



Capital markets research in accounting[☆]

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Abstract

I review empirical research on the relation between capital markets and financial statements. The principal sources of demand for capital markets research in accounting are fundamental analysis and valuation, tests of market efficiency, and the role of accounting numbers in contracts and the political process. The capital markets research topics of current interest to researchers include tests of market efficiency with respect to accounting information, fundamental analysis, and value relevance of financial reporting. Evidence from research on these topics is likely to be helpful in capital market investment decisions, accounting standard setting, and corporate financial disclosure decisions. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

1.1. *Objective of the review article*

My assignment is to review research on the relation between capital markets and financial statements. This is a broad area of research that originated with the seminal publication of Ball and Brown (1968). The literature has grown rapidly with over 1000 published papers in leading academic accounting and finance journals in the past three decades. The approach I adopt for the review involves a survey of the literature using an economics-based framework. I begin with a discussion of the demand for and supply of research on the relation between financial information and capital markets. This is the organizing framework of my discussion of various areas within capital markets research.

An important objective of the review is to produce a pedagogically valuable document. Toward this end, the review extends at least two previous comprehensive surveys of the capital markets research in accounting by Lev and Ohlson (1982) and Bernard (1989). Because they provide in-depth summaries of research in the 1970s and 1980s, the bulk of the research examined in my study is from the late 1980s and 1990s. In addition to offering a fairly detailed summary of research in the past 10–15 years, I discuss the genesis of important ideas in the literature and the concurrent developments that stimulated many of the ideas. I also critically evaluate the research findings and research designs employed in past research. The main objective is to offer competing hypotheses and explanations for the observed findings. This naturally leads to unresolved issues and directions for future research noted throughout the review. I hope doctoral students (and their instructors) find the study useful in preparing themselves for successful careers in research.

I review almost exclusively empirical capital markets research. However, empirical research is (or should be) informed by theory, since interpretation of empirical analysis is impossible without theoretical guidance. Therefore, I refer to the underlying theory and alternative hypotheses that bear on the analysis, some of which Verrecchia (2001) reviews.

While I attempt to be thorough, my own tastes and interests as well as my differential expertise in various areas within capital markets research influence the review's contents. In addition, within the empirical capital markets area, there are at least three topics that are examined extensively elsewhere. Holthausen and Watts (2001) present a critical assessment of the research on value relevance in the context of standard setting. Healy and Palepu (2001) evaluate empirical research on corporate disclosure and Shackelford and Shevlin (2001) examine tax-related capital markets research. Accordingly, I do not discuss the capital markets research in the above three areas, although I make references to them.

1.2. *Summary*

Capital markets research in accounting includes several topics, including research on earnings response coefficients and properties of analysts' forecasts, fundamental analysis and valuation research, and market efficiency tests. Instead of summarizing each topic, I comment on areas of current interest in capital markets research and offer thoughts on how academics can prepare themselves for producing high impact research.

The capital market research topics of primary interest to researchers currently appear to be tests of market efficiency with respect to accounting information (e.g., accounting methods and accruals), fundamental analysis and accounting-based valuation, and value relevance of financial reporting (see Holthausen and Watts, 2001). The mounting evidence of apparent market inefficiency documented in the financial economics and accounting literature has fueled accounting researchers' interest in fundamental analysis, valuation, and tests of market efficiency. Evidence of market inefficiency has created an entirely new area of research examining long-horizon stock-price performance following accounting events. This is in sharp contrast to the boom in short-window event studies and studies of economic consequences of standard setting of the 1970s and 1980s. Future work on tests of market efficiency with respect to accounting information will be fruitful if it recognizes that (i) deficient research design choices can create the false appearance of market inefficiency; and (ii) advocates of market inefficiency should propose robust hypotheses and tests to differentiate their behavioral-finance theories from the efficient market hypothesis that does not rely on irrational behavior.

I expect capital markets research on issues surrounding market efficiency, fundamental analysis, and valuation to continue. It is worthwhile thinking about how best to prepare for such research. A historical perspective provides helpful guidance. Capital markets research in accounting began in the late 1960s soon after the development of the efficient markets hypothesis and event study methodology (see Section 3) at the University of Chicago. Many of the early capital markets investigators in accounting also came from Chicago and were typically trained in finance and economics. I believe future successful capital markets researchers will also be similarly well trained with a solid grounding in economics-based and behavioral theories of market inefficiency, which have begun to mushroom in finance and economics. This will prepare accounting academics to make a meaningful contribution, not simply within the field of accounting, but in finance and economics as well.

1.3. *Outline of the review*

Section 2 presents a discussion of the sources of demand for capital markets research in accounting. I review early capital markets research in Section 3,

primarily with a pedagogical motivation. It contains an overview of the state of accounting research in the era prior to the Ball and Brown (1968) and Beaver (1968) and the developments in finance and economics in the mid-1960s that facilitated capital markets research in accounting. I discuss much of the capital markets research in the past two decades in Section 4. Section 4 is split into four subsections. Section 4.1 examines methodological research. Section 4.2 focuses on research evaluating alternative performance measures. Fundamental analysis research in accounting is the topic of Section 4.3 and tests of market efficiency in accounting are critically evaluated in Section 4.4. Capital markets research on standard setting is also a capital markets research topic, but I refer the reader to the Holthausen and Watts (2001) review. Section 5 presents a summary and conclusions.

2. Demand for capital markets research in accounting

A large fraction of published research in leading academic accounting journals examines the relation between financial statement information and capital markets, referred to as capital markets research. This voluminous published research is an indication of the demand for capital markets research.¹ There are at least four sources of the demand for capital markets research in accounting that explain its popularity: (i) fundamental analysis and valuation; (ii) tests of capital market efficiency; (iii) role of accounting in contracts and in the political process; and (iv) disclosure regulation. I discuss the four sources of demand for capital markets research below, and list the types of research studies I subsequently summarize in the review. While I believe the four sources account for a large fraction of the demand for capital markets research in accounting, these sources are neither mutually exclusive nor collectively exhaustive.

2.1. *Fundamental analysis and valuation*

Shareholders, investors, and lenders have an obvious interest in the value of a firm. In an efficient market, firm value is defined as the present value of expected future net cash flows, discounted at the appropriate risk-adjusted rate

¹I do not examine the decline in the cost of doing capital market research as an explanation for the explosive growth in the supply of capital market research over the past three decades. The cost has declined with the low-cost availability of computing power, statistical packages, and machine-readable databases such as security price data from the Center for Research in Security Prices (CRSP), financial statement data from Standard & Poor's Compustat, and analysts' forecast data from Institutional Brokers Estimate System (IBES).

of return. A firm's current performance as summarized in its financial statements is an important, but not the only input to the market's assessment of the firm's future net cash flows and thus into the firm's market valuation. This is consistent with the Financial Accounting Standard Board's (FASB's) conceptual framework that financial statements should help investors and creditors in "assessing the amounts, timing, and uncertainty" of future cash flows (FASB, 1978). Therefore, a temporal association between current financial performance and future cash flows, as well as a contemporaneous association between financial performance and security prices or price changes is expected. An important goal of capital markets research is to provide evidence on these relations.

The principal focus of fundamental analysis is on valuation aimed at identifying mispriced securities. This has been popular at least since Graham and Dodd published their book *Security Analysis* in 1934.² A large fraction of the nearly \$5 trillion currently invested in US mutual funds is actively managed, with fundamental analysis as the guiding principle of most mutual fund managers. Fundamental analysis entails the use of information in current and past financial statements, in conjunction with industry and macroeconomic data to arrive at a firm's intrinsic value. A difference between the current price and the intrinsic value is an indication of the expected rewards for investing in the security. Capital markets research on fundamental analysis has become extremely popular in recent years in part because of mounting evidence in the financial economics literature against the efficient markets hypothesis. The belief that "price convergence to value is a much slower process than prior evidence suggests" (Frankel and Lee, 1998, p. 315) has acquired currency among leading academics, spurring research on fundamental analysis. Capital markets research on fundamental analysis examines whether it successfully identifies mispriced securities. Fundamental analysis research thus cannot be disentangled from capital markets research on testing market efficiency.

The research on valuation and fundamental analysis that I review includes valuation models, such as those presented in Fama and Miller (1972, Chapter 2), Beaver et al. (1980), Christie (1987), Kormendi and Lipe (1987), Kothari and Zimmerman (1995), Ohlson (1995), and Feltham and Ohlson (1995). I then examine recent empirical applications of the valuation models like Dechow et al. (1999) and Frankel and Lee (1998). Finally, I discuss studies that employ fundamental analysis to forecast earnings and future stock returns (i.e., a test of market efficiency). Examples include Ou and Penman (1989a, b), Stober (1992), Lev and Thiagarajan (1993), Abarbanell and Bushee (1997, 1998), and Piotroski (2000).

² Recent editions of the book are titled "Graham and Dodd's Security Analysis" by Cottle et al. (1988).

2.2. *Tests of market efficiency*

Fama (1970, 1991) defines an efficient market as one in which “security prices fully reflect all available information”. Whether security markets are informationally efficient is of great interest to investors, managers, standard setters, and other market participants. The interest stems from the fact that security prices determine the allocation of wealth among firms and individuals. The security prices themselves are influenced by financial information, which explains academic and practicing accountants and standard setters’ interest in market efficiency research.

Market efficiency has important implications for the accounting profession. For example, rewards from fundamental analysis would diminish in an efficient market. A switch from one accounting method to another without a direct cash flow effect, a signaling effect, or incentive consequences does not affect security prices in an efficient market. Choice between disclosure in footnotes and recognition in financial statements (e.g., accounting for employee stock options) is less contentious from the perspective of its effect on security prices in an efficient market. Naturally, the opposite would be true in all of the above examples if markets were not efficient. Therefore, there is a demand for empirical research on market efficiency.

There is a huge literature testing market efficiency in finance, economics, and accounting. I concentrate on the literature in accounting. The accounting literature draws inferences about market efficiency from two types of tests: short- and long-horizon event studies and cross-sectional tests of return predictability or the anomalies literature. Event studies, which constitute the bulk of the literature, include the post-earnings-announcement drift literature (e.g., Ball and Brown, 1968; Foster et al., 1984; Bernard and Thomas, 1989, 1990; Ball and Bartov, 1996; Kraft, 1999); market efficiency with respect to accounting methods and method changes and research on functional fixation (e.g., Ball, 1972; Kaplan and Roll, 1972; Dharan and Lev, 1993; Hand, 1990; Ball and Kothari, 1991); and accrual management and analyst forecast optimism and long-term returns to initial public offerings and seasoned equities (e.g., Teoh et al., 1998a, b; Dechow et al., 1999; Kothari et al., 1999b).

Cross-sectional tests of return predictability, or the anomalies literature, examine whether the cross section of returns on portfolios formed periodically using a specific trading rule is consistent with a model of expected returns like the CAPM. The trading rules used have been either univariate indicators like earnings yield, or multivariate indicators employing a fundamental analysis of accounting ratios. Examples of research using univariate indicators are tests of the market’s (mis)pricing of earnings and cash flow yield (e.g., Basu, 1977, 1983; Lakonishok et al., 1994), accounting accruals (e.g., Sloan, 1996; Xie, 1997; Collins and Hribar, 2000a, b), and analysts’ forecasts (e.g., LaPorta,

1996; Dechow and Sloan, 1997). Examples of tests using multivariate indicators to earn long-horizon abnormal returns include ratio-based fundamental analysis (e.g., Ou and Penman, 1989a, b; Greig, 1992; Holthausen and Larcker, 1992; Abarbanell and Bushee, 1997, 1998), and fundamental value strategies (e.g., Frankel and Lee, 1998).

2.3. Role of accounting in contracts and in the political process

Positive accounting theory (see Watts and Zimmerman, 1986) predicts that the use of accounting numbers in compensation and debt contracts and in the political process affects a firm's accounting choices. A large body of literature in accounting tests predictions of positive accounting theory. Many of these tests entail the use of capital market data. For example, tests of the economic consequences of accounting examine stock price reactions to new accounting standards, and study whether cross-sectional variations in these stock price reactions are related to financial variables that proxy for contracting and/or political costs. To perform powerful tests of positive accounting theory and to ameliorate the effects of correlated omitted variables on the tests, researchers attempt to control for the effect of financial information on security prices that is unrelated to the positive accounting theory.³ This creates a demand for capital markets research that aids researchers in designing more powerful stock-price-based tests of the positive accounting theory.

I review a large body of methodological capital markets research that facilitates research on positive accounting theory. The methodological research includes the earnings response coefficient literature (e.g., Kormendi and Lipe, 1987; Easton and Zmijewski, 1989; Collins and Kothari, 1989); research on the properties of time series, management, and analysts' forecasts of earnings (e.g., Ball and Watts, 1972; Foster, 1977; Brown and Rozeff, 1978; Patell, 1976; Penman, 1980; Waymire, 1984); research about problems in drawing statistical inferences (e.g., Collins and Dent, 1984; Bernard, 1987); and discretionary accrual models (e.g., Healy, 1985; Jones, 1991; Dechow et al., 1995; Guay et al., 1996).

2.4. Disclosure regulation

In the US, the FASB, with authority delegated by the Securities and Exchange Commission (SEC), is charged with issuing standards that govern

³Watts (1992) makes a symmetric argument in the context of tests of the relation between financial statement numbers and stock prices. He contends that in order to perform powerful tests of competing theories about the relation between accounting numbers and stock prices, it behooves researchers to include positive accounting theory-based variables in the tests to control for their effects that are correlated with the capital market relations being tested.

the disclosure of financial information by publicly traded firms. Capital markets research can help ascertain whether FASB's stated objectives are served by the standards it has issued, either singly or collectively. For example, do financial statement numbers prepared according to a new standard convey new information to the capital markets? Are financial statement numbers prepared according to a new standard more highly associated with contemporaneous stock returns and prices? What are the economic consequences of the issuance of a new disclosure standard? The nature and extent of standard setting is also likely influenced by standard setters' perception of whether security markets are informationally efficient. Thus, standard setters have an interest in the capital markets research on tests of market efficiency.

Internationally, standard setters presumably seek evidence from capital markets research. The rapid globalization of capital, product, and labor markets has created a strong demand for international accounting standards in recent years. Perhaps the most important issue facing practitioners, and standard setters is whether there should be a uniform set of accounting standards or whether there should be diversity. If standards were to be uniform, should US generally accepted accounting principles (GAAP) be the standard? Or should standards be developed internationally? Or should standards differ across nations, depending on differences in legal, political, and economic environments? Are capital markets in other countries as (in)efficient as they are in the US, which could affect the nature of international accounting standards? Interest in these and related issues has precipitated a demand for capital markets research using international accounting and capital markets data.

Holthausen and Watts (2001) review and analyze the capital markets research on issues surrounding disclosure regulation, so I refrain from reviewing this area of capital markets research in detail.

3. Early capital markets research

Ball and Brown (1968) and Beaver (1968) heralded empirical capital markets research as it is now known. This section describes the state of accounting theory and thought that preceded the positive-economics-based empirical capital markets research of the late 1960s. Concurrent developments in economics and finance constituted the theoretical and methodological impetus to the early capital markets research in accounting. In my opinion, this historical detour exploring the forces that shaped early capital markets research has positive pedagogical externalities, particularly for guiding new researchers. Seasoned researchers can skip over portions of this section without a loss of continuity.

More importantly, another reason for a historical review is that capital markets research in accounting today appears to be in a similar state as accounting theory was prior to 1968. The efficient markets hypothesis and positive economics, as well as other related developments, facilitated the birth of capital markets research in the 1960s. In contrast, theoretical models of inefficient capital markets, research methodology, and evidence of apparent market inefficiency are the catalysts for a large portion of the capital markets research in accounting today.

3.1. The state of accounting theory in the early 1960s

Until the mid-1960s, accounting theory was generally normative. Accounting theorists advanced their accounting policy recommendations on the basis of an assumed set of accounting objectives. Hendriksen (1965, p. 2) defines “a most appropriate theory” as one that “supports the development of procedures and techniques that best fulfill the objectives of accounting”.⁴ He adds, “One of the first steps in the development of accounting theory, therefore, is a clear statement of the objectives of accounting.” Thus, theory development depended on the objectives assumed by a researcher, and theory evaluation was based on logic and deductive reasoning. There was little emphasis on the empirical validity of the theory’s predictions.

Since the theories were logically consistent, the basis for selecting one accounting policy over another was reduced to choosing among alternative objectives of accounting. However, since individuals disagreed on the objectives of accounting, there was no consensus on the optimal set of accounting policies. This led to skepticism about the usefulness of accounting income reported in the financial statements. Hendriksen (1965, p. 97) observes that “already there are rumblings that the income statement will see its demise in the near future unless drastic changes are made to improve the story it tells”. For a variety of reasons, many doubted whether historical cost accounting numbers conveyed useful information about, or an accurate assessment of, a firm’s financial health.

3.2. Concurrent developments that facilitated capital markets research in accounting

While accounting theorists and practitioners held a dim view of whether historical cost accounting numbers accurately reflected a firm’s financial health, scientific evidence on the issue did not exist. Providing empirical evidence to

⁴I use the discussion of accounting theory in Hendrikson’s book as a reasonable description of the state of accounting theory at the time. That description is similar to the one in Ball and Brown (1968) and Watts and Zimmerman (1986, Chapter 1).

ascertain whether accounting numbers contained or conveyed information about a firm's financial performance was the major motivation that led to the research of Ball and Brown (1968) and Beaver (1968). There were three major concurrent developments in finance and economics that forged the way for the seminal research by both Ball and Brown (1968) and Beaver (1968): (i) positive economics theory, (ii) the efficient markets hypothesis and the capital asset pricing model (CAPM) and (iii) the event study of Fama et al. (1969).

3.2.1. Positive economics

Friedman (1953) was perhaps the most prominent among those who were instrumental in making positive, as opposed to normative, science the mainstream research methodology in economics, finance, and accounting. Following Keynes' (1891) definition of positive science as "a body of systematized knowledge concerning what is", Friedman (1953, p. 7) describes positive science as "the development of a 'theory' or 'hypothesis' that yields valid and meaningful (i.e., not truistic) predictions about phenomena yet to be observed". Most accounting research since Ball and Brown (1968) and Beaver (1968) is positive and the role of accounting theory is no longer normative. Watts and Zimmerman (1986, p. 2) state: "The objective of accounting theory is to *explain* and *predict* accounting practice." This is noteworthy departure from the widespread practice of normative accounting theory.

3.2.2. Efficient markets hypothesis and the capital asset pricing model (CAPM)

Building on past theoretical and empirical work, Fama (1965) introduced, and subsequently made major contributions to the conceptual refinement and empirical testing of the efficient markets hypothesis. Fama (1965, p. 4) notes "In an efficient market, *on the average*, competition" among rational, profit-maximizing participants "will cause the full effects of new information on intrinsic values to be reflected 'instantaneously' in actual prices".

The maintained hypothesis of market efficiency opened the doors for positive capital markets research in accounting. Ball and Brown (1968, p. 160) assert that capital market efficiency provides "justification for selecting the behavior of security prices as an operational test of usefulness" of information in financial statements. Beaver (1968) offers a similar argument. Unlike previous normative research on accounting theories and optimal accounting policies, positive capital markets research began using changes in security prices as an objective, external outcome to infer whether information in accounting reports is useful to market participants.

Sharpe (1964) and Lintner (1965) developed the capital asset pricing model, CAPM. The CAPM predicts that a security's expected rate of return is increasing in the *covariance* risk of its cash flows, which is the covariance of a security's expected return with the expected return on the market portfolio. Therefore, a portion of the cross-sectional variation in security returns is due to

differences in the covariance risks of the securities. This risk-related variation in returns is generally not of interest to researchers who focus on firm-specific accounting information and its relation to the firm-specific component of the stock return. Therefore, the CAPM, along with the efficient market hypothesis, greatly facilitated the estimation of the firm-specific return component. The use of the firm-specific component alone enhances the power of the tests of information content of accounting reports (Brown and Warner, 1980, 1985).

3.2.3. *Event study of Fama et al. (1969)*

Fama et al. (1969) conducted the first event study in financial economics. Event studies are joint tests of market efficiency and the model of expected rates of return used in estimating abnormal returns. Fama et al.'s research design innovation permits researchers to align sample firms in event time and to then examine their security price performance before, during, and after economic events such as stock splits (Fama et al., 1969) and earnings announcements (Ball and Brown, 1968; Beaver, 1968).

3.2.4. *Positive accounting theory development: a short detour*

Circumstances similar to those that facilitated the Ball and Brown (1968) study also contributed to Watts and Zimmerman's positive accounting theory that revolutionized the accounting literature in the late 1970s (see Watts and Zimmerman, 1978, 1979, 1983, 1986). Watts and Zimmerman capitalized on the concurrent developments in finance and economics to explain some of the puzzles facing accounting researchers and practitioners. The impetus to Watts and Zimmerman's work was the seminal work of Jensen and Meckling (1976) and Ross (1977) that altered the course of the corporate finance literature. Jensen and Meckling (1976) articulate the implications of the agency problem between a firm's shareholders (principal) and the management (agent) and between shareholders and bondholders in an informationally efficient capital market. The agency problem arises in part because of the imperfect observability of managerial effort and costly contracting. This nexus of contracts view of a corporation enabled Watts and Zimmerman to develop hypotheses as to why there should be predictable variation in how firms account for their economic activities as well as why accounting standards would matter, even if capital markets were informationally efficient.

Watts and Zimmerman's political cost hypothesis extends the economics literature on regulation in a political process, as distinct from a market process (see Olson, 1971; Stigler, 1971; Posner, 1974; McCraw, 1975; Peltzman, 1976; Watts and Zimmerman, 1986, Chapter 10). Thus, the insight that led to the development of Watts and Zimmerman's positive accounting theory involves the accounting implications of the concurrent theoretical developments in

finance and economics. Watts and Zimmerman then tailored those theories to explain accounting phenomena.

3.3. *Association and event studies*

Ball and Brown (1968) and Beaver (1968) are the pioneering studies in capital markets research in accounting. Both perform an event study and Ball and Brown also conduct an association study. Both types of studies are now common in the literature.

In an event study, one infers whether an event, such as an earnings announcement, conveys new information to market participants as reflected in changes in the level or variability of security prices or trading volume over a short time period around the event (see Collins and Kothari, 1989, p. 144; Watts and Zimmerman, 1986, Chapter 3). If the level or variability of prices changes around the event date, then the conclusion is that the accounting event conveys new information about the amount, timing, and/or uncertainty of future cash flows that revised the market's previous expectations. The degree of confidence in this conclusion critically hinges on whether the events are dispersed in calendar time and whether there are any confounding events (e.g., a simultaneous dividend and earnings announcement) co-occurring with the event of interest to the researcher. As noted earlier, the maintained hypothesis in an event study is that capital markets are informationally efficient in the sense that security prices are quick to reflect the newly arrived information. Because event studies test for the arrival of information through an accounting event, they are also referred to as tests of information content in the capital markets literature in accounting. Besides Ball and Brown (1968) and Beaver (1968), other examples of event studies include Foster (1977), Wilson (1986), Ball and Kothari (1991), Amir and Lev (1996), and Vincent (1999).

An association study tests for a positive correlation between an accounting performance measure (e.g., earnings or cash flow from operations) and stock returns, both measured over relatively long, contemporaneous time periods, e.g., one year. Since market participants have access to many more timely sources of information about a firm's cash flow generating ability, association studies do not presume that accounting reports are the only source of information to market participants. Therefore, no causal connection between accounting information and security price movements is inferred in an association study. The objective is to test whether and how quickly accounting measures capture changes in the information set that is reflected in security returns over a given period. In addition to Ball and Brown (1968), other pertinent studies include Beaver et al. (1980), Rayburn (1986), Collins and Kothari (1989), Livnat and Zarowin (1990), Easton and Harris (1991), Easton et al. (1992), Dechow (1994), and Dhaliwal et al. (1999).

3.4. *Early evidence from event studies and association studies*

3.4.1. *Event study evidence*

Ball and Brown (1968) and Beaver (1968) provide compelling evidence that there is information content in accounting earnings announcements. Ball and Brown correlate the sign of the abnormal stock return in the month of an earnings announcement with the sign of the earnings change over that firm's previous year's earnings. They find a significantly positive correlation.

The maintained hypothesis underlying the Ball and Brown test is that the earnings expectation model is well specified in providing a clean measure of earnings surprise. That is, at least a portion of the earnings increase experienced by the firms classified as "good news" firms was a favorable surprise to the market, which led to increased security prices. Thus, the strength of the association between earnings announcement period abnormal return and the earnings surprise is a function of both the information content of earnings and the quality of the earnings expectation model employed. Ball and Brown provide evidence using two earnings expectation models: a simple random walk model and a market model in earnings.

Beaver (1968) circumvents the problem of specifying an earnings expectation model by examining the variability of stock returns and trading volume around earnings announcements. Beaver hypothesizes that the earnings announcement period is characterized by an increased flow of information compared to a non-earnings announcement period. He uses return volatility to infer the flow of information. The evidence supports Beaver's hypothesis.

Beaver also tests for the flow of information by comparing trading volume in the earnings announcement periods to that in the non-announcement periods. The notion here is that market participants have heterogeneous expectations about a forthcoming earnings announcement. Earnings announcements resolve some of the uncertainty and thus narrow the heterogeneity of beliefs, but in the process contribute to increased trading among the market participants who might have taken positions based on their pre-earnings announcement period heterogeneous expectations.⁵

3.4.2. *Association study evidence*

The Ball and Brown evidence clearly demonstrates that accounting earnings contemporaneously capture a portion of the information set that is reflected in security returns. The evidence also suggests that competing sources of information (including quarterly earnings) preempt the information in annual

⁵Recent models of investors' belief revision show that increased heterogeneity is also possible as a consequence of news events such as an earnings announcement (see Harris and Raviv, 1993; Kandel and Pearson, 1995; Bamber et al., 1999).

earnings by about 85%. In this sense, annual accounting numbers are not a particularly timely source of information to the capital markets.

The use of annual earnings to infer earnings' timeliness weakens the case in favor of earnings' timeliness because one of the sources of other information to the capital markets is quarterly earnings (see Foster, 1977). Even so, earnings are unlikely to be a particularly timely source of information. Because accounting earnings measurement rules emphasize transaction-based revenue recognition, compared to the stock market's focus on current and expected future net revenues, earnings' lack of timeliness is not surprising (e.g., Beaver et al., 1980; Collins et al., 1994). In other words, stock prices lead accounting earnings in terms of reflecting new information.

In addition to studying the association and information content of accounting earnings with respect to security returns, Ball and Brown also test for market efficiency by examining whether the market's reaction to good and bad news earnings announcement is quick and unbiased. They find preliminary evidence of a post-earnings announcement drift in that the market's adjustment to bad news in particular takes several months. This suggests market underreaction and subsequent gradual adjustment to the information in earnings. While Ball and Brown provide preliminary evidence of a post-earnings announcement drift, the anomaly literature on the drift took a solid root with the works of Jones and Litzenberger (1970), Litzenberger et al. (1971), Foster et al. (1984), and Bernard and Thomas (1989, 1990).⁶ This research is reviewed in Section 4 under tests of market efficiency.

Ball and Brown also compare the informativeness of earnings and cash flows to test whether the accrual process makes earnings more informative than cash flows. Their evidence suggests the annual abnormal return adjustment is greater for earnings changes than for cash flow changes, consistent with the accrual process making earnings more informative. Following Ball and Brown, a long stream of research examines the relative informativeness of earnings and cash flows.⁷ This research is reviewed in Section 4.

3.5. *Beyond the early evidence*

Ball and Brown (1968) and Beaver (1968) spawned an industry of capital markets research, which is systematically reviewed in the next two sections. Some of the research following Ball and Brown and Beaver replicates their results in different settings, e.g., in different countries, using interim earnings compared to annual earnings, using shorter earnings announcement periods, and by examining both the sign and magnitude compared to only the sign in

⁶ See Ball (1978) for an early survey of this literature.

⁷ Examples include Rayburn (1986), Bowen et al. (1987), Wilson (1986, 1987), Bernard and Stober (1989), Livnat and Zarowin (1990), and Dechow (1994).

Ball and Brown. I review this and subsequent capital markets research in Sections 4 and 5.

3.5.1. *Market efficiency and evaluation of accounting standards*

The early evidence of earnings' association with security returns and evidence of capital market efficiency in finance and economics led some accounting researchers to draw standard-setting implications.⁸ For example, Beaver (1972) in the *Report of the American Accounting Association Committee on Research Methodology in Accounting*, suggests that the association of accounting numbers with security returns can be used to rank order alternative accounting methods as a means of determining the accounting method that should become a standard. The report states that the "method which is more highly associated with security prices... ought to be the method reported in the financial statements" (p. 428), subject to considerations of competing sources of information and costs.⁹

The initial high expectations of the usefulness of capital markets research in guiding accounting standard setters to the socially most desirable accounting methods proved ephemeral. Gonedes and Dopuch (1974) and others quickly pointed out weaknesses (e.g., the free rider problem of non-purchasers' access to accounting information) in using the strength of the association with security returns as a determining criterion for the social desirability of an accounting standard. The debate, however, continues.

Many advocate changes in financial accounting standards because of the perception that current GAAP earnings have low correlation with security prices (e.g., Lev, 1989). They propose alternative accounting methods that arguably would improve the correlation with stock returns (e.g., Lev and Zarowin, 1999). Others contend that the correlation between accounting numbers and security returns would be a function of the objectives of financial statements. There is a demand for objective, verifiable information that is useful for contracting and performance evaluation purposes (Watts and Zimmerman, 1986). Such demand skews the accounting process in the direction of presenting historical information summarizing the effects of actual, rather than expected, transactions, i.e., the application of the revenue recognition principle. In contrast, security price changes primarily reflect revisions in expectations of future profitability. Consequently, the contemporaneous return–earnings association is expected to be small (Kothari, 1992). Commenting on standard setting and the research on the association between security returns and financial information, Lee (1999, p. 13) concludes: "Until accounting regulators decide that reported earnings should include anticipated profits from future exchanges (that is, until we abandon the "revenue

⁸Holthausen and Watts (2001) discuss this topic in detail.

⁹Also see Beaver and Dukes (1972) and Gonedes (1972).

recognition” principle), it is difficult to see how higher correlation with contemporaneous returns should have *any* standard setting implications.”¹⁰

Notwithstanding the conceptual debate over the appropriateness of the correlation with security returns as a criterion for evaluating financial accounting standards, the criterion continues to be used frequently, albeit with some cautionary language. For example, Dechow (1994) uses correlation with stock returns to compare earnings and cash flows as measures of a firm’s periodic performance and Ayers (1998) examines whether deferred tax accounting under SFAS No. 109 provides incremental value relevance over the previous standard for income taxes. One of the objectives of financial reporting, as stated in FASB (1978, paragraph 47), is “Financial reporting should provide information to help present and potential investors and creditors and other users in assessing the amounts, timing, and uncertainty” of prospective cash flows. This serves as a major motivation for researchers to use correlation with stock returns as a criterion for evaluating alternative accounting methods and performance measures.

3.5.2. *Role of maintained hypothesis*

A maintained hypothesis in research that uses correlation with stock returns as a criterion for evaluating accounting methods is that capital markets are efficient. However, in recent years, market efficiency has been subjected to significant empirical assault. There is mounting evidence of capital market anomalies, which suggests that capital markets might be inefficient. Section 4 examines some of this evidence in the context of the accounting capital markets literature. My limited objective here is to comment on the implications for capital markets research that assumes capital market inefficiency.

The appealing feature of market efficiency as a maintained hypothesis is that it often facilitates the specification of a relation between accounting information and security prices under the null hypothesis. For example, neither systematic positive nor negative abnormal returns are predicted in periods following the announcement of an accounting method change. Systematic evidence of non-zero abnormal returns would refute market efficiency.

If market inefficiency is the maintained hypothesis, then the relation between security prices and financial information under the null hypothesis is difficult to specify a priori. The challenge facing researchers is to place more structure on the form of the relations under market inefficiency (Fama, 1998). A wide range of relations is feasible under market inefficiency. It is important to develop refutable hypotheses on the basis of behavioral theories of inefficient financial

¹⁰ Barclay et al. (1999) make a similar point using managerial performance measurement as the motivation.

markets and to perform tests that discriminate between efficient and inefficient market hypotheses.¹¹ This is the essence of the positive theory of economics that has guided much capital markets research for the past three decades. Accountants armed with the knowledge of institutional details about accounting and the use of accounting information by financial analysts have a comparative advantage in developing theories and in designing more powerful tests of market efficiency and/or specific forms of market inefficiency.

3.6. *Summary*

The early event studies and association studies were seminal in several respects. First, they refuted the then prevailing concern that the historical cost earnings measurement process produces meaningless numbers. Second, these studies introduced positive empirical methodology and event study research design to the accounting literature. The early capital markets research amply demonstrated the benefits of incorporating the developments from, and contributing to, the economics and finance literature. Finally, the studies helped dispel the notion that accounting is a monopoly source of information to the capital markets. The early evidence clearly establishes that accounting is not a particularly timely source of information affecting security prices, with many competing sources of information pre-empting earnings information. This has accounting standard-setting implications.

4. **Capital markets research in the 1980s and 1990s**

Early capital markets research demonstrates that accounting reports have information content and that financial statement numbers reflect information that influences security prices, although not on a timely basis. The decades following the early research witnessed an explosive growth in capital markets research. I categorize the demand of this research into five main areas: (i) methodological capital markets research, (ii) evaluation of alternative accounting performance measures, (iii) valuation and fundamental analysis research, (iv) tests of market efficiency, and (v) value relevance of disclosures according to various financial accounting standards and economic consequences of new accounting standards. (Since Holthausen and Watts (2001) and Healy and Palepu (2001) examine item (v) in great detail, I do not discuss this item.)

Considerable overlap exists among the first four areas of research, but they have sufficiently different motivations and they strike me as quite distinct from

¹¹See Barberis et al. (1998), Daniel et al. (1998), and Hong and Stein (1999) for behavioral models that produce predictable security return patterns consistent with market inefficiency.

each other. The next four subsections consider the above four areas of research.

4.1. Methodological capital markets research

Capital markets research seeks to answer a wide range of questions. A sample of the questions examined in previous research includes:

- Do current cost earnings have incremental information content over historical cost earnings?
- Do differences in corporate governance structures affect the degree of information asymmetry in capital markets and, in turn, influence the timing and strength of the relation between security returns and earnings information?
- Does managerial ownership affect the informativeness of accounting numbers because of the separation of corporate ownership and control?
- Does the perceived quality of an auditor affect the relation between corporate earnings and security returns?
- How does the reporting of transitory gain as part of ordinary income and transitory loss as an extraordinary item affect prices?
- How do we test for the capital market effects of accounting method changes?
- Are disclosures about other post-retirement employee benefits (OPEB) value relevant?
- Does an economic value added (EVA[®]) performance measure correlate more highly with stock returns and prices than historical cost accounting earnings?
- What would be the consequence of the Securities and Exchange Commission discontinuing the requirement of reconciliation between the US GAAP and the foreign- or the International Accounting Standards-GAAP for the non-US firms seeking to list their shares on the US exchanges and raise capital in the US?
- Would financial statements be more informative about current economic income (i.e., change in the market value) if GAAP were changed to permit managers to capitalize R&D outlays?

To answer these questions, a researcher must control for the “normal” relation between financial statement information and security returns to isolate the treatment effect of interest. The normal relation obviously varies with the research setting, and could mean any relation other than the treatment effect. For example, in examining the effect of managerial ownership on the informativeness of accounting numbers, the investigator must control for the influence of growth opportunities on earnings’ informativeness because managerial ownership percentage is likely to be correlated with growth opportunities, which affect earnings’ informativeness. This effect of growth

might be unrelated to the potential agency effect of ownership control on earnings' informativeness.

I review methodological research in four sub-sections.

- (i) Earnings response coefficients research (Section 4.1.1),
- (ii) Properties of time series, management, and analysts' forecasts of earnings and earnings growth rates (Section 4.1.2).
- (iii) Methodological issues in drawing statistical inferences from capital markets research (Section 4.1.3).
- (iv) Models of discretionary and non-discretionary accruals (Section 4.1.4). Additional details on this issue are deferred to Section 4.4 on tests of market efficiency because in the capital markets context, the models of discretionary and non-discretionary earnings are frequently used in tests of market efficiency.

4.1.1. Earnings response coefficients research

4.1.1.1. Motivation for research on earnings response coefficients. Earnings response coefficient research is motivated by its potential use in valuation and fundamental analysis. As seen below, a valuation model underlies earnings response coefficient estimation. Another important methodological motivation for research on earnings response coefficients is to facilitate the design of more powerful tests of the contracting and political cost hypotheses or voluntary disclosure or signaling hypotheses in accounting.

4.1.1.2. Intuition for earnings response coefficients. Kormendi and Lipe (1987) is an early paper on earnings response coefficients (also see Miller and Rock, 1985). They build on the accounting association studies literature¹² and the macroeconomics literature on the permanent income hypothesis, which relates the time-series properties of consumption and income.¹³ Kormendi and Lipe estimate the magnitude of the relation between stock returns and earnings, the earnings response coefficient, and test whether firm-specific estimates of earnings response coefficients cross-sectionally exhibit a positive correlation with the time-series properties of the firms' earnings. Thus, earnings response coefficients are a mapping of earnings' time-series properties and discount rates into changes in equity market values. For example, if earnings' time-series properties are such that earnings innovations are permanent, then assuming a

¹²See, for example, Ball and Brown (1968), Foster (1977), Beaver et al. (1979, 1980, 1987), and Watts and Zimmerman (1986, Chapter 2).

¹³See, for example, Hall (1978), Flavin (1981), and Kormendi and LaHaye (1986). The permanent income hypothesis is developed in Modigliani and Brumberg (1954), Friedman (1957), and Ando and Modigliani (1963).

one-to-one relation between earnings innovations and net cash flow innovations, the earnings response coefficient is the present value of the perpetuity of the earnings innovation calculated by discounting the perpetuity at the risk-adjusted rate of return on equity. The present value of a \$1 permanent innovation in annual earnings is $(1 + 1/r)$, where r is the annual risk-adjusted discount rate for equity.

To predict earnings response coefficient magnitudes, a researcher thus requires a valuation model (e.g., dividend-discounting model), revisions in forecasts of future earnings based on current earnings information, and a discount rate. Time-series properties of earnings play a role in parsimoniously describing the revisions in earnings forecasts based on current earnings, but a rigorous theory for the time-series properties does not exist. The most promising area of research in the earnings response coefficient literature is to relate time-series properties of earnings to economic determinants like competition, technology, innovation, effectiveness of corporate governance, incentive compensation policies, etc. (see below). I believe further refinements in the valuation models and more accurate estimates of discount rates are likely to be only incrementally fruitful in furthering our understanding of the return–earnings relation or the earnings response coefficients.

4.1.1.3. Economic determinants of earnings response coefficients. Early research by Kormendi and Lipe (1987), Easton and Zmijewski (1989), and Collins and Kothari (1989) identifies four economic determinants of earnings response coefficients. These studies all begin with the discounted net cash flow valuation model that is standard in the finance and economics literature. To link earnings to security returns, a one-to-one link between revisions in the market's expectations of earnings and net cash flows is assumed. The price change in response to a \$1 earnings innovation is the \$1 innovation plus the discounted present value of the revision in expectations of all future periods' earnings. The four determinants of this price change or the earnings response coefficient are: persistence, risk, growth, and interest rate. I discuss each briefly.

Kormendi and Lipe (1987) and Easton and Zmijewski (1989) show that the greater the impact of an earnings innovation on market participants' expectations of future earnings, i.e., the more persistent the time-series property of earnings, the larger the price change or the earnings response coefficients. Collins and Kothari (1989, Table 1) relate the earnings response coefficient to a number of commonly assumed ARIMA time-series properties of earnings, including the random walk, moving average, and autoregressive properties.

Easton and Zmijewski (1989) explain why risk negatively affects earnings response coefficient. Risk here refers to the systematic (or non-diversifiable or the covariance) component of the equity cash flows' volatility. Single- or multi-beta versions of the CAPM imply that the equity discount rate increases

in the equity cash flows' systematic risk.¹⁴ Thus, greater risk implies a larger discount rate, which reduces the discounted present value of the revisions in expected future earnings, i.e., the earnings response coefficient.

Collins and Kothari (1989) predict a positive marginal effect of a firm's growth opportunities on the earnings response coefficient. Growth here refers either to existing projects or to opportunities to invest in new projects that are expected to yield rates of return that exceed the risk-adjusted rate of return, r , commensurate with the systematic risk of the project's cash flows (see Fama and Miller, 1972, Chapter 2). A firm's ability to earn above-normal rates of return on its current or future investments does not contradict capital market efficiency. It only means that the firm has monopoly power in the product markets and is able to earn (quasi) rents for a finite period. Stated differently, entry or exit in the product markets often does not instantaneously eliminate firms' ability to earn super-normal rates of return.¹⁵ To the extent current earnings are informative about the firm's growth opportunities, the price change is expected to be large. Collins and Kothari (1989, pp. 149–150) argue that the price reaction would be greater than that implied by the time-series persistence of earnings in part because persistence estimates from historical data are likely to be "deficient in accurately reflecting *current* growth opportunities".

Finally, Collins and Kothari (1989) predict a negative temporal relation between earnings response coefficients and the risk-free rate of interest. The logic here is straightforward. The discount rate, r , at any point in time is the sum of the risk-free rate of return at the time and a risk premium. If the risk-free rate of interest rises, then *ceteris paribus* the discounted present value of the revisions in expectations of future earnings innovations falls, inducing a negative temporal association between interest rate levels and earnings response coefficients.¹⁶

¹⁴The Sharpe (1964) and Lintner (1965) CAPM is a single-beta CAPM whereas the Fama and French (1993) three-factor model that includes size and book-to-market factors beyond the market factor or the Carhart (1997) four-factor model that adds the momentum factor to the Fama–French three-factor model is an example of multi-beta CAPM. The state-of-the-art in the finance literature is to use either the three- or the four-factor CAPM models (see Fama and French, 1997).

¹⁵In contrast, in an efficient capital market, prices adjust immediately to reflect changing expectations about a firm's earnings generating ability such that at any point in time an investor can only expect a normal rate of return on an investment in any stock.

¹⁶The argument ignores the possibility that changes in interest are simply changes in expected inflation and that the firm passes on the changes in inflation to its customers in the form of higher prices. In this case earnings response coefficients would be unrelated to interest rate changes. The negative relation between interest rates and earnings response coefficient implicitly assumes either interest rate changes covary positively with changes in real interest rates or inflation negatively impacts stock prices because of unanticipated inflation's negative effects on economic activity (see Fama and Schwert, 1977; Fama, 1981). See further discussion in Section 4.1.1.4.

4.1.1.4. *Assessment of the early evidence on earnings response coefficients.* Evidence in Kormendi and Lipe (1987), Easton and Zmijewski (1989), and Collins and Kothari (1989) indicates a statistically significant effect of the cross-sectional and temporal determinants on estimated earnings response coefficients. Numerous studies replicate these results and it has become an industry standard now in the capital markets literature to control for the effects of persistence, risk, and growth and focus on the incremental effect of a treatment variable, like ownership control, on earnings response coefficients.

Notwithstanding the success and impact of the earnings response coefficients literature, there are at least three criticisms of this research. First, the research on persistence and its relation to earnings response coefficients tends to be statistical in nature. I will revisit this issue in the context of research on time-series properties of earnings. Research on earnings response coefficients can be enriched by focusing on the economic determinants of the time series properties of firms' earnings. There is some work in this area. Ahmed (1994) draws on the works of Lev (1974, 1983), Thomadakis (1976), Lindenberg and Ross (1981), and Mandelker and Rhee (1984) on the relation between the potential to earn economic rents on a firm's assets and the degree of competition in the firm's industry and the firm's cost structure. Ahmed (1994, p. 379) then proposes and reports consistent evidence that "if accounting earnings reflect information about future economic rents generated by firms' assets-in-place, earnings response coefficients will vary inversely with competition and directly with the ratio of fixed costs to variable costs".¹⁷

Anthony and Ramesh (1992) draw on research on the relation between a firm's life cycle and business strategy¹⁸ to explain cross-sectional variation in earnings response coefficients. They argue that depending on a firm's stage in its life cycle, financial statement information is differentially informative about a firm's cash flow generating ability such that earnings response coefficients are predictably related to a firm's stage in its life cycle.¹⁹

¹⁷ Also see Biddle and Seow (1991) for evidence on cross-industry variation in earnings response coefficients and Baginski et al. (1999) for the impact of economic characteristics on earnings persistence measures.

¹⁸ See Porter (1980), and Spence (1977, 1979, 1981), Wernerfelt (1985), Richardson and Gordon (1980), and Rappaport (1981).

¹⁹ There is another stream of literature that derives predictions about the behavior of earnings response coefficients as a function of a firm's life cycle that is rooted in the resolution of uncertainty about the parameter values of the time-series properties of earnings (see Rao, 1989; Lang, 1991).

More recently, Ohlson (1995) introduces a mean-reverting process for residual income, which is in the spirit of competition eroding a firm's sustained ability to earn supernormal earnings. By modeling residual income, instead of total income or changes in income, as an autoregressive process, Ohlson (1995) better captures the intuitive economic effect of product-market competition. Dechow et al. (1999) report evidence that supports the economic modeling of residual income as an autoregressive process. However, they are able to achieve "only modest improvements in explanatory power" over research using simpler earnings capitalization and dividend-discounting models (Dechow et al., 1999, p. 3).

The second weakness of the literature linking earnings response coefficients to persistence is that it tends to present in-sample evidence. For example, Kormendi and Lipe (1987) and Collins and Kothari (1989) estimate time-series parameters and perform cross-sectional tests of a relation between the persistence parameters and earnings response coefficients over the same sample period.²⁰ The absence of a predictive test weakens our confidence in the results, even though the arguments and hypothesis are intuitive.²¹ Dechow et al. (1999) confirm that the autoregressive properties at the industry level have predictive power with respect to the persistence of earnings in future, but their objective was not to explicitly link persistence to earnings response coefficients.

The third criticism of the literature on earnings response coefficient determinants, made in Watts (1992, p. 238), is that it does "not control for differences in accounting earnings' ability to proxy for current and future cash flows and differences in accounting methods. This raises the distinct possibility of a correlated omitted variables problem". Salamon and Kopel (1991) independently make a similar point. The potential for a correlated omitted variables problem arises in part because of the following two possibilities. (i) There is an association between the earnings response coefficients' economic determinants like risk and accounting method choice. (ii) Accounting method

²⁰ Ali and Zarowin (1992) point out that tests that ignore the effect of transitory earnings components (see below) in relating earnings response coefficients to persistence overstate the importance of persistence. However, even after controlling for this overstatement, they report that persistence is a significant determinant of earnings response coefficients.

²¹ One weakness of Lys et al. (1998) is precisely that their use of in-sample time-series properties does not permit them to convincingly discriminate between the following two hypotheses: The effect of time-series properties on earnings response coefficients and the Easton et al. (1992) argument that temporal aggregation of earnings is key to a strong relation between returns and earnings. I will revisit this issue below in the context of research on reasons why estimated earnings response coefficients are too small compared to their predicted values under certain modeling assumptions.

choice is correlated with earnings' predictive power with respect to future cash flows. In general, the literature on economic determinants of earnings response coefficients has not adequately explored economic variables based on the contracting or accounting-choice theory literature as earnings response coefficients' determinants.²² This is worthy of future investigation.²³

4.1.1.5. Competing hypotheses to explain why estimated earnings response coefficients are "too small". Empirical estimates of earnings response coefficient magnitudes range from 1 to 3 (see, for example, Kormendi and Lipe, 1987; Easton and Zmijewski, 1989). Assuming a random walk as a reasonable description of the time series of annual earnings (see Ball and Watts (1972), and further discussion below) and a discount rate of about 10%, the expected magnitude of the earnings response coefficient is about 11 ($= 1 + 1/r$). Using price–earnings multiple as a reasonable estimate of the earnings response coefficient, one expects a magnitude of 8–20 depending on the time period examined. The relatively small magnitude of the earnings response coefficient compared to its predicted value motivated researchers to advance several hypotheses and explanations that I survey below. Interestingly, however, the inquiry into a comparison of the estimated with the predicted magnitude of the earnings response coefficients predates the earnings response coefficient literature that began with Kormendi and Lipe (1987).

Beaver et al. (1980) attempt to explain the difference between predicted and estimated values of earnings response coefficients by introducing three inter-related ideas: prices lead earnings (see below), a true-earnings-plus-noise model of accounting earnings, and a reverse-regression econometric research design. Another notable attempt appears in Easton and Harris (1991). Assuming the book value of equity is a noisy proxy for the market value of equity and assuming clean surplus, they argue that earnings measures the change in the market value of equity. They therefore argue that earnings-deflated-by-price should be used in addition to earnings-change-deflated-by-price in explaining

²²Exceptions include studies like Baber et al. (1996, 1998) that examine the interplay between earnings response coefficients, investment opportunities, and management compensation.

²³There is another criticism that concerns the temporal relation between interest rates and earnings response coefficients. Is the interest rate a causal determinant of earnings response coefficients? A large component of nominal interest rates is inflation. Finance and macroeconomics literature documents that shocks to inflation are negatively related to both shocks to real economic activity and stock market returns (see Fama and Schwert, 1977; Fama, 1981). Furthermore, real economic activity and business outlook are negatively related to expected rates of returns on stocks and bonds (see Fama and French, 1988, 1989; Balvers et al., 1990; Chen, 1991). This means interest rates might be positively related to the risk premium, as suggested in the literature on time-varying expected rates of returns. Thus, the interest rate effect on earnings response coefficients (or on price–earnings multiples) might be via time-varying risk premium (i.e., expected return on the market minus the risk-free rate of interest). Interest rate itself might not be the causal factor contributing to its negative relation with earnings response coefficients.

earnings. If the balance sheet perspective in Easton and Harris (1991) is adopted, the predicted coefficient on earnings is one, which implies earnings are entirely transitory. Since earnings are highly persistent, I find the Easton and Harris (1991) explanation unsatisfactory even though their evidence clearly shows that earnings-deflated-by-price significantly explains stock returns beyond the earnings-change variable. Kothari (1992) and Ohlson and Shroff (1992) offer alternative, earnings-expectations-based motivation for using earnings-deflated-by-price to explain stock returns in a return–earnings regression. In recent years, researchers estimating a return–earnings regression frequently use earnings-deflated-by-price variable to explain stock returns. However, the estimated earnings response coefficient is far from its predicted value of approximately the price–earnings multiple.

At least four hypotheses explain the observed low magnitudes of earnings response coefficients: (a) prices lead earnings; (b) inefficient capital markets; (c) noise in earnings and deficient GAAP; and (d) transitory earnings.²⁴ I discuss these below along with a summary of the evidence.

(a) *Prices lead earnings*: An important paper, Beaver et al. (1980), develops the idea that the information set reflected in prices is richer than that in contemporaneous accounting earnings.²⁵ In an efficient market, price changes instantaneously incorporate the present value of the revisions in the market's expectations of future net cash flows. In contrast, because of the revenue realization and expense matching principles that are fundamental to the earnings determination process (Statement of Financial Accounting Concepts No. 6, paras 78–79), accounting earnings incorporate the information reflected in price changes systematically with a lag. This is parsimoniously referred to as “prices lead earnings”.

One implication of prices leading earnings is that even though annual earnings' time-series properties are reasonably described as a random walk and thus successive earnings changes are unpredictable using the information in past time series of earnings, the information set reflected in prices contains

²⁴ An additional reason is whether the earnings response coefficient is estimated using time-series data for an individual firm or it is estimated for classes of securities in the cross section. Teets and Wasley (1996) offer compelling evidence that firm-specific, time-series estimates of earnings response coefficients are substantially larger than those estimated using cross-sectional regression. They show that the firm-specific estimates are on average larger because of a strong negative cross-sectional correlation between the variance of unexpected earnings and firm-specific earnings response coefficient. In pooled estimations, the high, unexpected earnings variance firms receive disproportionate weight, which causes the estimated coefficient to be smaller than the average of the firm-specific estimates.

²⁵ Following Beaver et al. (1980), there has been voluminous work on the implications of prices leading earnings. A selected list of papers includes Collins et al. (1987, 1994), Beaver et al. (1987, 1997), Freeman (1987), Collins and Kothari (1989), Kothari (1992), Kothari and Sloan (1992), Easton et al. (1992), Warfield and Wild (1992), Jacobson and Aaker (1993), Basu (1997), Ball et al. (2000), and Liu and Thomas (2000).

information about future earnings changes. That is, from the perspective of the market, successive annual earnings changes are not unpredictable. The econometric consequence of prices leading earnings is that when returns are correlated with contemporaneous earnings changes, only a portion of the earnings change is a surprise to the market. In an efficient market, the anticipated portion of the earnings change is irrelevant in explaining contemporaneous returns. This informationally irrelevant portion of earnings change contributes to a standard errors-in-variables problem (see Maddala, 1988, Chapter 11; or Greene, 1997, Chapter 9), which biases downward the earnings response coefficient and reduces the explanatory power of the return–earnings regression. Thus, simply correlating earnings change with returns or failure to use an accurate proxy for unexpected earnings in the presence of prices leading earnings is hypothesized as a reason for earnings response coefficients that are “too small”.

(b) *Inefficient capital markets*: If the market fails to correctly appreciate the implications of a current earnings surprise in revising its expectations of future earnings, the price change associated with earnings change will be too small. There is a large body of evidence that suggests that the stock market underreacts to earnings information and recognizes the full impact of the earnings information only gradually over time (see references in Section 3 on the post-earnings-announcement-drift literature and further discussion in this section under “tests of market efficiency”). Smaller-than-predicted values of earnings response coefficients are consistent with capital market inefficiency. Such an interpretation, however, should be tempered unless there is a logically consistent inefficient markets theory that predicts underreaction to earnings information. The reason is that overreaction is just as easily possible as underreaction in an inefficient market without a theory that predicts a particular phenomenon.

(c) *Noise in earnings and deficient GAAP*: The “noise in earnings” argument gained currency among accounting academics with Beaver et al. (1980).²⁶ While Beaver et al. elegantly express the intuition for why prices lead earnings, their modeling (Beaver et al., 1980, Section 2) relies on defining accounting earnings as the sum of “true earnings” plus value-irrelevant noise or a garbling component that is uncorrelated with stock prices (i.e., value) or returns in all periods.²⁷ This assumption enables Beaver et al. to present one model of the prices-lead-earnings phenomenon.²⁸ However, the “true-earnings-plus-noise”

²⁶ Also see Choi and Salamon (1990), Collins and Salatka (1993), Ramesh and Thiagarajan (1993), and Ramakrishnan and Thomas (1998).

²⁷ However, there is no consensus in the literature on the definition of value-irrelevant noise (see, for example, Ramakrishnan and Thomas, 1998).

²⁸ For a different approach, see Fama (1990), Lipe (1990), Ohlson and Shroff (1992), Kothari (1992), Kothari and Sloan (1992), and Kothari and Zimmerman (1995). This alternative approach is described below.

view of earnings suggests that accountants garble an otherwise “true earnings” signal about firm value. This seems counterintuitive and contrary to evidence on at least two grounds. First, there is evidence that accounting accruals are informative (see Rayburn (1986) and Dechow (1994), and many other studies). Second, regardless of whether accruals are informative or not, it seems unlikely that earnings without the accruals would be “true income”. There is no economic intuition to suggest that an earnings-measurement process that emphasizes a transaction-based approach would generate “true income”, which means earnings that capture all of the information that is in economic income, i.e., the change in equity market capitalization. In fact, the thesis of Beaver et al. is that prices lead earnings, which means the information set in price changes is richer than that in accounting earnings.

The deficient-GAAP argument takes the major objective of financial reporting to be “the prediction of future investor cash flows or stock returns” (Lev, 1989, p. 157). Proponents of the deficient-GAAP argument therefore use the return–earnings correlation as a measure of GAAP’s success in fulfilling its objective. The maintained hypothesis is that capital markets are informationally efficient and the major objectives of financial reporting are generally inferred from the FASB’s Statements of Financial Accounting Concepts.²⁹ In a series of papers, Baruch Lev with numerous coauthors has been probably the single biggest advocate of the “deficient GAAP” argument. Deficient GAAP is claimed to produce “low quality” earnings that exhibit only weak correlation with security returns. Lev (1989, p. 155) states, “While misspecification of the return/earnings relation or the existence of investor irrationality (“noise trading”) may contribute to the weak association between earnings and stock returns, the possibility that the fault lies with the low quality (information content) of reported earnings looms large.”

Lev expresses similar views in the context of accounting for research and development in Amir and Lev (1996), Aboody and Lev (1998), Lev and Sougiannis (1996), Lev and Zarowin (1999), and other papers. In addition, there is a vast positive empirical literature that examines the “deficient-GAAP” argument without making regulatory prescriptions. See, for example, Abraham and Sidhu (1998), Healy et al. (1999), and Kothari et al. (1999a) in the context of the capitalization versus expensing of research and development costs and Bryant (1999) in the context of full cost versus successful efforts method of accounting for oil-and-gas drilling costs.

²⁹ For example, Lev (1989) quotes the following from FASB (1978, para. 43): “The primary focus of financial reporting is information about an enterprise’s performance provided by measures of earnings and its components. Investors, creditors, and others who are concerned with assessing the prospects for enterprise net cash flows are especially interested in that information. Their interest in an enterprise’s future cash flows and its ability to generate favorable cash flows leads primarily to an interest in information about its earnings...”

The noise-in-earnings and deficient-GAAP arguments have similar consequences for the return–earnings correlation. Both weaken the contemporaneous return–earnings correlation and bias downward the earnings response coefficient (see, for example, Beaver et al., 1980; Lev, 1989, the appendix; or Kothari, 1992). However, I believe the two arguments are different. Noise is defined as a variable that is uncorrelated with the information in security returns in all time periods, i.e., current, past, and future. Deficient GAAP, in contrast, is simply another form of the prices-lead-earnings argument, except that there is a normative undercurrent in the deficient-GAAP argument. The deficient-GAAP argument posits that financial statements are slow to incorporate the information that is reflected in contemporaneous market values. In addition, it assumes that the greater the contemporaneous correlation of earnings with returns, the more desirable the GAAP that produces that earnings number. Unfortunately, the reasons why maximizing the earnings' correlation with stock returns is desirable are not well articulated or proven logically. I have touched upon this issue earlier, but a detailed treatment appears in Holthausen and Watts (2001).

(d) *Transitory earnings*: Although annual earnings are frequently assumed to follow a random walk, the presence of transitory components in earnings has long been recognized in the literature (see, for example, Brooks and Buckmaster, 1976; Ou and Penman, 1989a, b). There are several reasons for transitory earnings. First, certain business activities, like asset sales, produce one-time gains and losses.³⁰

Second, because of information asymmetry between managers and outsiders, and because of potential litigation, there is a demand for and supply of conservative accounting numbers. Following Basu (1997, p. 4), I define conservatism as asymmetry in the speed with which accounting numbers reflect economic gains and losses or earnings reflecting “bad news more quickly than good news” (also see Ball et al., 2000). Both information asymmetry and threat of litigation motivate management to disclose bad news on a more timely basis than good news. That is, the accounting recognition criteria have evolved to be less stringent for losses than gains such that anticipated losses, but not gains, are recognized more often and more quickly. Recognition of anticipated losses approximates recognition of the market value effect (loss) as it becomes known, so losses, like market value *changes*, are transitory. Hayn (1995) points out another reason for losses being transitory. She argues that the firm has an abandonment put option to discontinue the loss-making (or below-market return generating) operation and recoup the book value of the firm's assets. So,

³⁰ Here I assume the business events that produce one-time gains or losses are exogenous. If managerial incentives were to influence the occurrence of these events, then they would be endogenous (e.g., Bartov, 1991). The endogenous nature of these events is more realistic and it is discussed below.

only firms expecting to improve will continue operations, which means observed losses would be temporary. The loss-making firms' ability to recoup the book value through abandonment and adaptation enhances the book value's association with prices in periods when a firm is performing poorly (also see Berger et al., 1996; Burgstahler and Dichev, 1997; Barth et al., 1998; Wysocki, 1999).³¹ The role of book values in valuation and book values' association with prices are topics examined in some detail below and especially in Holthausen and Watts (2001).

Finally, managerial motivations rooted in agency theory might contribute to transitory gains and losses. For example, Healy (1985) hypothesizes and documents evidence that for compensation considerations in a costly contracting setting, managers might generate discretionary accruals that reduce high levels of non-discretionary earnings or might take a "big bath" to report an extreme loss.³² The "big bath" discretionary accrual behavior is also observed with incoming CEOs (see Pourciau, 1993; Murphy and Zimmerman, 1993). The discretionary component of the accruals is likely to be transitory and in fact mean reverting because accruals (eventually) reverse.

4.1.1.5.1. Econometric consequence of transitory earnings. The econometric consequence of transitory earnings components is straightforward. A simple model based on the analysis in Kothari and Zimmerman (1995, Section 5.1) illustrates the effect. I follow it up with a richer analysis later. Suppose

$$X_t = x_t + u_t,$$

where X_t is the reported earnings consisting of a random walk component, $x_t = x_{t-1} + e_t$, $e_t \sim N(0, s_e^2)$ and a transitory component, $u_t \sim N(0, s_u^2)$. Also assume that the market has no information beyond the time-series property of earnings and that e_t and u_t are uncorrelated. The earnings response coefficient on the transitory component is one. However, the market's sensitivity to the random walk component, i.e., the permanent component of earnings is $\beta = (1 + 1/r)$ or the average price–earnings multiple. Using the beginning-of-period-price, P_{t-1} , as the deflator, a return–earnings regression

$$R_t = \gamma_0 + \gamma_1 X_t / P_{t-1} + \text{error}_t$$

³¹ The abandonment option is a real option. See Robichek and Van Horne (1967) for an early treatment of the abandonment option in capital budgeting. The role of real options in valuation is an important emerging area in financial economics. See Pindyck (1988), Dixit and Pindyck (1994), Abel et al. (1996), and Trigeorgis (1996) for excellent treatments of real options and valuation. The idea of real options has recently been applied in accounting (see Wysocki, 1999), but I believe there is far more potential still to be realized.

³² Following Healy (1985), there is a huge literature that examines compensation-motivated earnings management. This and other earnings management literature on the debt and political cost hypotheses that originated with the positive accounting theory (see Watts and Zimmerman, 1978, 1986) is beyond the scope of my review, unless it is related to the capital markets research.

will yield a slope coefficient that falls between 1 and β because X_t is the sum of two independent variables with two different slope coefficients relating them to the dependent variable. Disentangling the two components and including those separately in the regression will yield coefficients on the two components that are closer to their predicted values (see, for example, Collins et al., 1997) and the model's explanatory power will increase. The γ_1 coefficient's magnitude depends on the relative magnitudes of the variances of the random walk and transitory components of earnings. If k is defined as $s_e^2/(s_e^2 + s_u^2)$, then γ_1 is expected to equal $k(\beta - 1) + 1$. Thus, if there are no transitory earnings, then $k = 1$ and the slope coefficient will be β . Alternatively, at the other extreme, if there are no permanent earnings, then $k = 0$ and the slope coefficient will be 1 on entirely transitory earnings.

As the assumption of zero correlation between the random walk and transitory earnings components is relaxed, the predictions about γ_1 's magnitudes naturally change. Economic hypotheses about managers' incentives would generally suggest a non-zero correlation between the two components, which complicates the analysis.

4.1.1.5.2. Evidence on transitory earnings' effect on earnings response coefficients. There is an extensive literature documenting a smaller earnings response coefficient on transitory earnings as proxied for by non-recurring items reported in the financial statements (see, for example, Collins et al., 1997; Hayn, 1995; Elliott and Hanna, 1996; Ramakrishnan and Thomas, 1998; Abarbanell and Lehavy, 2000a). In addition, there is a literature on non-linearities in the return–earnings relation that attempts to infer transitory earnings from the magnitude of earnings response coefficients. An S-shaped return–earnings relation is seen from the empirical results of Beaver et al. (1979). They find that abnormal returns associated with extreme earnings changes are not proportionately as large as those associated with the non-extreme earnings change portfolios, which gives rise to an S-shaped return–earnings relation. One interpretation is that the market does not expect extreme earnings changes to be permanent, so the price adjustment is smaller. Thus, there is a negative correlation between the absolute magnitude of the earnings change and the likelihood that it is permanent. An appealing economic intuition exists for this correlation. Either extreme earnings changes are a result of one-time, windfall gains and losses, or competition in the product market makes it unlikely that the extreme high level of profitability can be sustained. At the extreme low level of earnings, the abandonment option argument is relevant.

Freeman and Tse (1992) model the non-linear relation using an arc-tangent transformation. Cheng et al. (1992) propose a rank-regression approach to tackle non-linearity. Other research on the non-linear return–earnings relation includes Abdel-khalik (1990), Das and Lev (1994), Hayn (1995), Subramanyam (1996a), Basu (1997), and Beneish and Harvey (1998). While

the research on non-linearity is successful in improving the return–earnings regression fit, a strong economic foundation for the modeling is not apparent. Therefore, researchers must exercise caution in employing ad hoc statistical refinements.

4.1.1.6. Discriminating between competing hypotheses. Researchers have used many different research designs to discriminate between the above four competing hypotheses to explain the weak return–earnings correlation and why estimated earnings response coefficients are too small compared to those predicted on the basis of a random walk time series property of annual earnings. Prices leading earnings and the presence of transitory earnings appear to be the dominant explanations for the modest contemporaneous return–earnings association and for the observed magnitudes of earnings response coefficients. A summary of this research will hopefully make this apparent.

There is another reason for summarizing the above research. In many applications, researchers choose a research design from among many alternatives available. To facilitate research design selection in the future, I summarize the central features of and pros and cons of the research designs using common notation. The modeling below extends Fama's (1990) analysis of the effect of expanding the measurement window for both returns and earnings (industrial production) on the return–earnings correlation and earnings response coefficient.

An important distinction between the analysis in Fama (1990) or similar studies in finance and the return–earnings literature in accounting centers around the maintained hypothesis and motivation for the studies. In the finance literature, the maintained hypothesis is that explanatory variables like industrial production are real, economic, fundamental variables that a researcher has measured with a reasonable degree of accuracy. The motivation for their tests is to examine whether time-series or cross-sectional variation in stock returns is rational (efficient) in the sense that it is largely explained by economic fundamentals. The alternative hypothesis is that pricing in the market is not an outcome of the market participants' rational economic behavior. The objective of the accounting literature like Ball and Brown (1968) or Easton et al. (1992) is to assess whether the accounting earnings determination process captures the factors that affect security prices, with the maintained hypothesis that capital markets are informationally efficient. So, market efficiency is a maintained hypothesis and whether accounting captures underlying economic reality that moves the market is tested in the research (see Patell (1979) for a mathematically elegant treatment of these issues).

4.1.1.6.1. Assumptions and variable definitions. I present a simple model of the relation between earnings *growth* rates and stock returns, which captures

the prices-lead-earnings phenomenon. I use growth rates because it simplifies the analysis. However, the intuition from the analysis is equally applicable to return–earnings analysis that uses earnings or earnings change deflated by price as the earnings variable in the regressions. The particulars of the econometrics naturally change with different specifications of the variables, but the qualitative results continue to hold.

Suppose earnings growth in period t , X_t , is

$$X_t = x_t + y_{t-1}, \quad (1)$$

where x_t is the portion of earnings growth that is news to the market, whereas y_{t-1} is the portion of earnings growth that the market had anticipated at the beginning of period t . Stated differently, y_{t-1} is past earnings news that shows up in period t 's earnings, i.e., prices lead earnings. Further assume that x_t and y_{t-1} are uncorrelated and i.i.d. with $\sigma^2(x) = \sigma^2(y) = \sigma^2$. These assumptions imply earnings follow a random walk and that each component of earnings growth contributes to a new permanent level of earnings. Using earnings growth rates empirically poses practical difficulties because earnings can be negative. I assume this issue away here in the interest of a simple analysis that communicates the intuition.

Stock prices respond only to information about earnings growth, i.e., discount rates are assumed constant inter-temporally and cross-sectionally. Given the assumptions about earnings growth rates, return in period t , R_t , is

$$R_t = x_t + y_t. \quad (2)$$

Current stock return reflects the news in current earnings and news about earnings growth that will be captured in the next period's earnings. In this model, the market is assumed to have information about one-period-ahead earnings growth rate. This is a conservative assumption in that previous research suggests prices reflect information about two-to-three-year-ahead earnings growth (e.g., Kothari and Sloan, 1992).

Since all the earnings information is expressed in terms of growth rates and because all earnings growth is assumed to be permanent, annual stock returns are simply the sum of the earnings growth rates that are news to the market. That is, there is a one-to-one correspondence between stock returns and news in earnings growth rates, and the price response to unexpected earnings growth, i.e., the earnings response coefficient, is one. If, instead of using earnings growth rates, unexpected earnings deflated by the beginning of the period price are used, then the earnings response coefficient is $(1 + 1/r)$.

4.1.1.6.2. Contemporaneous one-period return–earnings relation. This is the commonly estimated annual return–earnings relation:

$$R_t = a + bX_t + e_t, \quad (3)$$

where b is the earnings response coefficient. The regression estimate of b is

$$\begin{aligned}
 b &= \text{Cov}(R_t, X_t) / \text{Var}(X_t) \\
 &= \text{Cov}(x_t + y_t, x_t + y_{t-1}) / \text{Var}(x_t + y_{t-1}) \\
 &= \text{Cov}(x_t, x_t) / [\text{Var}(x_t) + \text{Var}(y_{t-1})] \\
 &= \sigma^2 / (\sigma^2 + \sigma^2) \\
 &= 0.5.
 \end{aligned} \tag{4}$$

To determine the explanatory power, adjusted R^2 , of the regression, consider the decomposition of the dependent variable's variance ($= 2\sigma^2$):

$$\begin{aligned}
 \text{Var}(R_t) &= b^2 \text{Var}(X_t) + \text{Var}(e_t), \\
 2\sigma^2 &= 0.5^2 [\text{Var}(x_t) + \text{Var}(y_{t-1})] + \text{Var}(e_t) \\
 &= 0.5^2 [\sigma^2 + \sigma^2] + \text{Var}(e_t) \\
 &= 0.5\sigma^2 + 1.5\sigma^2.
 \end{aligned} \tag{5}$$

From (5), the adjusted R^2 , denoted as R^2 for parsimony, is

$$R_2 = (2\sigma^2 - 1.5\sigma^2) / 2\sigma^2 = 25\%. \tag{6}$$

Eqs. (4) and (6) provide results of a contemporaneous return–earnings regression with the market anticipating half the information in earnings growth rates [i.e., $\text{Var}(x_t) = \text{Var}(y_{t-1})$] one period ahead. The earnings response coefficient is 50% biased and the explanatory power of the regression is 25%. The estimated earnings response coefficient is biased because the anticipated portion of the earnings growth rate, y_{t-1} , is stale information that is irrelevant to explaining variation in current returns and it acts as measurement error in the independent variable. Bias in the slope coefficient reduces the model's explanatory power. This errors-in-variables problem is exacerbated if the market anticipated earnings growth rates more than one period in advance.

In addition to the errors-in-variables problem, note also that whereas variation in R_t is due to earnings growth rates x_t and y_t , which are reflected in current and next period's earnings, y_t is not included in the regression model. The absence of y_t means there is an omitted variable. This also contributes to reducing the model's explanatory power. Since y_t is (assumed to be) uncorrelated with the included independent variable, $X_t (= x_t + y_{t-1})$, the coefficients on the included earnings growth rates are not biased due to a correlated omitted variable.

Include future earnings in the return–earnings model: Previous research in accounting and finance employs several alternative approaches to mitigate the errors-in-variables and omitted-variable problems in the return–earnings or similar regressions. Jacobson and Aaker (1993) and Warfield and Wild (1992) in return–earnings regressions and Fama (1990) and Schwert (1990) in

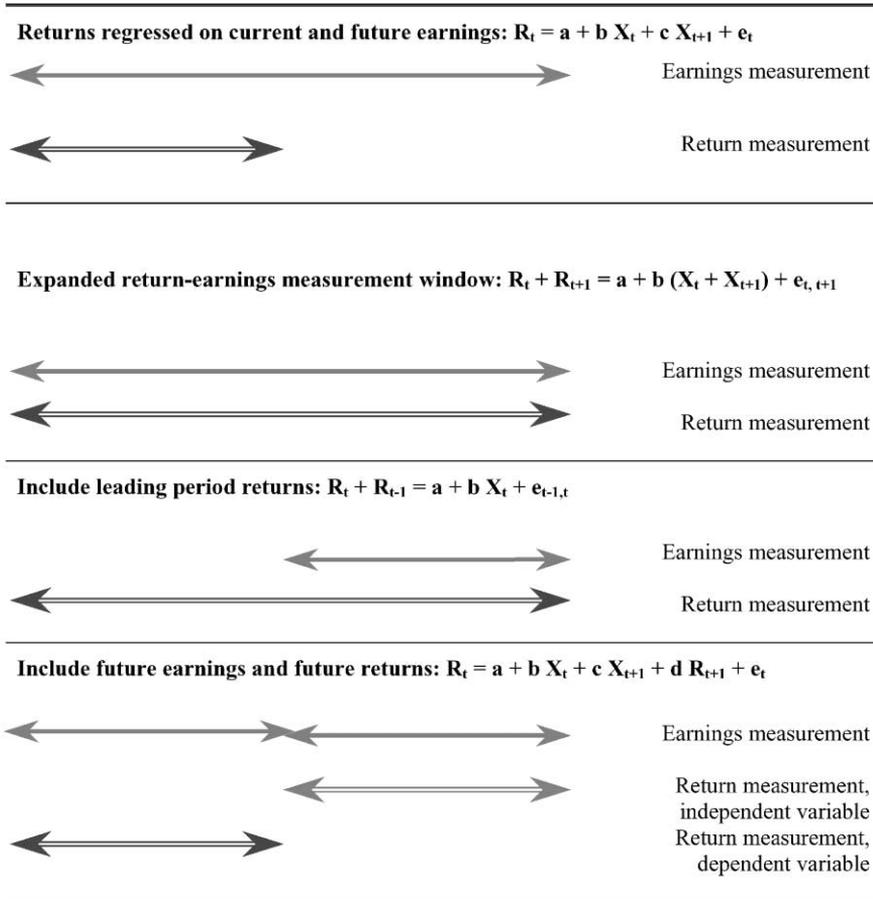


Fig. 1.

regressions of returns on industrial production include future years' earnings or production growth. In the context of the simple model, their approach estimates the following model (see Fig. 1):

$$R_t = a + bX_t + cX_{t+1} + e_t. \tag{7}$$

In this case, since X_t and X_{t+1} are uncorrelated (because the x and y components of earnings growth rates are assumed to be i.i.d.), b is the same as before in the univariate regression of returns on contemporaneous earnings growth, i.e., $b = 0.5$. The expected value of c is

$$c = \text{Cov}(x_t + y_t, x_{t+1} + y_t) / \text{Var}(x_{t+1} + y_t) = 0.5. \tag{8}$$

To derive the model's explanatory power, I decompose the variances

$$\begin{aligned}\text{Var}(R_t) &= b^2 \text{Var}(X_t) + c^2 \text{Var}(X_{t+1}) + \text{Var}(e_t), \\ 2\sigma^2 &= 0.5^2[2\sigma^2] + 0.5^2[2\sigma^2] + \text{Var}(e_t) = \sigma^2 + \sigma^2(e_t),\end{aligned}\quad (9)$$

$$R^2 = \sigma^2/2\sigma^2 = 50\%.\quad (10)$$

The explanatory power increases from 25% for the contemporaneous regression model to 50% upon the inclusion of future earnings growth rate. Coefficients on both current and future earnings growth will be value relevant, but biased because both contain earnings growth rate components that are irrelevant to explaining R_t . This also dampens the explanatory power. The R^2 is greater than that of the contemporaneous model because there is no omitted variable in Eq. (7).

4.1.1.6.3. Expanding the return–earnings measurement window. Easton et al. (1992), Warfield and Wild (1992), Fama (1990), and Schwert (1990) report results of estimating contemporaneous return–earnings models in which both returns and earnings measurement windows are allowed to vary. Expanding the measurement window mitigates both errors-in-variable and omitted-variable problems that arise because of prices leading earnings. In addition, if the noise is mean-reverting, then the ratio of the variance of noise to the variance of value-relevant earnings will decrease as the measurement window is expanded.³³ Ignoring noise, the effect of expanding the return–earnings measurement window on the following contemporaneous regression is (see Fig. 1)

$$R_t + R_{t+1} = a + b(X_t + X_{t+1}) + e_{t,t+1}.\quad (11)$$

The slope coefficient is

$$\begin{aligned}b &= \frac{\text{Cov}[(x_t + y_t + x_{t+1} + y_{t+1}), (x_t + y_{t-1} + x_{t+1} + y_t)]}{\text{Var}[(x_t + y_{t-1} + x_{t+1} + y_t)]} \\ &= 3\sigma^2/4\sigma^2 \\ &= 0.75.\end{aligned}\quad (12)$$

The explanatory power is

$$\begin{aligned}\text{Var}(R_t + R_{t+1}) &= b^2 \text{Var}(X_t + X_{t+1}) + \text{Var}(e_{t,t+1}), \\ 4\sigma^2 &= 0.75^2 \times 4\sigma^2 + \text{Var}(e_{t,t+1}).\end{aligned}\quad (13)$$

³³ In case of mean-reverting noise, variance of the sum of noise over n periods is less than n times the variance of noise in a single period. In contrast, i.i.d. value-relevant growth implies the variance of the sum of earnings growth rates over n periods is n times the single-period variance of the earnings growth rate. This causes the ratio of the variance of noise to the variance of earnings growth to decline as the measurement window is expanded.

From Eq. (13), the R^2 of the regression model (11) is 56.25%. The above analysis demonstrates that expanding the return measurement window yields a less biased earnings response coefficient and a higher explanatory power than in the case of a single-period contemporaneous return–earnings regression. If the measurement window is expanded further, then an even stronger regression fit will be obtained and the estimated slope becomes less biased.³⁴ However, there will always be an end-point problem. Some forward-looking information about earnings growth exists in returns, y_{t+1} in Eq. (12), but it is missing from the earnings variable (i.e., the omitted-variable problem). Similarly, earnings growth at the beginning part of the measurement window contains some stale information, y_{t-1} in Eq. (12), which serves as measurement error in the independent variable.

4.1.1.6.4. Including leading period return. Kothari and Sloan (1992), Warfield and Wild (1992), and Jacobson and Aaker (1993) regress current and past returns on current period earnings to overcome the errors-in-variables problem that arises in a return–earnings regression as a result of prices leading earnings. The regression in the context of the simple model here is (see Fig. 1)

$$(R_t + R_{t-1}) = a + bX_t + e_{t-1,t}. \quad (14)$$

The slope coefficient is

$$\begin{aligned} b &= \text{Cov}[(x_t + y_t + x_{t-1} + y_{t-1}), (x_t + y_{t-1})] / \text{Var}[(x_t + y_{t-1})] \\ &= 2\sigma^2 / 2\sigma^2 \\ &= 1. \end{aligned} \quad (15)$$

The explanatory power is

$$\begin{aligned} \text{Var}(R_t + R_{t-1}) &= b^2 \text{Var}(X_t) + \text{Var}(e_{t-1,t}), \\ 4\sigma^2 &= 1^2 \times 2\sigma^2 + \text{Var}(e_{t-1,t}). \end{aligned} \quad (16)$$

From Eq. (16), the R^2 of the regression model (14) is 50%, even though the slope coefficient is unbiased. The return–earnings association is not perfect because there are omitted (explanatory) variables in the model to explain information about future earnings growth that is reflected in current returns. In

³⁴ Unfortunately there are disadvantages of expanding the window too much. First, as the window is expanded, a larger fraction of the variation in the dependent variable in the cross section is accounted for by differences in expected rates of returns in the cross section. Therefore, it becomes increasingly difficult to unambiguously attribute explained variation from the return–earnings regression to earnings (or cash flow) information (see Easton et al. (1992) for a discussion of this concern and Fama and French (1988), Fama (1990), and Sloan (1993) for a discussion of the sources of variability in returns). Second, as the measurement window is expanded, a researcher must impose increasingly stringent data availability requirements, which introduces survivor biases. Third, discriminating between noise and prices-lead-earnings explanations becomes tenuous.

addition, the dependent variable has some news about earnings in period $t - 1$, x_{t-1} , that is also not included in the explanatory variable, X_t .

Leading period returns in regression model (14) are helpful in discriminating between the noise and prices-lead-earnings hypotheses. In the presence of noise the slope coefficient will not approach one, whereas by including higher-order lagged returns, the prices-lead-earnings phenomenon will be captured and the slope coefficient will increase towards one. Presence of transitory components in earnings will prevent the model from yielding a slope coefficient of one, however. Evidence in Kothari and Sloan (1992) suggests a dramatic rise in the earnings response coefficient as leading period returns are included, consistent with price leading earnings being an important characteristic of the information environment. Their estimated slope coefficients fall short of approaching the price-earnings multiples, consistent with both noise and transitory earnings components.

4.1.1.6.5. Including future earnings and future returns. We saw earlier that when returns are regressed on current and future earnings growth, an errors-in-variables problem arises in part because future earnings growth contains future information that cannot explain current returns. Drawing on Kothari and Shanken (1992), Collins et al. (1994) mitigate this errors-in-variables problem by including future return as an independent variable. The benefit of future return arises through its correlation with the new information in future earnings growth. Econometrically, future return removes the new information error from the future earnings growth variable.³⁵ Specifically, the regression model is (see Fig. 1)

$$R_t = a + bX_t + cX_{t+1} + dR_{t+1} + e_t. \quad (17)$$

The intuition for why including R_{t+1} mitigates the errors-in-variables problem in using future earnings growth is best seen from the following equivalent two-stage procedure (see the appendix of Kothari and Shanken, 1992). If X_{t+1} is regressed on R_{t+1} in a first stage regression, then the residual from that regression will be the portion of $t + 1$ period earnings growth that is unrelated to new information in R_{t+1} . This residual is (a noisy estimate of) the anticipated portion of earnings growth or the y_t component of X_{t+1} in the context of the simple model in this section. The second-stage of the procedure is a regression of R_t on X_t and the residual from the first stage regression, i.e., an estimate of y_t .

If proxies for both the new information in future earnings growth and for the anticipated component of current growth are accurate, then the approach in

³⁵ For a related practice in the accounting literature of using prior returns as a proxy for expected earnings, see Brown et al. (1987b), Collins et al. (1987), and Lys and Sivaramakrishnan (1988). Instead of past returns, Collins et al. (1994) use earnings yield at time $t - 1$ to control for the anticipated earnings growth for period t .

Kothari and Shanken (1992) and Collins et al. (1994) will be successful. That is, the estimated earnings response coefficients will be unbiased and the model's explanatory power will approach 100%. Note that the model in Eq. (17) will have to be expanded to also include proxies for the anticipated component of current growth, X_t . Of course, success of the model depends crucially on the quality of the proxies. Evidence in Collins et al. is largely consistent with the prices-lead-earnings argument and they find little support for the noise-in-earnings hypothesis.

4.1.1.6.6. Use of analysts' forecasts instead of future returns. Recently, Liu and Thomas (1999a, b), Dechow et al. (1999), and others have begun to directly incorporate information about revised expectations of future earnings growth in a return-earnings regression through the use of analysts' forecasts.³⁶ This is similar in spirit to the model in Eq. (17) in which expectations about earnings growth are econometrically backed out through the use of actual future earnings growth minus the impact of new information on future earnings growth. The Liu and Thomas (1999a, b) type of research begins with the Edwards and Bell (1961), Peasnell (1982), Ohlson (1995), and Feltham and Ohlson (1995) residual income valuation model. This model defines price as the sum of the book value of equity and the discounted present value of expected future residual earnings (i.e., earnings in excess of the cost of the expected book value of the equity capital employed in future years).³⁷ Residual income valuation models are a transformation of the dividend-discounting model (see Feltham and Ohlson, 1995; Dechow et al., 1999; or Lee, 1999), but express value directly in terms of current and future accounting numbers, book values and earnings. This potentially facilitates the use of analysts' forecasts.

Researchers typically use analysts' forecasts of earnings and book values of equity to proxy for expected future residual earnings.³⁸ Availability of forecasts in a machine-readable form has spurred the use of analysts' forecasts in capital markets research (see below). Recent research that uses analysts' forecasts documents a strong association between returns and contemporaneous earnings and revisions in analysts' forecasts in a residual income framework. However, more research is needed to determine whether the source of the

³⁶Also see Abdel-khalik (1990) for a similar approach with the motivation of developing a return-earnings model that accounts for non-linearity.

³⁷For a historical perspective on the concept of residual income valuation, see Biddle et al. (1997), who trace it all the way back to Hamilton (1777) and Marshall (1890).

³⁸Use of analysts' forecasts generally violates the clean surplus assumption underlying the residual income model because analysts' forecasts often exclude items that affect book values of equity. However, the use of analysts' forecasts should be guided by their usefulness in explaining and predicting empirical phenomena rather than whether they are consistent with the clean surplus assumption.

improved association is the use of analysts' forecasts or the residual income model or a combination. A comparison with simpler models with and without analysts' forecasts would be a natural next step. Dechow et al. (1999) have made a very good beginning in this respect.³⁹

4.1.1.6.7. Levels regression to obtain less biased estimates of earnings response coefficients. Kothari and Zimmerman (1995) argue that one advantage of the levels regression (i.e., price regressed on earnings) is that the errors-in-variables problem is avoided. The logic is straightforward. Current price contains all the information in current earnings plus some forward-looking information that is missing from current earnings because prices lead earnings. Therefore, when price is regressed on earnings, there is no errors-in-variables problem in the right-hand-side variable. Only forward-looking information, which is uncorrelated with the included independent variable, earnings, is omitted from the regression. The econometric consequence is that the estimated earnings response coefficient is unbiased, but that the explanatory power is sacrificed because of the omitted forward-looking information.

The bad news in using levels regressions is that there are potentially other econometric problems, like correlated omitted variables (e.g., growth), and heteroskedasticity. These and other related issues are discussed thoroughly in Brown et al. (1999) and Holthausen and Watts (2001).

4.1.1.7. Bottom line. The earnings response coefficient research has made significant progress in the last decade. However, notwithstanding these refinements, I believe the best a researcher can do currently is to test whether a coefficient is statistically significant or whether it is significantly greater than the coefficient on another variable (e.g., coefficient on earnings versus on cash flow from operations). The research also suggests that controlling for the effects of persistence, growth, and risk on earnings response coefficients is important. It is rare to see research examining whether the estimated coefficient equals some predicted value. Only occasionally have researchers attempted to test whether the estimated coefficient on transitory earnings equals one (e.g., Barth et al., 1992). The lack of tests of predicted coefficient magnitudes is in part because predicted values depend on unobservable forecasted earnings growth rates over all future periods and expected discount rates for future periods' earnings. Levels regressions yield earnings response coefficient estimates that are closer to economically plausible values. However, severe econometric problems make their use less attractive (see Holthausen and Watts, 2001).

³⁹ While there are advantages of using analysts' forecasts, there are also problems because of apparent optimism in analysts' forecasts, which varies cross-sectionally with earnings skewness (see Gu and Wu, 2000). I defer a detailed discussion of these issues to the next section.

4.1.2. *Time series, management, and analysts' forecasts of earnings*

This section explains the motivation for research on properties of time series, management, and analysts' forecasts of earnings (Section 4.1.2.1). I then describe research on the properties of time-series forecasts of earnings in Section 4.1.2.2, management's forecasts in Section 4.1.2.3, and finally the research on analysts' forecasts in Section 4.1.2.4.

4.1.2.1. Motivation for research on earnings forecasts. There are at least five reasons for research on the time-series properties of earnings and properties of management and analysts' forecasts (see Watts and Zimmerman (1986, Chapter 6), Schipper (1991), and Brown (1993) for discussions of some of these reasons). First, almost all models of valuation either directly or indirectly use earnings forecasts. The discounted cash flow valuation models (Fama and Miller, 1972, Chapter 2) often use forecasted earnings, with some adjustments, as proxies for future cash flows. The analytically equivalent residual-income valuation models (e.g., Edwards and Bell, 1961; Ohlson, 1995; Feltham and Ohlson, 1995) discount forecasted earnings net of "normal" earnings.

Second, capital markets research that correlates financial statement information with security returns frequently uses a model of expected earnings to isolate the surprise component of earnings from the anticipated component. In an efficient capital market, the anticipated component is uncorrelated with future returns, which are measured over the announcement period or the association study period. Any anticipated component that smears the estimated proxy for the surprise component of earnings, serves as noise or measurement error in the proxy and weakens the estimated return–earnings association. Thus, the degree of return–earnings association hinges critically on the accuracy of the unexpected earnings proxy used by a researcher, which naturally creates a demand for the time-series properties of earnings or analysts' forecasts.

Third, the efficient markets hypothesis is being increasingly questioned, both empirically and theoretically (with behavioral finance models of inefficient markets; see Daniel et al., 1998; Barberis et al., 1998; Hong and Stein, 1999). Accounting-based capital market research has produced evidence that is apparently inconsistent with market efficiency (see the detailed review below). A common feature of this research is to show that security returns are predictable and that their predictability is associated with the time-series properties of earnings and/or properties of analysts' forecasts, which creates a demand for research in the time-series properties of earnings and earnings forecasts.

Fourth, positive accounting theory research hypothesizes efficient or opportunistic earnings management and/or seeks to explain managers' accounting procedure choices. In this research there is often a need for "normal" earnings that are calculated using a time-series model of earnings.

For example, tests of the earnings smoothing hypothesis might examine properties of pre-smoothed and smoothed time series of earnings.

Finally, analyst and management forecasts are a source of information in the capital markets. The forecasts thus affect the information environment and influence the level and variability of security prices. There is a large literature (see Healy and Palepu, 2001) that examines the nature of the information environment, the demand and supply of forecasts, the incentives facing management and analysts and their effect on the properties of the forecasts, the effect of the properties of the forecasts on the variability of security returns and cost of capital, etc. In this research, properties of management and analysts' forecasts are an input.

4.1.2.2. Time-series properties of earnings. Brown (1993) examines the large body of literature on the time-series properties of earnings. I deliberately keep my remarks on the earnings' time-series properties short because I believe this literature is fast becoming extinct. The main reason is the easy availability of a better substitute: analysts' forecasts are available at a low cost in machine-readable form for a large fraction of publicly traded firms (see below).

4.1.2.2.1. Properties of annual earnings. Random walk: A large body of evidence suggests a random walk or random walk with drift is a reasonable description of the time-series properties of annual earnings. The early evidence appears in Little (1962), Little and Rayner (1966), Lintner and Glauber (1967), and additional references in Ball and Watts (1972). Ball and Watts (1972) conduct the first systematic study and fail to reject the random walk time-series property for annual earnings. Subsequent research confirms their conclusion (see Watts, 1970; Watts and Leftwich, 1977; Albrecht et al., 1977) by testing against the predictive ability of Box–Jenkins models of annual earnings vis-à-vis the random walk model. This is notwithstanding the indication of negative first-order autocorrelation in Ball and Watts (1972, Table 3) and other research.⁴⁰

The random walk property of annual earnings is puzzling. Unlike the random walk property of security prices, which is a theoretical prediction of the efficient capital markets hypothesis, economic theory does not predict a random walk in earnings.⁴¹ Accounting earnings do not represent the capitalization of expected future cash flows like prices. Therefore, there is no

⁴⁰ In-sample estimates of autocorrelation coefficients are biased downward because of the small sample bias that equals $-1/(T-1)$, where T is the number of time-series observations (see Kendall, 1954; Jacob and Lys, 1995). Bias-adjusted first-order serial correlation coefficients for annual earnings changes are close to zero (see Dechow et al., 1998a, Table 5).

⁴¹ The random walk property of security prices in an efficient capital market requires the additional assumption of constant expected rates of return, which might not be descriptive (see Fama, 1976, Chapter 5; Fama and French, 1988; Kothari and Shanken, 1997). Therefore, the random walk property is only an approximate prediction.

economic reason to expect annual earnings to follow a random walk (see, for example, Fama and Miller, 1972, Chapter 2; Watts and Zimmerman, 1986, Chapter 6).

Mean reversion: Starting with Brooks and Buckmaster (1976), a number of studies document evidence of mild mean reversion in annual earnings (see, for recent studies, Ramakrishnan and Thomas, 1992; Lipe and Kormendi, 1994; Fama and French, 2000). However, interpreting evidence of mean reversion from in-sample estimates of the time-series parameter values requires caution. Notwithstanding the evidence of mean reversion, predictive ability might not be much better than a random walk model in holdout samples (see Watts, 1970; Watts and Leftwich, 1977; Brown, 1993).

Economic reasons for mean reversion: There are several economic and statistical reasons to expect mean reversion in earnings. First, competition in product markets implies that above-normal profitability is not sustainable (Beaver and Morse, 1978; Lev, 1983; Ohlson, 1995; Fama and French, 2000). Second, accounting conservatism (see Basu, 1997) and litigation risk (see Kothari et al., 1988; Ball et al., 2000) motivate managers to recognize economic bad news more quickly than good news. As a result, firms often recognize anticipated losses.⁴² This recognition of losses makes losses less permanent and thus induces negative autocorrelation in earnings. Third, firms incurring losses have the option to liquidate the firm if the management does not anticipate recovery (Hayn, 1995; Berger et al., 1996; Burgstahler and Dichev, 1997; Collins et al., 1999). That means surviving firms are expected to reverse the poor performance. Thus, the abandonment option and survivor bias together imply the time series of earnings will exhibit reversals. Finally, the incidence of transitory special items and losses has increased dramatically over time (see, for example, Hayn, 1995; Elliott and Hanna, 1996; Collins et al., 1997), which means earnings changes are predictable. The increase in transitory items might be due in part to a shift in standard setting by the SEC and FASB toward mark-to-market accounting for some assets and liabilities.

Cross-sectional estimation: Fama and French (2000) introduce a cross-sectional estimation approach to the earnings forecasting literature to uncover the time-series properties of earnings. They argue that time-series estimation lacks power because there are only a few time-series observations of annual earnings available for most firms. In addition, use of a long time series introduces survivor bias. The survivor bias implies more observations of positive earnings changes following positive changes than expected by chance, for reasons discussed above. This offsets the underlying negative time-series correlation in earnings changes. The effect of survivor bias, together with low

⁴² Agency theory-based reasons (e.g., the nature of compensation contracts and CEO turnover) also might motivate managers to take a “big bath” in earnings.

power (i.e., large standard errors) of time-series estimation, favors the conclusion of a random walk in annual earnings.

In a cross-sectional estimation, annual earnings (levels or changes, and with or without a deflator) are regressed on its lagged observation. The estimation is performed annually and inferences are drawn on the basis of the time series of annual parameter estimates from the cross-sectional regressions. This is the well-known Fama and MacBeth (1973) procedure.

One weakness of cross-sectional estimation is that firm-specific information on the time-series properties is sacrificed. However, this is mitigated through a conditional estimation of the cross-sectional regression. Conditional estimation is an attempt to capture cross-sectional variation in the parameters of the time-series process of earnings (e.g., the autocorrelation coefficient). This approach is grounded in economic analysis, rather than the previous statistical exercise of fitting the best time-series model of earnings (e.g., fitting the best Box–Jenkins model). The conditional approach models the cross-sectional variation in earnings' autocorrelation coefficient as a function of its economic determinants. That is, the coefficient is hypothesized to vary with the realized values of a set of conditioning variables like past performance, dividend yield, leverage, industry competition, etc.⁴³ Since the number of observations in a cross section is typically large, it is generally possible to accommodate many economic determinants in the estimation. Overall, cross-sectional estimation enhances power, overcomes survivor bias problems, and permits a researcher to incorporate the effect of economic determinants of the time-series properties of earnings.

Conditional cross-sectional estimation: Previous research employs at least three different approaches to expand the information set beyond the past time series of earnings in obtaining conditional earnings forecasts (or conditional estimates of the parameters of the time-series process of earnings).

First, a conditional forecast is obtained using information on one or more determinants of the autocorrelation coefficient of earnings. For example, Brooks and Buckmaster (1976) focus on extreme earnings changes, Basu (1997) examines negative earnings changes, and Lev (1983) identifies economic determinants like barriers-to-entry in an industry, firm size, product type, and capital intensity of a firm; also see Freeman et al. (1982) and Freeman and Tse (1989, 1992). Recent studies estimating conditional forecasts include Fama and French (2000) and Dechow et al. (1999).

Second, price-based forecasts are used to improve on the time-series forecasts of earnings on the premise that prices reflect a richer information set than the past time series of earnings (Beaver et al., 1980). Research

⁴³The econometric approach to estimate a parameter conditional on a set of (state) variables is well developed in finance and economics. See, for example, Shanken (1990), Chan and Chen (1988), and Ferson and Schadt (1996) for time-varying conditional best estimation.

examining price-based earnings forecasts includes Beaver and Morse (1978), Freeman et al. (1982), Collins et al. (1987), Beaver et al. (1987), and Freeman (1987). Notwithstanding the fact that prices reflect a richer information set than the past time series of earnings, researchers have found it difficult to harness the information in prices at the firm level to make an economically important improvement. Therefore, this research has had only a modest impact on forecasting. The benefit of prices in improving forecasts or in backing out market expectations is primarily in long-horizon settings (e.g., Easton et al., 1992; Kothari and Sloan, 1992; Collins et al., 1994) precisely because prices anticipate earnings information for several future periods.

Finally, Ou and Penman (1989a, b), Lev and Thiagarajan (1993), and Abarbanell and Bushee (1997, 1998) use financial statement analysis of income statement and balance sheet ratios to forecast future earnings and stock returns. The primary motivation for this research is to employ fundamental analysis to identify mispriced securities. Superior earnings forecasts are only an intermediate product of this research.

4.1.2.2.2. Properties of quarterly earnings. Interest in the time-series properties of quarterly earnings arises for at least four reasons. First, quarterly earnings are seasonal in many industries because of the seasonal nature of their main business activity (e.g., apparel sales and toy sales). Second, quarterly earnings are more timely, so the use of a quarterly earnings forecast as a proxy for the market's expectation is likely more accurate than using a stale annual earnings forecast.

Third, GAAP requires that the quarterly reporting period is viewed as an integral part of the annual reporting period (see APB, 1973, Opinion No. 28; FASB, 1974, SFAS No. 3; FASB, 1977, FASB Interpretation No. 18). As a result, firms are required to estimate annual operating expenses and allocate these costs to quarterly periods. The fourth quarter thus offsets the intentional (i.e., opportunistic) and unintentional estimation errors in allocating expenses to the first three quarterly periods. This contributes to differences in the properties of fourth versus the first three quarterly earnings (see Bathke and Lorek, 1984; Collins et al., 1984; Mendenhall and Nichols, 1988; Salamon and Stober, 1994). More importantly, quarterly earnings are potentially a more powerful setting to test positive accounting theory based and capital markets research hypotheses (see, for example, Salamon and Stober, 1994; Hayn and Watts, 1997; Rangan and Sloan, 1998). The source of the power comes from the fact that the errors in estimating operating expenses in the first three quarters are offset in the fourth quarter, thus permitting tests that exploit this property of error reversals. One downside of using quarterly earnings is that they are not audited.

Finally, there are four times as many quarterly earnings observations as annual earnings observations. To the extent there is a loss of information in aggregation, a quarterly earnings time series has the potential to generate more

precise annual earnings forecasts than annual earnings-based forecasts (see for evidence, Hopwood et al., 1982). That is, less stringent data availability requirements are necessary using quarterly than annual earnings to achieve the same degree of precision of the forecasts. This enables the researcher to reduce survivor biases and to use a larger sample of firms.

While a quarterly earnings forecast is likely a more timely and accurate proxy for the market's expectation of earnings at the time of an earnings announcement, this benefit should be tempered by the following potential downside. The market's reaction to any information event reflects the revision in expectation of cash flows for all future periods. The market might be responding to information about future quarters, which may or may not be highly correlated with the information over a quarter (a relatively short time period). Therefore, despite greater accuracy, the strength of the association between the quarterly earnings surprise and narrow-window stock price reaction to the surprise is not higher than a long-window association (e.g., one year or longer). Recent evidence in Kinney et al. (1999) shows that the odds of the same sign of stock returns and earnings surprise are no greater than 60–40% even when using composite earnings forecasts tabulated by First Call Corporation.⁴⁴ The lack of a strong association should not be interpreted mechanically as an indication of noise in the earnings expectation proxy. The modest association is likely an indication of prices responding to information about future income that are unrelated to the current earnings information. That is, the forward-looking nature of prices with respect to earnings becomes an important consideration (see Kinney et al., 1999; Lev, 1989; Easton et al., 1992; Kothari and Sloan, 1992; Collins et al., 1994). In addition, increased incidence of transitory items in earnings in recent years further weakens the relation between current earnings surprise and revisions in expectations about future periods' earnings as captured in the announcement period price change.

ARIMA properties of quarterly earnings: Well-developed Box–Jenkins autoregressive integrated moving average (ARIMA) models of quarterly earnings exist (Foster, 1977; Griffin, 1977; Watts, 1975; Brown and Rozeff, 1979). Research comparing the models shows that the Brown and Rozeff (1979) model is slightly superior in forecast accuracy at least over short horizons (see Brown et al., 1987a). However, this advantage does not necessarily show up as a stronger association with short-window returns around quarterly earnings announcements (see Brown et al., 1987b). Simpler models like Foster (1977) do just as well as the more complicated models. The

⁴⁴ Kinney et al. (1999) use annual, not quarterly earnings forecast error. However, since first three quarters' earnings are known at the time of the annual earnings announcement, examining the association of annual earnings forecast error with a narrow window return is almost equivalent to examining a relation between quarterly earnings surprise and stock returns.

main advantage of the Foster (1977) model is that it can be estimated without the Box–Jenkins ARIMA software.

Currently the main use of quarterly earnings time-series models is in tests of market efficiency examining post-earnings-announcement drift (see below). In other capital markets research, researchers almost invariably use analysts' or management forecasts of earnings. As seen below, these forecasts are not only easily available, but they are more accurate and more highly associated with security returns.

4.1.2.2.3. Properties of components of earnings. There are at least three reasons for researchers' interest in the properties of earnings components. First, to examine whether earnings components are incrementally informative beyond earnings in their association with security prices.⁴⁵ This research is generally aimed at evaluating standards that require earnings components to be disclosed and fundamental analysis. Conclusions about the incremental association or information content of earnings components hinge on the accuracy of the proxies for the unexpected portion of the earnings components, which creates a demand for the time-series properties of earnings components.

Second, accruals and cash flows are the two most commonly examined components of earnings. Operating accruals represent accountants' attempt to transform operating cash flows into earnings that are more informative about firm performance and thus make earnings a more useful measure for contracting and/or in fundamental analysis or valuation. However, self-interested managers might use accounting discretion opportunistically and manipulate accruals, which would distort earnings as a measure of firm performance. Tests of accrual management hypotheses based on positive accounting theory examine accounting accruals' properties. These tests provide a motivation for research in the time-series properties of accruals and cash flows and other earnings components (e.g., current and non-current accruals, operating and investing cash flows, etc.).

Finally, interest in the time-series properties of earnings components also arises because summing the forecasts of the components might yield a more accurate forecast of earnings. The logic here is similar to that underlying the aggregation of quarterly earnings forecasts to improve the accuracy of annual earnings forecasts. The difference is that the aggregation of components is contemporaneous (i.e., cross-sectional) whereas the aggregation of quarterly forecasts is temporal. In both cases the assumption is that there is a loss of information in aggregation.

4.1.2.2.4. Current status and future directions for research in earnings components. There is an active interest in research on the properties of earnings components because of both positive accounting research and

⁴⁵See, for example, Lipe (1986), Rayburn (1986), Wilson (1986, 1987), Livnat and Zarowin (1990), Ohlson and Penman (1992), Dechow (1994), and Basu (1997).

fundamental analysis. Early research on the properties of accruals assumed naïve models (e.g., DeAngelo, 1986; Healy, 1985), but progress has been made since (e.g., Jones, 1991; Kang and Sivaramakrishnan, 1995; Dechow et al., 1995). I believe that modeling earnings components' properties using the nature of economic transactions and the accounting recording of those transactions is likely to be more fruitful than simply fitting time-series models on earnings components (see Guay et al., 1996; Healy, 1996). Dechow et al. (1998a) represent one attempt at modeling the time-series properties of accruals, operating cash flows, and earnings with sales as the starting point or primitive. The economic modeling of accruals or earnings components will not necessarily provide the best fit for the historical data, but it might have predictive power and ability to explain managerial behavior better than purely statistical time-series models.

4.1.2.3. Management forecasts. Management forecasts have many labels, including earnings warnings, earnings pre-announcements, and management's earnings forecasts. Earnings warnings and pre-announcements precede earnings announcements and typically convey bad news. Management's earnings forecasts are often soon after earnings announcements and do not necessarily communicate bad news to the market. Since management forecasts are voluntary, there are economic motivations for the forecasts. A detailed discussion of the economic issues surrounding management forecasts appears in the Healy and Palepu (2001) and Verrecchia (2001) review papers. A few examples of the economic issues include the following: (i) the threat of litigation influencing management's decision to issue voluntary forecasts and forecasts of bad news (e.g., Skinner, 1994; Francis et al., 1994; Kasznik and Lev, 1995); (ii) the effect of management's concern about the proprietary cost of disclosure on the nature of management forecasts (e.g., Bamber and Cheon, 1998); and (iii) the timing of management forecasts and the timing of insider buying and selling of company stocks (Noe, 1999). In this review, I only summarize the extant research on the properties of management forecasts. The summary describes the main findings and the hypotheses tested in the literature.

Early research on management forecasts appears in Patell (1976), Jaggi (1978), Nichols and Tsay (1979), Penman (1980), Ajinkya and Gift (1984), and Waymire (1984). They collectively show that management forecasts have information content. Specifically, management forecast releases are associated with significant increases in return variability (see e.g., Patell, 1976) and there is a positive association between the unexpected component of the management forecast and security returns around the forecast date (e.g., Ajinkya and Gift, 1984; Waymire, 1984).

One of the hypotheses for voluntary management forecasts is that through the forecasts management aligns investors' expectations with the superior

information that the management possesses (Ajinkya and Gift, 1984). This expectation-adjustment hypothesis implies that management forecasts are superior to market expectations of earnings at the time of management forecasts. However, previous evidence in Imhoff (1978) and Imhoff and Paré (1982) suggested management forecasts are not systematically more accurate than analysts' forecasts. Evidence consistent with the superiority of management vis-à-vis analysts' forecasts as a proxy for the market's prevailing expectation appears in Waymire (1984). Recent research examines issues like the relation between various types, precision, and credibility of management forecasts and security price changes (e.g., Pownall et al., 1993; Baginski et al., 1993; Pownall and Waymire, 1989; Bamber and Cheon, 1998). Overall, the evidence suggests that management forecasts have information content and the information content is positively correlated with a number of determinants of the quality of the management forecasts.

4.1.2.4. Analysts' forecasts. There is a huge empirical and theoretical literature on analysts' forecasts. I focus on the properties of analysts' forecasts and some determinants of these properties. I do not review the research that examines why analysts forecast earnings, the determinants of the number of analysts following a firm, and the consequences of analysts' following on the properties of security returns. Some of these issues are examined in Verrecchia (2001) and Healy and Palepu (2001). I recognize that the issues not examined here also affect the properties of analysts' forecasts, but nevertheless I consider those beyond the scope of my review of the capital markets research.

Buy- and sell-side analysts issue earnings forecasts. Most research in accounting examines sell-side analysts' forecasts because these are publicly available. Analysts from brokerage houses and investment-banking firms in the financial services industry issue sell-side forecasts. Buy-side analysts are typically employed by mutual funds and pension funds and issue forecasts primarily for internal investment decision-making purposes. Like most of the research on analysts' forecasts, I review the research on sell-side analysts' forecasts.

Analysts' forecasts research can be broadly divided into two categories. The first category examines properties of consensus analysts' forecasts. A consensus forecast is the mean or median of the analysts' forecasts of (either quarterly or annual or long-term) earnings of an individual firm. An example of research in this category would be "Are analysts' forecasts optimistic?" The second category focuses on the properties of individual analysts' forecasts either in the cross section or temporally. This category examines questions like "What are the determinants of an individual analyst's forecast accuracy?" and "Does skill affect the accuracy of an analyst's forecast?" There is overlap between these two areas of research, so the discussion is sometimes applicable to both.

4.1.2.4.1. Analysts' forecasts compared to time-series forecasts. Early research examines the accuracy of analysts' forecasts and their association with security returns, and compares these properties with time-series forecasts of earnings. Brown and Rozeff (1978) were the first to document superior accuracy of analysts' forecasts over time-series forecasts of quarterly earnings. Subsequent research offers conflicting evidence (see Collins and Hopwood (1980) and Fried and Givoly (1982) for confirming the evidence in Brown and Rozeff (1978), whereas Imhoff and Paré (1982) for contradictory evidence) and also raises the question of whether analysts' superiority stemmed from their timing advantage (i.e., access to more recent information) over time-series models. Brown et al. (1987a, b) test for both accuracy and association with security returns in comparing the quality of analysts' forecasts against time-series forecasts of quarterly earnings. They show that, even after controlling for the timing advantage, analysts' forecasts are more accurate and modestly more highly associated with stock returns than time-series forecasts. O'Brien (1988), however, documents conflicting evidence in which an autoregressive model forecast is more highly associated with returns than I/B/E/S forecasts. The conflicting evidence notwithstanding, in recent years it is common practice to (implicitly) assume that analysts' forecasts are a better surrogate for market's expectations than time-series forecasts. The issues of current interest are whether analysts' forecasts are biased, the determinants of the biases, and whether the market recognizes the apparent biases in pricing securities.

4.1.2.4.2. Optimism in analysts' forecasts. Many studies report evidence that analysts' forecasts are optimistic,⁴⁶ although the optimism appears to be waning in recent years (see Brown, 1997, 1998; Matsumoto, 1998; Richardson et al., 1999). There are at least three hypotheses consistent with the decline in analyst optimism: (i) analysts are learning from evidence of past biases (see Mikhail et al. (1997), Jacob et al. (1999), and Clement (1999) for mixed evidence on the effect of experience on learning); (ii) analysts' incentives have changed; and (iii) the quality of data used in the research examining analysts' forecast properties has improved (e.g., suffers less from survivor biases or selection biases).

4.1.2.4.3. Estimating bias in analysts' forecasts. Forecast optimism is inferred from a systematic positive difference between the forecast and actual earnings per share. The optimism has been documented using Value Line, I/B/E/S, and Zacks data sources for analysts' forecasts (Lim, 1998). The estimates of analyst optimism vary across studies in part because of differences in research designs, variable definitions, and time periods examined. Consider, for example, the following three recent studies that report properties of I/B/E/S

⁴⁶ Examples include Barefield and Comiskey (1975), Crichfield et al. (1978), Fried and Givoly (1982), Brown et al. (1985), O'Brien (1988), Stickel (1990), Abarbanell (1991), Ali et al. (1992), Brown (1997, 1998), Lim (1998), Richardson et al. (1999), and Easterwood and Nutt (1999).

analysts' forecasts: Lim (1998), Brown (1998), and Richardson et al. (1999). Each uses over 100,000 firm-quarter observations and analyzes I/B/E/S forecasts from approximately the same time period from 1983 or 1984 to 1996 or 1997.

Lim (1998, pp. 9–10) uses “the median of the unrevised estimates of a quarter's earnings across all brokerage firms”, although the use of the mean of analysts' forecasts is not uncommon in the literature (see, for example, Chaney et al., 1999).⁴⁷ Richardson et al. (1999) use individual analyst's forecast and average the forecast errors each month, whereas Brown (1998) reports results using only the most recent analyst forecast. Lim (1998) calculates forecast errors as the difference between the earnings forecast and actual earnings per share as reported on Compustat, based on the evidence in Philbrick and Ricks (1991) that actual earnings reported by I/B/E/S suffers from an “alignment problem”. In contrast, Brown (1998) and Richardson et al. (1999) use I/B/E/S actual earnings “for comparability with the forecast” (Richardson et al., 1999, p. 7).

Previous research also differs in its treatment of outliers. Lim (1998) excludes absolute forecast errors of \$10 per share or more, while Brown (1998) winsorizes absolute forecast errors greater than 25 cents per share and DeGeorge et al. (1999) delete absolute forecast errors greater than 25 cents per share. Richardson et al. (1999) delete price-deflated forecast errors that exceed 10% in absolute value. Brown (1998), DeGeorge et al. (1999), and Kasznik and McNichols (2001) do not use a deflator in analyzing analysts' forecast errors, whereas Lim (1998) and Richardson et al. (1999) deflate forecast errors by price. Analysis without a deflator implicitly assumes that the magnitude of undeflated forecast error is not related to the level of earnings per share (i.e., forecast errors are not heteroskedastic). In contrast, use of price deflation implicitly assumes that the deviation of the actual from forecasted earnings depends on the level of earnings per share or price per share and that price deflation mitigates heteroskedasticity.

4.1.2.4.4. Evidence of bias. Notwithstanding the research design differences, the evidence in most of the studies suggests analysts' optimism. This conclusion should be tempered by the fact that the forecast samples examined in various studies are not independent. Lim (1998) finds an average optimistic bias of 0.94% of price. The bias is considerably higher at 2.5% of price for small firms and it is 0.53% of price for large market capitalization stocks. He also reports that the bias is pervasive in that it is observed every year and in every market

⁴⁷Note that even if the distribution of actual earnings might be skewed, the distribution of analysts' forecasts for a given firm need not be skewed, so the use of the mean or median of analysts' forecasts might not make much difference. Evidence in O'Brien (1988) indicates that median forecasts are slightly smaller than the mean.

capitalization decile of sample firms, and it is observed in both newly covered and not newly covered securities by analysts.

While the forecast biases reported in Lim (1998) seem both statistically and economically large, Brown (1998) reports a mean bias of only a cent per share in the most recent analyst's forecast. His annual analysis from 1984 to 1997 reveals a range of bias from 2.6 cents per share optimism in 1993 to 0.39 cents per share pessimism in 1997. Richardson et al. (1999) also find that the bias declines dramatically, from 0.91% of the price to 0.09% of price, as the forecast horizon is shortened from one year to one month (also see O'Brien, 1988). Like Brown (1998), Richardson et al. also report that the bias has turned from optimism to pessimism in recent years. Abarbanell and Lehavy (2000a) take issue with this conclusion. They argue that forecast data providers like First Call, Zacks, and IBES have increasingly changed the definition of reported earnings to earnings from continuing operations and now require analysts to forecast earnings from continuing operations. Abarbanell and Lehavy (2000a) conclude that this change "plays a dominant role in explaining the recent declines in apparent forecast optimism and increases in the incidence of zero and small pessimistic forecast errors".

In most studies the median forecast bias is quite small (e.g., 0.01% in Lim, 1998), which suggests that extreme observations hugely influence the results, i.e., skewness of the earnings distribution drives the results. Consistent with earnings skewness, Gu and Wu (2000) and Abarbanell and Lehavy (2000b) find that a small number of forecast error observations disproportionately contributes to the observed bias.

4.1.2.4.5. Potential research design problems. Despite the apparently compelling evidence, I remain somewhat skeptical of the evidence of analysts' forecast bias for several reasons. First, forecast earnings and actual earnings against which the forecast is being compared do not always seem to be the same (see I/B/E/S data definitions), especially when Compustat actuals are used (see Sabino, 1999). Analysts generally forecast earnings without special items and other one-time gains and losses. I/B/E/S apparently adjusts the actual reported earnings number for special items and/or one-time gains and losses to back out the earnings number the firm would have reported consistent with the earnings number analysts were forecasting (see for details, Sabino, 1999; Abarbanell and Lehavy, 2000a). This procedure seems subjective and whether it contributes to the observed bias (or noise) is worthy of investigation.

Second, the coverage of data has improved dramatically through the years and the degree of bias has declined steadily (see evidence in Brown, 1997, 1998; Richardson et al., 1999). Is the evidence of bias related to the improvement in the coverage of firms in the data bases? Third, are there survival biases in the data? Survival bias might arise not simply because firms go bankrupt, but mostly because of mergers and acquisitions. Finally, what is the effect of mixing stale forecasts with recent forecasts? Evidence suggests recent forecasts

are less biased than forecasts issued earlier. However, not all analysts revise their forecasts, so the median forecast at any point in time is for a sample of recent and stale forecasts. What is the contribution to the bias arising from stale forecasts? Is analysts' proclivity to revise forecasts diminished if a firm is performing poorly? This would impart an optimistic bias as a result of using stale forecasts (see Affleck-Graves et al., 1990; McNichols and O'Brien, 1997). Analysis in Richardson et al. (1999), which examines forecast bias as a function of the horizon, appears to be a step in the right direction.

4.1.2.4.6. Bias in long-horizon forecasts. In addition to quarterly earnings forecasts, there is a large body of recent research that examines properties of long-horizon analysts' forecasts. Long-horizon forecasts are generally forecasts of growth over two-to-five years. Analysis of long-term earnings growth forecasts also reveals that these are generally optimistic (e.g., LaPorta, 1996; Dechow and Sloan, 1997; Rajan and Servaes, 1997). An emerging body of research examines analysts' long-term forecasts in tests of market efficiency (see below). I defer the discussion of some of the properties of analysts' long-term forecasts to the tests of market efficiency section of the paper.

4.1.2.4.7. Economic determinants of forecast bias. Evidence of optimism in analysts' forecasts has led to many studies proposing and testing hypotheses to explain the optimistic bias. The hypotheses fall in two broad categories. First, there are economic incentives based explanations for analysts' forecast optimism. Second, a behavioral cognitive-bias explanation for analysts' bias is proposed.

Incentives-based explanations: First, an important economic incentive motivating "sell-side" analysts to issue optimistic earnings forecasts is the compensation they receive for their services to the corporate finance arm of an investment-banking firm.⁴⁸ The corporate finance division derives revenues mainly from services related to securities issues and merger-and-acquisition activities. Sell-side analysts' optimistic forecasts help the corporate finance division generate business. The deterrent to analysts from issuing overly optimistic forecasts is that a portion of their annual compensation and their reputation, and thus human capital, are an increasing function of forecast accuracy and a decreasing function of forecast bias.⁴⁹ One prediction of the hypothesis here is that analysts working for an investment-banking firm doing business with the client firm (called affiliated analysts) would issue more optimistic forecasts than unaffiliated analysts. Lin and McNichols (1998a),

⁴⁸See Adair (1995), Ali (1996), Dechow et al. (1999), Dugar and Nathan (1995), Hansen and Sarin (1996), Hutton and McEwen (1997), Lin and McNichols (1998a,b), Michaely and Womack (1999), and Rajan and Servaes (1997).

⁴⁹Consistent with this hypothesis, Mikhail et al. (1999) document a significant relation between analyst turnover and relative forecast accuracy.

Michaely and Womack (1999), Dugar and Nathan (1995), and Dechow et al. (1999), among others, offer evidence consistent with the hypothesis.

An alternative interpretation for the observed bias in affiliated analysts' forecasts is as follows. The determination of affiliated analysts is not exogenous. Suppose there are N analysts, and all of them are assumed to issue unbiased forecasts. Assume furthermore that they independently issue N forecasts at time t for a firm i . Firm i 's management is interested in an investment-banking relation with one of the analyst's firm because it would like to issue new equity. Firm i might retain the investment-banking firm of the analyst issuing the highest of the N forecasts. That is, the firm's choice of the investment-banking analyst is likely in part a function of who is most bullish about the firm's prospects.⁵⁰ If the N forecasts were issued independently and since all the analysts are assumed to issue unbiased forecasts *on average*, the order statistic of the cross-sectional distribution of analysts' forecasts (or a forecast from the high end of the distribution) selected by the firm's management will *ex post* appear optimistic. I believe the challenge is to discriminate between the above explanation and the incentive-based opportunistic-forecast explanation.

Second, Lim (1998) and Das et al. (1998) argue that analysts might issue optimistic forecasts to gain increased access to information from management, especially in cases where the information asymmetry between the management and the investment community is high. Analysts' investment in developing better relations with firms' management improves the flow of information from managers as well as helps obtain more investment banking and brokerage business, and potentially more brokerage commissions from clients. Lim (1998) and Das et al. (1998) recognize that forecast bias is bad, but management might reward optimism by funneling information to the analyst. This information is helpful in improving forecast accuracy. The benefit to analysts is greatest when prior uncertainty is high. So analysts trade-off bias against information from management, which reduces the variance of the forecast error. This leads to an interior equilibrium, rather than a corner solution of huge optimistic bias.⁵¹ The hypothesis also generates a cross-sectional prediction that the bias would be increasing in variables that proxy for prior uncertainty and information asymmetry (e.g., firm size, and growth opportunities). Evidence in Lim (1998) and Das et al. (1998) is consistent with the hypothesis.

⁵⁰ While this provides an incentive for all analysts to be optimistic, recall that I have assumed unbiased forecasts. The argument I make here is unchanged even if the analysts are on average assumed to make optimistically biased forecasts. If this were the case, the affiliated analyst is expected to appear more optimistically biased than the rest.

⁵¹ See Laster et al. (1999) for a similar argument using publicity from their forecasts traded-off against accuracy as a motivation for analysts' optimistic bias.

Third, Gu and Wu (2000) hypothesize that the observed forecast bias results from analysts' incentives in the presence of earnings skewness. They argue that optimistic bias is rational and expected because analysts strive to minimize mean absolute forecast error. The median of a skewed distribution minimizes the mean absolute forecast error. Thus, if the realized earnings distribution is negatively skewed and if analysts seek to minimize the absolute forecast error, not mean squared error, then forecasts will be optimistically biased. Evidence in Gu and Wu (2000) is consistent with their skewness explanation. While Gu and Wu (2000) offer an interesting explanation, in their setting both optimistic and pessimistic biases are explained so long as analysts forecast median earnings. Therefore, if skewed earnings distribution suggests extreme surprising outcomes, then in good economic periods analysts ex post turn out to be pessimistic and they ex post turn out to be optimistic in bad economic times. Gu and Wu (2000) cannot discriminate between the above explanation and their hypothesis that analysts have an incentive to forecast the median.

Finally, Abarbanell and Lehavy (2000b) propose that it is management's incentive to take earnings baths that largely contributes to the observed optimistic bias in analysts' forecasts. That is, unlike the previous explanations, Abarbanell and Lehavy (2000b) argue that the bias has nothing to do with analysts' incentives or cognitive biases (see below). Instead, they show that earnings management observations disproportionately impact the estimated bias, which prior research seeks to explain on the basis of analysts' incentives and/or cognitive biases.

Cognitive-bias explanations: Cognitive-bias explanations for analysts' optimism have been proposed mainly to explain anomalous security-return evidence that suggests market inefficiency in long-horizon returns. Evidence of apparent market overreaction to past good and bad price performance (i.e., a profitable contrarian investment strategy) prompted a cognitive bias in analysts' forecasts as an explanation. Drawing upon the behavioral theories of Tversky and Kahneman (1984) and others, DeBondt and Thaler (1985, 1987, 1990), Capstaff et al. (1997), and DeBondt (1992) propose a cognitive-bias explanation for analysts' forecast optimism. Specifically, they hypothesize that analysts systematically overreact to (earnings) information, which imparts an optimistic bias in analysts' forecasts. However, in order for an optimistic bias in analysts' forecasts to arise, there must be some asymmetry in overreaction such that analysts' overreaction to good news is not fully offset by their overreaction to bad news. Elton et al. (1984) argue that analysts overestimate firms performing well and Easterwood and Nutt (1999) document evidence that analysts overreact to good earnings information, but underreact to bad earnings information. The source of asymmetry in the analysts' overreaction is not fully understood in the literature. The asymmetry also makes it difficult to explain the post-earnings-announcement drift because reversal in the reaction to good news earnings is not observed.

Research also examines whether there is a cognitive-bias-induced overreaction and optimism in analysts' forecasts (see Klein, 1990; Abarbanell, 1991) as well as whether the apparent security-return overreaction⁵² is a result of the market believing analysts' cognitive-bias-induced overreacting and biased forecasts (e.g., LaPorta, 1996; Dechow and Sloan, 1997). Klein's (1990) evidence is inconsistent with overreaction in analysts' forecasts and Abarbanell (1991) infers underreaction to earnings information, which is consistent with the post-earnings-announcement drift. In recent work, Abarbanell and Lehavy (2000b) fail to find evidence consistent with cognitive bias inducing optimistic bias in analysts' forecasts. I defer the security-return evidence to Section 4 where I discuss research on market efficiency with respect to analysts' long-horizon forecasts.

Other explanations: In addition to the above incentives-based and cognitive-bias-related explanations for analysts' optimism, at least three other explanations are offered in the literature. These are (see Brown, 1998): herd behavior (Trueman, 1994); low earnings predictability (Huberts and Fuller, 1995); and analysts prefer to withhold unfavorable forecasts (Affleck-Graves et al., 1990; McNichols and O'Brien, 1997).

4.1.2.4.8. Properties of individual analyst's forecasts. Research in this area almost invariably has a descriptive component that documents properties of individual analyst's forecasts. Other research analyzes properties of individual analyst's forecasts in the context of analysts' economic incentives in issuing earnings forecasts, i.e., the costs and benefits of issuing accurate or biased forecasts. The latter is more interesting, but also more difficult.

Research on the properties of individual analysts' forecasts can be categorized into three streams. First, there is research on cross-sectional variation in and determinants of analysts' forecast accuracy. Second, research examines whether analysts' forecasts are efficient in using all the information available at the time of their forecasts. Third, there is research on systematic differences in the properties of analysts' forecasts between groups of analysts (e.g., affiliated versus unaffiliated analysts), which might be related to differential economic incentives facing the groups of analysts.

4.1.2.4.9. Differential forecast accuracy and its determinants. The early literature fails to find differential forecast accuracy among analysts (see Brown and Rozeff, 1980; O'Brien, 1990; Butler and Lang, 1991). Failure to control for the confounding effect of forecast recency on forecast accuracy contributed to the lack of finding significant differential forecast accuracy. Using larger data sets and better controls for forecast horizon, Sinha et al. (1997) conclude that analysts differ in terms of their forecast accuracy. They show that even in hold

⁵²See DeBondt and Thaler (1985, 1987), Chan (1988), Ball and Kothari (1989), Chopra et al. (1992), Ball et al. (1995), and Fama and French (1995) for research examining whether investors and the stock market overreact to information over long horizons.

out samples (i.e., an ex ante analysis), superior forecasters based on past performance outperform other analysts in forecast accuracy (also see Stickel (1992), for the forecast superiority of the *Institutional Investor All American Research Team vis-à-vis* other analysts). Sinha et al. also find that poor performers do not necessarily repeat poor performance. Their evidence is consistent with economic Darwinism in that superior forecasters survive, but poor performers are possibly weeded out in the marketplace.

Recent examples of research examining the determinants of analyst forecast superiority include Mikhail et al. (1997), Jacob et al. (1999), and Clement (1999). The evidence in these studies suggests that experience (or learning), the size of the brokerage firm that an analyst works for, and the complexity of the analyst's task (number of firms and industries followed by an analyst) affect forecast accuracy. The evidence on experience appears mixed in part because of data problems. For example, data are available only since 1984, so even if some analysts were experienced at the start of the data availability year, they are coded as no more experienced as a novice. In addition, inferences about the effect of long experience are confounded by potential survivor bias problems.

4.1.2.4.10. Efficiency of analysts' forecasts. A number of studies show that analysts' forecasts are inefficient in the sense that they do not fully incorporate past information available at the time of their forecasts. Evidence in Lys and Sohn (1990), Klein (1990), and Abarbanell (1991) suggests that analysts underreact to past information reflected in prices. There is evidence of serial correlation in forecast revisions of individual analysts surveyed by Zacks Investment Research (see Lys and Sohn, 1990), in the Value Line forecasts (see Mendenhall, 1991) and in the I/B/E/S consensus forecasts (see Ali et al., 1992). This research examines whether analysts' underreaction to past information and/or earnings information is a potential explanation for the post-earnings-announcement drift (also see Abarbanell and Bernard, 1992).

The inefficiency of analysts' forecasts in incorporating available information in revising their forecasts raises the question of an analyst's incentive to provide an accurate forecast. Stated differently, is the cost of incorporating all the information outweighed by potential benefits? This requires better knowledge of (or proxies for) the cost and reward structure of a financial analyst.

4.1.2.4.11. Differences in forecast accuracy across classes of analysts. Recent research examines whether economic incentives motivate different classes of analysts (e.g., analysts affiliated with a brokerage firm that has an investment-banking relation with the firm whose earnings are being forecast versus unaffiliated analysts). This research, discussed earlier, examines both differences in forecast accuracy across the classes of analysts and security price performance in an attempt to ascertain whether capital markets are fixated on biased analysts' forecasts. I will revisit the issues surrounding market efficiency below.

4.1.3. *Methodological issues and capital markets research*

There are several issues involved in drawing statistical inferences in capital markets research. Although econometric in nature, some methodological research appears in the accounting literature because it addresses issues that are unique to capital markets research in accounting. The uniqueness often stems either from the properties of accounting data or from choice of research design (e.g., levels regressions). There is a voluminous body of research that examines econometric issues germane to capital markets research. These issues are important and have a tremendous bearing on the inferences we draw from the statistical analysis presented in the research. However, to keep the review focused, I survey this research only by way of listing the main issues and refer the reader to the relevant literature for technical details. The main issues include:

- (i) bias in test statistics because of cross-correlation in the data or regression residuals (see Schipper and Thompson, 1983; Collins and Dent, 1984; Sefcik and Thompson, 1986; Bernard, 1987; Christie, 1987; Kothari and Wasley, 1989; Brav, 2000; Mitchell and Stafford, 2000);
- (ii) price and return regression models (see Lev and Ohlson, 1982; Christie, 1987; Landsman and Magliolo, 1988; Kothari and Zimmerman, 1995; Barth and Kallapur, 1996; Barth and Clinch, 1999; Easton, 1998; Brown et al., 1999; Holthausen and Watts, 2001); and
- (iii) comparing the information content of alternative models, e.g., comparing the association of earnings versus cash flows with stock returns (see Davidson and MacKinnon, 1981; Cramer, 1987; Vuong, 1989; Dechow, 1994; Biddle et al., 1995; Biddle and Seow, 1996; Dechow et al., 1998b; Ball et al., 2000).

4.1.4. *Models of discretionary and non-discretionary accruals*

4.1.4.1. *Motivation.* I review methodological research on models of discretionary and non-discretionary accruals because of their preeminent role in researchers' ability to draw correct inferences in capital markets and other research in accounting. Discretionary accruals and earnings management are used synonymously in the literature. Schipper (1989) defines earnings management as "purposeful intervention in the external reporting process, with the intent of obtaining some private gain to managers or shareholders". The discretionary accrual models split total accruals into a discretionary component, which serves as a proxy for earnings management, and a non-discretionary portion. The non-discretionary accrual together with operating cash flows is the non-discretionary portion of reported earnings. At least three streams of research use discretionary accrual models.

First, discretionary accrual models are used in tests of contracting- and political-cost-based hypotheses about management's incentives to

manipulate accounting numbers (i.e., opportunistic use of accruals). Alternatively, this research hypothesizes that firms choose accounting policies or include discretionary accruals in earnings to convey management's private information about the firm's prospects or to more accurately reflect the firm's periodic performance, i.e., the efficient contracting use of accruals (see Holthausen and Leftwich, 1983; Watts and Zimmerman, 1990; Holthausen, 1990; Healy and Palepu, 1993). This body of research is usually not in the capital markets area.

Second, using market efficiency as a maintained hypothesis, many studies test the efficient contracting and opportunism hypotheses by correlating earnings components with stock returns. This research is frequently aimed at testing the information content or association with security returns of new mandated recognition or disclosure standards of accounting. Examples of this research include studies examining whether banks' disclosures of fair values of investments and loans contain value-relevant information (see, e.g., Barth, 1994; Barth et al., 1996; Nelson, 1996). Alternatively, research examines properties of voluntarily disclosed accounting data to test the efficient contracting and opportunism hypotheses (e.g., Beaver and Engel, 1996; Wahlen, 1994). Beaver and Venkatachalam (1999) is an example of research that simultaneously tests the information content and opportunism hypotheses, i.e., it allows for both non-strategic noise and opportunistic accrual manipulation.

Third, a recent popular area of research tests the joint hypothesis of market inefficiency and accrual manipulation with a capital market motivation, e.g., an incentive to manipulate accruals upward in periods prior to stock issues (see Dechow et al., 1996; Jiambalvo, 1996). Recent developments in financial economics and accounting, which are suggestive of informational inefficiency of the capital markets, have fueled this research. The research tests whether there is a positive association between current manipulated (or discretionary) accruals and subsequent risk-adjusted abnormal stock returns. Examples of research in this area include Sloan (1996), Teoh et al. (1998a–c), Rangan (1998), and Ali et al. (1999).

4.1.4.2. Discretionary accrual models. There are five well-known time-series models of discretionary accruals in the literature.⁵³ These are: the DeAngelo (1986) model, the Healy (1985) model, the industry model used in Dechow and Sloan (1991), the Jones (1991) model, and the modified-Jones model by Dechow et al. (1995). Of these only the Jones and modified-Jones models are commonly used in research in part because they outperform the rest in terms of specification and power (see Dechow et al., 1995). Thomas and Zhang (1999)

⁵³Strictly speaking, they are models of non-discretionary accruals and the residual (or the intercept plus the residual) from each model is an estimate of discretionary accruals.

dispute Dechow et al.'s finding and conclude "Only the Kang-Sivaramakrishnan model, which is coincidentally the least popular model, performs moderately well." Kang and Sivaramakrishnan (1995) employ an instrumental variable approach to estimate discretionary accruals.

Moreover, cross-sectional estimation of the Jones model (see DeFond and Jiambalvo, 1994; Subramanyam, 1996b) has replaced the original time-series formulation of the model in terms of recent application. DeFond and Jiambalvo (1994), Subramanyam (1996b) and other studies have legitimized the cross-sectional estimation. Their evidence suggests the performance based on cross-sectional estimation is no worse than that using time-series estimation of the Jones and modified-Jones models. Cross-sectional estimation imposes milder data availability requirements for a firm to be included for analysis than time-series estimation. This mitigates potential survivor bias problems. The precision of the estimates is also likely higher in cross-sectional estimation because of larger sample sizes than the number of time-series observations for an individual firm. The downside of cross-sectional estimation is that cross-sectional variation in the parameter estimates is sacrificed. However, conditional cross-sectional estimation is a good remedy for the problem (see previous discussion in the context of time-series properties of annual earnings forecasts in Section 4.1.2, and Fama and French, 2000; Dechow et al., 1999).

4.1.4.3. Evaluation of discretionary accruals models. An influential study by Dechow et al. (1995) evaluates the power and specification of alternative discretionary accrual models. Their conclusion that the "modified version of the model developed by Jones (1991) exhibits the most power in detecting earnings management" (Dechow et al., 1995, p. 193) serves as the basis for the widespread use of the modified-Jones model. Dechow et al. (1995, p. 193) also conclude that, while "all of the models appear well specified when applied to a random sample", "all models reject the null hypothesis of no earnings management at rates exceeding the specified test levels when applied to samples of firms with extreme financial performance". Finally, Dechow et al. (1995, p. 193) find that "the models all generate tests of low power for earnings management...".

Since earnings management studies almost invariably examine samples of firms that have experienced unusual performance, the most relevant conclusion from Dechow et al. (1995) is that the discretionary accrual models are seriously misspecified. The misspecification arises because the magnitude of normal accruals, i.e., non-discretionary or expected accruals, is correlated with past (and contemporaneous) firm performance. The dependence arises for two reasons. First, as discussed in Section 4.1 on the time-series properties of earnings, firm performance conditional on past performance does not follow a random walk. Second, both operating accruals and operating cash flows are strongly mean reverting (see Dechow (1994) for evidence, and Dechow et al.

(1998a, b) for a model that explains the correlation structure), which means these variables are not serially uncorrelated. However, none of the five discretionary accrual models used in the literature explicitly captures accruals' serial correlation property, so estimated discretionary accruals are biased and contaminated with non-discretionary accruals. Evidence in Guay et al. (1996), who use market-based tests, and Hansen (1999), who examines the behavior of future earnings, suggests that the extent of the non-discretionary accrual component in estimated discretionary accruals is large. Thomas and Zhang's (1999) conclusion is still stronger. They infer that the commonly used models "provide little ability to predict accruals".

I now turn attention to power of the tests that use discretionary accruals. Power of a test is the frequency with which the null hypothesis is rejected when it is false. In assessing the power of the discretionary accrual models, there are two relevant issues. First, if a test is misspecified (i.e., rejection frequency under the null exceeds the significance level of the test, e.g., 5%), statements about the power of the test are not particularly meaningful. Second, assuming that the estimated discretionary accruals are adjusted for bias due to past performance or other reasons, I would argue that the discretionary accrual models yield tests of high, not low power. This conclusion contrasts with Dechow et al. (1995). They examine the power of the tests using individual securities, i.e., sample size is one. Since almost all research studies use samples in excess of 50–100, assuming independence, the standard deviation of the mean discretionary accrual is an order of magnitude smaller than that in Dechow et al. (1995).⁵⁴ Therefore, in most research settings, the power is considerably higher than reported in Dechow et al. (1995). Not surprisingly, the null of zero discretionary accruals is often rejected in empirical research.

4.1.4.4. Future research: Better models of discretionary accruals and better tests. The misspecification of and bias in the discretionary accrual models suggest that inferences about earnings management might not be accurate. Accruals should be modeled as a function of a firm's immediate past economic performance, so that discretionary accruals can be more accurately isolated (see Kaplan, 1985; McNichols and Wilson, 1988; Guay et al., 1996; Healy, 1996; Dechow et al., 1998a). Shocks to a firm's economic performance affect normal accruals as well as serve as a strong motivation to managers to manipulate accruals both opportunistically and to convey information. This complicates the researcher's task of separating discretionary from non-discretionary accruals.

Collins and Hribar (2000b) point to another problem in identifying not only discretionary accruals, but total accruals as well. They show that a researcher's

⁵⁴ Even if the standard deviation is estimated with a correction for cross-sectional dependence, it is likely to be considerably smaller than that for a sample of one firm as in Dechow et al. (1995).

estimate of total accruals using the balance sheet approach instead of taking information directly from a cash flow statement is economically significantly biased in the presence of mergers and acquisitions and discontinued operations.⁵⁵ Precise information on cash flows and accruals has become available only after the Statement of Financial Accounting Standard No. 95 became effective in 1987, and many research studies use the balance sheet approach even in the recent period. The misestimation of total accruals increases the error in estimating discretionary accruals and potentially biases the estimated discretionary accrual. If the test sample firms are more active in mergers and acquisitions or have discontinued operations more frequently than the control sample firms, then Collins and Hribar (2000b) analysis suggests the inferences might be incorrect. Their replication of the studies examining seasoned equity offering firms' accrual manipulation reveals that the bias in estimated discretionary accruals largely accounts for the apparent manipulation documented in Teoh et al. (1998a) and elsewhere.

Another complicating factor is whether discretionary accruals are motivated by managerial opportunism or efficient contracting considerations. Subramanyam (1996b) reports results of the tests of estimated discretionary accruals' association with returns and with future earnings and cash flow performance. He concludes that discretionary accruals are on average informative, not opportunistic.⁵⁶ In contrast, portfolios representing firms with extreme amounts of accruals, which are likely to be flagged as extreme discretionary accrual portfolios, are suggestive of accrual manipulation with a motivation to (successfully) fool capital markets (see Sloan, 1996; Xie, 1997; Collins and Hribar, 2000a, b). Because the opportunism and efficient contracting motivations are likely linked to managers' incentives and firm performance, it behooves researchers to link the development of a discretionary accrual model to firm performance.

Simultaneous with the development of better economic models of discretionary accruals, improved tests using discretionary accruals are required. The demand for better tests arises for at least three reasons. First, research using discretionary accruals frequently examines multi-year performance, whereas methodological studies like Dechow et al. (1995) examine discretionary accrual performance over only one year. Second, test statistics calculated assuming cross-sectional independence might be misspecified especially when a researcher examines performance over multi-year horizons. See Brav (2000), for evidence on bias in tests of long-horizon security-return performance using

⁵⁵ Also see Drtina and Largay (1985), Huefner et al. (1989), and Bahnson et al. (1996).

⁵⁶ However, Subramanyam (1996b) finds that the coefficient on discretionary accruals is smaller than that on non-discretionary accruals, which is consistent with discretionary accruals being partially opportunistic or that they are less permanent than non-discretionary accruals.

tests that ignore positive cross-sectional dependence (also see Collins and Dent, 1984; Bernard, 1987).

Third, test statistics for multi-year performance might be misspecified because long-horizon performance is likely right skewed (or might exhibit some other form of non-normality) and not all sample firms survive, so there might be a survivor bias. While a *t*-test using a large sample size is quite robust to non-normality, the combination of skewness (or other forms of non-normality) and cross-sectional dependence might contribute to test misspecification. Use of Bootstrap standard errors would be an option that is worth examining to tackle problems arising from both non-normality and survivor biases.

Fourth, the percentage of firms surviving the multi-year test period in a typical research study is considerably smaller than 100%. For example, Teoh et al. (1998c) study a sample of 1514 IPOs for a six-year post-IPO period. In their tests based on the return-on-sales performance measure using a matched-pair sample, the number of firms surviving in the sixth post-IPO year is only 288, i.e., 19% of the original sample (see Teoh et al., 1998c, Table 2, panel C). Such a large reduction in sample size is not unique to the Teoh et al. (1998c) study. Surprisingly, however, there is no systematic evidence in the literature on whether such a large degree of attrition imparts a bias. Moreover, in a matched-pair research design, is the attrition due more often to the lack of survival of test firms or matched control firms? Does this matter?

Finally, evidence in Barber and Lyon (1996) suggests that use of a performance-matched control firm yields unbiased measures of abnormal operating performance in random and non-random samples. Use of performance-matched samples is common in research examining discretionary accruals. However, a systematic study of the specification and power of the tests of discretionary accruals using performance-matched control firm samples is missing in the literature.

4.1.4.5. Capital market research implications. Of direct relevance in this review of the capital markets literature is the question whether capital market studies are affected by problems with the discretionary accrual models. I believe they are. Let me give one example. Consider the hypothesis in Aharony et al. (1993), Friedlan (1994), Teoh et al. (1998b, c), and other studies that in the years leading up to an IPO, management biases financial performance upward through positive discretionary accruals.

First, management's IPO decision is endogenous. It is likely to be taken in the light of superior past and expected future economic performance and a need for cash for investments to meet the anticipated demand for the company's products and services. However, high growth is mean reverting. One reason is that a portion of high growth often results from transitory earnings due to a non-discretionary (or neutral) application of GAAP. Thus, a

portion of the subsequent performance reversal is expected and may not be due to discretionary accruals.

Second, the popularly used modified-Jones model treats all of the increase in accounts receivables as discretionary (see Teoh et al., 1998c; Dechow et al., 1995).⁵⁷ Thus, legitimate revenue growth on credit is treated as discretionary or fraudulent (see Beneish, 1998). This means, since extreme revenue growth is mean reverting, the modified-Jones model exacerbates the bias in estimated discretionary accrual in the post-IPO period.

The above example suggests the possibility of bias in estimated discretionary accruals (also see Beneish, 1998). More careful tests are warranted to draw definitive conclusions. In addition to documenting evidence of discretionary accruals, researchers correlate the estimated discretionary accruals with contemporaneous and subsequent security returns to test market efficiency. I defer to Section 4.4 a discussion of potential consequences of misspecified discretionary accrual models for inferences about the market's fixation on reported accounting numbers in the context of tests of market efficiency. As noted above, the capital market motivation for accrual manipulation has assumed great importance in the light of evidence suggesting capital markets might be informationally inefficient.

4.2. Alternative accounting performance measures

Starting with Ball and Brown (1968), many studies use association with stock returns to compare alternative accounting performance measures like historical cost earnings, current cost earnings, residual earnings, operating cash flows, and so on. A major motivation for research comparing alternative performance measures is perceived deficiencies in some of the performance measures. For example, Lev (1989), the AICPA Special Committee on Financial Reporting (1994), also known as the Jenkins Committee, and compensation consultants like Stern, Stewart & Company (Stewart, 1991) all argue that the historical cost financial reporting model produces earnings of “low quality” vis-à-vis firm performance.

Researchers' explicit or implicit use of the term “earnings quality” is either in the context of examining whether earnings information is useful to investors for valuation or in evaluating managers' performance. Capital-markets research typically assumes that an accounting performance measure serves

⁵⁷ Teoh et al. (1998c, p. 192) describe their estimation of discretionary accruals as follows: “... we first estimate expected current accruals by cross-sectionally regressing current (not total) accruals on only the change in sales revenues. The expected current accruals is calculated using the estimated coefficients in the fitted equation after subtracting the change in trade receivables from the change in sales revenues. The residual of current accruals is the abnormal current accruals”.

either the managerial performance measure role or the valuation information role. A managerial performance measure indicates the value added by the manager's efforts or actions in a period, whereas a measure designed to provide information useful for valuation gives an indication of the firm's economic income or the change in shareholders' wealth. The former has a contracting motivation and the latter has an informational or valuation motivation. Although I expect the performance measure with the contracting motivation to be positively correlated with the performance measure designed with a valuation motivation, I do not expect the two to be the same (see discussion below). Therefore, I believe the research design comparing alternative performance measures should be influenced by the assumed choice of the objective.

4.2.1. Review of past research

Early research on association studies (e.g., Ball and Brown, 1968), which is reviewed in Section 3, firmly establishes that earnings reflect some of the information in security prices. However, this early research did not perform statistical tests comparing alternative performance measures, since the primary concern was to ascertain whether there is any overlap between earnings information and the information reflected in security prices.

In the 1980s several studies statistically compared stock returns' association with earnings, accruals, and cash flows. This research includes long-window association studies by Rayburn (1986), Bernard and Stober (1989), Bowen et al. (1986, 1987), and Livnat and Zarowin (1990) and short-window tests by Wilson (1986, 1987). Apart from providing a formal test, their motivation is that previous research used a relatively crude measure of cash flows. They also use more sophisticated expectation models to more accurately isolate the unexpected components of earnings (accruals) and cash flows, because returns in an efficient market only reflect the unanticipated components. The conclusion from most of these studies is that there is incremental information in accruals beyond cash flows.

In this heavily researched area of the relative information content of earnings and cash flows, Dechow's (1994) innovation is in developing cross-sectional predictions about the conditions that make earnings relatively more informative about a firm's economic performance than cash flows (also see Dechow et al., 1998a). Dechow (1994) argues that the emphasis in previous research on unexpected components of the performance measures is misplaced. She views performance measures as primarily serving a contracting purpose. Therefore, she is not interested in a research design that (i) attempts to obtain the most accurate proxy for the anticipated component of a performance measure and (ii) correlates the unanticipated component with stock returns. She argues that managers' compensation contracts almost invariably specify only one summary performance variable (e.g., earnings) and that the contracts

rarely specify it in terms of the innovation in the variable (e.g., unexpected earnings). Dechow (1994) therefore forcefully argues that tests evaluating alternative performance measures should seek to identify the best alternative measure, regardless of whether each measure provides incremental association.⁵⁸

4.2.2. Current interest

Recent research examines new performance measures that the FASB requires to be disclosed (e.g., comprehensive income compared to primary earnings per share by Dhaliwal et al., 1999). Alternatively, research compares different measures advocated by compensation consultants like Stern Stewart & Company against earnings (e.g., EVA compared against earnings by Biddle et al., 1997) or measures that have evolved in different industries (e.g., Vincent (1999) and Fields et al. (1998) examine alternative performance measures used by real estate investment trusts, REITs). Evidence from these studies suggests that performance measures that have evolved voluntarily in an unregulated environment (e.g., performance measures in the REIT industry) are more likely to be incrementally informative than those mandated by regulation (e.g., comprehensive income).

4.2.3. Unresolved issues and future research

4.2.3.1. Correlation with returns as a criterion. Research evaluating alternative performance measures frequently uses association with security returns as the criterion to determine the best measure. Going back to Gonedes and Dopuch (1974), a long-standing issue has been whether association with stock returns is the right test. Holthausen and Watts (2001) offer an in-depth analysis of the issue as well. Research evaluating alternative performance measures must recognize that the objective of a particular performance measure should influence the choice of a test. Consider the scenario in which the performance measure and financial statements are geared towards facilitating debt contracts. It is not clear that a performance measure that seeks to measure the change in the value of the firm's growth options, which would be reflected

⁵⁸ Dechow (1994) proposes the Vuong (1989) test, which, in substance, is a test of difference between the adjusted explanatory powers of two models, each with one (set of) explanatory variable(s), but the same dependent variable in both the models. Following Dechow (1994), the Vuong (1989) test has become the industry standard. However, there are alternatives to the Vuong test, as developed in Biddle et al. (1995), or the Davidson and MacKinnon (1981) non-nested J-test. Biddle and Seow (1996) claim that the Biddle et al. (1995) test's specification and power are at least as good as or better than the Vuong and J-tests in the presence of heteroskedastic and cross-correlated data (see Dechow et al., 1998b). Another alternative is to compare *r*-squares of two models with or without the same dependent variable using the standard error of the *r*-square as derived in Cramer (1987). This approach is helpful in making comparisons across countries (see for example, Ball et al., 2000) or across industries.

in the change in the firm's market capitalization, is of greatest interest to the firm's debt-holders.

As another example, if the objective of a performance measure is to report the net value of the delivered output in the past period, then it may not necessarily correlate highly with stock returns (see, for example, Lee, 1999; Barclay et al., 1999). The reason is that return for a period reflects the consequences of only the unanticipated component of the period's delivered output and revisions in expectations about future output. Once we accept that highest correlation with returns is neither a necessary nor a sufficient condition in comparing alternative performance measures, then incremental information content of a measure becomes a questionable criterion in evaluating alternative performance measures.

4.2.3.2. Level or unanticipated component of a performance measure. As noted earlier, Dechow (1994) argues that most management compensation contracts use only one accounting performance measure and that the measure is not the unexpected component of the performance variable. She therefore advocates against using the unexpected component of the performance measure. This suggests correlating the level of the performance measure with the level of price. Use of beginning-of-the-period price as a deflator for both dependent and independent variables is motivated by the econometric benefits (e.g., fewer correlated omitted variables, lesser heteroscedasticity and reduced serial correlation) that follow from using price as a deflator (see Christie, 1987). However, Ohlson (1991), Ohlson and Shroff (1992), and Kothari (1992) show that, because price embeds expectations about future performance, it serves not only as a deflator with econometric benefits, but it in effect correlates returns with the unexpected component of the performance measure. Therefore, if the objective is to focus on the total performance measure, not just its unexpected component, then should it be correlated with returns or prices? Correlation with prices indeed correlates the entire performance measure with prices because current price contains information in the surprise as well as the anticipated components of the performance measure (Kothari and Zimmerman, 1995).⁵⁹ The down side of correlating prices with a performance measure is that there can be severe econometric problems due to heteroscedasticity and correlated omitted variables (see Gonedes and Dopuch, 1974; Schwert, 1981; Christie, 1987; Holthausen, 1994; Kothari and Zimmerman, 1995; Barth and Kallapur, 1996; Skinner, 1996; Shevlin, 1996; Easton, 1998; Holthausen and Watts, 2001).

⁵⁹ For other advantages of using price regressions, also see Lev and Ohlson (1982) and Landsman and Magliolo (1988).

4.2.3.3. Correlation with future cash flows. An important stated objective of financial accounting standards is that financial information should be helpful to users in assessing the amount, timing, and uncertainty of future cash flows (see FASB, 1978). An operational interpretation of this criterion is to compare performance measures on the basis of their correlation with future cash flows. Some recent research examines earnings' correlation with future cash flows (see Finger, 1994; Dechow et al., 1998a; Barth et al., 1999). If a researcher employs correlation with future cash flows as the criterion to evaluate alternative performance measures, then the performance measure's correlation with prices would serve as a complementary test. The benefit of using price is that it contains information about expected future cash flows in an efficient market, which means the vector of expected future cash flows is collapsed into a single number, price. Of course, the trade-off is econometric problems in using price-level regressions (see Holthausen and Watts, 2001) and the effect of discount rates on price, holding cash flows constant.

4.3. Valuation and fundamental analysis research

This section begins with a discussion of the motivation for research on fundamental analysis (Section 4.3.1). Section 4.3.2 explains the role of fundamental analysis as a branch of capital markets research in accounting. Section 4.3.3 describes the dividend discounting, earnings capitalization, and residual income valuation models that are used frequently in accounting research. This section also reviews the empirical research based on these valuation models. Section 4.3.4 reviews the fundamental analysis research that examines financial statement ratios to forecast earnings and to identify mispriced stocks.

4.3.1. Motivation for fundamental analysis

The principal motivation for fundamental analysis research and its use in practice is to identify mispriced securities for investment purposes. However, even in an efficient market there is an important role for fundamental analysis. It aids our understanding of the determinants of value, which facilitates investment decisions and valuation of non-publicly traded securities. Regardless of the motivation, fundamental analysis seeks to determine firms' intrinsic values. The analysis almost invariably estimates the correlation between the intrinsic value and the market value using data for a sample of publicly traded firms. The correlation between market values and intrinsic value might be estimated directly using intrinsic values or indirectly by regressing market values on determinants of the intrinsic value. In this section, I examine the latter. The last step in fundamental analysis is to evaluate the success or failure of intrinsic valuation on the basis of the magnitude of risk-adjusted returns to a

trading strategy implemented in periods subsequent to intrinsic valuation. This is a test of market efficiency and I discuss research on this topic in Section 4.4.

4.3.2. *Is fundamental analysis accounting research?*

To better answer the question whether research on fundamental analysis should be considered as part of accounting research,⁶⁰ first compare the information set in financial statements with the set incorporated in market values. Since market value is the discounted present value of expected future net cash flows, forecasts of future revenues, expenses, earnings, and cash flows are the crux of valuation. Lee (1999, p. 3) concludes that the “essential task in valuation is forecasting. It is the forecast that breathes life into a valuation model”. However, in most economically interesting settings (e.g., IPOs, high-growth firms, and efficiency enhancing and/or synergy motivated mergers), financial statements prepared according to current GAAP are likely to be woefully inadequate as summary statistics for the firm’s anticipated future sales, and therefore, for predicted future earnings information that is embedded in the current market values. Therefore, unless current accounting rules are changed dramatically, it is unlikely that financial statements in themselves will be particularly useful or accurate indicators of market values.

The reliability principle that underlies GAAP is often cited as the reason why financial statements do not contain forward-looking information that affects market values. For example, Sloan (1998, p. 135) surmises “It seems that it is the reliability criterion that makes the difference between the myriad of variables that can help forecast value and the much smaller subset of variables that are included in GAAP.” While the reliability principle is important, I believe the revenue recognition principle is just as, if not more, important. The revenue recognition principle reduces financial statements to answering the question “What have you done for me lately?” Thus, even if future revenue were to be reliably anticipated (at least a big fraction of it can be for many firms), still *none* of it would be recognized. Since market values and changes in those values depend crucially on news about future revenues, current GAAP financial statements are unlikely to be particularly timely indicators of value.

In spite of a lack of timely information in financial statements, I emphasize the following. First, lack of timeliness in itself does not imply a change in GAAP with respect to the revenue recognition principle (or the reliability principle) is warranted; I am merely describing current GAAP. There are economic sources of demand for historical information in financial statements and therefore for the revenue recognition principle, but that is beyond the

⁶⁰This question might be asked of some other research as well (e.g., market efficiency research in accounting). However, my casual observation is that this question is raised more frequently in the context of fundamental analysis.

scope of this review. Second, there is still some information conveyed by financial reports that is not already in the public domain, as seen from the event study research on the information content of accounting. The association study and the earnings response coefficient literatures seek to ascertain whether accounting captures some of the information that affects security prices and how timely are accounting reports in reflecting that information. As discussed earlier, one concern in this literature is whether GAAP and/or managerial discretion render accounting numbers devoid of value-relevant information.

Given the historical nature of information in financial statements, meaningful fundamental analysis research requires accounting researchers to expand the definition of capital markets research to include research using forecasted earnings information for fundamental analysis. Lee (1999) offers a spirited defense of this viewpoint. He concludes (p. 17) “User-oriented research, such as valuation, is definitely a step in the right direction” for accounting researchers. I concur. However, such research has to move beyond reporting descriptive statistics and evidence of the success of trading strategies into proposing theories and presenting empirical tests of the hypotheses derived from the theories.

Students of fundamental analysis and valuation research should have an understanding of alternative valuation models and fundamental analysis techniques both from the perspective of fulfilling the demand for valuation in an efficient market and intrinsic valuation analysis designed to identify mispriced securities. Below I summarize valuation models and empirical research evaluating the models. I follow this up with fundamental analysis research like Ou and Penman (1989a, b), Lev and Thiagarajan (1993), and Abarbanell and Bushee (1997, 1998). Whether abnormal returns can be earned using intrinsic value calculation or fundamental analysis is deferred to the next section on tests of market efficiency.

4.3.3. Valuation models

For fundamental analysis and valuation, the accounting literature relies on the dividend-discounting model or its transformation, like the earnings (capitalization) model or the residual income model. An ad hoc balance sheet model is also popular in the literature (e.g., Barth and Landsman, 1995; Barth, 1991, 1994; Barth et al., 1992). It implicitly relies on the assumption that a firm is merely a collection of separable assets whose reported amounts are assumed to be noisy estimates of their market values. The balance sheet model is used primarily to test value relevance in the context of evaluating financial reporting standards, which is not the primary focus of my review (see Holthausen and Watts, 2001). Moreover, when used, the balance sheet model is typically augmented to also include earnings as an additional variable, which makes it empirically similar to the transformed dividend-discounting models. I therefore

only discuss the dividend-discounting model and its accounting-variable-based transformations.

4.3.3.1. Dividend-discounting and earnings capitalization models. This model is generally attributed to Williams (1938). The dividend-discounting model defines share price as the present value of expected future dividends discounted at their risk-adjusted expected rate of return. Formally,

$$P_t = \sum_{k=1}^{\infty} E_t[D_{t+k}] / \prod_{j=1}^k (1 + r_{t+j}), \quad (18)$$

where P_t is the share price at time t , \sum is the summation operator, $E_t[D_{t+k}]$ is the market's expectation of dividends in period $t+k$, \prod is the product operator, and r_{t+j} is the risk-adjusted discount rate that reflects the systematic risk of dividends in period $t+j$.

As seen from Eq. (18), price depends on the forecasts of future dividends and the discount rates for future periods. Gordon (1962) makes simplifying assumptions about both the dividend process and discount rates to derive a simple valuation formula, known as the Gordon Growth model. Specifically, if the discount rate, r , is constant through time and dividends are expected to grow at a constant rate $g < r$, then

$$P_t = E_t(D_{t+1}) / (r - g). \quad (19)$$

Since future dividends can be rewritten in terms of forecasted values of future earnings and future investments, the dividend-discounting model can be reformulated. Fama and Miller (1972, Chapter 2) is an excellent reference for making the basic transition from the dividend-discounting model to an earnings capitalization model.⁶¹ Fama and Miller make several points that are helpful in understanding the drivers of share price. First, value depends on the forecasted profitability of current and forecasted future investments, which means dividend policy per se does not affect firm value, only a firm's investment policy affects value (Miller and Modigliani, 1961). Fama and Miller (1972) entertain dividend signaling to the extent that a change in dividends conveys information about the firm's investment policy and in this sense mitigates information asymmetry.⁶²

Second, the growth rate, g , in Eq. (19) depends on the extent of reinvestment of earnings into the firm and the rate of return on the investments. However, reinvestment itself does not increase market value today unless the return on

⁶¹ For a more sophisticated treatment that allows for a changing discount rate, see Campbell and Shiller (1988a, b), Fama (1977, 1996), and Rubinstein (1976).

⁶² See Ross (1977), Bhattacharya (1979), Asquith and Mullins (1983), Easterbrook (1984), Miller and Rock (1985), Jensen (1986), and Healy and Palepu (1988), for some of the literature on dividend signaling.

investments in the future exceeds the discount rate or the cost of capital, r . That is, if the expected return on investments in all future periods exactly equals r , then share price is simply X_{t+1}/r , where X_{t+1} is forecasted earnings for the next period. This valuation is obtained regardless of the degree of expansion either through reinvestment or through issuance of new equity. Fama and Miller (1972, p. 90) refer to this valuation as “the capitalized value of the earnings stream produced by the assets that the firm currently holds”. Share value will be higher than X_{t+1}/r only if the firm has opportunities to invest in projects that are expected to earn an above-normal rate of return (i.e., return in excess of r).

Third, capitalization of forecasted earnings generally yields incorrect valuation because future earnings also reflect growth due to reinvestment (i.e., plow back of earnings) and investments financed by new issuance of equity. So, the transformation from a dividend-discounting model to an earnings capitalization model requires an adjustment to exclude the effect of reinvestment on future earnings, but include any effect on future earnings as a result of earning an above-normal rate of return (i.e., the effect of growth opportunities on earnings).

Earnings capitalization models are popular in accounting and much of the earnings response coefficient literature relies on them (see Beaver, 1998; Beaver et al., 1980). In earnings response coefficient applications of earnings capitalization models, forecasted earnings are either based on time-series properties of earnings (e.g., Beaver et al., 1980; Kormendi and Lipe, 1987; Collins and Kothari, 1989) or analysts' forecasts (e.g., Dechow et al., 1999). This literature finesses the reinvestment effect on earnings by assuming that future investments do not earn above-normal rates of returns, which is equivalent to assuming a 100% dividend–payout ratio (e.g., Kothari and Zimmerman, 1995). The marginal effect of growth opportunities is accounted for in the earnings response coefficient literature by using proxies like the market-to-book ratio, or through analysts' high forecasted earnings growth. The hypothesis is that such growth opportunities will have a positive marginal effect on earnings response coefficients (e.g., Collins and Kothari, 1989) because growth stocks' prices are greater than X_{t+1}/r , the no-growth valuation of a stock.

4.3.3.2. Residual income valuation models. The Ohlson (1995) and Feltham and Ohlson (1995) residual income valuation models have become hugely popular in the literature.⁶³ Starting with a dividend-discounting model, the residual income valuation model expresses value as the sum of current book

⁶³ Several critiques of the Ohlson and Feltham–Ohlson models appear in the literature. These include Bernard (1995), Lundholm (1995), Lee (1999), Lo and Lys (2001), Sunder (2000), and Verrecchia (1998).

value and the discounted present value of expected abnormal earnings, defined as forecasted earnings minus a capital charge equal to the forecasted book value times the discount rate. Ohlson (1995) and others (e.g., Bernard, 1995; Biddle et al., 1997) point out that the concept of residual income valuation has been around for a long time.⁶⁴ However, Ohlson (1995) and Feltham and Ohlson (1995) deserve credit for successfully reviving the residual income valuation idea, for developing the ideas more rigorously, and for impacting the empirical literature.

The Ohlson (1995) model imposes a time-series structure on the abnormal earnings process that affects value. The linear information dynamics in the model (i) specifies an autoregressive, time-series decay in the current period's abnormal earnings, and (ii) models "information other than abnormal earnings" into prices (Ohlson, 1995, p. 668). The economic intuition for the autoregressive process in abnormal earnings is that competition will sooner or later erode above-normal returns (i.e., positive abnormal earnings) or firms experiencing below-normal rates of returns eventually exit. The other information in the Ohlson model formalizes the idea that prices reflect a richer information set than the transaction-based, historical-cost earnings (see Beaver et al., 1980).

The Feltham and Ohlson (1995) model retains much of the structure of the Ohlson (1995) model except the autoregressive time-series process. The Feltham–Ohlson residual income valuation model expresses firm value in terms of current and forecasted accounting numbers, much like the dividend-discounting model does in terms of forecasted dividends or net cash flows. Forecasted abnormal earnings can follow any process and they reflect the availability of other information. This feature enables the use of analysts' forecasts in empirical applications of the Feltham–Ohlson model and is sometimes claimed to be an attractive feature of the valuation model vis-à-vis the dividend-discounting model. For example, in comparing the applications of the dividend-discounting model to the residual income valuation model, Lee et al. (1999) conclude that "practical considerations, like the availability of analysts' forecasts, makes this model easier to implement" than the dividend-discount model (also see Bernard, 1995, pp. 742–743). The illusion of ease arises because, assuming clean surplus, one can value the firm directly using abnormal earnings forecasts, rather than backing out net cash flows from pro forma financial statements. Abnormal earnings forecasts are the difference between (analysts') forecasts of earnings and a capital charge,

⁶⁴The predecessor papers of the residual valuation concept include Hamilton (1777), Marshall (1890), Preinreich (1938), Edwards and Bell (1961), Peasnell (1982), and Stewart (1991).

i.e., $E_t[X_{t+k} - r BV_{t+k-1}]$. Using abnormal earnings forecasts, the share price at time t , P_t , is expressed as⁶⁵

$$P_t = BV_t + \sum_{k=1}^{\infty} E_t[X_{t+k} - r BV_{t+k-1}]/(1+r)^k, \quad (20)$$

where BV_t is the book value of equity at time t , $E_t[\cdot]$ the expectation operator where the expectation is based on information available at time t , X_t the earnings for period t , and r the risk-adjusted discount rate applicable to the equity earnings (or cash flows).

While Eq. (20) expresses price in terms of forecasted book values and abnormal earnings, those forecasts have precisely the same information as forecasts of dividends, which are implicit in analysts' forecasts of earnings. Stated differently, the residual income valuation model is a transformation of the dividend-discounting model (see Frankel and Lee, 1998; Dechow et al., 1999; Lee et al., 1999).

In addition to the apparent ease of implementation, Bernard (1995) and others argue that another appealing property of the residual income valuation model is that the choice of accounting method does not affect the model's implementation. If a firm employs aggressive accounting, its current book value and earnings would be high, but its forecasted earnings will be lower and the capital charge (or normal earnings) would be higher. Therefore, lower forecasted future abnormal earnings offset the consequences of aggressive accounting that appear in current earnings. Unfortunately, the elegant property that the effect of the management's choice of accounting methods on earnings in one period is offset by changes in forecasted earnings has three unappealing consequences. First, it renders the Feltham–Ohlson model devoid of any accounting content, just as a dividend-discounting model is not particularly helpful for financial reporting purposes. The accounting content is lost because the model does not offer any guidance or predictions about firms' choice of accounting methods or properties of accounting standards, notwithstanding the frequent use of the term conservative and unbiased accounting in the context of the residual income model. This point is discussed in detail in Lo and Lys (2001), Sunder (2000), Verrecchia (1998), and Holthausen and Watts (2001).

Second, from a practical standpoint of an analyst, even though reduced future abnormal earnings offset the effect of aggressive accounting methods, an analyst must forecast future abnormal earnings by unbundling current earnings into an aggressive-accounting-method-induced component and remaining regular earnings.

⁶⁵The pricing equation is misspecified in the presence of complex, but routinely encountered, capital structures that include preferred stock, warrants, executive stock options etc. I ignore such misspecification in the discussion below.

Third, the interpretation of abnormal earnings is clouded. Some researchers interpret expected abnormal earnings as estimates of economic rents (Claus and Thomas, 1999a,b; Gebhardt et al., 1999). However, the choice of accounting methods mechanically affects the estimates of expected abnormal earnings, so those estimates by themselves are not an indication of economic rents. For example, a firm choosing the pooling of interest method of accounting for a merger will have higher expected “abnormal” earnings compared to an otherwise identical firm that uses the purchase method of accounting for mergers. In contrast, America Online is expected to report an amortization charge of approximately \$2 billion per year for next 25 years as a result of its merger with Time Warner, which will be accounted for as a purchase transaction.

4.3.3.3. Empirical applications and evaluation of valuation models. All valuation models make unrealistic assumptions. This feature is common to most theoretical models, like the Ohlson (1995) model that imposes a particular structure on the abnormal earnings process and other information. It is fruitless to criticize one or more of these models on the basis of the realism of the assumptions.⁶⁶ Assuming efficient capital markets, one objective of a valuation model is to explain observed share prices. Alternatively, in an inefficient capital market, a good model of intrinsic or fundamental value should predictably generate positive or negative abnormal returns. Therefore, in the spirit of positive science, it is worthwhile examining which of these models best explains share prices and/or which has the most predictive power with respect to future returns. In this section, I evaluate models using the former criteria, whereas the next section focuses on the models’ ability to identify mispriced securities.

Several recent studies compare the valuation models’ ability to explain cross-sectional or temporal variation in security prices (see Dechow et al., 1999; Francis et al., 1997, 1998; Hand and Landsman, 1998; Penman, 1998; Penman and Sougiannis, 1997, 1998; Myers, 1999).⁶⁷ Two main conclusions emerge from these studies. First, even though the residual income valuation model is identical to the dividend-discounting model, empirical implementations of the dividend-discounting model yield value estimates do a much poorer job

⁶⁶ Lo and Lys (2001), in the spirit of Roll’s (1977) critique of the CAPM, argue that the Feltham and Ohlson (1995) and Ohlson (1995) models are not testable. Any test of the models is a joint test of the model (or the model’s assumptions) and that the model is descriptive of the market’s pricing of stocks.

⁶⁷ In an influential study, Kaplan and Ruback (1995) evaluate discounted cash flow and multiples approaches to valuation. Since they do not examine earnings-based valuation models, I do not discuss their study.

of explaining cross-sectional variation in market values than earnings capitalization models (e.g., Francis et al., 1997; Penman and Sougiannis, 1998). Second, the traditional implementation of the dividend-discounting model by capitalizing analysts' forecasts of earnings is just about as successful as the residual income valuation model (e.g., Dechow et al., 1999; Lee et al., 1999; Liu et al., 2000). I discuss and explain the two conclusions below.

The poor showing of the dividend-discounting model, the first conclusion stated above, appears to be a consequence of inconsistent application of the model in current research (see Lundholm and O'Keefe (2000) for an in-depth discussion). Consider the implementation of the model in Penman and Sougiannis (1998) and Francis et al. (1997) with a five-year horizon for dividend forecasts plus terminal value. The dividend forecasts for the five years generally account for a small fraction of current market value. This is not surprising because dividend yield is only a few percent. The terminal value is estimated assuming a steady-state growth in dividends beyond year five. It is common to assume the steady-state growth rate, g , to be either zero or about 4%. Both Penman and Sougiannis (1998) and Francis et al. (1997) report results using $g = 0$ or 4% in perpetuity.

The inconsistent application of the dividend-discount model arises because if $g = 0$, then the forecasted dividend in period 6 should be the earnings for period 6. FD_{t+6} should equal forecasted earnings for year 6 because once the no-growth assumption is invoked, the need for investments diminishes compared to that in the earlier growth periods. That is, there is no longer a need to plow earnings back into the firm to fund investments for growth. Investments roughly equal to depreciation would be sufficient to maintain zero growth in steady state. Therefore, cash available for distribution to equityholders will approximate earnings, i.e., the payout ratio will be 100%. Thus, assuming a zero growth in perpetuity will typically result in a huge permanent increase in dividends from year 5 to year 6, with dividends equal to earnings in years 6 and beyond. Instead, both Penman and Sougiannis (1998) and Francis et al. (1997) use $FD_{t+5}(1 + g)$, where FD_{t+5} is the forecasted dividend for year 5. Naturally, they find that dividend capitalization models perform poorly.⁶⁸ However, if the implications of the zero-growth assumption are applied consistently to the dividend discounting and the residual income valuation models, the fundamental value estimate from both models will be identical.⁶⁹ Similar logic applies to other growth rate assumptions.

Francis et al. (1997, Tables 3 and 4) do report results using the dividends=earnings assumption to calculate the terminal value, but their

⁶⁸ Additional misspecification is possible because earnings are eventually paid to both common and preferred stockholders, but the abnormal earnings valuation model is implemented without full consideration to preferred shareholders.

⁶⁹ See Lundholm and O'Keefe (2000) and Courteau et al. (2000) for further details on this point.

approach is confounded by the fact that they use Value Line's five-year-ahead forecast of the price–earnings multiple. Ironically, either because of the implicit assumption of dividends=earnings or because Value Line is skilled in forecasting the future price–earnings multiple, the value estimates in Francis et al. that implicitly use the dividends=earnings assumption for terminal value, are more accurate than all other models. The former explanation is more likely because otherwise a trading strategy based on the Value Line forecasts would yield huge abnormal returns.

The second conclusion from the empirical literature on valuation models is that simple earnings capitalization models with ad hoc and/or restrictive assumptions do as well as the more rigorous residual income valuation models in explaining cross-sectional variation in prices. The economic intuition underlying the residual income valuation model is appealing. In the spirit of the model, empirical applications generally assume that above-normal rates of returns on investments will decay and there is a careful attempt to account for the wealth effects of growth through reinvestment. Still, Dechow et al. (1999) find a simple model that capitalizes analyst's next period earnings forecast in perpetuity (i.e., a random walk in forecasted earnings and 100% dividend payout, both ad hoc assumptions) does better than the residual income valuation model.^{70,71} What explains this puzzle?

To understand the lack of improved explanatory power of the more sophisticated valuation models, consider the variance of the independent variable, forecasted earnings. Forecasted earnings have two components: normal earnings (= the capital charge) and expected abnormal earnings. Since the present value of normal earnings is the book value, which is included as an independent variable, the normal earnings component of forecasted earnings serves as an error in the independent variable that uses forecasted earnings to explain prices. However, for annual earnings data, most of the variance of forecasted earnings is due to expected abnormal earnings. Use of a constant discount rate across the sample firms further reduces the variance accounted for by normal earnings in the residual income valuation model applications (Beaver, 1999).⁷² Therefore, in spite of the fact that forecasted earnings are contaminated by normal earnings, which contributes to misestimated

⁷⁰The improved explanatory power of fundamental values estimated using analysts' forecasts vis-à-vis historical earnings information highlights the important role of other information that influences expectations of future earnings beyond the information in past earnings (e.g., Beaver et al., 1980).

⁷¹Kim and Ritter (1999) find that IPOs are best valued using forecasted one-year-ahead earnings per share and Liu et al. (2000) present similar evidence comparing multiples of forecasted earnings against more sophisticated valuation models.

⁷²However, substituting a firm-specific discount rate is unlikely to make a big difference. Use of firm-specific discount rate is not without a cost: discount rates are notoriously difficult to estimate and existing techniques estimate the rates with a large standard error (see Fama and French, 1997).

persistence in the context of valuation, the resulting errors-in-variables problem is not particularly serious. The variance of the measurement error is small relative to the signal variance, i.e., the variance of forecasted earnings minus normal earnings. In addition, any error in estimating the cost of capital employed to calculate normal earnings diminishes the benefit of adjusting forecasted earnings for normal earnings.

While controlling for normal earnings is not helpful in the above context, as an economic concept it rests on solid grounds. The preceding discussion is not intended to discourage the use of discount rates or risk adjustment. It simply highlights one context where the payoff to the use of risk adjustment is modest. Over long horizons, risk adjustment is potentially more fruitful.

There are at least three other empirical attempts (Myers, 1999; Hand and Landsman, 1998, 1999) to test Ohlson's (1995) linear information dynamics valuation model. All three studies as well as Dechow et al. (1999) find evidence inconsistent with the linear information dynamics. I do not think one learns much from rejecting the linear information dynamics of the Ohlson model. Any one-size-fits-all description of the evolution of future cash flows or earnings for a sample of firms is likely to be rejected. While an autoregressive process in residual income as a parsimonious description is economically intuitive, there is nothing in economic theory to suggest that all firms' residual earnings will follow an autoregressive process at all stages in their life cycle. A more fruitful empirical avenue would be to understand the determinants of the autoregressive process or deviations from that process as a function of firm, industry, macroeconomic, or international institutional characteristics. The conditional estimation attempts in Fama and French (2000) and Dechow et al. (1999) to parameterize the autoregressive coefficient (discussed in Section 4.1.2) are an excellent start.

4.3.3.4. Residual income valuation models and discount rate estimation. An emerging body of research uses the dividend-discounting model and the Feltham–Ohlson residual income valuation model to estimate discount rates. This research includes papers by Botosan (1997), Claus and Thomas (1999a, b), and Gebhardt et al. (1999). The motivation for this research is twofold.

First, there is considerable debate and disagreement among academics and practitioners with respect to the magnitude of the market risk premium (see Mehra and Prescott, 1985; Blanchard, 1993; Siegel and Thaler, 1997; Cochrane, 1997) and whether and by how much it changes through time with changing riskiness of the economy (Fama and Schwert, 1977; Keim and Stambaugh, 1986; Fama and French, 1988; Campbell and Shiller, 1988a; Kothari and Shanken, 1997; Pontiff and Schall, 1998). The market risk premium is the difference between the expected return on the market portfolio of stocks and the risk-free rate of return. The historical average realized risk premium has been about 8% per year (Ibbotson Associates, 1999).

Second, the cost of equity capital of an individual firm is a function of both the market risk premium and its relative risk (e.g., beta of the equity in the context of the CAPM). In spite of a vast body of research in finance and economics, the dust has still not settled on the set of priced risk factors. In addition, estimates of a security's sensitivity to priced factors, i.e., estimates of relative risks, are notoriously noisy. Therefore, the state-of-the-art estimate of cost of equity (relative risk times the risk premium plus the risk-free rate) is extremely imprecise (see Fama and French, 1997; Elton, 1999).

Research that uses the Feltham–Ohlson model to estimate equity discount rates attempts to improve upon the cost of equity estimates obtained using the traditional methods in finance. The empirical approach to estimating the cost of equity using the Feltham–Ohlson model is quite straightforward. It seeks to exploit information in analysts' forecasts and current prices, rather than that in the historical time series of security prices, to estimate discount rates. Gebhardt et al. (1999) note that practitioners have long attempted to infer discount rates from analysts' forecasts (e.g., Damodaran, 1994; Ibbotson, 1996; Gordon and Gordon, 1997; Madden, 1998; Pratt, 1998), but that the same approach is not popular among academics.

In an efficient market, price is the discounted present value of the sum of the book value and the discounted present value of the forecasted residual income stream. Analysts' forecasts of earnings and dividend–payout ratios are used to forecast the residual income stream. The cost of equity then is defined as the discount rate that equates the price to the fundamental value, i.e., the sum of book value and the discounted residual income stream. An analogous approach can be employed to infer discount rates using forecasts of future dividends.

Since the information used in the residual income valuation model is identical to that needed for the dividend-discount model, discount rates backed out of a dividend-discount model should be exactly the same as those from the residual income valuation model. However, studies using earnings-based valuation models to back out market risk premiums or equity discount rates claim that earnings-based valuation models yield better estimates of discount rates than using the dividend-discount model. For example, Claus and Thomas (1999a, b, p. 5) state: “Although it is isomorphic to the dividend present value model, the abnormal earnings approach uses other information that is currently available to reduce the importance of assumed growth rates, and is able to narrow considerably the range of allowable growth rates by focusing on growth in rents (abnormal earnings), rather than dividends.”

The striking conclusion from the Claus and Thomas (1999a, b) and Gebhardt et al. (1999) studies is that their estimate of the risk premium is only about 2–3%, compared to historical risk premium estimated at about 8% in the literature. In line with the small risk premium, the studies also find that cross-sectional variation in the expected rates of return on equity that would

capture differences in firms' relative risks is also quite small. However, Gebhardt et al. (1999) show that the variation in their estimates of costs of equity is correlated with many of the traditional measures of risk. This increases our confidence in the estimated discount rates.

The attempts to estimate the market risk premium and costs of equity address an important question. The intuition for why the estimated discount rates are less dispersed is that rational forecasts are less variable than actual data.⁷³ Therefore, estimates of discount rates using forecast data are also expected to be less volatile than those obtained using ex post data. While it is appealing to use forecast data to estimate discount rates, there is also a downside, and hence, I think it is premature to conclude that the risk premium is as low as 2–3% for at least two reasons.

First, it is possible that forecasted growth, especially the terminal perpetuity growth rate, used in the abnormal earnings valuation model is too low. The lower the forecasted growth, mechanically the lower the discount rate must be in order for the price-equal-to-the-fundamental-value identity to hold.

Second, the earnings-based fundamental valuation approach used to estimate discount rates assumes market efficiency. However, the same approach is also employed to conclude that returns are predictable and that the market is currently overvalued (e.g., Lee et al. (1999), and many other academics and practitioners). That is, assuming forecasts are rational and accurate estimates of discount rates are used, Lee et al. and others conclude that equities are predictably mispriced. Ironically, another body of research uses the residual income valuation model to conclude that analysts' forecasts are biased, and that the market is naively fixated on analysts' forecasts, and therefore returns are predictable (e.g., Dechow et al., 1999, 2000).

In summary, of the three variables in the valuation model—price, forecasts, and discount rates—two must be assumed correct to solve for the third. Using different combinations of two variables at a time, research has drawn inferences about the third variable. Because the assumptions in the three sets of research are incompatible, the conclusions are weak. Research on stock mispricing relative to fundamental valuation, properties of analysts' forecasts, and market's naïve reliance on analysts' forecasts provides evidence on potential settings where the model fails or the market's pricing is inconsistent with that based on the valuation model. That is, the evidence is inconsistent with the joint hypothesis of the model and market efficiency. These are tests of market efficiency that I review in the next section. A fruitful avenue for future research would be to provide further evidence on the relation between estimated discount rates and subsequent returns (see Gebhardt et al., 1999).

⁷³ See Shiller (1981) for using this argument in the context of testing the rationality of the stock market. Shiller's work led to a huge literature in finance and economics on examining whether stock markets are excessively volatile.

4.3.4. Fundamental analysis using financial ratios

This stream of research has two objectives. First, it uses information in financial ratios to forecast future earnings more accurately than using other methods (e.g., time-series forecasts and/or analysts' forecasts). Second, it identifies mispriced securities. The underlying premise is that the financial-ratio-based model predicts future earnings better than the alternatives and this superior predictive power is not reflected in current share prices (i.e., market are inefficient).

4.3.4.1. Earnings prediction. There is a long-standing interest in earnings prediction in the accounting literature (see Section 4.1.2). Below I focus on forecasts of future earnings and accounting rates of returns using financial ratios. There is a long history of practitioners and academics interpreting univariate ratios like the price–earnings multiple and price-to-book ratio as leading indicators of earnings growth (see, for example, Preinreich, 1938; Molodovsky, 1953; Beaver and Morse, 1978; Cragg and Malkiel, 1982; Peasnell, 1982; Penman, 1996, 1998; Ryan, 1995; Beaver and Ryan, 2000; Fama and French, 2000). The economic logic for the predictive power of price–earnings and price-to-book ratios with respect to future earnings is straightforward. Price is the capitalized present value of a firm's expected future earnings from current as well as future expected investments, whereas current earnings only measure the profitability of realized revenues from current and past investments. Price thus has information about the firm's future profitability, which contributes to the predictive ability of price–earnings and price-to-book ratios with respect to future earnings growth. In addition to the predictive ability stemming from the forward-looking information in prices about future earnings, the ratio-based earnings prediction literature also examines the role of transitory earnings and accounting methods in forecasting earnings.

Ou and Penman (1989a,b) initiated rigorous academic research on earnings prediction based on a multivariate analysis of financial ratios. The main idea is to examine whether combining information in individual ratios about future earnings growth can yield more accurate forecasts of future earnings. Ou and Penman use statistical procedures to reduce a large number of financial ratios to a subset that is most effective in forecasting future earnings. In holdout samples, they show that the forecasting model using the subset of the ratios outperforms time-series models of annual earnings in terms of forecast accuracy and contemporaneous association with stock returns.

Several extensions of Ou and Penman's earnings prediction research appear in the literature. For example, the innovation in Lev and Thiagarajan (1993) and Abarbanell and Bushee (1997, 1998) is that, unlike Ou and Penman (1989a, b), they use “*a priori* conceptual arguments to study any of their” ratios

(Abarbanell and Bushee, 1998, p. 22). They demonstrate that the earnings prediction signals in variables like growth in accounts receivables relative to sales growth and gross margin rate are incrementally associated with contemporaneous stock returns and are significantly helpful in predicting future earnings.

Other ratio-based earnings prediction approaches typically seek to exploit the information in prices about future earnings. For example, Penman (1996, 1998) develops techniques that combine the information in price–earnings ratios and price-to-book ratios that is superior to using any one ratio to forecast future earnings or the return on equity. Presence of transitory earnings contaminates price–earnings ratio as an indicator of growth. This weakness in price–earnings ratios is in part remedied by also using the price-to-book ratio, which signals growth in book equity and future returns on equity and because it is relatively unaffected by current transitory earnings. Penman (1998) presents empirical evidence on the benefits of combining the information in price–earnings and price-to-book ratios for earnings prediction. Specifically, using historical data, Penman (1998) estimates optimal weights on price–earnings and price-to-book ratios to forecast one- and three-year-ahead earnings. The evidence suggests moderate forecasting gains from optimal weighting of information in the two ratios.

Another example of ratio-based earnings prediction research is Beaver and Ryan (2000). They decompose “bias” and “lag” components of the price-to-book ratios to forecast future book returns on equity. Bias in the book-to-market ratio arises when a firm uses conservative accounting such that its book value of equity is expected to be persistently below the share price. Beaver and Ryan define lag as the time it takes for book values to catch up with stock prices in reflecting a given economic gain or loss. Consistent with economic intuition, Beaver and Ryan (2000) predict an inverse relation between bias and future return on equity, i.e., high book-to-market ratio forecasts low earnings growth. The horizon over which bias is helpful in predicting the return on equity depends on lag or the speed with which book values adjust to reflect an economic gains and losses. If the lag is short-lived, then the prediction horizon is also short. Evidence in Beaver and Ryan is broadly consistent with their predictions.

A final example of ratio-based earnings prediction research is Penman and Zhang (2000). They study the interaction of changes in growth and conservative accounting practices like expensing of research and development and marketing costs. The interaction is helpful in forecasting future earnings because extreme changes in growth are mean reverting and the effect is noticeable in the case of firms that are intensive in research and development and marketing or LIFO inventory reserves, etc. They predict and find that firms exhibiting extreme changes in research and development and marketing expenditures and LIFO reserves exhibit a rebound in their return on net assets.

Penman and Zhang label this phenomenon as the predictive ability of earnings quality.

4.3.4.2. Summary. The ratio-based earnings prediction literature focuses on the forecasting power of financial ratios with respect to future earnings. Empirical evidence is generally consistent with the ratios' ability to predict earnings growth. These models, however, rarely outperform analysts' forecasts of earnings, especially forecasts over long horizons. The primary interest in the ratio-based forecasting models is the lure of above-normal investment returns from simple, cheaply implementable models.

4.3.4.3. Return prediction. A large number of the ratio-based earnings prediction studies also examine whether trading strategies that exploit information about earnings growth earn above-normal rates of return. For example, Ou and Penman (1989a, b), Lev and Thiagarajan (1993), Abarbanell and Bushee (1998), Piotroski (2000), and Penman and Zhang (2000) demonstrate that the information in the earnings prediction signals is helpful in generating abnormal stock returns (see the next section), which suggests market inefficiency with respect to financial statement information.

4.4. Tests of market efficiency: overview

In this section, I discuss the empirical literature in accounting on tests of market efficiency. The review is deliberately narrowly focused on empirical issues. I do not examine market efficiency topics like the definition of market efficiency and tests of mean reversion in aggregate stock returns. These topics are important and essential for understanding the market efficiency research in accounting, but are beyond the scope of my review. Fortunately, several excellent surveys of the market efficiency literature exist. I encourage interested researchers to read Ball (1978, 1992, 1994), Fama (1970, 1991, 1998), LeRoy (1989), MacKinlay (1997), and Campbell et al. (1997).

Market efficiency tests in the financial accounting literature fall into two categories: event studies and cross-sectional tests of return predictability (see Fama, 1991). Event studies examine security price performance either over a short window of few minutes to a few days (short-window tests) or over a long horizon of one-to-five years (long-horizon tests). Section 4.4.1 discusses the attractive features as well as research design and data problems in drawing inferences about market efficiency based on short- and long-window event studies. Section 4.4.2 surveys the empirical literature on event studies. I review event studies from the post-earnings-announcement drift literature in Section 4.4.2.1, studies of market efficiency with respect to accounting methods and method changes and functional fixation in Section 4.4.2.2, and studies on

long-horizon returns to accrual management and analyst forecast optimism in Section 4.4.2.3.

Cross-sectional tests of return predictability (or anomalies studies) examine whether the cross section of returns on portfolios formed periodically using a specific trading rule are consistent with a model of expected returns like the CAPM. These are tests of the joint hypothesis of market efficiency and the equilibrium expected rate of return model employed by the researcher. Section 4.4.3 reviews the literature on cross-sectional tests of return predictability. Section 4.4.3.1 summarizes results of tests of the market's (mis)pricing of earnings yields and accounting accruals and Section 4.4.3.2 discusses findings from tests of long-horizon returns to fundamental analysis.

4.4.1. Issues in drawing inferences from event studies

Event studies are tests of market efficiency. They test the impact, speed, and unbiasedness of the market's reaction to an event. In an efficient capital market, a security's price reaction to an event is expected to be immediate and subsequent price movement is expected to be unrelated to the event-period reaction or its prior period return. The modern literature on event studies originates with Fama et al. (1969) and Ball and Brown (1968), who examine security return behavior surrounding stock splits and earnings announcements.⁷⁴ Since then hundreds of event studies have been conducted in the legal, financial economics, and accounting literatures. There are two types of event studies: short-window event studies and long-horizon post-event performance studies. The inferential issues for the short-window event studies are straightforward, but they are quite complicated for the long-horizon performance studies. I discuss the salient issues of each type of study below.

4.4.1.1. Short-window event studies. Short-window event studies provide relatively clean tests of market efficiency, in particular when sample firms experience an event that is not clustered in calendar time (e.g., earnings announcement day returns or merger announcement day returns). The evidence from short-window event studies is generally consistent with market efficiency. The evidence using intra-day, daily, and weekly returns to wide-ranging events like earnings announcements, accounting irregularities, mergers, and dividends suggests the market reacts quickly to information releases. In some cases, the reaction appears incomplete and there is a drift, which contradicts market efficiency.

In a short-window test, researchers face few problems of misestimating the expected return over the short event window (e.g., Brown and Warner, 1985). Expected market return per day is about 0.05%, so the misestimation in a

⁷⁴The first published event study is Dolley (1933). Like Fama et al. (1969), it examines the event-period price effects of stock splits.

security's return due to risk mismeasurement (e.g., Scholes and Williams, 1977; Dimson, 1979) in most cases is likely to be less than 0.01–0.02% per day.⁷⁵ This is small relative to an average abnormal return of 0.5% or more that is commonly reported in event studies.⁷⁶

One concern in assessing the significance of the average market reaction in the event period is that the event might induce an increase in return variability (e.g., Beaver (1968) reports increased return variability around earnings announcements). Tests that fail to account for the increased return variability excessively reject the null hypothesis of zero average abnormal return (e.g., Christie, 1991; Collins and Dent, 1984). Use of the cross-sectional standard deviation of event period abnormal returns greatly mitigates the potential problem arising from an event-induced increase in return variability.

4.4.1.2. Long-horizon event studies. A long-horizon event study tests whether one-to-five-year returns following an event are systematically non-zero for a sample of firms. These studies assume that the market can overreact or underreact to new information and that it can take a long time to correct the misvaluation because of continued apparently irrational behavior and frictions in the market. The source of underreaction and overreaction is human judgment or behavioral biases in information processing. There is a systematic component to the behavioral biases so that in the aggregate the pricing implications of the biases do not cancel out, but manifest themselves in security prices deviating systematically from those implied by the underlying fundamentals. Several recent studies model the price implications of human behavioral biases to explain apparent long-horizon market inefficiency (e.g., Barberis et al., 1998; Daniel et al., 1998; Hong and Stein, 1999; DeBondt and Thaler, 1995; Shleifer and Vishny, 1997).

Recent evidence in the finance and accounting literature suggests huge apparent abnormal returns spread over several years following well-publicized events like initial public offerings, seasoned equity issues, and analysts' long-term forecasts. Collectively this research poses a formidable challenge to the efficient markets hypothesis. However, before we conclude that markets are grossly inefficient, it is important to recognize that long-horizon event studies suffer from at least three problems: risk misestimation, data problems, and the lack of a theory of market inefficiency as the null hypothesis. For an in-depth

⁷⁵An implicit assumption is that the event does not cause the sample securities' beta risks to increase by an order of magnitude. See Ball and Kothari (1991) for stocks' daily beta risk in event time over 21 days centered around earnings announcements and Brennan and Copeland (1988) for evidence on risk changes around stock split announcements.

⁷⁶The real danger of failing to reject the null hypothesis of no effect when it is false (i.e., a type II error) in a short-window event study stems from uncertainty about the event day (see Brown and Warner, 1985).

discussion of conceptual and empirical problems in drawing inferences from long-horizon tests of market efficiency, see Barber and Lyon (1997), Kothari and Warner (1997), Fama (1998), Lyon et al. (1999), and Loughran and Ritter (2000).

4.4.1.2.1. Risk measurement and risk factors. Misestimation of risk can produce economically and statistically significant magnitudes of apparent abnormal returns because the post-event return measurement period is long. Risk misestimation can arise because sensitivity to a risk factor is measured incorrectly or because a relevant risk factor is omitted from the model of expected returns. Random errors in estimating stocks' risks are not a serious problem because almost all the studies examine performance at a portfolio level.⁷⁷ Risk misestimation is a problem, however, if the misestimation is correlated across the stocks in a portfolio. This scenario is plausible because of the endogenous nature of economic events, i.e., the subset of firms experiencing an economic event is not random with respect to the population of firms. Typically unusual performance precedes an event and risk changes are associated with past performance (e.g., French et al., 1987; Chan, 1988; Ball and Kothari, 1989; Ball et al., 1993, 1995).

With regards to potential bias in estimated abnormal performance because of omitted risk factors, the finance literature has not quite settled on the risk factors priced in stock valuations as well as the measurement of the risk factors. Thus, for potential reasons of both risk mismeasurement and omitted risk factors, misestimation of securities' expected returns in a long-horizon event study is a serious concern. Stated differently, discriminating between market inefficiency and a bad model of expected returns is difficult in long-horizon event studies.

4.4.1.2.2. Data problems. A variety of data problems afflict long-horizon event studies and make it difficult to draw definitive inferences about market efficiency. (i) Survivor and data-snooping biases can be serious in long-horizon performance studies, especially when both stock-price and financial accounting data are used in the tests, as is common in many long-horizon market efficiency tests in accounting (see Lo and MacKinlay, 1990; Kothari et al., 1995, 1999b). Since many studies analyze financial and return data for the surviving subset of the sample firms, inferential problems arise due to potential survivor biases in the data. It is not uncommon to observe 50% or more of the initial sample of firms failing to survive the long horizon examined in the study.

(ii) Problems of statistical inferences arise in long-horizon performance studies. Sample firms' long-horizon returns tend to be cross-correlated even if

⁷⁷ Random errors in risk estimation and thus in abnormal return estimation can be a serious problem if the researcher correlates estimated abnormal returns with firm-specific variables like financial data and proxies for trading frictions. The random error weakens the correlation and thus the test's power.

the event is not perfectly clustered in calendar time (Bernard, 1987; Brav, 2000). Long-horizon return data are highly right skewed, which poses problems in using statistical tests that assume normality (see Barber and Lyon, 1997; Kothari and Warner, 1997; Brav, 2000). Because of the statistical properties of return data, the literature raises questions whether the appropriate return measure is buy-and-hold returns or monthly returns cumulated over a long period (see Roll, 1983; Blume and Stambaugh, 1983; Conrad and Kaul, 1993; Fama, 1998; Mitchell and Stafford, 2000). Loughran and Ritter (2000) discuss additional inference problems that arise because the timing of events is endogenous. For example, we witness IPO waves either because there are periods of good investment opportunities and/or because issuers believe the market is overvalued. As a result, it is possible that misvalued event firms contaminate the benchmark portfolios (e.g., market, size, and book-to-market portfolios) and inferences from market efficiency tests are flawed.

(iii) Skewness of financial variables (returns and or earnings) coupled with non-randomness in data availability and survivor biases can produce apparent abnormal performance and a spurious association between ex ante information variables like analysts' growth forecasts and ex post long-horizon price performance (see Kothari et al., 1999b). As noted above, in long-horizon studies, it is not uncommon to encounter data availability for less than 50% of the initial sample either because post-event financial data are unavailable or because firms do not survive the post-event long horizon. If this decline in sample size is not random with respect to the original population of firms experiencing an event, then inferences based on the sample examined by a researcher can be erroneous. Kothari et al. (1999b) present evidence to suggest both skewness in financial data and non-random survival rates in samples drawn from CRSP, Compustat, and IBES databases.

Long-horizon market inefficiency studies generally report larger magnitudes of abnormal returns for subsets of firms. These subsets of firms often consist of small market capitalization stocks, stocks that trade at low prices with relatively large proportionate bid–ask spreads, stocks that are not traded frequently (i.e., illiquid stocks), and stocks that are not closely followed by analysts and other information intermediaries in the market (Bhushan, 1994). The pronounced indication of market inefficiency among stocks with high trading frictions and less information in the market is interpreted as prices being set as if the market naïvely relies on biased analyst forecasts. While this is possible, there is at least one alternative explanation. The data problems discussed above are likely more prevalent in samples where we observe the greatest degree of apparent inefficiency. Careful attention to data problems will help discriminate between competing explanations for evidence that currently is interpreted as market inefficiency.

4.4.1.3. A theory of market inefficiency and specification of the null hypothesis. In addition to potential risk measurement and data problems discussed above, there is another challenge in drawing definitive conclusions about market efficiency. While much of the research concludes market inefficiency, further progress will be made if researchers develop a theory that predicts a particular return behavior and based on that theory design tests that specify market inefficiency as the null hypothesis. Researchers should then design powerful tests that fail to reject that null hypothesis. An excellent example of such research is Bernard and Thomas (1990), who specify stock-price behavior under a naïve earnings expectation model as well as a sophisticated earnings expectation model. However, there is still a need for a well-developed theory of naïve investor behavior that can be subjected to empirical testing in other contexts or a theory that would be helpful in explaining observed return behavior in contexts such as those discussed below.

Currently the null of market efficiency is rejected regardless of whether positive or negative abnormal return (i.e., under- or over-reaction) is observed. A theory of market inefficiency should specify conditions under which market under- and over-reaction is forecasted. For example, why does the market overreact to accruals in annual earnings (as in Sloan, 1996), but underreact to quarterly earnings information as seen from the post-earnings announcement drift? What determines the timing of abnormal returns in the long-horizon studies? For example, why does Frankel and Lee's (1998, Table 8 and Fig. 2) fundamental valuation strategy, which is designed to exploit mispricing, produce relatively small abnormal returns in the first 18 months, but large returns in the following 18 months? Sloan (1996, Table 6) finds that more than half of the three-year hedge portfolio return (i.e., lowest minus the highest accrual decile portfolio) return is earned in the first year and a little less than one-sixth of the three-year return is earned in the third year of the investment strategy.

Some have priors that the inefficiency would be corrected quickly, whereas others argue it can take a long time. For example, W. Thomas (1999, p. 19) in his analysis of the market's ability to process information about the persistence of the foreign component of earnings, states: "... I proceed under the assumption that mispricing is more likely to cause only a short-term relation with abnormal returns while unidentified risk is more likely to cause a short- and long-term relation with abnormal returns." If transaction costs, institutional holdings, and other related characteristics are an impediment to speedy absorption of information in stock prices, then long-horizon studies should test whether there is a positive relation between the horizon over which abnormal returns are earned and proxies for the information environment. If large stocks earn abnormal returns for several years, I would interpret that as damaging to the market inefficiency hypothesis.

Another important reason for the demand for a theory of market inefficiency is to understand what might cause markets to be inefficient (i.e., why might prices deviate systematically from economic fundamentals?). Several empirical studies document that intrinsic values estimated using the residual income model predict future returns (see Lee (1999), and discussion below for summaries). However, the residual income model or the dividend-discount model provides little guidance in terms of why we should expect to predict future returns using estimated intrinsic values. Such a prediction requires a theory for why and where prices would deviate systematically from intrinsic values so the theory can be tested empirically.⁷⁸ The theory would either use investors' behavioral biases or trading frictions to predict deviations of security prices from their intrinsic values. Accounting researchers' efforts on fundamental analysis and tests of market efficiency would be more fruitful if some energy is channeled into the development and tests of theories of inefficiency.

4.4.1.4. Summary. Long-horizon performance studies and tests of market efficiency are fraught with methodological problems. The problems in data bases, potential danger of researchers engaging in data snooping, non-normal statistical properties of data, and research design issues collectively weaken our confidence in the conclusion that markets are grossly inefficient in processing information in news events quickly and unbiasedly. I foresee considerable research that attempts to overcome the problems faced in long-horizon tests so that we can draw more definitive conclusions about market efficiency. Capital markets researchers in accounting should exploit their knowledge of institutional details and financial data and design more creative long-horizon tests of market efficiency. However, the challenges in designing better tests also underscore the need for a sophisticated training in cutting-edge research in finance and econometrics.

4.4.2. Evidence from event studies

Short-window tests: Like the evidence in the financial economics literature, most of the evidence from short-window event studies in the capital markets literature in accounting is consistent with market efficiency. However, some evidence suggests market inefficiency. This is discussed in the context of post-earnings-announcement drift and functional fixation.

Evidence suggests the market's reaction to news events is immediate and unbiased. Consider the market's reaction to earnings announcements as reported in two illustrative studies: Lee (1992) and Landsman and Maydew

⁷⁸The parallels here are Jensen and Meckling's (1976) agency theory to explain deviations from the Modigliani and Miller (1958) and Miller and Modigliani (1961) no-effects predictions for corporate finance in frictionless markets, and Watts and Zimmerman's (1978) contracting and political cost hypotheses to explain firms' preference among alternative accounting methods in informationally efficient capital markets.

(1999). Lee (1992) uses intra-day return and trading volume data. He observes a statistically significant price reaction of the same sign as the earnings surprise. The reaction occurs within 30 min of the earnings announcement, with no statistically discernible price effect thereafter. Investors' trading volume reaction reported in Lee (1992) is also short lived: less than 2 h for large trades and a few hours for small trades. Landsman and Maydew (1999) analyze the market's reactions to earnings announcements over three decades. They too find that the stock return volatility and trading volume are significantly greater on earnings announcement days, but the activity reverts to normal conditions immediately thereafter.

The above findings reinforce previous evidence in Beaver (1968) and May (1971) using weekly price and trading volume data around annual and quarterly earnings announcement dates and Patell and Wolfson's (1984) intraday return analysis around earnings announcements. Other research offers a variety of refinements to suggest that the market predictably discriminates between different types of news announcements and the information content of those announcements. For example, several studies report an inverse relation between the information content (i.e., price and trading volume reaction) of earnings announcements and transaction costs and pre-disclosure (or interim) information (see Grant, 1980; Atiase, 1985, 1987; Bamber, 1987; Shores, 1990; Lee, 1992; Landsman and Maydew, 1999). Others examine the effects of audit quality, seasonality, accrual errors in first three quarters versus the fourth quarter, transitory earnings, etc. on the stock price reaction to earnings announcements (e.g., Teoh and Wong, 1993; Salamon and Stober, 1994; Freeman and Tse, 1992) and find evidence generally consistent with rationality in the cross-sectional variation in the market's response.

Long-horizon tests: There has been a surge of research on long-horizon tests of market efficiency in recent years. Collectively this research reports economically large abnormal returns following many events. As noted earlier, there are methodological questions about this evidence. I review the evidence of long-horizon abnormal performance following earnings announcements, accrual management, analysts' forecast optimism, and accounting method changes.

4.4.2.1. Post-earnings-announcement drift. Post-earnings-announcement drift is the predictability of abnormal returns following earnings announcements. Since the drift is of the same sign as the earnings change, it suggests the market underreacts to information in earnings announcements. Ball and Brown (1968) first observe the drift. It has been more precisely documented in many subsequent studies.⁷⁹ The drift lasts up to a year and the magnitude is both statistically and

⁷⁹ See Jones and Litzenger (1970), Brown and Kennelly (1972), Joy et al. (1977), Watts (1978), Foster et al. (1984), Rendleman et al. (1987), Bernard and Thomas (1989, 1990), Freeman and Tse (1989), Mendenhall (1991), Wiggins (1991), Bartov (1992), Bhushan (1994), Ball and Bartov (1996), and Bartov et al. (2000), among others.

economically significant for the extreme good and bad earnings news portfolios. A disproportionate fraction of the drift is concentrated in the three-day periods surrounding future quarterly earnings announcements, as opposed to exhibiting a gradually drifting abnormal return behavior. Because of this characteristic and because almost all of the drift appears within one year, I characterize the drift as a short-window phenomenon, rather than a long-horizon performance anomaly. The profession has subjected the drift anomaly to a battery of tests, but a rational, economic explanation for the drift remains elusive.

The property of the drift that is most damaging to the efficient market hypothesis is documented in detail in Rendleman et al. (1987), Freeman and Tse (1989), and Bernard and Thomas (1989, 1990). Collectively, these studies show that the post-earnings-announcement abnormal returns are consistent with the market acting as if quarterly earnings follow a seasonal random walk process, whereas the true earnings process is more complicated. In particular, the true process might be more accurately described as a seasonally differenced first-order auto-regressive process with a seasonal moving-average term to reflect the seasonal negative autocorrelation (Brown and Rozeff, 1979). A large fraction of the drift occurs on subsequent earnings announcement dates and the drift consistently has the predicted sign for the extreme earnings portfolios. These properties diminish the likelihood of an efficient markets explanation for the drift.

Numerous studies seek to refine our understanding of the drift. Ball and Bartov (1996) show that the market is not entirely naïve in recognizing the time-series properties of quarterly earnings. However, their evidence suggests the market underestimates the parameters of the true process. So, there is predictability of stock performance at subsequent earnings announcement dates. Burgstahler et al. (1999) extend the Ball and Bartov (1996) result by examining the market's reaction to special items in earnings. Their results also suggest the market only partially reflects the transitory nature of special items. Soffer and Lys (1999) dispute Ball and Bartov's (1996) results. Using a two-stage process to infer investors' earnings expectations, Soffer and Lys (1999, p. 323) "are unable to reject the null hypothesis that investors' earnings expectations do not reflect any of the implications of prior earnings for future earnings". Abarbanell and Bernard (1992) conclude that the market's failure to accurately process the time-series properties of earnings is due in part to dependence in analysts' forecast errors (also see Lys and Sohn, 1990; Klein, 1990; Abarbanell, 1991; Mendenhall, 1991; Ali et al., 1999).

Research attempting to understand whether the market's earnings expectations are naïve has used security prices to infer the expectations. While this approach has many desirable properties, J. Thomas (1999) warns of the danger of incorrect inferences and Brown (1999) proposes an alternative approach examining whether the time-series properties of analysts' forecasts exhibit the naïve property. If not, then the search for alternative explanations for the observed security return behavior gains credibility.

Bhushan (1994) shows that the magnitude of the drift is positively correlated with the degree of trading frictions, which makes commercial attempts to exploit the drift economically less attractive. Bartov et al. (2000) examine whether the magnitude of the drift is decreasing in investor sophistication, as proxied for by the extent of institutional ownership in a stock (see Hand, 1990; Utama and Cready, 1997; Walther, 1997; El-Gazzar, 1998). Brown and Han (2000) examine predictability of returns for the subset of firms whose earnings exhibit first-order auto-regressive property, which is far less complex than the Brown and Rozeff (1979) model. They conclude that the market fails to recognize the autoregressive earnings property only for firms that have relatively less pre-disclosure information (i.e., small firms with relatively unsophisticated investors). Even in these cases, they find the drift is asymmetric in that the drift is observed for large positive, but not negative, earnings surprises.⁸⁰

Attempts to explain the drift on the basis of transaction costs and investor sophistication, in my opinion, are not entirely satisfying. Since a non-trivial fraction of the drift shows up on one-to-three-quarters-ahead earnings announcement days, there is a substantial opportunity for a number of market participants to exploit the mispricing, at least in the case of stocks experiencing good earnings news. Many of these market participants likely engage in trades in similar stocks for other reasons, so the marginal transaction costs to exploit the drift are expected to be small. Risk mismeasurement is also unlikely to explain the drift because the drift is observed in almost every quarter and because it is concentrated in a few days around earnings announcements.

Another stream of research in the accounting and finance literature examines whether the post-earnings announcement drift (or the earnings-to-price effect) is incremental to or subsumed by other anomalies (see Fama and French (1996), Bernard et al. (1997), Chan et al. (1996), Raedy (1998), Kraft (1999), and discussion in Section 4.4.3). The anomalies examined include the size, book-to-market, earnings-to-price, momentum, industry, trading volume, long-term contrarian investment strategy, past sales growth, and fundamental analysis effects, and combinations of these effects.⁸¹ Kraft (1999) concludes

⁸⁰Since Brown and Han (2000) focus on a relatively small fraction (20%) of the population of firms, their tests might have lower power.

⁸¹The following studies report evidence on the anomalies: Banz (1981) on the size effect; Basu (1977, 1983) on the earnings-to-price effect; Rosenberg et al. (1985) and Fama and French (1992) on the book-to-market effect; Lakonishok et al. (1994) on the sales growth (or value-versus-glamour) and cash-flow-to-price effects; DeBondt and Thaler (1985, 1987) on the long-term contrarian effect; Jegadeesh and Titman (1993) and Rouwenhorst (1998) on the short-term momentum effect; Moskowitz and Grinblatt (1999) on the industry-factor effects to explain the momentum effect; Lee and Swaminathan (2000) on the momentum and trading volume effects; and Lev and Thiagarajan (1993) and Abarbanell and Bushee (1997, 1998) on the fundamental analysis effect.

that other anomalies or the Fama–French three-factor model (see Fama and French, 1993) do not subsume the drift, whereas evidence in Fama and French (1996) suggests that their three-factor model explains the earnings-to-price effect.

4.4.2.1.1. Summary. The post-earnings announcement drift anomaly poses a serious challenge to the efficient markets hypothesis. It has survived a battery of tests in Bernard and Thomas (1989, 1990) and many other attempts to explain it away. It appears to be incremental to a long list of anomalies that are inconsistent with the joint hypothesis of market efficiency and an equilibrium asset-pricing model. The survival of the anomaly 30 years after it was first discovered leads me to believe that there is a rational explanation for it, but evidence consistent with rationality remains elusive.

4.4.2.2. Accounting methods, method changes and functional fixation

4.4.2.2.1. Research design issues. Capital markets research has long examined whether the stock market is efficient with respect to cross-sectional differences in firms' use of accounting methods and to changes in accounting methods. Since most accounting method choices do not in themselves create a cash flow effect, tests of market efficiency with respect to accounting methods have been an easy target. However, this has proved to be one of the more difficult topics. Firms' choice of accounting methods and their decisions to change methods are not exogenous. Cross-sectional differences in firms' accounting method choice potentially reflect underlying economic differences (e.g., differences in investment–financing decisions, growth opportunities, debt and compensation contracts, etc.; see Watts and Zimmerman, 1986, 1990). The economic differences contribute to variations in the expected rates of return and price–earnings multiples. Therefore, an assessment of the pricing of accounting effects is clouded by the effect of underlying economic differences among the firms.

Accounting method change events also have their pros and cons in testing market efficiency. Managers' decisions to change accounting methods typically follow unusual economic performance and accounting method changes might be associated with changes in the firms' investment and financing decisions. For example, Ball (1972), Sunder (1975), and Brown (1980) find that the average earnings and stock-return performance of firms switching to income-decreasing LIFO inventory method are above normal in the period leading up to the inventory accounting method change. Since changes in economic performance and changes in investment and financing decisions are generally associated with changes in expected rates of return, accurate assessment of long-horizon risk-adjusted performance following accounting method changes is tricky. Another practical problem with an event study approach to accounting method changes is that many firms do not publicly announce the accounting method change, so there

can be considerable uncertainty associated with the date the market learns about the method change.⁸²

Another problem is that surprise announcements of accounting method changes themselves often convey information that causes market participants to reassess firm value.⁸³ For example, the market frequently greets firms' announcements of changes in capitalization and revenue recognition policies with large price swings (e.g., on March 18, 1992, Chambers Development Co. experiences a –63% stock price reaction to its announcement that it would expense instead of capitalize development costs; see Revsine et al., 1999, pp. 19–23). Some academics and the financial press interpret the reaction as the market's fixation on reported accounting numbers because the accounting method change in itself did not affect the firm's cash flow for the accounting period. The reasoning is only partially right in that the accounting method change might easily have influenced the market's expectation of future cash flows. Thus, in order to interpret the market's reaction to accounting method changes as consistent with market efficiency, one must model changes in cash flow expectations concurrent with the accounting method change and other cash flow effects arising from contracting, tax, and/or regulatory considerations.

4.4.2.2.2. Evidence: accounting method differences. A large body of literature examines whether the market is mechanically fixated on reported earnings. The conclusion that emerges from this literature is that broadly speaking the market rationally discriminates between non-cash earnings effects arising from the use of different accounting methods. However, an unresolved and contentious question is whether there is a modest degree of inefficiency. I believe the evidence is fairly strong that managerial behavior is consistent with the market behaving as if it is functionally fixated on reported accounting numbers, but that the security price behavior itself is at worst only modestly consistent with functional fixation.

Beaver and Dukes (1973) is probably the first study to examine whether the stock market rationally recognizes the non-cash effects of accounting methods on reported earnings in setting security prices. They compare the price–earnings ratios of firms using accelerated and straight-line depreciation methods. Consistent with market efficiency, they find that accelerated depreciation firms' price–earnings ratios exceed those of straight-line depreciation method firm. Moreover, the difference more or less disappears once the straight-line depreciation method firms' earnings are restated to those obtained under the accelerated depreciation method. Additional analysis also reveals

⁸²With increasing pressure on firms to publicly disclose accounting events like method changes and the decreasing costs of electronically searching for the information, it is easier in today's environment to precisely identify the announcement date of an accounting method change.

⁸³See the literature on signaling and voluntary disclosure.

that the accelerated and straight-line depreciation samples of firms did not exhibit statistically or economically significant differences in systematic risk or earnings growth (see Beaver and Dukes, 1973, Table 2).

Many other studies examine market efficiency with respect to accounting method differences. Lee (1988) and Dhaliwal et al. (2000) examine differences in price–earnings ratios between LIFO and non-LIFO firms. Dukes (1976) shows that the market values research and development costs as an asset even though they are expensed for reporting purposes (also see Lev and Sougiannis, 1996; Aboody and Lev, 1998). Evidence also suggests that the market began to reflect pension liabilities even before they appeared on financial statements (Dhaliwal, 1986) and a firm's risk reflects the debt equivalence of operating leases (see Lipe (2000, Section 2.3.2) for a summary of evidence).

While there is considerable evidence consistent with market efficiency, some discordant notes coexist. Vincent (1997) and Jennings et al. (1996) examine stock prices of firms using the purchase and pooling-of-interests accounting methods for mergers and acquisitions. They find that firms using the purchase accounting method are disadvantaged. The authors compare the price–earnings ratios of the firms using the pooling method to those using the purchase method. For this comparison, they restate earnings numbers of the pooling method firms as if these firms used the purchase accounting method. They find that the price–earnings ratios of the pooling method firms are higher than the purchase accounting method users.

The Vincent (1997) and Jennings et al. (1996) evidence is consistent with the conventional wisdom among investment bankers that Wall Street rewards reported earnings and thus prefers pooling-of-interests earnings. Regardless of whether the conventional wisdom is valid in terms of security price behavior, it appears to have a real effect on the pricing of acquisitions accounted for using the pooling or purchase method. Nathan (1988), Robinson and Shane (1990), and Ayers et al. (1999) all report that bidders pay a premium for a transaction to be accounted for as pooling of interests. Lys and Vincent (1995) in their case study of AT&T's acquisition of NCR, conclude that AT&T spent about \$50 to possibly as much as \$500 million to account for the acquisition using the pooling method.

To complement the analysis of pricing and premium magnitudes in pooling and purchase accounting, researchers also examine long-horizon returns following merger events accounted for using the pooling and purchase methods. Hong et al. (1978) and Davis (1990) are early studies of acquirers' post-merger abnormal returns. They examine whether abnormal returns to acquirers using the purchase method are negative, consistent with the market reacting negatively to goodwill amortization after the merger. Neither study finds evidence of the market's fixation on reported earnings.

Rau and Vermaelen (1998) and Andrade (1999) reexamine post-merger performance of pooling and purchase method users employing state-of-the-art techniques to estimate long-horizon abnormal returns and using larger samples of mergers from recent decades. They reach somewhat opposite conclusions. Rau and Vermaelen (1998) compare the post-merger returns of a third of the acquirers reporting the largest earnings impact of merger accounting against the middle and lowest third of the acquirers ranked according to the merger earnings impact. The post-merger one-, two-, or three-year returns for the three samples are not statistically different from zero or different from each other. Andrade (1999) also examines the post-merger performance, but uses regression analysis with controls for a large number of confounding variables. He finds a positive and statistically significant 18-month abnormal return effect attributable to the merger-accounting impact on earnings. However, the effect is “one order of magnitude smaller than implied by practitioners’ views” (Andrade, 1999, Abstract). He therefore concludes that “it makes little sense for managers to expend time, effort, and resources in structuring the deal so as to improve its impact on reported EPS” (Andrade, 1999, p. 35).

Andrade (1999) also analyzes merger announcement-period returns to test whether the market reaction is increasing in the merger-accounting-earnings effect. He observes a statistically significant, but economically small positive impact of merger accounting earnings. This is weakly consistent with functional fixation. Hand (1990) advances an “extended” version of the functional fixation hypothesis. It argues that the likelihood that the market is functionally fixated is decreasing in investor sophistication. Hand (1990) and Andrade (1999) find evidence consistent with extended functional fixation in different types of accounting event studies.⁸⁴ This is similar to the negative relation between the magnitude of post-earnings-announcement drift and investor sophistication discussed earlier in this section.

Summary: Differences in accounting methods (e.g., purchase versus pooling accounting for mergers and acquisitions) can produce large differences in reported financial statement numbers without any difference in the firm’s cash flows. We do not observe systematic, large differences in the prices of firms employing different accounting methods. This rules out noticeable magnitudes of market fixation on reported financial statement numbers. There is some evidence, however, to suggest that over long horizons differences in accounting methods produce measurable differences in risk-adjusted stock returns. Whether these abnormal returns suggest a modest degree of market inefficiency or they are a manifestation of the problems in accurately measuring long-horizon price performance is unresolved.

⁸⁴See Ball and Kothari (1991) for theory and evidence that calls into question the extended functional fixation hypothesis.

4.4.2.2.3. Accounting method changes. Accounting method changes are distinct from accounting method differences in that method changes are the consequence of a deliberate action to change a method at a point in time and are thus amenable to an event study centered on the event of accounting method change. In contrast, accounting method differences between firms can persist indefinitely so long as firms continue with their respective accounting methods. Thus, there is no accounting event and therefore samples of firms with accounting method differences are typically not amenable to an event study.

Some of the earliest capital markets research analyzes accounting method changes as a means of testing market efficiency (see, for example, Ball, 1972; Kaplan and Roll, 1972; Archibald, 1972; Sunder, 1973, 1975). Collectively this research examines security returns at the time of and surrounding accounting method changes. Conclusions from this research are that the announcement effects of accounting method changes are generally small and the long-horizon performance of firms making accounting method changes is inconclusive with respect to the efficient markets hypothesis. The lack of conclusive results is because of cash flow effects of some method changes (e.g., switch to and from LIFO inventory method) and the endogenous and voluntary nature of accounting method changes. Therefore, there are information effects and potential changes in the determinants of expected returns associated with the method changes. In addition, much progress has been made in estimating the long-horizon performance in an event study (see Barber and Lyon, 1997; Kothari and Warner, 1997; Barber et al., 1999).

Many studies examine the stock-price effects of accounting method changes. Studies on firms' switch to and from LIFO inventory method are particularly popular; see, for example, Ricks (1982), Biddle and Lindahl (1982), Hand (1993, 1995). Evidence from these studies remains mixed. However, with the exception of Dharan and Lev (1993), a study that carefully re-examines long-horizon stock-price performance around accounting method changes using state-of-the-art long-horizon performance measurement techniques is sorely missing from the literature. Such a study would be timely in part because the long-horizon market inefficiency hypothesis has acquired currency in academic as well as practitioner circles.

4.4.2.3. Long-horizon returns to accrual management and analyst forecast optimism

4.4.2.3.1. The logic. Several studies examine long-horizon stock market efficiency with respect to accrual management and analysts' optimistic earnings growth forecasts. The crux of the argument is that information from firms' owners and/or managers and financial analysts about firms' prospects (e.g., earnings growth) reflects their optimism and that the market behaves naively in that it takes the optimistic forecasts at face value.

Firms' owners and managers and financial analysts have an incentive to issue optimistic forecasts.⁸⁵ Owners and managers issuing new equity can reap benefits if the issue price is inflated. Owners and managers are hypothesized to attempt to inflate the price of initial public offerings or seasoned equity offerings by influencing the market's expectations of future earnings. Toward this end, they manipulate upward reported earnings through discretionary accounting accruals.

Financial analysts' incentive to issue optimistic forecasts stems from the fact that the investment-banking firms they work for derive benefits from investment banking and brokerage business of the client firms. Optimistic forecasts potentially generate greater business from the clients. In addition, optimistic forecasts might induce client managements to share private information with the financial analysts.

The cost of accrual management and optimistic forecasts is a loss of credibility and reputation for accuracy in the event that accrual management and forecast optimism are detected. In addition, there is the potential danger of facing lawsuits and civil and criminal penalties for fraud in the event of an eventual decline in share prices when future earnings realizations suggest forecast optimism. Owners, managers, and financial analysts must trade off the potential benefits against the costs. The benefits from accrual manipulation and analysts' optimism obviously depend in part on the success in inflating security prices. The market's failure to recognize the optimistic bias in accruals and analysts' forecasts requires a theory of market inefficiency that is still being developed and tested in the literature. There are at least three reasons for systematic mispricing of stocks resulting from the market's naïve reliance on optimistic information. They are the presence of frictions and transaction costs of trading, limits on market participants' ability to arbitrage away mispricing, and behavioral biases that are correlated among market participants (e.g., herd behavior). Capital markets research testing market efficiency primarily examines whether there is evidence of accrual manipulation and forecast optimism and whether securities are systematically mispriced. The literature in accounting is yet to develop theories of market inefficiency, which have begun to appear in the finance and economics journals.

4.4.2.3.2. Evidence. Several studies present challenging evidence to suggest that discretionary accruals in periods immediately prior to initial public offerings and seasoned equity offerings are positive.⁸⁶ Evidence in these studies also suggests the market fails to recognize the earnings manipulation, which is inferred on the basis of predictable subsequent negative long-horizon price

⁸⁵Managers' incentives are assumed to be aligned with owners' incentives. In an IPO, this assumption is descriptive because managers are often also major owners and/or managers have substantial equity positions typically in the form of stock options.

⁸⁶See Teoh et al. (1998a–c), Teoh and Wong (1999), and Rangan (1998).

performance. Negative, statistically significant cross-sectional association between ex ante estimated accrual manipulation and stocks' ex post price performance exists, which violates market efficiency.

A well-developed literature examines whether analysts' forecasts are optimistic at the time of initial or seasoned equity offerings. Hansen and Sarin (1996), Ali (1996), and Lin and McNichols (1998a) fail to find optimism in short-term analysts' forecasts around equity offerings. Lin and McNichols (1998a) and Dechow et al. (2000) hypothesize that analysts' long-term forecasts might be optimistic because the market places less emphasis on the accuracy of long-term forecasts and long-term forecasts are more relevant for valuation than short-term forecasts. The Lin and McNichols (1998a) and Dechow et al. (2000) evidence on long-term forecast optimism is conflicting: Lin and McNichols (1998a, Table 2, p. 113) report negligible optimistic bias (lead analysts forecast 21.29% growth versus unaffiliated analysts forecast 20.73% growth), whereas the Dechow et al. (2000, Table 2, p. 16) evidence suggests a large bias (affiliated analysts 23.3% versus unaffiliated analysts 16.5%). Dechow et al. argue that stocks' long-horizon negative performance following seasoned equity offerings is due to the market's naïve fixation on analysts' optimistic long-term earnings growth forecasts. They show that the bias in analysts' long-term growth forecasts is increasing in the growth forecast, and post-equity-offer performance is negatively related to the growth rate at the time of the equity offers. Unlike Dechow et al., Lin and McNichols (1998a) do not find a difference in future returns.

Research also examines whether analysts affiliated with the investment-banking firm providing client services are more optimistic in their earnings forecasts and stock recommendations than unaffiliated analysts' forecasts. Rajan and Servaes (1997), Lin and McNichols (1998a), and Dechow et al. (2000) all report that affiliated analysts issue more optimistic growth forecasts than unaffiliated analysts. Similarly, Michaely and Womack (1999) and Lin and McNichols (1998a, b) find that affiliated analysts' stock recommendations are more favorable than unaffiliated analysts' recommendations.

4.4.2.3.3. Assessment of the evidence. The body of evidence in this area challenges market efficiency. However, there are several research design issues that are worth addressing in future research. Many of these are discussed elsewhere in the review. First, as discussed in the context of discretionary accrual models (Section 4.1.4), estimation of discretionary accruals for non-random samples of firms like IPO firms and seasoned equity offering firms is problematic. Long horizons further complicate the tests. In addition, the evidence in Collins and Hribar (2000b) that previous findings of accrual manipulation in seasoned equity offering firms using the balance sheet method might be spurious is damaging to the market inefficiency hypothesis not only because of problems in estimating discretionary accruals but also for the following logical reason. Consider the evidence in Teoh et al. (1998a) that

estimated discretionary accruals of seasoned equity offering firms are negatively correlated with subsequent returns. Collins and Hribar (2000b) show that the estimated discretionary accruals are biased (i.e., accrual manipulation result is spurious) and that the bias is correlated with the seasoned equity offering firms' merger and acquisition activity. This means subsequent abnormal returns are unrelated to management's discretionary accruals, and instead appear to be correlated with firms' merger and acquisition activity. Thus, either the market is fixated on discretionary accruals or the market commits systematic errors in processing the valuation implications of merger and acquisition activity. As always, the possibility of some other phenomenon driving the return behavior following seasoned equity offerings exists.

Second, the association between *ex ante* growth forecasts or other variables and *ex post* performance variables might be spuriously strengthened because of survivor biases and data truncation (see Kothari et al. (1999b), and discussion earlier in this section).

Third, long-horizon performance measurement is problematic. Techniques that recognize long-horizon issues should be used to estimate abnormal performance (e.g., the Carhart (1997) four-factor model or the Fama and French (1993) three-factor model, or the Daniel et al. (1997) characteristic-based approach). Some argue that the three- and four-factor models in the finance literature are empirically motivated and lack a utility-based theoretical foundation. More importantly, these models might over-correct for the systematic component in stock returns in that returns to factors like book-to-market might indicate systematic mispricing, i.e., market inefficiency (see, e.g., Dechow et al., 2000). Even if empirically motivated factors were to merely capture systematic mispricing (rather than represent compensation for risk), it is important to control for these factors in estimating abnormal returns. The reason is straightforward. Researchers typically test whether a treatment variable or an event generates abnormal performance. If similar performance is also produced by another variable, like firm size to book to market, then it becomes less plausible that the observed performance is attributable to the treatment variable or the event. Abnormal performance can be realized by simply investing in potentially many stocks of similar characteristics regardless of whether or not they experience the event studied by the researcher.

Finally, classification of affiliated and unaffiliated analysts is not exogenous. As discussed in the section on the properties of analysts' forecasts, it is possible that firms choose those investment bankers whose analysts are (genuinely) most optimistic (i.e., give the highest forecasts) from among all the analysts.⁸⁷ So, we expect the affiliated analysts to have larger forecast errors than the

⁸⁷If my assumption is not descriptive of the process of selection of an affiliated analyst investment-banking firm, the criticism is not applicable.

unaffiliated analysts. Therefore, the evidence that affiliated analysts' forecasts are more biased than unaffiliated analysts' forecasts is not particularly helpful. Research must attempt to demonstrate that analysts bias their forecasts upward because of the lure of investment-banking business (i.e., demonstrate causality).

4.4.3. *Cross-sectional tests of return predictability*

Cross-sectional tests of return predictability differ from event studies in two respects. First, to be included in the analysis, firms need not experience a specific event like seasoned equity issue. Second, return predictability tests typically analyze returns on portfolios of stocks with specific characteristics (e.g., quintile of stocks reporting largest ratios of accruals to total assets or extreme analysts' forecasts) starting with a common date each year, whereas the event date in event studies is typically not clustered in calendar time.

Cross-sectional return predictability tests of market efficiency almost invariably examine long-horizon returns, so they face the problems discussed previously. Four problems are worth revisiting. First, expected return mismeasurement can be serious in long-horizon tests. Second, researchers typically focus on stocks exhibiting extreme characteristics (e.g., extreme accruals) that are correlated with unusual prior performance, so changes in the determinants of expected return are likely to be correlated with the portfolio formation procedure. Third, survival bias and data problems can be serious, in particular if the researcher examines extreme performance stocks. Finally, since there is perfect clustering in calendar time, tests that fail to control for cross-correlation likely overstate the significance of the results.

There are two types of cross-sectional return predictability tests frequently conducted in accounting: predictability tests that examine performance on the basis of univariate indicators of market's mispricing (e.g., earnings yield, accruals, or analysts' forecasts) and tests that evaluate the performance of multivariate indicators like the fundamental value of a firm relative to its market value (e.g., Ou and Penman, 1989a, b; Abarbanell and Bushee, 1997, 1998; Frankel and Lee, 1998; Piotroski, 2000). Both sets of tests provide strong evidence challenging market efficiency. Both univariate and multivariate indicators of mispricing generate large magnitudes of abnormal performance over a one-to-three-year post-portfolio-formation periods. The focus of future research should be to address some of the problems I have discussed above in reevaluating the findings of the current research from return-predictability tests. I summarize below the evidence from the two types of return-predictability tests.

4.4.3.1. *Return predictability using univariate indicators of mispricing.* Early tests of return predictability using univariate indicators of mispricing used

earnings yield (e.g., Basu, 1977, 1983). This evidence attracted considerable attention in the literature and the evidence from the earnings yield and other anomalies eventually led to multi-beta CAPM models like the Fama–French three-factor (i.e., market, size, and book-to-market) model or Carhart (1997) four-factor model that also includes momentum as a factor.

The recent flurry of research in return-predictability tests examines whether indicators other than earnings yield generate long-horizon abnormal performance. Examples of this research include the Lakonishok et al. (1994) tests based on cash flow yield and sales growth; the LaPorta (1996) and Dechow and Sloan (1997) tests of market overreaction stemming from analysts' optimism; and the Sloan (1996), Collins and Hribar (2000a, b) and Xie (1999) tests of the market's overreaction to extreme accrual portfolios.

The theme most common in this literature is that the market overreacts to univariate indicators of firm value and it corrects itself over a long horizon. The overreaction represents market participants' naïve fixation on reported numbers and their tendency to extrapolate past performance. However, because there is mean reversion in the extremes (e.g., Brooks and Buckmaster, 1976), the market's initial reaction to extreme univariate indicators of value overshoots fundamental valuation, and thus provides an opportunity to earn abnormal returns.⁸⁸

While many of the univariate indicators of return-predictability suggest market overreaction, using both cash flow and earnings yield as indicators of market mispricing suggests market underreaction. One challenge is to understand why the market underreacts to earnings, but its reaction to its two components, cash flows and accruals, is conflicting. Previous evidence suggests that the market underreacts to cash flow and overreacts to accruals. Recently research has begun to address these issues theoretically as well as empirically. For example, Bradshaw et al. (1999) examine whether professional analysts understand the mean reversion property of extreme accruals. They find that analysts do not incorporate the mean reversion property of extreme accruals in their earnings forecasts. Bradshaw et al. (1999, p. 2) therefore conclude "investors do not fully anticipate the negative implications of unusually high accruals". While Bradshaw et al.'s explanation is helpful in understanding return predictability using accruals, it would be of interest to examine whether similar logic can explain the cash flow and earnings yield anomalies. Extreme earnings and cash flows are also mean reverting. What is predicted about analysts' forecasts with respect to these two variables and how does that explain the market's underreaction to earnings?

⁸⁸ Variations of the overreaction and extrapolation of past performance arguments appear in the following studies. Lakonishok et al. (1994) in the context of past sales growth and current cash flow and earnings yield; Sloan (1996) in the context of accruals; and LaPorta (1996) and Dechow and Sloan (1997) in the context of analysts' forecasts.

While much evidence suggests market over- and under-reaction, other studies are inconsistent with such market behavior. For example, Abarbanell and Bernard (2000) fail to detect the stock market's myopic fixation on current performance, i.e., market overreaction. Ali et al. (1999) undertake a different approach to understand whether market participants' naïveté contributes to cross-sectional return predictability using accruals. As several researchers hypothesize in the post-earnings-announcement drift literature, Ali et al. (1999) test whether returns to the accruals strategy are greater in magnitude for the high transaction cost, low analyst following, and low institutional ownership stocks. The literature hypothesizes these characteristics proxy for low investor sophistication, so a given level of accrual extremity in these stocks should yield greater magnitudes of abnormal returns than high investor sophistication stocks. Ali et al. (1999) do not find significant correlation between investor sophistication and abnormal returns. Zhang (2000) draws a similar conclusion in the context of market's fixation on analyst forecast optimism and auto-correlation in forecast revisions. These findings make it less likely that returns to the accrual strategy and apparent return reversals following analysts' optimistic forecasts arise from investors' functional fixation. The evidence makes it more likely that the apparent abnormal returns represent compensation for omitted risk factors, statistical and survival biases in the research design, biases in long-horizon performance assessment, or period-specific nature of the anomaly. Naturally, further research is warranted.

4.4.3.2. Return predictability using multivariate indicators of mispricing. Ou and Penman (1989a, b) use a composite earnings change probability measure called *Pr*. They estimate the *Pr* measure from a statistical data reduction analysis using a variety of financial ratios. The *Pr* measure indicates the likelihood of a positive or negative earnings change. Ou and Penman (1989a, b) report positive abnormal returns to the *Pr*-measure-based fundamental strategy.

The Ou and Penman (1989a, b) studies attracted a great deal of attention in the literature. They rejuvenated fundamental analysis research in accounting, even though their own findings appear frail in retrospect. Holthausen and Larcker (1992) find that the *Pr* strategy does not work in a period subsequent to that examined in Ou and Penman (1989a, b). Stober (1992) and Greig (1992) interpret returns to the *Pr* strategy as compensation for risk. Stober (1992) reports that abnormal performance to the *Pr* strategy continues for six years and Greig (1992) finds that size subsumes the *Pr* effect.

Lev and Thiagarajan (1993), Abarbanell and Bushee (1997, 1998), and Piotroski (2000) extend the Ou and Penman analysis by exploiting traditional rules of financial-ratio-based fundamental analysis to earn abnormal returns. They find that the resulting fundamental strategies pay double-digit abnormal returns in a 12-month period following the portfolio-formation date. The

conclusion of the market's sluggish adjustment to the information in the ratios is strengthened by the fact that future abnormal returns appear to be concentrated around earnings announcement dates when the earnings predictions of the analysis come true (see Piotroski, 2000).

Frankel and Lee (1998), Dechow et al. (1999), and Lee et al. (1999) extend the multivariate fundamental analysis to estimating stocks' fundamental values and investing in mispriced stocks as suggested by their fundamental values. They use the residual income model combined with analysts' forecasts to estimate fundamental values and show that abnormal returns can be earned.⁸⁹

5. Summary and conclusions

In this paper I review research on the relation between capital markets and financial statement information. I use an economics-based framework of demand for and supply of capital markets research in accounting to organize the paper. The principal sources of demand for capital markets research are fundamental analysis and valuation, tests of market efficiency, the role of accounting in contracts and in the political process, and disclosure regulation. In summarizing past research, I critique existing research as well as discuss unresolved issues and directions for future research. In addition, I offer a historical perspective of the genesis of important ideas in the accounting literature, which have greatly influenced future accounting thought in the area of capital markets research. An exploration of the circumstances, forces, and concurrent developments that led to significant breakthroughs in the literature will hopefully guide future accounting researchers in their career investment decisions.

Ball and Brown (1968) heralded capital markets research into accounting. Key features of their research, i.e., positive economics championed by Milton Friedman, Fama's efficient markets hypothesis, and the event study research design in Fama et al. (1969), were the cornerstones of the economics and finance research taking place concurrently at the University of Chicago. History repeated itself with Watts and Zimmerman's positive accounting theory research in the late 1970s. While the above are just two examples, many other developments in accounting are also influenced by concurrent research and ideas in related fields. The important conclusion here is that rigorous training in and an on-going attempt to remain abreast of fields beyond accounting will enhance the probability of successful, high-impact research.

⁸⁹ Lee et al. (1999) results are also somewhat frail in that they fail to find abnormal returns unless they use information in the short-term risk-free rates in calculating fundamental values. Since fundamental analysis never emphasized the importance of, let alone the need of, information in short-term interest rates, I interpret their evidence as not strong.

Section 4 surveys empirical capital markets research. The topics include methodological research (e.g., earnings response coefficients, time series and analysts' forecasts, and models of discretionary accruals); research examining alternative performance measures; valuation and fundamental analysis research; and finally, accounting research on tests of market efficiency. The areas of greatest current interest appear to be research on discretionary accruals, influence of analysts' incentives on the properties of their forecasts, valuation and fundamental analysis, and tests of market efficiency. The revival of interest in fundamental analysis is rooted in the mounting evidence that suggests capital markets might be informationally inefficient and that prices might take years before they fully reflect available information. Fundamental valuation can yield a rich return in an inefficient market. A large body of research demonstrates economically significant abnormal returns spread over several years by implementing fundamental analysis trading strategies. Evidence suggesting market inefficiency has also reshaped the nature of questions addressed in the earnings management literature. Specifically, the motivation for earnings management research has expanded from contracting and political process considerations in an efficient market to include earnings management designed to influence prices because investors and the market might be fixated on (or might over- or under-react to) reported financial statement numbers.

Evidence of market inefficiency and abnormal returns to fundamental analysis has triggered a surge in research testing market efficiency. Such research interests academics, investors, and financial market regulators and standard setters. The current rage is examination of long-horizon security price performance. However, this research is methodologically complicated because of skewed distributions of financial variables, survival biases in data, and difficulties in estimating the expected rate of return on a security. Progress is possible in testing market efficiency if attention is paid to the following issues. First, researchers must recognize that deficient research design choices can create the false appearance of market inefficiency. Second, advocates of market inefficiency should propose robust hypotheses and empirical tests to differentiate their behavioral-finance theories from the efficient market hypothesis that does not rely on investor irrationality. The above challenges in designing better tests and refutable theories of market inefficiency underscore the need for accounting researchers trained in cutting-edge research in economics, finance, and econometrics.

6. Uncited References

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