

Stock Prices and Earnings: A History of Research

Patricia M. Dechow, Richard G. Sloan,
and Jenny Zha

Haas School of Business, University of California, Berkeley, California 94720;
email: patricia_dechow@haas.berkeley.edu, richard_sloan@haas.berkeley.edu,
jenny_zha@haas.berkeley.edu

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Abstract

Accounting earnings summarize periodic corporate financial performance and are key determinants of stock prices. We review research on the usefulness of accounting earnings, including research on the link between accounting earnings and firm value and research on the usefulness of accounting earnings relative to other accounting and nonaccounting information. We also review research on the features of accounting earnings that make them useful to investors, including the accrual accounting process, fair value accounting, and the conservatism convention. We finish by summarizing research that identifies situations in which investors appear to misinterpret earnings and other accounting information, leading to security mispricing.

1. INTRODUCTION

No other single event has been found to explain more of the cross-sectional variation in stock returns than the earnings announcement. Earnings announcements are the primary mechanism through which public companies provide periodic financial performance updates to investors. It is therefore not surprising that a considerable body of academic research examines the relation between stock prices and earnings. Our goal is to review this voluminous literature. We emphasize at the outset that this review is not intended to be comprehensive. Instead, we identify the areas that we consider to be most important and provide a summary and analysis of key papers. The sequence in which we cover these areas closely follows their development in chronological time, although issues of pedagogy frequently lead us to deviate from a pure chronology.

We begin our review by summarizing research on the usefulness of earnings in setting stock prices. We first review research examining whether investors use information in earnings announcements. This research makes no attempt to model how the information in earnings announcements is used; rather, it simply examines the relation between the announcements and various measures of stock market activity. This research establishes that earnings announcements contain information that is used by investors to make their trading decisions. We next review research examining how investors use information in earnings announcements to set stock prices. This research must model how investors use information in earnings announcements to update their expectations of future cash flows on the underlying stocks. We close the first section by reviewing research identifying factors affecting the relative usefulness of earnings compared to other competing sources of accounting and nonaccounting information.

The second section covers research examining the underlying characteristics of accounting earnings that influence their usefulness to investors. This research moves beyond treating earnings as a black box, by examining how the procedures followed by accountants in producing earnings affect their usefulness. We begin with a review of research on accrual accounting. The accrual accounting process is designed to provide investors with timely and relevant information about expected future cash flows rather than simply reporting past cash flows. We review research examining the success of accrual accounting in achieving this objective. We next review research on conservatism. Conservatism refers to the tendency of accounting rules to err in the direction of understating earnings in the face of uncertainty. Examples include the immediate expensing of R&D and the requirement that assets be written down when they have been impaired, but not up when they have appreciated. We conclude the section by examining research on the use of fair values in accounting. The use of fair value accounting has increased over time and is shifting the role of accounting away from summarizing past transactions and toward forecasting future transactions.

The third section summarizes research examining whether stock prices correctly reflect information in earnings and their components. This research models how information in earnings and their components can be used to forecast future cash flows and then assesses whether investors appear to use the correct model. We begin by reviewing research on the post-earnings-announcement drift (PEAD). This research suggests that investors underreact to “good” and “bad” news in earnings announcements. We next review research on the accrual anomaly. This research establishes that the accrual component of earnings is less persistent than the cash flow component and provides evidence that investors do not fully anticipate the lower persistence of the accrual component. We conclude this section with a selective review of research on value investing, which involves investing in stocks that appear to be priced cheaply relative to fundamental metrics such as earnings.

We conclude the review by summarizing the key insights from past research and identifying some opportunities for future research.

2. RESEARCH ON THE USEFULNESS OF EARNINGS IN SETTING STOCK PRICES

2.1. Are Earnings Announcements Useful?

The earnings announcement is the primary event through which corporations provide periodic performance updates to investors. In the United States, publicly listed firms have been required since 1970 to file detailed quarterly income statements with the Securities and Exchange Commission on Form 10-Q. Most companies also announce earnings to investors ahead of their Form 10-Q filing through voluntary earnings announcements. The information provided in these voluntary earnings announcements varies widely and ranges from a brief summary of bottom line earnings to a detailed set of financial statements. Because earnings announcements are the primary mechanism through which earnings are first communicated to investors, they were the focus of early research on the usefulness of earnings.

The most basic question addressed by early research is whether investors react to earnings announcements. There are at least two reasons why earnings announcements could lack informational value. First, the procedures used to compute earnings could be so riddled with measurement error that they could render earnings of little use to investors. Second, the information contained in earnings announcements could be conveyed to investors through other more timely sources, such as dividend announcements or new product announcements. Beaver (1968) provides the seminal paper in this area. He investigates whether earnings announcements lead to significant increases in trading volume and stock price volatility. A key feature of Beaver's research design is that it does not require modeling investor expectations. In other words, there is no attempt to determine whether specific earnings announcements convey good versus bad news. Instead, the focus is on whether earnings announcements convey any news at all. The drawback of this research design is that it cannot provide insights into exactly how investors use information in earnings announcements. Nevertheless, it provides an important first step in establishing whether or not earnings announcements convey useful information.

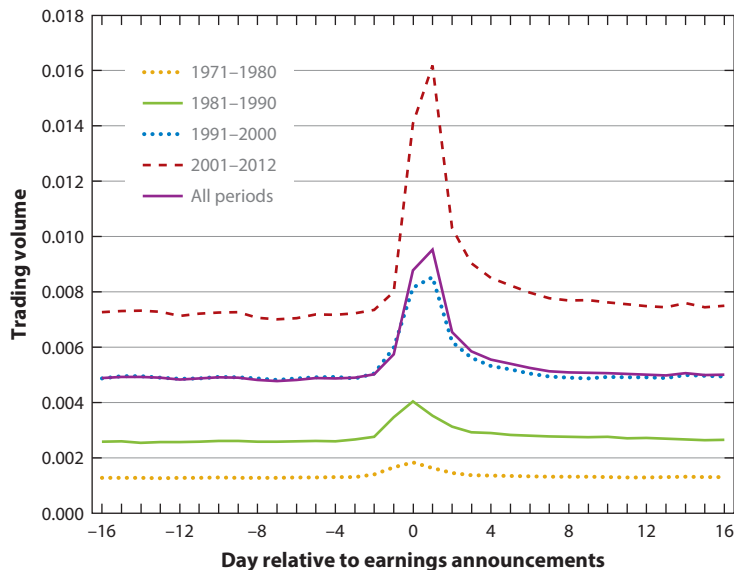
We provide an updated replication of Beaver's (1968) key volume and price tests in **Figure 1**. Beaver used annual earnings announcements, since quarterly announcements were less common during his sample period. He also imposed several requirements to rule out confounding events, such as focusing on firms with non-December fiscal year-ends. His results, and our replication of his results, provide strong support for the hypothesis that earnings announcements convey information to investors. **Figure 1a** demonstrates that trading volume approximately doubles around earnings announcements, while **Figure 1b** shows that squared abnormal stock returns (or price residual returns) approximately double around earnings announcements. Also interesting is that the information content of earnings announcements was highest during the most recent 2001–2012 subperiod. It is not clear what caused the information content of earnings to increase during this period. Finally, we learn something different from the price and volume tests. The price tests tell us that earnings announcements cause investors, in aggregate, to revise their expectations about firm value. The volume tests suggest that trading activity is important for price discovery around earnings announcements, suggesting that the valuation implications of earnings are not immediately clear to all investors.

2.2. Is the Earnings Number Useful?

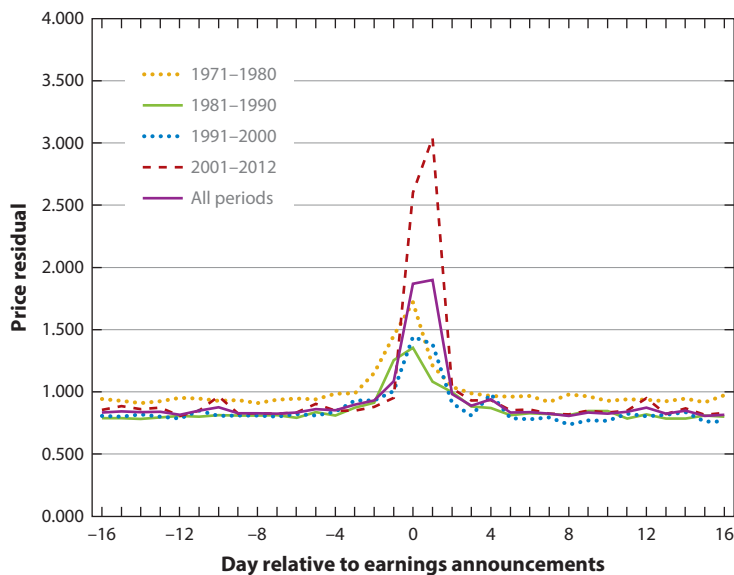
Beaver's (1968) research design speaks to the usefulness of information in earnings announcements but does not speak directly to whether and how investors use the bottom line earnings number. Although Benston (1967) was first to investigate the relation between stock price changes and earnings changes, Ball & Brown (1968) is commonly regarded as the seminal paper in this

area. They develop a model of what investors expect earnings to be and then define positive earnings surprises as good news and negative earnings surprises as bad news. This research design allows them to provide empirical evidence contrary to claims that accounting earnings are useless. Ball & Brown's research design hinges on three assumptions regarding how investors use earnings in setting prices. First, markets are assumed to be efficient so that price movements can be interpreted as rational responses to new information about firm value. Second, higher earnings are

a Trading volume analysis



b Price residual analysis



assumed to be indicative of higher firm value. Third, their model of expected earnings is assumed to correctly reflect investors' earnings expectations. In this latter respect, Ball & Brown use a naïve expectations model in which earnings are expected to be the same as in the previous year and a regression model in which unexpected earnings are defined as the residual from a regression of earnings changes on a market-wide index of earnings changes. The results are quite similar across the different expectations models.

We provide an approximate replication of Ball & Brown's (1968) key empirical results in **Figure 2**. This figure plots cumulative abnormal stock returns around earnings announcements for equally weighted portfolios of good news and bad news firms using the naïve expectations model. Despite using an updated and more comprehensive sample, our results are remarkably similar to those presented by Ball & Brown. Their key results are summarized as follows. First, the earnings number clearly reflects information that is used by investors, as the cumulative spread between the good news and bad news portfolios is approximately 30% over the 18 months surrounding the earnings announcement. Second, the annual earnings announcement does not rank highly as a timely medium, given that 85%–90% of the return spread occurs before the announcement. More timely sources likely include other earnings-related announcements, such as interim earnings announcements and management earnings forecasts. This conclusion therefore only relates to the information content of the annual earnings announcement and not the information content of all earnings-related announcements. Third, the market appears to underreact to annual earnings announcements, because the cumulative return spread between the good and bad news portfolios continues to increase for at least two months after the announcement month. This final result is not emphasized in Ball & Brown's conclusion, perhaps because it is difficult to reconcile with the market efficiency assumption underlying their research design; yet, it subsequently spawned much additional research, which we discuss in Section 4.

2.3. How is the Earnings Number Used?

Ball & Brown (1968) assume a rudimentary link between earnings and stock prices. They simply assume that unexpectedly high (low) earnings will lead to an increase (decrease) in stock prices. There is no attempt to specify the functional form of the relation between earnings surprises and revisions in expectations of future cash flows. Indeed, Ball & Brown (1968, p. 177) contend that there are some difficult econometric problems associated with specifying the relationship between the magnitude of the unexpected income change and the associated stock price adjustment. Perhaps for this reason, little progress had been made prior to Kormendi & Lipe's (1987) work in this area. They start with the proposition that a firm's stock price equals the present value of the

Figure 1

This figure replicates Beaver's (1968) tests of volume and price reactions to earnings announcements over the past 40 years. We plot the (a) trading volume and (b) price residual during the $[-16, 16]$ window surrounding the earnings announcement. Our sample is comprised of 762,032 firm-quarters from 1971 to 2012. Quarterly earnings announcement dates (RDQ) are available from Compustat starting in 1971. Volume and price information from CRSP must be non-missing from 16 days before the announcement date to 16 days after the announcement date. With less restrictive sample criteria than Beaver (1968), we include all fiscal year-end firms and both quarterly and annual earnings announcements. In panel a, trading volume reaction is calculated as the daily volume (VOL) divided by the number of shares outstanding (SHROUT) from CRSP. In panel b, price residual is calculated as u^2/s^2 , where u^2 is the squared residual of the firm's daily return on the S&P Composite Index return, and s^2 is the variance of all firms' residuals from regressing returns on the S&P Composite Index return that day.

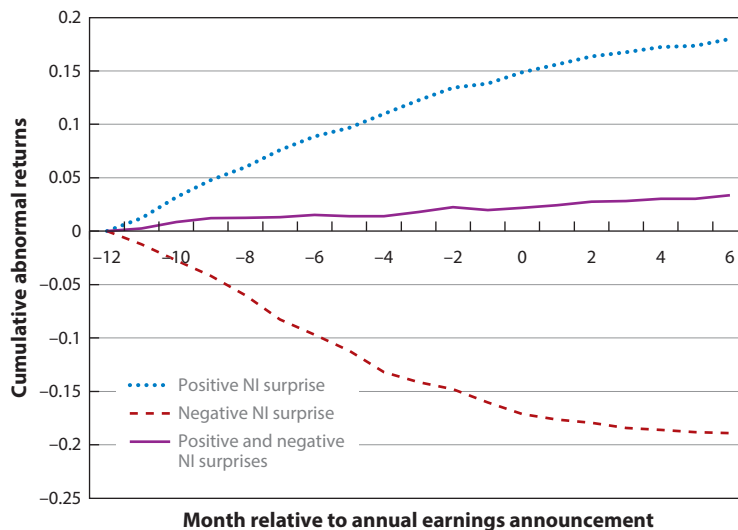


Figure 2

Following Ball & Brown (1968), we plot the cumulative abnormal returns over the $[-12, 6]$ month window for firms with positive (negative) annual earnings surprises and for all firms. Our sample is comprised of 165,224 firm-years from 1971 to 2012 that have non-missing earnings, returns, and earnings announcement dates. Annual earnings are measured as net income (NI) from Compustat. Cumulative abnormal returns are market-adjusted returns using the CRSP equal-weighted return, accumulated from 12 months before the earnings announcement month. Fourth-quarter earnings announcements dates (RDQ) are available from Compustat starting in 1971. Returns from CRSP must be non-missing from 12 months before the announcement month to 6 months after the announcement month. Our sample criteria are less restrictive than those of Ball & Brown (1968), who required CRSP price observations for 100 months and included only December fiscal year-end firms. Earnings surprise is the actual earnings minus the expected earnings ($X_t - E[X_t]$). We use the naïve model for earnings expectations such that a positive (negative) annual change in earnings defines a positive (negative) earnings surprise.

expected future benefits accruing to its equity holders. They then make the assumptions that (a) the present value of the revisions in expected future earnings approximates the present value of the revisions in these expected future benefits, and (b) the market's earnings expectations can be approximated by a univariate time-series model. These assumptions allow them to specify the functional form of the relation between earnings surprises and stock returns. In this respect, assumption *a* simply asserts that there is an association between future earnings and the future benefits accruing to equity holders. In particular, there is no attempt to explain why this should be the case.

The key prediction tested by Kormendi & Lipe (1987) is that the magnitude of the stock price reaction to an earnings innovation is positively related to the persistence of the earnings innovation, as estimated from their univariate time-series model of earnings. Their assumptions allow them to specify the exact functional form of the relationship between earnings innovations and stock price changes. However, they decide not to rely exclusively on tests of whether observed stock prices conform exactly to the predicted functional form on the grounds that assumptions *a* and *b* are only approximations. Instead, they examine the less restrictive hypothesis that the stock price reaction to an earnings innovation has a positive relation with the estimated persistence of the earnings innovation over a cross section of firms. Their results confirm this hypothesis, reporting a Pearson correlation of 0.39 between the stock price response to earnings announcements and

estimated earnings persistence. In follow-up tests, however, they note that the magnitude of the stock price response is only approximately 35% as large as predicted by their valuation model, consistent with violations of assumptions *a* and *b*.

Kormendi & Lipe (1987) helped to spawn a large body of research on the determinants of the earnings response coefficient (ERC), which is the coefficient obtained from a regression of stock returns on contemporaneous earnings surprises. Kormendi & Lipe identify the persistence of earnings innovations as an important determinant of the ERC. Other ERC determinants identified in subsequent research include the market-to-book ratio (Collins & Kothari 1989, Easton & Zmijewski 1989) and the components of the discount factor used to discount the future benefits to equity holders, including the risk free rate (Collins & Kothari 1989) and the beta (Easton & Zmijewski 1989). In addition, Hayn (1995) shows that ERCs are lower for firms reporting losses, consistent with accounting losses being less persistent than accounting profits.

2.4. When Are Earnings Relatively Less Useful?

Although earnings are one important determinant of stock prices, there are clearly other accounting and nonaccounting determinants, including balance sheet values and nonfinancial indicators such as customer satisfaction. There is a large body of research investigating these other determinants of stock prices; next, we review a subset of the papers identifying significant determinants.

2.4.1. Other income statement numbers. The earliest research in this area asks whether considering the components of the income statement helps explain stock returns versus a simple focus on bottom line earnings. Lipe (1986) employs the same research design as Kormendi & Lipe (1987), and classifies income statement line items into six components, testing whether differentially modeling the persistence of each component improves the forecasts of future earnings. Lipe finds that decomposing earnings improves forecasts, although the improvements are not large and subsequent research rarely engages in such decompositions. One notable and intuitive finding by Lipe (1986) is that items classified as “other” on the income statement are significantly less persistent than the remaining components of earnings. This line item captures many nonrecurring items, such as gains and losses on asset sales and asset write-downs. Consistent with the lower persistence of this component of earnings, Lipe also finds that innovations in “other” components of earnings lead to smaller stock price revisions.

Subsequent research confirms Lipe’s (1986) findings. Fairfield, Sweeney & Yohn (1996) find that income statement amounts relating to extraordinary items, discontinued operations, and special items are all significantly less persistent than “recurring” components of income. Elliott & Hanna (1996) and Burgstahler, Jiambalvo & Shevlin (2002) find that stock prices partially reflect the lower persistence of earnings attributable to asset write-downs and special items. Consequently, subsequent research on the pricing of earnings sometimes employs various measures of recurring earnings. One common approach to doing this is to use the “actual” earnings numbers distributed by data aggregators, such as I/B/E/S, that collect analysts’ earnings forecasts. Many companies report pro forma earnings numbers in their unaudited earnings announcements. These pro forma numbers exclude various components of earnings, such as nonrecurring items and stock-based compensation expense. The sell-side analysts following these companies usually forecast the pro forma earnings number, and so the actual earnings number that I/B/E/S reports is the realized pro forma earnings as opposed to the realized net income number reported in the firm’s audited financial statements. Several studies show that the pro forma numbers reported by I/B/E/S are more closely associated with stock prices than the numbers reported in the audited financial statements (e.g., Bradshaw & Sloan 2002, Brown & Sivakumar 2003).

2.4.2. Balance sheet numbers. Another potentially important source of information about firm value is the balance sheet. The balance sheet lists the assets (future economic benefits) and liabilities (future economic obligations) of the firm. If the accounting process successfully identified all such benefits and obligations and valued them at their fair values, then the balance sheet itself would be sufficient for determining firm value. The balance sheet, however, relies on amortized historical costs for many assets (e.g., property, plant and equipment) and ignores other assets altogether (e.g., internally generated intangibles). Because of these measurement issues, early research assumed that the balance sheet would be less relevant than the income statement for valuation.

One of the major catalysts for a change in thinking regarding the role of the balance sheet was the seminal paper by Ohlson (1995). Ohlson formalized the role of accounting numbers in firm valuation, enabling research to move beyond Kormendi & Lipe's (1987) assertion that future earnings correspond to the future benefits being valued by investors. Loosely speaking, as Ohlson noted, valuation theory indicates that investors should value future dividends. Because dividends can be inferred from the excess of accounting earnings over the change in the book value of equity, Ohlson notes that we can recast the traditional dividend valuation model in terms of future accounting earnings and book values. The resulting expression indicates that firm value is equal to the sum of the current book value of common equity plus the present value of all future residual income, where residual income is a linear combination of earnings and book values.

Ohlson's analysis indicates that if residual income is transitory and difficult to forecast, then firm value can be approximated by book value. For example, consider a closed-end fund that holds a portfolio of liquid equity securities that are valued on the balance sheet based on their recent market quotations. The value of such a fund can be approximated by its accounting book value, given that the earnings of the fund, which consist largely of the gains and losses on the investment portfolio, are expected to fluctuate unpredictably from period to period. Therefore, book value should be relatively more useful in determining firm value when assets and liabilities are carried at fair value.

Research in this area generally confirms the dual role of earnings and book values in explaining firm value. Collins, Maydew & Weiss (1997) find that the combined explanatory power of earnings and book values has remained fairly constant at between 50% and 60% over their sample period. However, they also find that the incremental value relevance of earnings has declined, whereas the incremental value relevance of book values has increased. They explain much of this shift through a marked increase in nonrecurring charges to earnings and negative earnings in the latter part of their sample period.

A related line of research examines the relative importance of earnings and book values in explaining the value of financially distressed firms. Burgstahler & Dichev (1997) show that firm value is a convex function of earnings and book value that depends on the ratio of earnings to book value. Earnings better explain firm value when the ratio is high and firms are likely to remain in the same line of business; book value better explains firm value when the ratio is low and firms are likely to adapt their resources to alternative uses. Similarly, Barth, Beaver & Landsman (1998), using a sample of bankrupt firms, show that the relative weight of earnings (book value) in explaining firm value increases (decreases) with financial health. Finally, Collins, Pincus & Xie (1999) explore different potential explanations for the greater value relevance of book values in loss-making firms. They find that book values serve as a relatively good proxy for expected future earnings in loss firms and as a good proxy for abandonment value in firms that are most likely to cease operations and liquidate.

2.4.3. Other sources of information. The research discussed thus far analyzes the usefulness of accounting information. Another line of research investigates the usefulness of earnings compared to the broader information set that extends beyond accounting information. Beaver, Lambert & Morse

(1980) set the stage for this research by building on Ball & Brown's (1968) finding that much of the information in earnings is reflected in security prices months in advance. In particular, Beaver, Lambert & Morse (1980) demonstrate that the earnings expectations reflected in security prices are more accurate than the time-series earnings expectations models they examine. Collins, Kothari & Rayburn (1987) build on Beaver, Lambert & Morse by identifying firm size as an important determinant of cross-sectional variation in the extent to which prices anticipate earnings. They argue that firm size proxies for the amount of information and the number of financial intermediaries processing information.

Subsequent research investigates the reasons for earnings' lack of timeliness and attempts to identify the other more timely sources of value relevant information. Interestingly, this research was particularly popular during the Internet bubble of the late 1990s, during which time security prices seemed particularly out of line with accounting numbers. Lev & Zarowin (1999) find that the usefulness of accounting numbers declined through the 20 years prior to their study and attribute the decline primarily to the failure of the accounting system to adequately reflect innovative activities. Related research investigates specific industries in order to identify the key drivers of value. Amir & Lev (1996) examine the cellular phone industry and find that indicators of subscriber growth are particularly important determinants of firm value; Trueman, Wong & Zhang (2001) examine the Internet industry and find that unique visitors and page views are important determinants of stock prices. In this respect, it is important to point out that the accounting rules use the sales transaction as a trigger for the recognition of value creation. Thus, in early-stage companies, investors are likely to look to other sources of information that anticipate future sales.

3. WHAT MAKES EARNINGS USEFUL?

The prior section discusses research on the usefulness of accounting earnings and other accounting numbers. In this section, we discuss research on the underlying characteristics of accounting numbers that were intended to make them useful. Accounting numbers are the result of the application of a voluminous set of Generally Accepted Accounting Principles (GAAP) that continue to evolve over time. In order to identify the characteristics of accounting numbers that make them useful, it is helpful to begin by specifying a "naïve" accounting system that could be readily implemented without reference to GAAP. The natural choice is a cash accounting system, whereby the financial position of a business is measured by the magnitude of its cash holdings, and the earnings of the business are measured by the net cash generated during the period, inclusive of any cash paid to the owners. Research has analyzed three important features of GAAP that are designed to make accounting numbers more useful than those generated by cash accounting. The first characteristic is the accrual accounting process, through which the accounting system recognizes certain noncash expected future benefits and obligations. The second characteristic is conservatism, which calls for the exercise of prudence in the recognition and measurement of future benefits and obligations under conditions of uncertainty. The third is fair value accounting, which allows certain future benefits and obligations to be valued based on either market quotations or management's assessment of fair value. We discuss research on each of these three characteristics below.

3.1. Accruals

In its simplest form, the value of a stock is worth the expected future dividend payments discounted at the equity cost of capital. Earnings do not directly enter the equation. So why is it that the market appears to respond so heavily to earnings news? The Financial Accounting Standards Board (FASB 2010, p. 4) states the following in its *Statement of Financial Accounting Concepts No. 8*:

OB17. Accrual accounting depicts the effects of transactions, and other events and circumstances on a reporting entity's economic resources and claims in the periods in which those effects occur, even if the resulting cash receipts and payments occur in a different period. This is important because information about a reporting entity's economic resources and claims and changes in its economic resources and claims during a period *provides a better basis for assessing the entity's past and future performance than information solely about cash receipts and payments during that period.* [emphasis added]

However, others doubt this assumption and take the view that “cash is king.” For example, as articulated by Shepherd (2012):

While many investors focus on a company's earnings per share (EPS), there are other metrics that may be more indicative of a company's prospects for growth. That's because *EPS can be easily manipulated and isn't always an accurate representation of how much cash a business has at its disposal*; management can game when certain expenses and revenue are recognized in addition to the myriad of other accounting gimmicks that can be employed to artificially inflate EPS. In short, earnings don't automatically translate into liquidity. [emphasis added]

So, which is better at measuring a firm's performance, earnings or cash flows? Dechow (1994) investigates this question. She assumes that markets are efficient and so prices reflect a broad set of information. Dechow (1994) analyzes the R^2 from yearly regressions of returns on earnings or cash flows. She finds that the explanatory power of earnings tends to dominate that of cash flows and shows that the accrual adjustments made to earnings are relatively more useful over shorter measurement periods (such as a quarter or a year versus four years), for firms with more volatile operating activities and for firms with longer operating cycles.

We perform a related test in **Figure 3**, which reports the R^2 from yearly cross-sectional regressions of price on various measures of annual earnings and cash flows per share. **Figure 3** reveals that the earnings measures are generally more strongly associated with value than the cash flow measures over the years 1971 to 2012. Consistent with Bradshaw & Sloan (2002), pro forma “street” earnings appear to have the highest R^2 , suggesting that removing nonrecurring items improves earnings' ability to reflect value. In a similar vein, Penman & Sougiannis (1998) use measures of dividends, cash flows, and earnings as separate inputs into finite-horizon valuation models to determine which measure is more highly associated with value. Consistent with Dechow (1994), they find earnings to be a more useful input than dividends or cash flows.

What does accrual accounting do and how does it improve earnings' ability to reflect periodic performance? The elements of accrual accounting fall into the following four categories:

1. Accruals anticipating future cash inflows: The revenue recognition principle allows firms to recognize revenue and record an asset before the cash is received, as long as revenue is realizable and earned (e.g., accounts receivable).
2. Accruals anticipating future cash outflows: Firms are required to anticipate certain costs that have not yet been incurred. This results in the recording of a corresponding liability or contra asset (e.g., warranty liability).
3. Deferrals delaying the recognition of expenses despite a current cash outflow: Firms can capitalize certain cash outlays as assets when they are expected to yield future economic benefits. For example, when a firm pays cash for inventory, the cost is capitalized and is not expensed until the inventory is sold (or impaired).

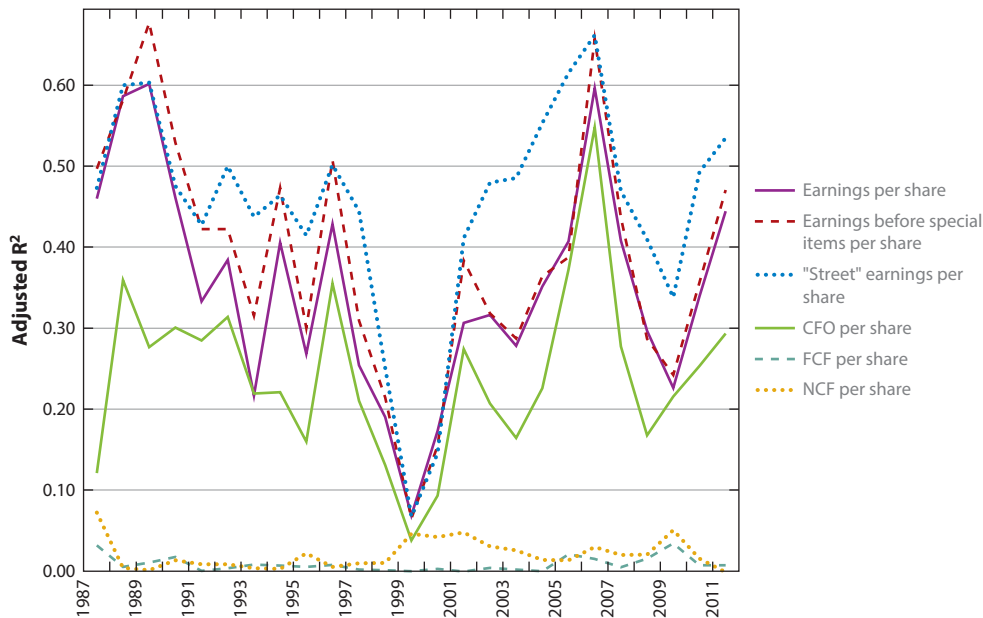


Figure 3

The adjusted R^2 of annual cross-sectional price regressions allows us to compare the explanatory power of earnings measures (earnings, earnings before special items, and “street” earnings) versus cash flow measures (CFO, FCF, and NCF) with respect to stock prices. Prices are obtained from CRSP and are measured three months after the fiscal year-end. Earnings per share are measured as income before extraordinary items (IB) divided by common shares outstanding (CSHO) from Compustat. Earnings before special items per share are measured as IB less special items (SPI), divided by CSHO. “Street” earnings per share is the actual annual EPS reported by I/B/E/S divided by CSHO. CFO per share is measured as cash flow from operations (OANCF) divided by CSHO. Free cash flow is measured as OANCF plus cash flow from investing (IANCF) divided by CSHO. Net cash flow is measured as the annual change in cash balance (ΔCH) divided by CSHO. All earnings and cash flow measures are set to missing at the 1% and 99% tails. Our sample consists of 42,259 firm-years from 1987 to 2011.

4. Deferrals delaying the recognition of revenues despite a current cash inflow: Firms are required to defer the recognition of revenue (a liability) when a customer pays cash in advance but the firm has not yet provided the good or service.

Category 1 makes the information in earnings timelier than cash flows. Categories 2 through 4 allow earnings to match costs with revenues and, as a consequence, reduce earnings volatility and increase earnings persistence relative to cash flows.

Dechow & Dichev (2002) empirically examine the association of accruals with past, present, and future cash flows. They run the following pooled cross-sectional regression:

$$\text{Accruals}_t = b_0 + b_1 \text{CFO}_{t-1} + b_2 \text{CFO}_t + b_3 \text{CFO}_{t+1} + e,$$

and find that $b_1 = 0.19$, $b_2 = -0.51$, and $b_3 = 0.18$. The coefficient b_1 indicates that accruals are positively related to past cash flows (consistent with categories 3 and 4); b_3 indicates that accruals are positively related to future cash flows (consistent with categories 1 and 2); and the negative coefficient on b_2 indicates that accruals perform a matching function (consistent with categories 2 and 3). Barth, Cram & Nelson (2001) investigate whether accrual components (such as accounts receivable, inventory, payables, and depreciation) are differentially useful for

predicting one-year-ahead cash flows. Their results are intuitive in that they find that accounts receivable are positively related to future cash flows and payables are negatively related to future cash flows.

The results discussed thus far suggest that when choosing a performance measure, if we have to choose between earnings and cash flows, then we should choose earnings. However, investors do not have to choose between these two measures and can incorporate information in both. If two firms in the same industry have the same \$100 earnings, but firm A's earnings are primarily composed of cash flows (\$90 cash, \$10 accruals) whereas firm B's earnings are primarily composed of accruals (\$10 cash, \$90 accruals), do both numbers convey the same information about future earnings and cash flows? Sloan (1996) investigates this question. First, he runs the following pooled cross-sectional earnings persistence regression, after first deflating the earnings measures by the amount of invested capital:

$$\text{Earnings}_{t+1} = d_0 + d_1 \text{Earnings}_t + e.$$

He finds that $d_1 = 0.84$, indicating that approximately 84% of current earnings persist into next year's earnings. Next, he decomposes current earnings into its accrual and cash components and repeats the regression:

$$\text{Earnings}_{t+1} = b_0 + b_1 \text{Accruals}_t + b_2 \text{CFO}_t + e.$$

He finds that $b_1 = 0.77$ and $b_2 = 0.86$. Because the accrual and cash flow components are not equally persistent, firms A and B will not have equally persistent earnings of 0.84. Firm A will have more persistent earnings than firm B because a greater portion of firm A's earnings is due to cash flows. In other words, earnings backed by cash flows are higher "quality" in the sense that they are more persistent.

There are two broad reasons why the accrual component is less persistent than the cash component: (a) Accruals are subject to estimation error and earnings management. Management cannot always perfectly forecast future benefits and obligations. Accounting rules are not perfect and can add noise. These estimation errors and their subsequent reversals adversely impact the persistence of earnings. (b) Accruals reflect sales growth. Accounting accruals capture investments in working capital related to firm growth, and diminishing returns to new investments can cause reductions in future accounting rates of return (see Fairfield, Whisenant & Yohn 2003).

Allen, Larson & Sloan (2013) empirically investigate the importance of these competing explanations for the lower persistence of the accrual component of earnings. They decompose accruals into three components: (a) "good" matching accruals that relate to recent past or future cash flows, (b) "good" accruals related to firm growth, and (c) the remaining measurement error in accruals. Their results indicate that matching accruals that map into surrounding cash flows improve earnings persistence; growth-related accruals, which are subject to diminishing returns, are less persistent; and the final measurement error component is by far the least persistent.

Dechow & Dichev (2002) hypothesize that accruals that do not map into past or future cash flows are likely to be of lower quality. They suggest that the magnitude of the residual from their regression (reported above) can be used to evaluate the extent of estimation error in earnings. They find firms with larger absolute residuals have larger absolute accruals, operate in more volatile environments, and have less persistent earnings.

In summary, the accrual accounting process improves earnings' ability to reflect periodic operating performance. However, as accruals are subject to measurement error, investors should realize that the accrual component of earnings is less persistent than the cash flow component of earnings. In Section 4, we discuss research investigating whether investors correctly price the accrual and cash flow components of earnings.

3.2. Conservatism

Conservatism tempers the accrual accounting process by calling for prudence in the face of uncertainty. Thus, although the accrual accounting process recognizes and measures expected future benefits and obligations, many uncertain expected benefits and obligations are either omitted or understated. Perhaps the most important manifestation of conservatism is that the expected benefits of future sales cannot be recognized until a sales transaction has taken place. Thus, although the value of a profitable ongoing business is driven by the expected profits on future sales, such expected benefits are not recognized by the accounting system until the sales occur. This is an important reason why the research discussed in Section 2 finds that accounting earnings are a relatively untimely source of information about firm value. In particular, Ball & Brown (1968) and Beaver, Lambert & Morse (1980) show that accounting numbers are an untimely source of information on firm value, whereas Amir & Lev (1996) and Trueman, Wong & Zhang (2001) identify other sources of more timely information.

Another important manifestation of conservatism is that certain investments cannot be recognized as future benefits. When a business makes certain types of investments to generate future sales, the accounting process generally allows the investments to be capitalized, recognizing a future benefit that is valued at amortized cost. Thus, although the amount of expected future cash flows cannot be recognized as benefits, the cost of the investments made to generate the future cash flows usually can be capitalized. When these investments subsequently generate benefits, the capitalized costs are amortized (i.e., recognized as an expense). Some investments, however, cannot be capitalized under current accounting rules; these include investments in research, development, and marketing. Numerous authors present evidence suggesting that the restrictions on capitalizing such investments adversely affect the value relevance of accounting information. For example, Lev & Zarowin (1999) show that changes in R&D spending are associated with the decreasing informativeness of earnings. Lev & Sougiannis (1996) estimate the R&D capital that is omitted from firms' book values and show that incorporating R&D capital in book values and earnings increases their value relevance. Finally, Penman & Zhang (2002) show that such conservative accounting practices lead to temporary distortions in accounting rates of return.

The two manifestations of accounting conservatism described above are often referred to as unconditional conservatism. This distinguishes them from a third common manifestation of conservatism that is referred to as conditional conservatism. Conditional conservatism refers to the asymmetric recognition of write-downs (also referred to as impairments) on past investments. Recall that most past investments are capitalized and valued at amortized historical cost. Conditional conservatism refers to a set of accounting rules that require these assets to be written down if their estimated fair values drop below their carrying values, but does not allow them to be upwardly revalued if their estimated fair values rise above their carrying values. Basu (1997) was the first to clearly articulate and document the impact of conditionally conservative accounting on the relation between prices and earnings. He shows that conditional conservatism results in asymmetric timeliness in the relation between earnings and stock returns, whereby negative stock returns are associated with relatively large negative earnings realizations, and positive stock returns are associated with relatively small positive earnings realizations. Basu's paper started a large literature attempting to explain cross-sectional variation in the extent to which firms' earnings exhibit asymmetric timeliness. A recent paper by Lawrence, Sun & Sloan (2013) shows that mandatory accounting rules are an important determinant. In particular, they show that asset write-downs are a nonlinear function of a firm's book-to-market ratio, with the nonlinearity being particularly pronounced around a book-to-market ratio of one, where the carrying value of the firm's assets exceeds the market value.

3.3. Fair Values

In the previous subsection, we indicated that most assets and liabilities are carried at amortized cost. Recent years, however, have witnessed a significant shift in accounting rules toward the use of fair values, particularly for financial assets. Certain financial assets have been carried at fair value for many years. Examples include financial securities with active quotations that are held for trading purposes and financial securities held by mutual funds. Accounting rules have increasingly called for the provision of fair values in accounting measurements and supplemental disclosures. These developments have led to a large body of research on the value relevance of fair value measurements.

Barth's (1994) seminal study investigates how the disclosed fair values of banks' investment securities and the associated gains and losses are reflected in security prices. The main finding is that fair values provide significant explanatory power for stock prices beyond that in historical costs. Barth's study tempered earlier conclusions that errors in fair value estimates compromise their value relevance. Subsequent research extended Barth's study to assess the value relevance of fair value estimates for banks' operating assets and liabilities, such as their loan portfolios. Relative to investment securities, operating assets such as banks' internally originated and serviced loans are generally more difficult to fair-value and are more likely to have proprietary value for the bank (e.g., goodwill associated with customer relationships). Hence, the benefits of fair value estimates are less clear in this setting, and the results of studies in this setting are also mixed. Barth, Beaver & Landsman (1996) find evidence of incremental explanatory power for loans' fair values. In contrast, Eccher, Ramesh & Thiagarajan (1996) and Nelson (1996) do not find robust evidence of value relevance for banks' operating assets and liabilities.

Asset revaluations offer a setting in which to evaluate the value relevance of fair values for nonfinancial assets. Although US accounting standards do not permit upward asset revaluations, they are permitted by international accounting standards. Specifically, international accounting standards allow for the upward revaluation of certain noncurrent assets when their fair values rise sufficiently above their carrying values. Researchers have investigated the value relevance of asset revaluations in places including the UK and Australia. This research includes Easton, Eddy & Harris (1993); Barth & Clinch (1998); Harris & Muller (1998); and Aboody, Barth & Kasznik (1999). The findings indicate that asset revaluations are reflected in stock prices and future operating performance. Research by Cotter & Richardson (2002) also finds that revaluations based on independent appraisals are somewhat more reliable than director-based revaluations.

More recently, fair value research has focused on the value relevance of fair value estimates using different inputs according to the fair value hierarchy established by US accounting standard setters. This hierarchy of inputs (Level 1, Level 2, and Level 3 inputs) classifies fair value measurement, from the most to the least verifiable and representationally faithful:

1. Level 1 inputs are defined as "quoted prices (unadjusted) in active markets for identical assets or liabilities that the reporting entity has the ability to access at the measurement date" (FASB 2011, ASC 820-35-40).
2. Level 2 inputs are "inputs other than quoted prices included within Level 1 that are observable for the asset or liability, either directly or indirectly" (FASB 2011, ASC 820-35-47).
3. Level 3 inputs are defined as "unobservable inputs for the asset or liability" (FASB 2011, ASC 820-35-52).

Several studies find that the value relevance of fair value measurements is greater for higher-level inputs (Kolev 2008; Goh, Ng & Yong 2009; Song, Thomas & Yi 2010). More recent

research by Altamuro & Zhang (2013) and Lawrence, Siriviriyakul & Sloan (2013), however, finds that Level 3 fair values better reflect underlying intrinsic values. This highlights a fundamental dilemma for fair value accounting: If market prices deviate from underlying intrinsic values, then using market prices to determine fair values can exacerbate mispricing.

4. DO STOCK PRICES CORRECTLY REFLECT INFORMATION IN EARNINGS?

Much of the research discussed above assumes that equity markets are efficient, using stock prices to evaluate the value relevance and usefulness of earnings. At the same time, a growing body of research offers evidence that is inconsistent with the efficient market hypothesis. Earnings and related accounting numbers feature prominently in this research, and the findings suggest that prices are surprisingly inefficient with respect to accounting information. First, prices take several months to fully reflect the information in earnings surprises. Second, prices seem to “fixate” on earnings, ignoring other accounting information that identifies temporary distortions in earnings. Third, value investment strategies exploiting deviations between prices and estimates of firm value based on accounting numbers generate superior long-run stock returns. We review research on these market inefficiencies below.

4.1. The Post-Earnings-Announcement Drift (PEAD)

PEAD refers to the phenomenon of abnormal stock returns’ tendency to be positive (negative) in the months following good (bad) news earnings announcements. Recall that Ball & Brown (1968) initially documented this phenomenon using annual earnings announcements. Foster, Olsen & Shevlin (1984) replicate Ball & Brown’s results using quarterly earnings announcements and a “seasonal random walk with drift” earnings expectations model. Their results indicate that in the 60 trading days following an earnings announcement, stocks ranked in the highest decile of earnings surprise outperform stocks ranked in the lowest decile of earnings surprise by approximately 6%. To put these results in perspective, these returns are approximately half as large as the corresponding returns in the 60 days leading up to and including the earnings announcement date, and so, approximately one-third of the overall response is delayed.

Figure 4 reports the cumulative returns to the PEAD strategy over the past 40 years, for stocks trading on major US exchanges. This implementation uses quarterly earnings announcements and a seasonal random walk earnings expectations model that goes long in the highest decile and short in the lowest decile of earnings surprises. The strategy is rebalanced every three months after the end of the fiscal quarter, which is typically at least a month after the corresponding earnings announcement. The returns cumulate to almost 400% over the 40 years examined (approximately 4% when annualized) and have been fairly consistent over time. The only multiyear periods of underperformance follow the stock market crashes of 2001 and 2008, which were likely accompanied by a sharp reversal in the fortunes of many companies.

A large body of subsequent research has examined possible explanations for PEAD. Bernard & Thomas (1989) examine a variety of explanations and conclude that it is a delayed response to new information. They find no support for the competing hypothesis that it is due to omitted risk premia. A companion study by Bernard & Thomas (1990) provides evidence that the drift reflects investors’ naïve reliance on a seasonal random walk earnings expectations model. The rational expectations model should reflect the fact that seasonal differences in quarterly earnings are positively serially correlated for up to three quarters. Bernard & Thomas (1990) show that the amount and timing of the drift is consistent with investors using the naïve seasonal random walk

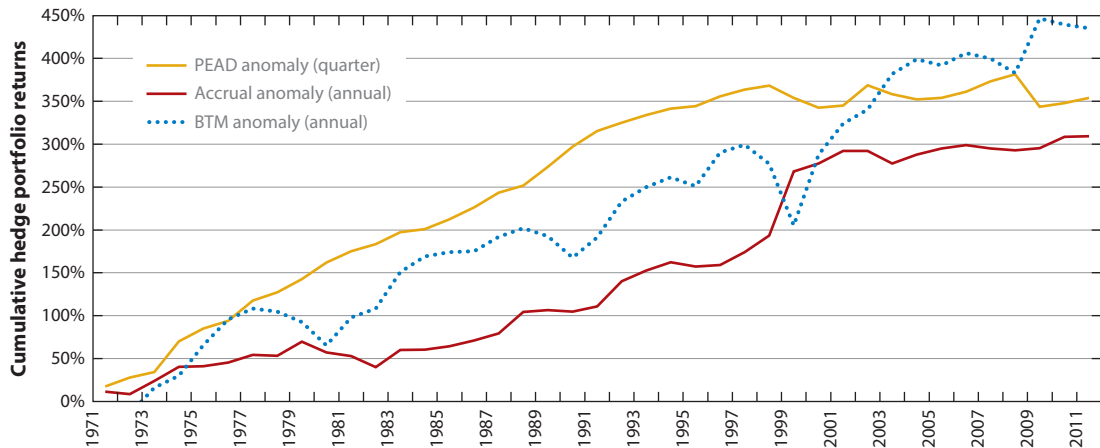


Figure 4

The cumulative hedge portfolio returns to the accrual anomaly, book-to-market (BTM) anomaly, and post-earnings-announcement drift (PEAD) anomaly show the extent to which these trading strategies have generated returns over the past 40 years. The accrual anomaly strategy is implemented by buying the decile of firms with the lowest accruals and shorting the decile of firms with the highest accruals. The decile portfolios are formed based on annual information and are rebalanced annually. Following Sloan (1996), accruals are defined as working capital accruals, and only December fiscal year-end firms are included. Working capital accruals are calculated as $(\Delta \text{ACT} - \Delta \text{CH}) - (\Delta \text{LCT} - \Delta \text{DL} - \Delta \text{TXP}) - \text{DP}$ scaled by average total assets, where all variables are from Compustat and required to be non-missing. CRSP returns are measured as one-year buy-and-hold returns starting from April 1 of the following year, generally when firms' financial statements have been released to market participants. The accrual anomaly sample includes 78,448 firm-years from 1971 to 2011. The BTM strategy is implemented by buying the decile of firms with the highest BTM ratio and shorting the decile of firms with the lowest BTM ratio. The decile portfolios are constructed on annual information and are rebalanced annually. The BTM ratio is calculated as $\text{CEQ} / (\text{PRCC}_F * \text{CSHO})$, where all variables are from Compustat and required to be non-missing. Only December fiscal year-end firms are included. CRSP returns are measured as one-year buy-and-hold returns starting from April 1 of the following year. The BTM sample includes 121,996 firm-years from 1971 to 2011. The PEAD strategy is implemented by buying the decile of firms with the most positive earnings surprises and shorting the decile of firms with the most negative earnings surprises. The decile portfolios are formed based on quarterly earnings surprises and are rebalanced quarterly. We use the seasonal random walk model for our earnings expectations, such that an increase (decrease) in earnings relative to the same quarter in the previous year is a positive (negative) surprise. Only March, June, September, and December fiscal year-end firms are included. CRSP returns are measured as three-month buy-and-hold returns starting from three months after the fiscal quarter-end, and the annual portfolio returns are calculated as the sum of the four three-month returns during that year. The PEAD sample includes 575,059 firm-quarters from 1971 to 2011. In all three samples, observations with stock prices less than \$5 are dropped.

model and being surprised by these predictable positive correlations. A subsequent paper by Doyle, Lundholm & Soliman (2006) shows that the drift is even larger when earnings surprises are estimated using sell-side analysts' earnings forecasts in place of time-series forecasts. They also find that the drift is much larger for smaller and less liquid firms, where the costs of arbitrage are greater. The conclusion emerging from this literature is that stock prices generally exhibit a significant lag in updating expectations to new financial information.

4.2. The Accrual Anomaly

In Section 3.1, we described how accounting earnings can be decomposed into a cash component and an accrual component, where the latter component is based on accounting estimates of expected future benefits and obligations. We also discussed evidence showing that the accrual component of earnings is less persistent than the cash component of earnings. The accrual component of earnings can be estimated using information from the balance sheet and the statement of

cash flows. This provides a useful setting for examining whether investors “fixate” on earnings as the headline measure of firm performance or whether they rationally incorporate other information about the persistence of earnings’ underlying components. Sloan (1996) was the first to conduct such an examination. He found that stock prices act as if investors fixated on earnings while ignoring information in the accrual component of earnings. Thus, if the accrual component of earnings is unusually high (low), investors tend to place a high (low) price on the stock, because they do not realize that the high (low) earnings are less likely to persist.

Figure 4 reports the returns to Sloan’s accrual strategy over the past 40 years. The strategy goes long in stocks in the lowest accrual decile and short in stocks in the highest accrual decile and is rebalanced annually. The cumulative returns top 300% over the past 40 years, or over 3% on an annualized basis. Interestingly, the returns to the accrual anomaly spiked in the years immediately following the publication of Sloan (1996) and then tapered off. This result has led Green, Hand & Soliman (2011) to conclude that the accrual anomaly was arbitrated away by hedge funds following its publication in the academic literature. Only time will tell whether this is the case, although it seems odd that other anomalies such as PEAD have not suffered a similar fate.

Several studies have followed up on Sloan (1996), either corroborating the earnings fixation explanation or proposing new explanations. Bradshaw, Richardson & Sloan (2001) show that sell-side analysts’ earnings forecasts tend to fixate on earnings, ignoring information in the accrual component of earnings. Richardson et al. (2005) extend the limited measure of working capital accruals considered by Sloan to include noncurrent accruals and show that this extension identifies even greater mispricing. A competing body of literature argues that the accrual anomaly instead reflects cross-sectional and temporal variation in the cost of capital (e.g., Wu, Zhang & Zhang 2010). Under this explanation, firms experience shocks to their costs of capital that impact current investment and future stock returns. For example, a sudden reduction in the cost of capital will lead to an increase in investment, accruals, and stock prices and a reduction in expected returns. Such an outcome is also possible if investors become irrationally exuberant about the prospects of a firm and the firm exploits this exuberance by raising new capital on favorable terms and investing in low return projects. Thus, the explanation for the accrual anomaly remains open to question.

4.3. Value Investing

A long line of research and investment practice, starting at least as far back as Graham & Dodd (1934), considers strategies that invest in stocks whose recent accounting numbers make them appear cheap relative to their current prices. Academic research has confirmed that such investment strategies have consistently yielded superior long-term stock returns. For example, Basu (1977) finds that stocks with higher earnings-to-price ratios have higher future returns, and Rosenberg, Reid & Lanstein (1985) find that firms with higher book-to-market ratios have higher future returns. These findings have been corroborated by many subsequent studies spanning different time periods and countries. Figure 4 reports the returns to buying high book-to-market firms and selling low book-to-market firms for US stocks. The cumulative returns top 400% over the past 40 years, or over 4% on an annualized basis. The strategy is not without risk, however, as it suffered a multiyear period of underperformance during the Internet bubble of the late 1990s. The natural explanations for the higher returns to such strategies are that stocks can be mispriced and this mispricing can be detected by looking at accounting numbers that capture the underlying intrinsic value of the stocks (see Lakonishok, Shleifer & Vishny 1994). An alternative explanation is that these ratios capture systematic exposure to risk factors that are rationally priced by investors (see Fama & French 1995). Distinguishing between these competing explanations has proved difficult.

One unique setting in which the evidence favors the mispricing explanation is closed-end funds. These funds hold portfolios of securities and trade on stock exchanges. Their book values are computed as the sum of the market values of the securities that they hold. These funds often experience unexplained deviations between their book values and market values that tend to revert, causing predictable variation in expected returns. Because it is difficult to understand why these funds should be exposed to different fundamental risks from the underlying portfolio of stocks that they hold, they offer evidence in support of the mispricing explanation (see Pontiff 1995).

5. CONCLUSIONS

Research on stock prices and earnings has enjoyed a long and productive history. Early research focused on whether earnings were value relevant and whether they were useful to investors. In retrospect, the answer to the former question seems to be obvious. As articulated by Ohlson (1995), earnings are tied to the long-run cash distributions paid on securities, and so they are clearly value relevant. On the issue of usefulness, the answer is more complex. Stock prices clearly respond to information in earnings announcements. Yet earnings are also a relatively untimely source of information, particularly for early-stage firms engaging in innovative activities. This should not necessarily be viewed as a shortcoming of earnings in particular or the accounting process in general. Earnings are primarily designed to provide relatively reliable information about firm value that is based on past transactions. Subjective information about expected future transactions can be communicated through alternative mechanisms.

Research on the characteristics that make earnings useful highlights the trade-off between timeliness and reliability. Incorporating basic accrual transactions, such as accruing revenue on accounts receivable and capitalizing inventory, clearly adds to the usefulness and timeliness of earnings. There is also evidence suggesting that incorporating the fair values of assets and liabilities enhances the usefulness of earnings, although evidence is more mixed. The estimation of fair value is subject to managerial discretion and often there is no active market quotation for similar assets. Finally, although there has been a trend toward incorporating more market prices into the measurement of assets and liabilities, evidence suggests that market prices can measure underlying intrinsic value with error. Consideration should therefore be given to basing accounting measurements on transactions relating to the underlying cash flows of the firm rather than to market prices.

DISCLOSURE STATEMENT

The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

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Contents

History of American Corporate Governance: Law, Institutions, and Politics <i>Eric Hilt</i>	1
Blockholders and Corporate Governance <i>Alex Edmans</i>	23
Corporate Takeovers and Economic Efficiency <i>B. Espen Eckbo</i>	51
Payout Policy <i>Joan Farre-Mensa, Roni Michaely, and Martin Schmalz</i>	75
Corporate Liquidity Management: A Conceptual Framework and Survey <i>Heitor Almeida, Murillo Campello, Igor Cunha, and Michael S. Weisbach</i>	135
Corporate Pension Plans <i>João F. Cocco</i>	163
Bank Capital and Financial Stability: An Economic Trade-Off or a Faustian Bargain? <i>Anjan V. Thakor</i>	185
Contingent Capital Instruments for Large Financial Institutions: A Review of the Literature <i>Mark J. Flannery</i>	225
Counterparty Risk: A Review <i>Stuart M. Turnbull</i>	241
The Industrial Organization of the US Residential Mortgage Market <i>Richard Stanton, Johan Walden, and Nancy Wallace</i>	259
Investor Flows to Asset Managers: Causes and Consequences <i>Susan E.K. Christoffersen, David K. Musto, and Russ Wermers</i>	289

Exchange-Traded Funds: An Overview of Institutions, Trading, and Impacts <i>Ananth Madhavan</i>	311
Stock Prices and Earnings: A History of Research <i>Patricia M. Dechow, Richard G. Sloan, and Jenny Zha</i>	343
Information Transmission in Finance <i>Paul C. Tetlock</i>	365
Insider Trading Controversies: A Literature Review <i>Utpal Bhattacharya</i>	385
Security Market Manipulation <i>Chester Spatt</i>	405
Financialization of Commodity Markets <i>Ing-Haw Cheng and Wei Xiong</i>	419
Forward Rate Curve Smoothing <i>Robert A. Jarrow</i>	443
Optimal Exercise for Derivative Securities <i>Jérôme Detemple</i>	459
 Indexes	
Cumulative Index of Contributing Authors, Volumes 1–6	489
Cumulative Index of Chapter Titles, Volumes 1–6	491
 Errata	
An online log of corrections to <i>Annual Review of Financial Economics</i> articles may be found at http://www.annualreviews.org/errata/financial	