)$$

$$\text{FO 2: } MVE_{it} = (BV_{i,t-1}) + [RE_{it} - (r_e)(BV_{i,t-1})] , \quad (4.17)$$

A Significant Positive Z-statistic Indicates that Model 2 is Rejected in Favor of Model 1

Results for 1992 and 1993 (n=676): with all candidate adjustments to earnings or book value.

Comparisons of Model 1 vs Model 2

FO 1 vs FO 2

	Model 1: $\bar{R}^2$	Model 2: $\bar{R}^2$	$\bar{R}^2$ Difference	Z-statistic	Prob > Z-stat
1992-1993	0.875	0.827	0.0476	1.348	0.089

[1] The table shows tests results using Vuong's [1989] likelihood ratio test for two (single-period) specifications of the Feltham-Ohlson [1995] valuation model. The two specifications are denoted FO 1 (using adjusted measures of book value and earnings) and FO 2 (using reported values of book value and earnings). Each uses a measure of book value of the firm (either reported or adjusted) and calculates abnormal earnings for the period using alternative measures of firm performance (either reported or adjusted) required to equate the cost of equity capital. The years 1992 and 1993 are tested for firms in the sample. Negative book values as reported or after adjusted are deleted from the sample. In 1992 and 1993, 34 firms were dropped leaving 676 firms in the final sample. The table shows the adjusted R^2 values for model 1 and model 2 [i.e., FO 1 vs FO 2, respectively] and their differences in explanatory power. The Z-statistic based on Vuong's [1989] likelihood ratio test for equivalence in explanatory power in nonnested models is presented as a test statistic for the competing models. A significant positive Z-statistic suggests that the second model being tested is rejected in favor of the first model.

The variables are: *MVE* = the market value of common equity at the end of the third month following the close of the current fiscal year, *BV* = reported net book value for the current year, *adjBV* = adjusted net book value for the current year, *RE* = reported earnings from continuing operations for the current year, and *adjRE* = adjusted earnings from continuing operations for the current year.

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