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How Much New Information Is There in Earnings?

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ABSTRACT

We quantify the relative importance of earnings announcements in providing new information to the share market, using the R^2 in a regression of securities' calendar-year returns on their four quarterly earnings-announcement "window" returns. The R^2, which averages approximately 5% to 9%, measures the proportion of total information incorporated in share prices annually that is associated with earnings announcements. We conclude that the average quarterly announcement is associated with approximately 1% to 2% of total annual information, thus providing a modest but not overwhelming amount of incremental information to the market. The results are consistent with the view that the primary economic role of reported earnings is not to provide timely new information to the share market. By inference, that role lies elsewhere, for example, in settling debt and compensation contracts and in disciplining prior information,including more timely managerial disclosures of information originating in the firm's accounting system. The relative informativeness of earnings announcements is a concave function of size. Increased information during earnings-announcement windows in recent years is due only in part to increased concurrent releases of management forecasts.

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There is no evidence of abnormal information arrival in the weeks surrounding earnings announcements. Substantial information is released in management forecasts and in analyst forecast revisions prior (but not subsequent) to earnings announcements.

1. Introduction

We propose a simple but robust method of quantifying the relative importance of earnings announcements in providing new information to the share market. The method provides a measure of the proportion of the total information incorporated in share prices over a year that is associated with its four quarterly earnings announcements. The measure is the R^2 value obtained from a regression of securities' calendar-year returns on their four earnings-announcement "window" returns.

Our principal result is that the four quarterly earnings announcements collectively are associated with approximately 6% to 9%, on average, of the total information incorporated in share prices over the year. If extreme observations are deleted, this falls to approximately 5% to 6%. The average quarterly earnings announcement thus is associated with about 1% or 2% of the total annual information. We also report abnormal share trading volume at quarterly announcements of 0.25%, approximately, of the annual trading volume. These results imply that earnings announcements provide a modest but not overwhelming amount of incremental information.

The comparatively low "surprise" content of earnings announcements is to be expected, for a variety of reasons. By its nature, accounting earnings is low frequency (quarterly), not discretionary (announced every quarter, independent of whether there is substantial new information to report), and primarily backward-looking. Other information, and hence revision in share price, is comparatively high frequency, frequently discretionary (released only when there is substantial information to report), and both forward-looking and backward-looking.

While an inkling of the relatively low informativeness of earnings announcements can be gleaned from a close reading of prior studies—including Ball and Brown [1968], Beaver [1968], Foster, Olsen, and Shevlin [1984], and Bernard and Thomas [1990]—the literature does not provide a robust and precise measure of how important earnings are as a source of new information to the share market. Perhaps as a consequence, in our experience there are widely divergent beliefs on this important issue. Thus, our primary objective is to provide a more precise and robust measure of the amount of new information in earnings than has hitherto been available.

We employ deliberate redundancy in the term *new* information, to stress our focus on the "surprise" content of public earnings *announcements*. We do not address the role of earnings over longer intervals. Nor do we address directly the role of firms' accounting systems in producing timelier information released by managers (such as monthly sales figures or earnings forecasts) or by other parties (such as analysts and the press). While it might initially seem tempting to widen the event window to capture the price reaction to prior earnings-related information, and in particularto encompass analysts' and managers' earnings forecasts, when taken to the limit this would require the event window to begin at the firm's very inception, since *all* information other than changes in expected returns (discount rates) that causes share price revision relates to present and future earnings. Furthermore, when the return window is widened beyond the effective announcement period, the research question no longer is the amount of earnings "surprise." Widening the window to the fiscal year or even beyond is appropriate when testing the role of financial reporting in contractual settings, such as debt and management compensation, in which settlement is made—and hence outcomes are determined—with only an annual frequency. Timeliness then is more appropriately measured from regressions of annual earnings on annual returns, as in Basu [1997]. In contrast, short windows are appropriate for measuring the amount of *new* information in public *announcements*.[1]

Our research design has several desirable properties. First, it does not require estimates of an earnings "surprise" variable. The only earnings-related data required are announcement dates, not quantities. Consequently, the design does not require estimation of earnings expectations, using proxies such as lagged earnings or analysts' consensus forecasts, and thus it is not affected by errors in measuring expectations. A second attractive feature of this design is that, by allowing the regression slopes to differ from unity, the event-window price reaction is allowed to spill over into correlated price changes outside the window. It thus is less susceptible to underestimating the informational role of earnings arising from any initial market underreaction to earnings.[2] In comparison with simply studying return volatility within the earnings-announcement window, the research design therefore does not assume market "efficiency." Indeed, the method provides a test of efficiency, since slopes greater (less) than unity imply initial market under-(over)reaction to earnings-related information, and slopes equal to unity are consistent with market "efficiency." The research design therefore provides a new measure of earnings mispricing.

We report that all four slope coefficients from the regression of annual returns on the quarterly event-window returns exceed unity, consistent with "post–earnings announcement drift" (Ball and Brown [1968], Foster, Olsen, and Shevlin [1984], Bernard and Thomas [1989]) and with price momentum generally (Jegadeesh and Titman [1993]), though not all coefficients

[1] Butler, Kraft, and Weiss [2007, p.183] draw a similar distinction between "intraperiod" and "long-horizon" timeliness.

[2] If the market initially underreacts to earnings information, volatility inside the event window decreases and volatility outside the window increases. Both effects bias downward the estimated relative importance of earnings information in research designs that address only the event-window abnormal price reaction. However, our approach does not incorporate revisions in stock prices after the end of the calendar year.

are significantly different from unity. The average of the four slopes is approximately 1.07 to 1.15, depending on the return specification, implying that only a minor portion of the price adjustment during the earnings-announcement window spills over into the remainder of the calendar year. This is a considerably lower estimate than obtained under conventional research designs.

Recent years exhibit a sharp increase in the proportion of annual information released during the earnings event windows. The increase occurs perhaps as far back as 2000, and is particularly acute in the last three years of our sample, 2004 to 2006. It could be due to increased financial reporting quality subsequent to changes in accounting standards or to changed manager and auditor incentives after Enron/Sarbanes-Oxley. It could be due to a reduction in analyst forecast activity, Regulation Fair Disclosure (FD), chance, changed product or factor market conditions, or a combination of factors. It appears to be more pronounced for larger firms, and does not appear to be caused by a change in the sample composition of listed firms over time. An increase in management forecasts released concurrently with earnings (Anilowski, Feng, and Skinner [2007]) explains only part of the change.

The analysis can be extended to measure the relative amount of information that is produced during periods adjacent to the earnings event windows. The results suggest that information arrival is slightly lower than normal both before and after earnings announcements, which is somewhat surprising. In the weeks prior to earnings announcements, one might expect information production by managers, analysts, and investors (e.g., Kim and Verrecchia [1997]), but we find no evidence of unusual price activity. In the weeks following earnings announcements, one might expect analysts to revise their forecasts of future earnings, but the data suggest that revision consists of incorporating the new information in the announcement into the forecasts, rather than producing new information.

Our regression design also can be used to quantify the relative informativeness of some other variables, such as dividends and forecasts. To investigate the absence of unusual price volatility in the weeks surrounding earnings announcements, we study the earliest forecast revision by an analyst after each of the four quarterly earnings announcements, and the last revision before. The average abnormal adjusted R^2 from annual regressions of calendar-year returns on returns at the four earliest forecast revisions is approximately zero. For the four latest forecast revisions it is 4.7%, and it increases substantially in recent years. In contrast with earnings announcements, management forecasts are discretionary and occur less frequently and thus, when made, each is associated with approximately 25% of quarterly return volatility.

This research design is simple, but we believe it sheds light on the amount of new information conveyed in earnings and thus—indirectly—on the economic role of accounting earnings. If the primary economic role of accounting earnings is not to provide new information to the share market in a timely fashion, then it might lie elsewhere, for example, in the settlement of contracts (Watts and Zimmerman [1986]) and in the confirmation (and hence disciplining) of prior information (Gigler and Hemmer [1998], Ball [2001]), including information derived from managers' private access to their firms' accounting systems and released to the market in various ways.

Section 2 reviews the literature and ideas that form the background to this study. Section 3 describes the research design and sample, and section 4 outlines the event-window return volatility results. Section 5 expands the analysis to measure the extent of information produced during adjacent nonannouncement windows, while section 6 analyses the information content of management forecasts and analysts' earnings forecast revisions. Section 7 briefly outlines the trading volume results. Section 8 offers conclusions and some thoughts concerning future research.

2. *Background*

Even though earnings announcements undoubtedly contain an element of "surprise," there are valid reasons not to expect them to provide substantial new information to the share market. One reason not to expect substantial new information in earnings announcements is *relative frequency*. Earnings announcements are low frequency, occurring quarterly (in some countries, semiannually). In comparison, revisions in expectations, and hence in share prices, are high frequency, occurring relatively continuously. This difference is due largely to the myriad sources of more timely information available to investors, including aggregate, industry, and firm-specific information. Examples of aggregate-level information are statistical releases by the Federal Reserve, the Bureau of Labor Statistics, and other Government agencies; prices from capital, foreign exchange, and derivatives markets; and releases of survey data on macroeconomic expectations, consumer confidence, and sentiment. Industry-level information includes industry association surveys and reports, sales data, prices, hotel occupancy rates, airline capacity utilization, etc. Firm-specific information includes changes in management, changes in strategies, mergers and acquisitions, restructurings, new products, product sales figures and forecasts, factor and product prices, labor negotiations, security analyst reports and forecasts, rating agency reports, and management forecasts. Market participants combine this information with their knowledge of the business to form expectations about performance. Given this plethora of more timely information, it is not surprising that the majority of firms report earnings that are closely in line with investors' and analysts' expectations. Indeed, managers have incentives to minimize earnings surprises, and hence to release information on factor and product prices, product sales, etc., in a more timely fashion than by awaiting its incorporation in the formal earnings release.

A second reason to expect earnings announcements to be untimely is that they are not *discretionary*. Many disclosures are selected as a function of their informativeness. For example, managers can be expected to issue earnings forecasts only when they have substantial private information to make public.[3] Consistent with this selection hypothesis, we show that management earnings forecasts are considerably less frequent than earnings announcements but, when made, they are considerably more informative. In comparison, there is essentially no discretionary selection involved in whether to report earnings: Firms are required to report every quarter, independent of whether there is substantial new information to report.

A third reason to expect earnings announcements to be largely anticipated is that accounting income is based primarily on backward-looking information, such as past product sales and past production costs. Accounting "recognition" principles and practices generally are geared toward reporting actual outcomes, not toward incorporating the latest revisions in expectations of future outcomes. Share price is based on all available information, both backward-looking and forward-looking. An element of forward-looking expectations is introduced by accounting accruals (Dechow [1994]), including loss-recognition accruals (Basu [1997]). In addition, accounting earnings follows a random walk–like process and hence contains information about future earnings. Nevertheless, accounting earnings is a substantially more backward-looking variable than share price, and than revision in share price. The implication is the well-documented result that prices lead earnings (e.g., Ball and Brown [1968], Beaver, Lambert, and Morse [1980], Easton, Harris, and Ohlson [1992], Kothari and Sloan [1992]), and hence that the surprise content of earnings is limited.

These reasons lead us to the expectation that earnings announcements are unlikely to be a major source of timely new information. Nevertheless, it could be easy to gain the opposite impression from the financial press, which devotes substantial coverage to announcements and to price changes around the day they are made. While some of the price changes can appear substantial, it is important to note that there is no "baseline" adjustment here for the underlying volatility of share prices, that is, for the typical magnitude of the price changes that occur in the absence of earnings announcements. Further, no adjustment is being made for selection effects—that is, for the press focusing its reporting on the larger earnings and price changes. The fact that earnings announcements contain an element of surprise does not in itself attest to their *relative* importance as a source of new information.

A similar impression could be garnered from much of the academic literature, which has a checkered history on this issue. Ball and Brown [1968, p. 176] draw two contrasting conclusions:

> The initial objective was to assess the usefulness of existing accounting income numbers by examining their information content and timeliness. . . . Its content is . . . considerable. However, the annual income report does not rate highly as a timely medium.

[3] Motives for informing the market might include reducing capital costs (Botosan [1997]), avoiding stockholder litigation (Skinner [1997]), trading on better terms as insiders (Penman [1982]), or complying with securities law.

Despite the clear conclusion that earnings are lacking in timeliness, Bamber, Christensen, and Gaver [2000] document subsequent literature leaving the impression that earnings announcements are periods when substantial new information is released. Those authors attribute this in part to a misinterpretation of Beaver [1968]. Bamber, Christensen, and Gaver [2000, p. 111] claim that the literature ignored the effect on Beaver's [1968] results of an unrepresentative sample, consisting of 143 small non-12/31 firms with fewer than 20 annual *Wall Street Journal* news items.[4] They conclude that subsequent evidence of low timeliness—reported, for example, in Oppong [1980], Atiase [1985], and Bamber [1986, 1987]—did not substantially influence the literature's interpretation of Beaver's [1968] results.[5]

We believe an additional problem in interpreting many prior studies arises from the way those studies explicitly or implicitly implement "baseline" adjustments. It can be misleading to compare event-window price behavior with equivalent behavior over nonevent weeks or days, without placing these short windows in a longer-term perspective. While these analyses indicate how earnings-announcement price behavior compares with typical nonannouncement days, they can give a misleading impression of how significant the event-window price behavior is in the overall information environment. Thus, if price volatility on quarterly earnings-announcement days is double its typical daily level, a graphical representation of daily volatility will reveal a substantial "spike" at the event—yet the increase in volatility is only one-sixtieth of a quarter's total volatility (assuming, for illustration, that nonannouncement daily returns are identically and independently distributed (i.i.d.) and 60 trading days per quarter).

Similarly, Beaver [1968] reports a 67% increase in the squared unexpected price changes in the earnings-announcement week relative to nonannouncement weeks, and a 33% increase in trading volume. While graphs of these statistics in event time reveal a sharp increase at the announcement, the increases are on the order of only 5% and 2%, respectively, of the total quarterly price behavior (assuming Beaver's [1968] results for annual earnings apply to every quarter, assuming that nonannouncement weekly returns are i.i.d., and ignoring any upward bias due to sample selection or skew). We propose that total price volatility over at least the fiscal period of the earnings report is a more appropriate baseline for assessing the relative importance of earnings announcements in providing new information to

[4] As they take care to point out, the misinterpretation occurs in subsequent literature. Beaver [1968, p. 72] clearly outlines his sample selection criteria, and even cautions the reader as follows: "As long as the criteria are visible ex ante, the population for which the study's findings are relevant can be easily identified. Also, the sample criteria can be relaxed in future studies to discover the generality of the findings presented here for other populations."

[5] Ironically in view of their own hypothesis—that the literature overgeneralizes Beaver's [1968] results from a small, unrepresentative sample—Bamber, Christensen, and Gaver [2000] do not emphasize that Atiase's [1985] sample also is small and unrepresentative. Atiase [1985] studies just 200 firms in two quarters (the second quarters of 1971 and 1972).

investors, because it benchmarks earnings relative to all information sources over the same interval.

To be sure, a careful reading of Ball and Brown [1968], Beaver [1968], Morse [1981], Chambers and Penman [1984] Foster, Olsen, and Shevlin [1984], Bernard and Thomas [1990], Collins, Kothari, Shanken, and Sloan [1994] Beaver [1998, p. 105–106], Nichols and Wahlen [2004], and other studies could support the conclusion that earnings announcements are not a timely source of information, even though only Ball and Brown [1968] explicitly state that conclusion. In addition, the results of Oppong [1980] and Atiase [1985] could cause strong doubts as to the extent of earnings informativeness. Similarly, to highlight the effects of small firms in Beaver [1968], Bamber, Christensen, and Gaver [2000] show that the magnitude of the market reaction at earnings announcements by Fortune 200 firms, which constitute two-thirds of the New York Stock Exchange's total market value, is statistically indistinguishable from price movements in several of the weeks surrounding the earnings announcements. Recently, Beekes and Brown [2006a,b] reformulate the Ball and Brown [1968] analysis of annual earnings timeliness. Further, Butler, Kraft, and Weiss [2007] report that, prior to the introduction of mandatory quarterly reporting, there was little difference between the price behavior of firms reporting quarterly and those reporting only semiannually, suggesting that a higher frequency of reporting does not add substantial new information. There thus is available evidence to doubt that earnings are a source of substantial new information.

No study to our knowledge has quantified the importance of earnings as a timely source of information relative to the total information environment. Perhaps as a consequence, in our experience there are widely divergent opinions on this issue. The method we use to estimate the relative informativeness of earnings announcements measures the proportion of the total information incorporated in share prices over a year that is associated with the four quarterly earnings announcements during the year.

3. Research Design and Sample

To provide a more precise and more readily interpretable measure of how much value-relevant information is provided at earnings releases, we calculate the adjusted R^2 from a regression of calendar-year returns on returns in each of the four three-day announcement "event windows" during the year. We estimate annual cross-sectional regressions of calendar-year returns (R_i $(annual)$) on returns in the four quarterly earnings-announcement windows (R_i $(windowK)$, $K = 1$ to 4) during the calendar year:

$$R_i(annual) = a_0 + a_1 R_i(window1) + a_2 R_i(window2) + a_3 R_i(window3) + a_4 R_i(window4) + \varepsilon_i \quad (1)$$

The regression adjusted R^2 measures the proportion of annual return variability associated with the four earnings event windows.

We estimate the regression from annual cross-sections. Similar results are obtained from firm-level time-series regressions, though they are more likely to be affected by survivorship bias. In the following subsections, we discuss issues relating to empirical implementation and interpretation.

3.1 SAMPLE

The sample comprises all firm-years with data available on the quarterly Compustat and daily Center for Research in Security Prices (CRSP) return files from January 1972 to December 2006. The sample period is determined by the availability of earnings-announcement dates on Compustat. The earnings-announcement window is defined as day -1 to day $+1$, where day 0 is the Compustat announcement date, though our research design is relatively insensitive to the length of the window chosen. We include only firm-years that have exactly four earnings announcements in the calendar year, whose four event windows lie entirely within the calendar year, and that have returns data on the CRSP daily file for at least 240 trading days (out of approximately 252 trading days, on average). The last of these requirements eliminates an average of 25 firms per year (0.7% of the observations).

3.2 RETURN MEASUREMENT

Calendar-year buy-and-hold returns are computed from the daily returns. Earnings-announcement returns are buy-and-hold returns over days -1 to $+1$, relative to the Compustat earnings-announcement date, day 0. The convention followed is that the quarter designates the calendar quarter in which the earnings *announcement* occurs, which typically is in the quarter following the fiscal period over which earnings are calculated. For example, "quarter 1" is January through March, which for a December 31 firm is the calendar quarter in which the prior fiscal year's and fourth quarter's earnings typically are released.

The results are somewhat sensitive to whether returns are calculated in arithmetic or logarithmic terms, so both are presented. Log returns can be meaningfully aggregated across time, and hence are more consistent with a linear regression of annual returns on event-window returns. However, averaging logarithmic returns across a portfolio of stocks is problematic, and they exhibit some left skew. Conversely, arithmetic returns can be logically aggregated across securities, but not time, and exhibit considerable right skew. The appropriate choice is unclear, so we present both.

3.3 BENCHMARKING THE REGRESSION R^2

To infer the information content of earnings announcements, we compare the adjusted R^2 value from regression (1) against a benchmark that is designed to reflect normal price volatility. Specifically, we calculate the abnormal R^2 value as the difference between the regression adjusted R^2 value and its expected value under the null hypothesis that daily returns, including earnings-announcement window returns, are i.i.d. across time. In an average year with 252 trading days, the four three-day windows then would contain approximately 4.8% (12/252) of the total annual information, so we take 4.8% to be the expected value of the adjusted R^2 under the null.[6]

Evidence of serial correlation in daily returns challenges the validity of the i.i.d. assumption underlying this benchmark. For instance, French and Roll [1986] show that daily returns are negatively autocorrelated due to bid–ask bounce in prices. It therefore might seem that a more appropriate benchmark would be obtained from regressions of annual returns on randomly chosen three-day windows that do not include earnings announcements. This procedure can be expected to provide a lower benchmark than obtained when ignoring the negative serial correlation. However, Bernard and Thomas [1989] document positive autocorrelation in daily returns conditional on earnings announcements, which implies that the benchmark might be adjusted upward. The issue is whether it is appropriate to force the negative correlation in non-earnings-announcement windows onto earnings-announcement windows, where such correlation does not exist and if anything is reversed.

To examine how serial correlation affects the benchmark, we re-estimate regression (1) for the primary sample in tables 2 and 3 below, but replacing the four actual event-window returns each firm/year with returns for the same firm/year in four randomly chosen three-day windows. A random date is chosen from the 13 weeks surrounding each earnings-announcement date, subject to the requirement that the date is in the same calendar year and on the same day of the week as the actual earnings-announcement date. The regressions are otherwise identical to those reported in tables 2 and 3. The mean adjusted R^2 value in these regressions is 3.8% for arithmetic returns and 5.3% for logarithmic returns. This is 1.0% lower than our 4.8% annual benchmark for arithmetic returns (0.25% per quarter lower) and 0.5% higher than our benchmark for logarithmic returns (0.125% per quarter). These simulations do not incorporate the observed positive autocorrelation in returns conditional on earnings announcements, and hence understate the adjusted R^2 values. While the precise appropriate benchmark is debatable, the simulation results suggest that the benchmark of 4.8% under the i.i.d assumption is not unreasonable, and that the choice of benchmark does not affect the tenor of our conclusions.

4. *Event-Window Contribution to Annual Return Volatility*

4.1 SUMMARY STATISTICS

Table 1 reports annual summary statistics for calendar-year returns and for returns in each of the four quarterly earnings-announcement windows.

[6] The expected R^2 value is computed annually, based on the number of trading days in that year, which varies between 248 in 2001 and 254 in 1992 and 1996. The expectation therefore varies only slightly, between 4.7% and 4.8%.

TABLE 1

Summary Statistics for Returns in Calendar Years and in the Four Earnings-Announcement Windows

Panel A: Arithmetic returns

		No. of Obs.	Mean	Median	Skewness	% Obs. = 0	% Obs. > 0
Calendar-year returns	1972–2006 mean	3,682	0.182	0.089	4.065	0.36	59.1
	t-statistic		4.47	2.71	5.76		
	1972–1989 mean	2,492	0.166	0.103	2.250	0.39	61.3
	1990–2006 mean	4,941	0.199	0.075	5.987	0.33	56.8
Earnings-announcement window returns in quarter 1	1972–2006 mean	3,682	0.006	0.001	1.754	2.13	50.6
	t-statistic		4.97	2.09	7.76		
	1972–1989 mean	2,492	0.007	0.001	1.213	2.81	50.7
	1990–2006 mean	4,941	0.005	0.001	2.327	1.41	50.4
Earnings-announcement window returns in quarter 2	1972–2006 mean	3,682	0.006	0.001	2.901	2.36	50.2
	t-statistic		4.28	2.01	3.14		
	1972–1989 mean	2,492	0.004	0.001	1.193	3.13	49.0
	1990–2006 mean	4,941	0.008	0.002	4.710	1.53	51.4
Earnings-announcement window returns in quarter 3	1972–2006 mean	3,682	0.001	0.000	1.192	2.36	48.4
	t-statistic		1.23	0.05	5.44		
	1972–1989 mean	2,492	0.002	0.001	1.032	3.24	48.1
	1990–2006 mean	4,941	0.001	−0.001	1.362	1.43	48.7
Earnings-announcement window returns in quarter 4	1972–2006 mean	3,682	0.003	0.000	1.975	2.38	48.5
	t-statistic		1.75	−0.27	5.61		
	1972–1989 mean	2,492	0.000	−0.002	1.690	3.31	46.7
	1990–2006 mean	4,941	0.006	0.002	2.277	1.40	50.5

Panel B: Logarithmic returns

		No. of Obs.	Mean	Median	Skewness	% Obs. = 0	% Obs. > 0
Calendar-year returns	1972–2006 mean	3,682	0.034	0.069	−0.466	0.36	59.1
	t-statistic		0.89	2.13	−4.15		
	1972–1989 mean	2,492	0.062	0.077	−0.320	0.39	61.3
	1990–2006 mean	4,941	0.005	0.060	−0.620	0.33	56.8
Earnings-announcement window returns in quarter 1	1972–2006 mean	3,682	0.003	0.001	0.167	2.13	50.6
	t-statistic		2.43	2.09	1.59		
	1972–1989 mean	2,492	0.005	0.001	0.300	2.81	50.7
	1990–2006 mean	4,941	0.001	0.001	0.027	1.41	50.4
Earnings-announcement window returns in quarter 2	1972–2006 mean	3,682	0.003	0.001	0.281	2.36	50.2
	t-statistic		2.25	2.00	1.90		
	1972–1989 mean	2,492	0.002	0.001	0.348	3.13	49.0
	1990–2006 mean	4,941	0.003	0.002	0.210	1.53	51.4
Earnings-announcement window returns in quarter 3	1972–2006 mean	3,682	−0.002	0.000	−0.327	2.36	48.4
	t-statistic		−1.36	0.04	−1.98		
	1972–1989 mean	2,492	0.000	0.001	0.070	3.24	48.1
	1990–2006 mean	4,941	−0.004	−0.001	−0.747	1.43	48.7
Earnings-announcement window returns in quarter 4	1972–2006 mean	3,682	−0.001	0.000	−0.120	2.38	48.5
	t-statistic		−0.59	−0.29	−1.03		
	1972–1989 mean	2,492	−0.003	−0.002	0.134	3.31	46.7
	1990–2006 mean	4,941	0.001	0.002	−0.389	1.40	50.5

This table presents summary statistics for calendar-year returns and for earnings-announcement returns. Calendar-year buy-and-hold returns are computed from daily CRSP returns. Earnings-announcement returns are buy-and-hold returns for the three days surrounding the Compustat announcement date. Firm-years with other than four earnings announcements or with daily return data for fewer than 240 trading days are excluded. Annual statistics (mean, median, skew) from the distribution of return across stocks are computed for the calendar-year return and for the four earnings-announcement window returns. The table presents means of these statistics across years, with associated Fama–Macbeth t-statistics. Panel A presents statistics for arithmetic returns, while panel B presents results for logarithmic returns.

Panels A and B report statistics for arithmetic and logarithmic returns, respectively, calculated from identical firm-year samples.

The different distributional properties of arithmetic and logarithmic returns are apparent. In the average calendar year over 1972 to 2006, the median arithmetic and logarithmic returns are similar (8.9% and 6.9%, respectively), but the means (18.2% and 3.4%, respectively) and the skew statistics (+4.065 and −0.466, respectively) differ substantially. The mean 1972 to 2006 logarithmic return (3.4%) is not even significant (Fama–MacBeth t-statistic of 0.89). Analogous differences are observed in each of the four three-day event-window return distributions, and in both the 1972 to 1989 and 1990 to 2006 subperiods.

The first two quarterly earnings-announcement windows in the calendar year experience significant positive mean and median arithmetic and logarithmic returns. The arithmetic (logarithmic) mean announcement window return for both quarters is 0.6% (0.3%) over three days, which is approximately 50% (25%) on an annualized basis. This is consistent with an expected risk premium during earnings-announcement periods.[7] However, the medians during the announcement windows are only 0.1%. Both the mean and median earnings-announcement returns in the third and fourth quarters are not significantly different from zero. The p-value from an F-test for equal mean returns in the four announcement windows is 0.04 for arithmetic returns and 0.02 for logarithmic returns.

In every calendar quarter, more than 2% of all firms experience zero returns in the three-day earnings windows, consistent with an absence of material new information for these firms. The frequency of zero event-window returns falls substantially over time.

4.2 ABNORMAL R^2: NEW INFORMATION IN EARNINGS

Tables 2 and 3 report results for arithmetic and logarithmic returns, respectively, calculated from identical firm-year samples. The sample size rises from 1,405 firms in 1972 to 6,140 firms in 2000, and falls to 4,822 firms in 2006. Panel A presents regression estimates for individual years, and panels B through D summarize them for the full sample, December year-end firms, and non-December year-end firms, respectively.

For the full sample over 1972 to 2006 in panel A, the average abnormal adjusted R^2 from the annual regressions is 5.9% for arithmetic returns and 9.3% for logarithmic returns, allowing for the 4.8% expected value under the null. Individual quarterly earnings announcements therefore are associated, on average, with approximately 1.5% to 2.3% of all the value-relevant information affecting prices in a year. The abnormal R^2 is positive in 34

[7] See Chari, Jagannathan, and Ofer [1988], Ball and Kothari [1991], Lamont [1998], Cohen et al. [2007], and Lamont and Frazzini [2007]. Consistent with this literature, untabulated results show that the mean announcement-window returns are substantially larger for smaller stocks.

TABLE 2

Annual Regressions of Calendar-Year Returns on the Four Announcement Window Returns (Arithmetic Returns)

Year	Intercept	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Abnormal R^2 %	No. of Obs.
Panel A: All firms							
1972	0.067	0.758	1.160	1.396	0.780	7.4	1,405
1973	−0.319	0.516	0.666	0.602	0.835	3.8	1,778
1974	−0.264	0.793	0.943	0.522	0.888	7.1	2,211
1975	0.589	0.982	1.397	1.660	2.057	8.2	2,273
1976	0.423	0.877	1.136	1.444	1.128	5.5	2,283
1977	0.136	0.971	0.874	1.556	0.897	4.9	2,316
1978	0.141	1.506	1.187	0.636	0.419	3.9	2,282
1979	0.373	0.894	1.457	1.013	1.843	1.9	2,202
1980	0.302	0.703	0.970	1.490	1.272	2.2	2,187
1981	0.048	1.294	1.048	1.080	1.318	11.4	2,146
1982	0.291	1.712	1.054	1.274	1.829	7.7	2,106
1983	0.332	1.379	0.989	1.425	1.018	6.8	2,634
1984	−0.054	1.025	0.856	0.602	1.120	6.1	3,012
1985	0.289	1.050	1.651	1.141	0.880	3.8	3,091
1986	0.071	1.087	1.147	0.900	0.991	7.9	3,011
1987	−0.087	1.152	1.061	1.069	0.072	5.6	3,265
1988	0.219	1.085	1.195	1.593	1.178	7.6	3,277
1989	0.165	1.277	1.360	1.306	1.004	6.5	3,385
1990	−0.169	0.484	0.729	0.887	0.554	2.9	3,393
1991	0.462	1.700	2.568	1.083	1.287	7.9	3,515
1992	0.184	3.402	0.832	0.808	1.297	7.3	3,772
1993	0.221	1.299	1.395	1.427	1.345	6.7	4,076
1994	−0.023	0.778	0.887	0.680	1.174	4.5	4,537
1995	0.338	1.556	0.764	1.324	1.406	1.9	5,042
1996	0.169	0.774	1.565	1.194	1.177	4.5	5,395
1997	0.224	1.248	0.945	0.880	1.149	4.8	5,644
1998	−0.041	0.974	0.828	0.899	0.576	1.1	5,840
1999	0.384	1.370	1.145	1.549	1.999	−1.1	5,528
2000	−0.056	0.695	0.905	1.377	0.730	5.1	6,140
2001	0.193	1.238	0.837	1.536	0.659	1.6	5,868
2002	−0.116	1.268	1.317	0.547	0.262	8.8	5,484
2003	0.738	2.049	2.525	1.341	2.607	6.6	5,100
2004	0.223	1.473	1.220	1.053	1.007	9.7	4,953
2005	0.061	1.245	1.319	1.473	1.130	13.9	4,890
2006	0.171	1.256	1.020	1.041	1.064	11.7	4,822
Panel B: Time-series summary statistics (full sample)							
1972–2006 mean	0.162	1.196	1.170	1.137	1.113	5.9	3,682
p-value ($H_0 = 1$)		0.03	0.02	0.02	0.20		
1972–2006 median	0.171	1.152	1.061	1.141	1.120	6.1	3,385
p-value ($H_0 = 1$)		0.00	0.02	0.00	0.00		
1972–1989 mean	0.151	1.059	1.119	1.150	1.085	6.0	2,492
1990–2006 mean	0.174	1.342	1.224	1.123	1.143	5.8	4,941

(*Continued*)

TABLE 2—*Continued*

	Intercept	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Abnormal R^2 %	No. Obs.
Panel C: Time-series summary statistics (December fiscal year-end sample)							
1972–2006 mean	0.161	1.102	1.161	1.176	1.143	5.5	2,368
p-value ($H_0 = 1$)		0.10	0.04	0.02	0.16		
1972–2006 median	0.172	1.177	1.081	1.138	1.142	5.4	1,923
p-value ($H_0 = 1$)		0.00	0.00	0.00	0.00		
1972–1989 mean	0.152	0.986	1.126	1.197	1.111	5.5	1,484
1990–2006 mean	0.170	1.226	1.197	1.153	1.176	5.5	3,305
Panel D: Time-series summary statistics (non-December fiscal year-end sample)							
1972–2006 mean	0.164	1.268	1.190	1.067	1.074	6.9	1,307
p-value ($H_0 = 1$)		0.05	0.04	0.31	0.40		
1972–2006 median	0.177	1.194	1.067	1.076	1.046	6.6	1,368
p-value ($H_0 = 1$)		0.00	0.10	0.02	0.74		
1972–1989 mean	0.150	1.135	1.137	1.063	1.055	7.0	1,005
1990–2006 mean	0.178	1.408	1.246	1.070	1.094	6.7	1,628

This table presents estimates from the following regression of calendar-year arithmetic returns ($R_i(annual)$) on the four quarterly earnings-announcement returns in the year ($R_i(window1)$ to $R_i(window4)$):

$$R_i(annual) = a_0 + a_1 R_i(window1) + a_2 R_i(window2) + a_3 R_i(window3) + a_4 R_i(window4) + \varepsilon_i$$

Calendar-year arithmetic buy-and-hold returns are computed from daily CRSP returns. Earnings-announcement returns are arithmetic buy-and-hold returns for the three days surrounding the Compustat announcement date. Firm-years with other than four earnings announcements or with daily return data available for fewer than 240 trading days are excluded. Panel A presents annual regression coefficients and abnormal R^2 values for all firms. Panels B to D present time-series summary statistics for the full sample and December and non-December fiscal year-end firms. The p-values are from F-tests that the mean coefficient is 1.0 and sign tests that the frequency of coefficients exceeding 1.0 is 0.5. Abnormal R^2 is the regression adjusted R^2 value minus its expectation assuming i.i.d. daily returns.

of the 35 years (arithmetic) and in all years (logarithmic), and hence is statistically significant under a binomial sign test at a p-value < 0.0001.

Three points suggest these could be upward-biased estimates. First, the R^2 values reflect the price response to all information that is released during the earnings-announcement window, not only earnings. Concurrent information includes management commentary on the financials, management earnings forecasts (we report evidence on them below), press commentary, dividend announcements, restructuring plan announcements, non-GAAP "street" earnings, and analyst forecast revisions.[8] Second, because the average regression slope coefficients exceed unity, the 1.5% to 2.3% estimate incorporates some correlated price response that occurs outside the three-day announcement period. Third, in the following subsection we report that the abnormal R^2 values are substantially reduced when outliers are excluded.

Overall, the result that quarterly earnings announcements are associated with 1.5% to 2.3% of the total annual price volatility implies they contain a modest but not overwhelming amount of new information.

[8] Francis, Schipper, and Vincent [2002] and Collins, Li, and Xie [2008].

TABLE 3

Annual Regressions of Calendar-Year Returns on the Four Announcement Window Returns (Logarithmic Returns)

Year	Intercept	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Abnormal R^2 %	No. of Obs.
Panel A: All firms							
1972	0.017	0.844	1.202	1.367	0.963	11.7	1,405
1973	−0.491	1.131	1.066	1.202	1.315	10.0	1,778
1974	−0.383	0.945	1.334	0.926	1.054	12.0	2,211
1975	0.409	0.570	0.860	0.925	1.189	9.0	2,273
1976	0.315	0.663	0.886	0.982	0.859	8.9	2,283
1977	0.087	0.838	0.835	1.301	0.735	6.7	2,316
1978	0.093	1.116	0.982	0.679	0.354	5.5	2,282
1979	0.254	0.806	1.041	0.710	1.212	4.6	2,202
1980	0.207	0.701	0.728	1.121	0.908	4.5	2,187
1981	−0.005	1.287	1.084	1.135	1.283	12.3	2,146
1982	0.183	1.401	1.020	1.021	1.488	9.9	2,106
1983	0.239	1.135	0.727	1.103	0.972	9.2	2,634
1984	−0.119	1.403	1.165	0.801	1.588	9.4	3,012
1985	0.190	0.932	1.396	0.980	0.904	6.4	3,091
1986	0.005	1.101	1.273	0.999	1.128	9.2	3,011
1987	−0.174	1.305	1.319	1.378	0.317	7.0	3,265
1988	0.134	0.966	1.070	1.483	1.112	10.5	3,277
1989	0.066	1.109	1.337	1.340	1.220	8.9	3,385
1990	−0.308	0.581	1.140	1.459	1.043	8.3	3,393
1991	0.255	0.967	1.111	0.933	1.045	8.0	3,515
1992	0.070	1.231	0.915	0.942	0.900	10.5	3,772
1993	0.100	1.117	1.039	1.169	0.999	10.4	4,076
1994	−0.116	1.041	0.942	0.839	1.251	7.5	4,537
1995	0.172	1.064	1.077	1.124	1.130	8.2	5,042
1996	0.050	0.955	1.143	0.978	1.256	8.5	5,395
1997	0.086	1.227	1.068	0.988	1.351	9.3	5,644
1998	−0.211	1.046	1.004	1.066	0.907	5.5	5,840
1999	0.047	0.837	0.828	1.087	0.977	2.9	5,528
2000	−0.359	1.154	1.340	2.268	1.602	11.5	6,140
2001	−0.026	1.012	0.758	1.402	0.705	6.6	5,868
2002	−0.300	1.726	1.449	0.960	0.525	10.3	5,484
2003	0.436	0.883	1.112	0.708	0.931	8.7	5,100
2004	0.131	1.260	0.998	0.889	0.852	15.9	4,953
2005	−0.016	1.303	1.155	1.563	1.085	20.4	4,890
2006	0.100	1.103	0.964	0.998	1.095	15.9	4,822
Panel B: Time-series summary statistics (full sample)							
1972–2006 mean	0.033	1.050	1.068	1.109	1.036	9.3	3,682
p-value ($H_0 = 1$)		0.23	0.04	0.04	0.47		
1972–2006 median	0.070	1.064	1.068	1.021	1.045	9.0	3,385
p-value ($H_0 = 1$)		0.02	0.00	0.74	0.32		
1972–1989 mean	0.057	1.014	1.074	1.081	1.033	8.6	2,492
1990–2006 mean	0.006	1.089	1.061	1.140	1.038	9.9	4,941

(*Continued*)

TABLE 3—*Continued*

	Intercept	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Abnormal R^2 %	No. Obs.
Panel C: Time-series summary statistics (December fiscal year-end sample)							
1972–2006 mean	0.039	1.022	1.037	1.134	1.072	8.6	2,368
p-value ($H_0 = 1$)		0.63	0.26	0.03	0.28		
1972–2006 median	0.074	1.041	1.040	1.093	1.099	8.2	1,923
p-value ($H_0 = 1$)		0.02	0.10	0.00	0.10		
1972–1989 mean	0.068	0.939	1.017	1.082	1.072	7.5	1,484
1990–2006 mean	0.009	1.111	1.058	1.189	1.071	9.8	3,305
Panel D: Time-series summary statistics (non-December fiscal year-end sample)							
1972–2006 mean	0.023	1.068	1.099	1.055	0.989	10.4	1,307
p-value ($H_0 = 1$)		0.14	0.04	0.29	0.81		
1972–2006 median	0.068	1.044	1.125	1.019	0.988	10.1	1,368
p-value ($H_0 = 1$)		0.02	0.00	0.32	0.74		
1972–1989 mean	0.042	1.089	1.143	1.047	0.994	10.4	1,005
1990–2006 mean	0.003	1.046	1.052	1.064	0.983	10.3	1,628

This table presents estimates from the following regression of calendar-year logarithmic returns ($R_i(annual)$) on the four quarterly earnings-announcement returns in the year ($R_i(window1)$ to $R_i(window4)$):

$$R_i(annual) = a_0 + a_1 R_i(window1) + a_2 R_i(window2) + a_3 R_i(window3) + a_4 R_i(window4) + \varepsilon_i$$

Calendar-year logarithmic buy-and-hold returns are computed from daily CRSP returns. Earnings-announcement returns are logarithmic buy-and-hold returns for the three days surrounding the Compustat announcement date. Firm-years with other than four earnings announcements or with daily return data available for fewer than 240 trading days are excluded. Panel A presents annual regression coefficients and abnormal R^2 values for all firms. Panels B to D present time-series summary statistics for the full sample and December and non-December fiscal year-end firms. The p-values are from F-tests that the mean coefficient is 1.0 and sign tests that the frequency of coefficients exceeding 1.0 is 0.5. Abnormal R^2 is the regression adjusted R^2 value minus its expectation assuming i.i.d. daily returns.

4.3 DELETING EXTREME OBSERVATIONS

To assess whether results are sensitive to extreme outliers, we re-estimate them for a trimmed sample that excludes, in each calendar year, the extreme 1% on either side of the calendar-year and announcement-window returns. Deletion of an individual quarter requires deletion of the entire firm/year. In untabulated results, the average annual abnormal R^2 values fall substantially, for the entire period and also for the two subperiods. The full-period average falls from 5.9% to 4.8% (arithmetic) and from 9.3% to 6.0% (logarithmic). Thus, after deleting outliers, individual quarterly earnings announcements are associated with 1.2% to 1.5% of the total annual price volatility.

4.4 DECEMBER FISCAL YEAR-END FIRMS

The abnormal R^2 values, on average, are approximately one-fifth larger for non-December fiscal year-end firms than for December fiscal year-end firms. For the arithmetic returns in table 2, the averages are 5.5% for December fiscal year-end firms and 6.9% for non-December fiscal year-end firms. For the logarithmic returns in table 3, the respective averages are 8.6% and 10.4%. These results are consistent with prior evidence that the earnings of December fiscal year-end firms are less incrementally informative (Bamber, Christensen, and Gaver [2000]).

4.5 GOOD AND BAD AGGREGATE NEWS

We next examine how the average R^2 value varies in years with predominantly good news versus those with predominantly bad news, defined as years with positive and negative aggregate sample mean returns, respectively. In untabulated results, the 11 (24) calendar years where the mean returns are negative (positive) exhibit an average abnormal adjusted R^2 value of 5.0% (6.2%), using arithmetic returns. For logarithmic returns, the corresponding averages are 9.1% and 9.3%.

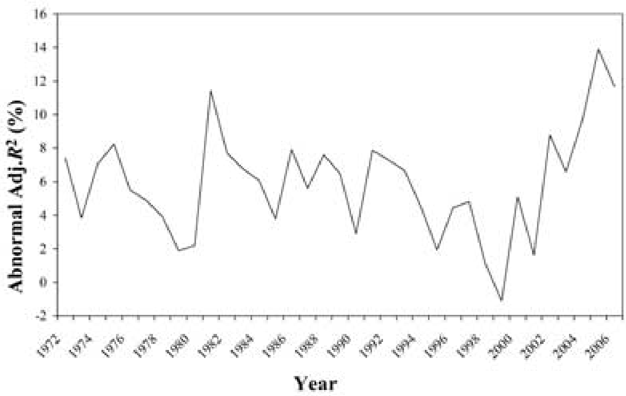
4.6 SLOPE COEFFICIENTS: MISPRICING EARNINGS

For the full sample in panel A and for all years 1972 to 2006, and for both arithmetic and logarithmic returns, each of the four slope coefficients from the regression of annual returns on the quarterly event-window returns exceeds unity. The coefficients are statistically significantly different from one at the conventional 5% level for event windows in the first through third calendar quarters for arithmetic returns, and in the second and third calendar quarters for logarithmic returns. This result is consistent with the seemingly delayed reaction to earnings known as "post–earnings announcement drift" (e.g., Ball and Brown [1968], Bernard and Thomas [1989, 1990]). It also is consistent with delayed reaction to information in periods prior to the earnings announcement that is corrected at the time of the announcement, and with price momentum generally (Jegadeesh and Titman [1993]).

Economically, the slopes are close to unity, the expected coefficient if the market correctly prices earnings and earnings-related information (specifically, if there is no systematic under- or overreaction that is corrected within the same calendar year). The average of the four slopes is approximately 1.15 for arithmetic returns (table 2, panel B) and 1.07 for logarithmic returns (table 3, panel B), implying that only 0.005 (0.07^2) to 0.025 (0.15^2) of the price volatility during the three-day earnings-announcement window spills over into volatility at other times during the calendar year. This is a considerably lower estimate of the proportion of delayed market reaction to earnings than is obtained by correlating postannouncement returns with earnings (Ball and Brown [1968], Foster, Olsen, and Shevlin [1984], Bernard and Thomas [1989]), as distinct from our design, which correlates them with earnings-announcement returns. We suspect that this occurs in part because our measure is relatively free of the bias that arises from earnings being correlated with expected returns and changes in expected returns (Ball [1978]). It also could be due to postannouncement returns in this research design being truncated at the end of the calendar year, which could particularly affect earnings announcements in the fourth quarter. Against this, we note that the design incorporates what could be labeled "pre–earnings announcement drift"—underreaction to earnings-related information prior to the earnings announcement that is corrected at the time of the announcement.

Trimming the data, by deleting 1% of the observations on both extremes of calendar-year and announcement-window returns, leads to estimated

Panel A: Abnormal adjusted R^2 values from annual cross-sectional regressions of calendar-year arithmetic returns on arithmetic returns at the four quarterly earnings announcements in the calendar year



Panel B: Slope coefficients from annual cross-sectional regressions of calendar-year arithmetic returns on arithmetic returns at the four quarterly earnings announcements in the calendar year

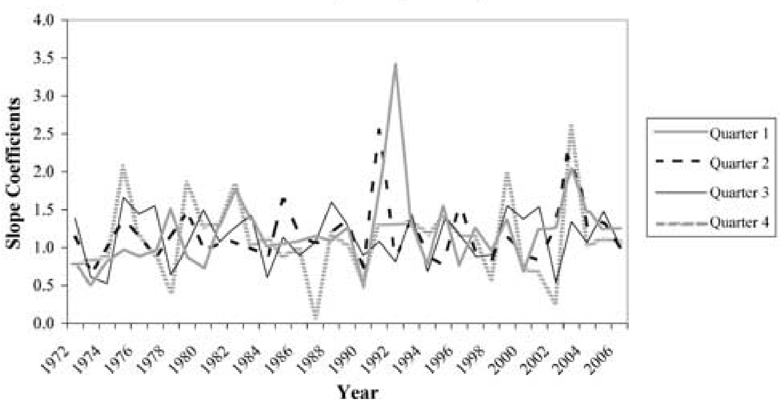


FIG. 1.—Abnormal adjusted R^2 values and slope coefficients from annual 1972 to 2006 cross-sectional regressions of calendar-year returns on returns at the four quarterly earnings announcements. Calendar-year buy-and-hold returns are computed from daily CRSP returns. Earnings-announcement returns are buy-and-hold returns for the three days surrounding the Compustat announcement date. The sample is all firm-years with available data on the quarterly Compustat and daily CRSP files. Firm-years with other than four earnings announcements or with daily returns data for fewer than 240 trading days are excluded.

slopes that are closer to (and not significantly different from) the null of unity. These results are not tabulated.

4.7 INDIVIDUAL YEAR AND SUBPERIOD RESULTS

Figure 1 depicts the time series of annual abnormal R^2 values. There is a sharp increase during recent years in the proportion of annual price revision that occurs in the four earnings-event windows. In panel A of tables 2 and 3, the annual abnormal R^2 value increases sharply somewhere in the 2000 to

2006 period. The abnormal R^2 values in the last three years with data, 2004 to 2006, are the three highest of the 35 years studied (logarithmic returns), or three of the four highest (arithmetic returns).[9] A similar increase is observed in event-window abnormal volume, expressed as a percentage of annual volume. The highest median abnormal volume occurs in the last four years, 2003 to 2006 (individual years are not reported in table 11 below).

One explanation for the sharp increase is an increased relative informativeness of earnings in recent years. An increase in relative informativeness of earnings could arise from a “real” increase in exogenous earnings shocks, due, for example, to more volatile product and factor market conditions. It could arise from changes in accounting standards such as Statement of Financial Accounting (SFAS) 142 and SFAS 144, which set new rules for the impairment of intangible and tangible long-term assets, effective 2002, or from the Financial Accounting Standards Board’s increased emphasis on “fair value” accounting generally. It could be due to changes in managers’ and auditors’ incentives, in response to the Enron era scandals or the enactment of the Sarbanes-Oxley Act of 2002. These events could have increased the monitoring of financial reporting by parties such as auditors, internal auditors, boards, and the press, increasing the probability of detecting low-quality financial reporting. At the same time, these events most likely increased the expected legal and political costs of being discovered to have engaged in low-quality reporting.

An alternative explanation is deterioration over time in forecast accuracy, causing an increased surprise content of earnings. This could arise from a reduction in analyst forecast activity, due in turn to Regulation FD, which became effective in October 2000. It could arise from restrictions imposed on analysts subsequent to the biased-research scandals in 2000 to 2003, though a recent increase in the price reaction to analyst forecast revisions, reported in section 6, appears to rule this explanation out.[10]

One feasible explanation, a change in sample composition, is made plausible by the fall in sample size from 6,140 to 4,822 firms between 2000 and 2006, and by the seemingly low abnormal R^2 values during the “internet boom” period. We investigate this by studying a constant sample of 1,593 firms with complete data in every year over 1996 to 2006. Results for arithmetic and logarithmic returns are presented in panels A and B of table 4, respectively. In both panels, the increase in the abnormal R^2 value over 2000 to 2006 is even sharper than those reported for the full sample in tables 2

[9] We became aware of Smith [2007] while our paper was under review. Smith’s [2007] basic results—and research design—are remarkably similar to ours. The recent increase in event-window contribution to volatility in our sample is consistent with the evidence in Francis, Schipper, and Vincent [2002], and the Landsman and Maydew [2002] finding that announcement period return volatility increases over time, but it largely postdates their sample periods.

[10] Allegations of biased analyst reports surfaced in 2000. In early 2001, New York’s attorney general, Eliot L. Spitzer, commenced an investigation that culminated in an April 2003 settlement involving $1.4 billion in fines and fraud charges.

TABLE 4

Annual Regressions of Calendar-Year Returns on the Four Earnings-Announcement Window Returns, for a Constant Sample of 1,593 Firms over 1996–2006

Year	Intercept	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Abnormal R^2 %	No. of Obs.
Panel A: Arithmetic returns							
1996	0.199	0.649	1.708	1.082	1.390	7.4	1,593
1997	0.294	1.541	0.926	1.233	0.982	7.1	1,593
1998	0.030	0.622	0.898	1.501	0.570	3.5	1,593
1999	0.241	1.084	2.104	1.347	2.267	0.2	1,593
2000	0.105	0.803	1.072	1.426	0.594	4.9	1,593
2001	0.206	0.905	0.636	1.638	0.887	3.0	1,593
2002	−0.081	1.573	2.804	0.627	0.588	17.2	1,593
2003	0.568	1.879	1.713	0.782	1.872	4.5	1,593
2004	0.218	0.944	1.370	1.458	1.374	12.6	1,593
2005	0.049	1.194	1.311	1.196	1.089	16.9	1,593
2006	0.167	1.089	1.141	1.108	1.042	17.0	1,593
1996–2006 mean	0.181	1.117	1.426	1.218	1.151	8.6	1,593
p-value ($H_0 = 1$)		0.36	0.05	0.04	0.38		
Panel B: Logarithmic returns							
1996	0.119	0.794	1.294	0.823	1.043	9.1	1,593
1997	0.195	1.321	0.868	1.051	0.731	9.1	1,593
1998	−0.074	0.719	1.148	1.241	0.571	4.6	1,593
1999	0.047	0.643	1.031	0.721	1.173	3.0	1,593
2000	−0.034	0.725	1.108	1.496	0.866	7.7	1,593
2001	0.093	0.861	0.399	1.227	0.694	5.3	1,593
2002	−0.159	1.352	1.461	0.790	0.421	9.8	1,593
2003	0.381	0.801	0.825	0.639	0.857	6.2	1,593
2004	0.153	0.826	1.119	1.074	0.958	18.0	1,593
2005	0.005	1.122	1.153	1.255	0.929	20.2	1,593
2006	0.120	0.997	0.886	0.927	0.975	22.0	1,593
1996–2006 mean	0.077	0.924	1.027	1.022	0.838	10.5	1,593
p-value ($H_0 = 1$)		0.32	0.76	0.79	0.03		

This table presents estimates from the regression of calendar-year returns on the four quarterly earnings-announcement returns in the year for a constant sample of firms over the years 1996 to 2006. Calendar-year buy-and-hold returns are computed from daily CRSP returns. Earnings-announcement returns are buy-and-hold returns for the three days surrounding the Compustat announcement date. Firm-years with other than four earnings announcements or with daily return data for fewer than 240 trading days are excluded. Panels A and B present estimates using arithmetic and logarithmic returns, respectively. The p-values are from F-tests that the mean coefficient is 1.0. Abnormal R^2-square is the regression adjusted R^2 value minus its expectation assuming i.i.d. daily returns. Only firms that have data to estimate the regressions in each of the years 1996 to 2006 are included in the analysis.

and 3, so the increase does not appear to be caused by a change in sample composition.[11]

4.8 CONCURRENT MANAGEMENT FORECASTS

The apparent increase in information released in the announcement window appears due only in small part to the post-2001 increase in concurrently

[11] The abnormal R^2 values in table 4 generally are larger than for their full-sample counterparts in tables 2 and 3, especially in the later years, possibly due to the 10-year sample selection bias.

TABLE 5

Percentage of Firm-Quarters with Management Forecasts Issued in and between Earnings-Announcement Windows

	In the Earnings-Announcement Window			
Year	Day 0	Day −1	Day +1	Between Earnings-Announcement Windows
1994	0.02	0.02	0.00	0.56
1995	0.14	0.13	0.07	2.00
1996	0.26	0.19	0.04	3.26
1997	0.56	0.24	0.08	4.09
1998	1.21	0.22	0.20	6.39
1999	2.24	0.17	0.32	6.73
2000	2.18	0.10	0.17	5.19
2001	8.15	0.12	0.29	8.65
2002	10.53	0.17	0.25	7.06
2003	12.47	0.17	0.22	6.46
2004	14.59	0.21	0.28	6.38
2005	15.46	0.15	0.24	5.58
2006	17.47	0.20	0.43	5.37

This table presents the annual frequency of management forecasts as a function of event time. It reports, for each calendar year, the percentage of earnings announcements where a management forecast is issued on the day of the announcement (day 0), on the day before the announcement (day −1), on the day after the announcement (day +1), and outside earnings-announcement windows (i.e., between day +1 of the previous quarter and day −1 of the current quarter). Management forecasts are obtained from the First Call database for all firms with earnings announcements on the CRSP–Compustat merged database, and are available from 1994 onwards. All management forecasts in First Call are considered, irrespective of their periodicity (quarterly or annual) and whether the forecast was a number, a range, or a qualitative statement.

released management forecasts, reported by Anilowski, Feng, and Skinner [2007, table 2].[12] Table 5 reports, for each calendar year, the percentage of earnings announcements where a management forecast is issued on the day of the announcement (day 0), on the day before the announcement (day −1), on the day after the announcement (day +1), and outside the earnings-announcement windows (i.e., between day +1 of the previous quarter and day −1 of the current quarter). Management forecasts are obtained from the First Call database for all firms with earnings announcements on the CRSP–Compustat merged database, and are available from 1994 onwards. All management forecasts in First Call are considered, irrespective of their periodicity (quarterly or annual) and whether the forecast is a number, a range, or a qualitative statement. Consistent with the evidence in Anilowski, Feng, and Skinner [2007, table 2], after approximately 2001 a larger fraction of firms release concurrent forecasts. By 2006, more than one in six quarterly earnings announcements are accompanied by a management forecast.[13]

[12] See also Waymire [1985], Hoskin, Hughes, and Ricks [1986], and Rogers, Skinner, and Van Buskirk [2008].

[13] The effect of the increased First Call coverage of management forecasts, identified by Anilowski, Feng, and Skinner [2007, p. 60], is unclear. This does not explain the observed post-2001 increase in management forecasts between earnings windows, unless First Call has increased its coverage of forecasts only if concurrent with earnings announcements.

TABLE 6

Regressions of Calendar-Year Returns on the Four Earnings-Announcement Window Returns, after Excluding Firm-Years in Which a Management Forecast Is Issued

	Year	Intercept	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Abnormal R^2 %	No. of Obs.
Panel A: Excludes firm-years with a management forecast in an earnings-announcement window								
Arithmetic returns	1994–2006 mean	0.181	1.246	1.138	1.118	1.154	5.2	4,595
	p-value ($H_0 = 1$)		0.03	0.20	0.18	0.39		
	1994–2006 median	0.171	1.263	0.961	1.211	1.097	4.5	4,673
	p-value ($H_0 = 1$)		0.02	0.12	0.02	0.02		
	1994–1999 mean	0.179	1.126	0.996	1.063	1.241	2.4	5,165
	2000–2006 mean	0.183	1.348	1.260	1.165	1.080	7.5	4,106
Logarithmic returns	1994–2006 mean	−0.004	1.149	1.072	1.157	1.051	9.6	4,595
	p-value ($H_0 = 1$)		0.07	0.24	0.21	0.53		
	1994–2006 median	0.050	1.080	1.067	1.040	1.131	8.1	4,673
	p-value ($H_0 = 1$)		0.00	0.59	0.12	0.59		
	1994–1999 mean	0.006	1.019	0.997	0.999	1.130	6.6	5,165
	2000–2006 mean	−0.013	1.261	1.137	1.292	0.984	12.3	4,106
Panel B: Excludes firm-years with management forecasts								
Arithmetic returns	1994–2006 mean	0.197	1.257	1.139	1.129	1.143	5.1	4,033
	p-value ($H_0 = 1$)		0.04	0.18	0.17	0.44		
	1994–2006 median	0.183	1.246	1.055	1.254	1.057	4.2	4,101
	p-value ($H_0 = 1$)		0.02	0.59	0.02	0.02		
	1994–1999 mean	0.201	1.153	0.961	1.062	1.243	2.3	4,481
	2000–2006 mean	0.193	1.346	1.290	1.187	1.058	7.5	3,650
Logarithmic returns	1994–2006 mean	0.009	1.157	1.074	1.161	1.042	9.7	4,033
	p-value ($H_0 = 1$)		0.05	0.28	0.21	0.60		
	1994–2006 median	0.062	1.093	1.028	1.020	1.132	8.6	4,101
	p-value ($H_0 = 1$)		0.00	0.12	0.12	0.12		
	1994–1999 mean	0.022	1.025	0.953	0.984	1.129	6.5	4,481
	2000–2006 mean	−0.002	1.271	1.177	1.313	0.968	12.5	3,650

This table replicates tables 2 and 3 after excluding firm-years in which management forecasts are issued. Management forecasts are obtained from the First Call database for all firms with earnings announcements on the CRSP–Compustat merged database, and are available from 1994 onwards. All management forecasts in First Call are considered, irrespective of their periodicity (quarterly or annual) and whether the forecast was a number, a range, or a qualitative statement. In panel A, only firm-years in which a management forecast is issued in an earnings-announcement window are excluded. In panel B, all firm-years in which a management forecast is issued are excluded, irrespective of whether the forecast is issued within an earnings-announcement window or not.

This result suggests two things. First, the increased frequency of concurrent management forecasts could explain at least part of the sharp increase in the apparent informativeness of earnings announcements after 2000. Second, the abnormal R^2 values reported in tables 2 and 3 could overstate the informativeness of earnings announcements per se.

To better understand this issue, panel A of table 6 reports results for a sample that excludes all firm-years in which a management forecast was issued in any of the four earnings-announcement windows. From 1994 (when the First Call data commence) to 2002, there are only minor differences between these results and the full-sample results in tables 2 and 3. For arithmetic returns, the average abnormal R^2 value in the period 1994 to 2006 is 5.2%, marginally lower than the 5.6% for the full sample in table 2. The equivalent estimate for logarithmic returns is marginally higher than for the full sample in table 3 (9.6% vs. 9.3%). Moreover, from untabulated results we find that the average abnormal R^2 value in the last four sample years, 2003 to 2006, falls, on average, by only 1% when concurrent management forecasts are excluded. These results are not sensitive to the choice of arithmetic versus logarithmic returns, and similar results are obtained from a constant-composition sample excluding management forecasts during earnings windows. This evidence implies that concurrent management forecasts explain only a small amount of the informativeness of earnings announcements as reported in tables 2 and 3 and of the sharp increase in recent years.

To further examine whether the relatively low informativeness of earnings announcements observed in tables 2 and 3 is due to managers prereleasing earnings information through management forecasts, we exclude all firm-years in which a management forecast is issued at any time, either inside or outside the four event windows. The results, reported in panel B of table 6, show that here too the abnormal R^2 values are similar to those for the full sample. On average, over 1994 to 2006, the abnormal R^2 values for arithmetic returns decline from 5.6% in table 2 to 5.2% when firm-years with management forecasts are excluded. A small increase in the average abnormal R^2 value is observed for logarithmic returns, from 9.3% to 9.6%. These results indicate that earnings announcements have relatively low explanatory ability for annual stock return volatility, even when managers do not preempt the announcements with earnings forecasts.

4.9 EFFECT OF SIZE

Earnings announcements are generally viewed as more informative for smaller firms, because they have a sparser "information environment." Smaller firms attract lower media coverage and analyst following, resulting in lower information production outside their earnings-announcement windows (Atiase [1985], Collins, Kothari, and Rayburn [1987]). This reasoning addresses only the supply of information to the market, and ignores the likelihood that the demand for information increases in size. Simply put, large firms have more information requiring analysis than do small firms: They tend to have a wider range of products, greater geographical dispersion in operations, more assets, more liabilities, and more customers. If all the activities of a firm are independent, there are no scale economies in information production and we expect firm size to be proportional to the amount of observed information produced, and hence proportional to proxies for information production such as the number of analysts following its stock. We then expect both the unconditional variance of returns and the conditional (on earnings announcements) variance to decline with size at the same rate, leaving the relative informativeness of earnings independent of size. Because the activities of a firm likely are positively correlated (e.g., the reaction to a new product is similar across consumers), following standard asset-pricing logic one might expect information production to be a convex function of size and the relative informativeness of earnings to be a concave function of size.

To examine this issue, each year we sort firms into quintiles based on size and then estimate separate calendar-year regressions for each quintile. The results from these size-sorted regressions are presented in panels A through C of table 7 for three size proxies: market capitalization, book value of

TABLE 7

Average Abnormal R^2 Values and Slope Coefficients from Annual Regressions of Calendar-Year Returns on the Four Earnings-Announcement Window Returns, for Firms Sorted on Size, Market-to-Book Ratio, Book Leverage, and One-Digit SIC Code

Quintile	Period	Intercept	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Abnormal R^2 %	No. of Obs.
Panel A: Market capitalization quintiles								
Quintile 1	1972–2006 mean	0.209	1.132	1.158	1.004	1.109	5.6	683
(small)	p-value ($H_0 = 1$)		0.46	0.18	0.96	0.41		
	1972–2006 median	0.226	0.897	1.072	1.139	0.961	5.2	644
	p-value ($H_0 = 1$)		0.02	0.10	0.32	0.00		
	1972–1989 mean	0.151	0.889	1.176	1.051	0.998	5.5	472
	1990–2006 mean	0.270	1.391	1.140	0.955	1.227	5.7	907
Quintile 2	1972–2006 mean	0.194	1.125	1.205	1.153	1.093	6.3	684
	p-value ($H_0 = 1$)		0.13	0.07	0.10	0.32		
	1972–2006 median	0.218	1.157	1.044	1.149	1.006	5.2	644
	p-value ($H_0 = 1$)		0.02	0.00	0.74	0.00		
	1972–1989 mean	0.174	0.922	1.067	1.158	1.091	6.9	473
	1990–2006 mean	0.216	1.340	1.350	1.148	1.095	5.6	908
Quintile 3	1972–2006 mean	0.162	1.232	1.174	1.292	1.162	7.6	684
	p-value ($H_0 = 1$)		0.01	0.00	0.00	0.09		
	1972–2006 median	0.169	1.273	1.165	1.308	1.172	7.1	645
	p-value ($H_0 = 1$)		0.00	0.00	0.00	0.00		
	1972–1989 mean	0.160	1.177	1.155	1.298	1.137	7.1	473
	1990–2006 mean	0.164	1.290	1.193	1.285	1.188	8.1	908
Quintile 4	1972–2006 mean	0.140	1.217	1.215	1.263	1.054	8.7	684
	p-value ($H_0 = 1$)		0.00	0.05	0.00	0.58		
	1972–2006 median	0.145	1.123	1.116	1.250	1.039	9.4	644
	p-value ($H_0 = 1$)		0.02	0.00	0.74	0.00		
	1972–1989 mean	0.152	1.235	1.036	1.265	1.125	6.9	473
	1990–2006 mean	0.127	1.198	1.404	1.261	0.979	10.6	908
Quintile 5	1972–2006 mean	0.123	1.186	1.012	1.117	1.063	7.0	684
(large)	p-value ($H_0 = 1$)		0.01	0.89	0.24	0.52		
	1972–2006 median	0.139	1.104	0.974	1.145	0.951	6.1	644
	p-value ($H_0 = 1$)		0.10	0.00	0.32	0.00		
	1972–1989 mean	0.129	1.259	1.038	1.110	1.186	5.9	472
	1990–2006 mean	0.116	1.109	0.984	1.124	0.934	8.1	908
Panel B: Book value of total assets quintiles								
Quintile 1	1972–2006 mean	0.215	1.173	1.138	1.171	0.937	5.5	650
(small)	p-value ($H_0 = 1$)		0.38	0.19	0.08	0.60		
	1972–2006 median	0.191	1.046	1.044	1.199	0.850	4.1	641
	p-value ($H_0 = 1$)		0.74	0.00	0.00	0.00		
	1972–1989 mean	0.176	0.806	1.185	1.273	0.784	5.0	394
	1990–2006 mean	0.257	1.561	1.089	1.062	1.098	5.9	921
Quintile 2	1972–2006 mean	0.169	1.242	1.132	1.034	1.164	6.6	650
	p-value ($H_0 = 1$)		0.00	0.22	0.76	0.27		
	1972–2006 median	0.199	1.154	1.108	1.009	1.035	6.4	642
	p-value ($H_0 = 1$)		0.02	0.74	0.10	0.00		
	1972–1989 mean	0.149	1.233	1.031	0.945	1.001	6.2	394
	1990–2006 mean	0.190	1.251	1.239	1.128	1.337	7.1	922
Quintile 3	1972–2006 mean	0.153	1.244	1.238	1.227	1.055	7.3	650
	p-value ($H_0 = 1$)		0.03	0.01	0.03	0.60		
	1972–2006 median	0.177	1.148	1.216	1.124	1.047	6.4	642
	p-value ($H_0 = 1$)		0.00	0.10	0.10	0.00		
	1972–1989 mean	0.150	1.245	1.121	1.231	1.052	7.1	394
	1990–2006 mean	0.156	1.243	1.362	1.223	1.058	7.5	921

(*Continued*)

TABLE 7—*Continued*

Quintile	Period	Intercept	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Abnormal R^2 %	No. of Obs.
Quintile 4	1972–2006 mean	0.146	1.108	1.270	1.140	1.075	6.1	650
	p-value ($H_0 = 1$)		0.30	0.02	0.13	0.46		
	1972–2006 median	0.164	1.114	1.206	1.173	1.131	5.8	642
	p-value ($H_0 = 1$)		0.00	0.00	0.10	0.00		
	1972–1989 mean	0.145	1.067	1.042	1.063	1.174	3.5	394
	1990–2006 mean	0.147	1.151	1.511	1.222	0.971	8.9	922
Quintile 5	1972–2006 mean	0.139	1.049	1.201	1.196	1.061	6.1	650
(large)	*p*-value ($H_0 = 1$)		0.68	0.08	0.06	0.61		
	1972–2006 median	0.159	1.090	1.014	1.220	1.133	6.3	641
	p-value ($H_0 = 1$)		0.74	0.00	0.32	0.00		
	1972–1989 mean	0.136	0.968	1.155	1.207	1.124	5.9	394
	1990–2006 mean	0.142	1.135	1.249	1.184	0.994	6.2	921
Panel C: Book value of equity quintiles								
Quintile 1	1972–2006 mean	0.216	1.186	1.092	1.049	0.956	5.2	677
(small)	*p*-value ($H_0 = 1$)		0.30	0.40	0.56	0.69		
	1972–2006 median	0.191	0.989	1.051	1.117	0.787	5.2	635
	p-value ($H_0 = 1$)		0.02	0.10	0.00	0.00		
	1972–1989 mean	0.172	0.875	1.065	1.054	0.817	5.1	453
	1990–2006 mean	0.263	1.516	1.121	1.045	1.104	5.4	915
Quintile 2	1972–2006 mean	0.176	1.167	1.236	1.139	1.270	7.8	678
	p-value ($H_0 = 1$)		0.09	0.02	0.08	0.01		
	1972–2006 median	0.185	1.159	1.087	1.182	1.204	8.2	636
	p-value ($H_0 = 1$)		0.00	0.0 2	0.00	0.00		
	1972–1989 mean	0.157	1.020	1.162	1.174	1.289	8.2	453
	1990–2006 mean	0.196	1.322	1.313	1.103	1.250	7.4	916
Quintile 3	1972–2006 mean	0.157	1.282	1.214	1.213	1.106	7.4	678
	p-value ($H_0 = 1$)		0.00	0.00	0.05	0.32		
	1972–2006 median	0.188	1.266	1.238	1.098	1.045	6.9	635
	p-value ($H_0 = 1$)		0.00	0.00	0.32	0.00		
	1972–1989 mean	0.149	1.256	1.115	1.213	1.059	7.1	453
	1990–2006 mean	0.167	1.309	1.318	1.213	1.157	7.6	916
Quintile 4	1972–2006 mean	0.145	1.114	1.242	1.222	1.124	8.0	678
	p-value ($H_0 = 1$)		0.08	0.01	0.02	0.25		
	1972–2006 median	0.159	1.142	1.105	1.097	1.066	7.6	636
	p-value ($H_0 = 1$)		0.00	0.00	0.02	0.00		
	1972–1989 mean	0.151	1.211	1.212	1.168	1.189	7.0	453
	1990–2006 mean	0.139	1.012	1.274	1.280	1.055	9.0	916
Quintile 5	1972–2006 mean	0.133	1.155	1.083	1.135	1.058	6.8	677
(large)	*p*-value ($H_0 = 1$)		0.05	0.39	0.09	0.55		
	1972–2006 median	0.144	1.110	1.015	1.224	1.078	6.1	635
	p-value ($H_0 = 1$)		0.74	0.02	0.32	0.00		
	1972–1989 mean	0.137	1.203	0.967	1.102	1.133	5.8	453
	1990–2006 mean	0.129	1.104	1.205	1.170	0.979	7.8	915
Panel D: Market-to-book ratio quintiles								
Quintile 1	1972–2006 mean	0.234	1.070	1.185	1.122	1.070	5.9	663
(small)	*p*-value ($H_0 = 1$)		0.49	0.11	0.14	0.57		
	1972–2006 median	0.216	1.022	1.039	1.127	1.037	6.1	628
	p-value ($H_0 = 1$)		0.74	0.02	0.32	0.00		
	1972–1989 mean	0.203	0.936	1.121	1.118	1.003	6.2	444
	1990–2006 mean	0.267	1.211	1.253	1.126	1.141	5.6	894
Quintile 2	1972–2006 mean	0.176	1.370	1.297	1.038	1.036	8.0	663
	p-value ($H_0 = 1$)		0.20	0.07	0.68	0.71		
	1972–2006 median	0.185	1.210	1.258	1.041	1.037	6.9	628
	p-value ($H_0 = 1$)		0.00	0.10	0.32	0.00		
	1972–1989 mean	0.167	1.166	1.235	1.063	1.040	7.6	445
	1990–2006 mean	0.186	1.586	1.362	1.011	1.033	8.3	895

(*Continued*)

TABLE 7—*Continued*

Quintile	Period	Intercept	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Abnormal R^2 %	No. of Obs.
Quintile 3	1972–2006 mean	0.163	1.169	1.153	1.270	1.239	7.3	663
	p-value ($H_0 = 1$)		0.00	0.10	0.01	0.04		
	1972–2006 median	0.185	1.182	1.111	1.206	1.377	7.5	628
	p-value ($H_0 = 1$)		0.00	0.00	0.10	0.00		
	1972–1989 mean	0.157	1.080	1.140	1.299	1.146	7.1	445
	1990–2006 mean	0.169	1.263	1.166	1.239	1.337	7.6	894
Quintile 4	1972–2006 mean	0.133	1.152	1.084	1.066	1.122	6.0	663
	p-value ($H_0 = 1$)		0.05	0.19	0.50	0.31		
	1972–2006 median	0.139	1.159	0.988	1.071	1.118	5.3	628
	p-value ($H_0 = 1$)		0.74	0.32	0.74	0.00		
	1972–1989 mean	0.132	1.042	1.084	0.906	1.026	4.9	445
	1990–2006 mean	0.135	1.269	1.085	1.236	1.224	7.2	895
Quintile 5	1972–2006 mean	0.125	1.090	1.090	1.120	1.037	5.0	663
(large)	p-value ($H_0 = 1$)		0.32	0.34	0.27	0.75		
	1972–2006 median	0.115	1.061	1.099	0.954	0.885	4.8	628
	p-value ($H_0 = 1$)		0.02	0.74	0.00	0.00		
	1972–1989 mean	0.114	0.935	1.067	1.057	1.081	4.3	444
	1990–2006 mean	0.137	1.254	1.114	1.187	0.991	5.7	894
Panel E: Debt-to-equity ratio								
Quintile 1	1972–2006 mean	0.176	1.414	1.248	1.083	1.116	7.7	700
(small)	p-value ($H_0 = 1$)		0.06	0.08	0.36	0.39		
	1972–2006 median	0.181	1.080	1.016	1.183	1.019	7.6	622
	p-value ($H_0 = 1$)		0.32	0.02	0.74	0.00		
	1972–1989 mean	0.142	1.131	1.159	1.171	1.021	7.8	445
	1990–2006 mean	0.213	1.715	1.342	0.989	1.215	7.5	970
Quintile 2	1972–2006 mean	0.177	1.181	1.244	1.157	1.129	6.7	638
	p-value ($H_0 = 1$)		0.06	0.01	0.05	0.27		
	1972–2006 median	0.158	1.158	1.114	1.153	0.974	5.6	623
	p-value ($H_0 = 1$)		0.10	0.00	0.32	0.00		
	1972–1989 mean	0.156	1.022	1.210	1.124	1.112	6.9	446
	1990–2006 mean	0.200	1.350	1.280	1.192	1.147	6.6	841
Quintile 3	1972–2006 mean	0.162	1.196	1.084	1.276	1.107	7.2	669
	p-value ($H_0 = 1$)		0.01	0.28	0.01	0.19		
	1972–2006 median	0.186	1.220	1.084	1.342	1.079	7.9	623
	p-value ($H_0 = 1$)		0.10	0.00	0.02	0.00		
	1972–1989 mean	0.158	1.206	1.017	1.209	1.158	6.7	445
	1990–2006 mean	0.167	1.186	1.154	1.347	1.052	7.7	906
Quintile 4	1972–2006 mean	0.154	1.110	1.232	1.200	1.095	7.8	669
	p-value ($H_0 = 1$)		0.24	0.02	0.07	0.29		
	1972–2006 median	0.175	0.988	1.088	1.274	1.040	6.9	623
	p-value ($H_0 = 1$)		0.00	0.00	0.10	0.00		
	1972–1989 mean	0.162	1.088	1.160	1.198	0.973	7.3	446
	1990–2006 mean	0.146	1.133	1.308	1.202	1.223	8.2	906
Quintile 5	1972–2006 mean	0.157	0.985	1.232	1.081	1.029	4.8	669
(large)	p-value ($H_0 = 1$)		0.86	0.09	0.40	0.83		
	1972–2006 median	0.190	0.995	1.173	1.017	0.916	4.1	623
	p-value ($H_0 = 1$)		0.02	0.74	0.02	0.00		
	1972–1989 mean	0.149	0.889	1.072	1.002	1.079	4.4	445
	1990–2006 mean	0.166	1.085	1.401	1.164	0.975	5.3	905

(*Continued*)

assets, and book value of equity. Returns are arithmetic (similar results apply to logarithmic returns). Extreme observations are not deleted. For each of the three size proxies, the abnormal adjusted R^2 value averaged across all years is best described as a concave function of size. In each case, the

TABLE 7—*Continued*

Panel F: Industry classification (one-digit SIC code)

Period	Intercept	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Abnormal R^2 %	No. of Obs.
Agriculture, forestry, fishing, mining, and construction (0,1)							
1972–2006 mean	0.182	1.557	1.029	0.903	1.317	5.8	241
p-value ($H_0 = 1$)		0.28	0.89	0.55	0.08		
1972–2006 median	0.159	0.867	0.787	0.900	1.176	2.7	255
p-value ($H_0 = 1$)		0.02	0.74	0.02	0.00		
1972–1989 mean	0.178	0.990	0.871	0.882	1.475	4.8	209
1990–2006 mean	0.185	2.157	1.196	0.925	1.150	6.9	276
Manufacturing (2,3)							
1972–2006 mean	0.166	1.165	1.130	1.188	1.119	7.0	1549
p-value ($H_0 = 1$)		0.05	0.03	0.00	0.24		
1972–2006 median	0.169	1.146	1.100	1.255	1.036	6.0	1486
p-value ($H_0 = 1$)		0.00	0.00	0.02	0.00		
1972–1989 mean	0.150	1.066	1.184	1.154	1.034	7.1	1250
1990–2006 mean	0.183	1.270	1.072	1.225	1.208	6.8	1865
Transportation, communications, and utilities (4)							
1972–2006 mean	0.154	1.057	1.181	1.197	0.859	5.6	308
p-value ($H_0 = 1$)		0.59	0.24	0.25	0.33		
1972–2006 median	0.173	1.060	1.099	0.975	0.871	5.3	319
p-value ($H_0 = 1$)		0.02	0.74	0.02	0.00		
1972–1989 mean	0.147	1.075	0.851	1.028	0.891	5.5	233
1990–2006 mean	0.160	1.039	1.530	1.375	0.826	5.8	387
Wholesale and retail trade (5)							
1972–2006 mean	0.154	1.070	1.263	1.120	1.001	8.1	355
p-value ($H_0 = 1$)		0.54	0.06	0.28	1.00		
1972–2006 median	0.141	1.051	1.260	0.968	0.859	7.7	345
p-value ($H_0 = 1$)		0.00	0.74	0.02	0.00		
1972–1989 mean	0.163	1.063	0.999	1.105	0.998	6.5	242
1990–2006 mean	0.144	1.077	1.543	1.137	1.003	9.7	474
Finance, insurance, and real estate (6)							
1972–2006 mean	0.150	0.885	1.146	1.149	1.205	6.5	559
p-value ($H_0 = 1$)		0.44	0.16	0.20	0.13		
1972–2006 median	0.162	0.872	1.195	1.109	1.045	6.1	446
p-value ($H_0 = 1$)		0.00	0.02	0.32	0.00		
1972–1989 mean	0.125	0.705	0.988	1.418	1.198	7.0	247
1990–2006 mean	0.176	1.075	1.312	0.865	1.214	5.9	889
Services (7,8)							
1972–2006 mean	0.190	1.158	1.169	1.308	1.048	7.1	453
p-value ($H_0 = 1$)		0.23	0.22	0.02	0.72		
1972–2006 median	0.189	1.082	1.069	1.191	1.020	6.9	385
p-value ($H_0 = 1$)		0.32	0.02	0.74	0.00		
1972–1989 mean	0.177	0.969	1.141	1.483	1.052	7.5	182
1990–2006 mean	0.204	1.357	1.199	1.122	1.045	6.7	740

This table presents estimates from annual regressions of calendar-year returns on the four earnings-announcement window returns, for firms sorted on size, market-to-book ratio, book leverage, and one-digit SIC code. Regressions are as described in tables 2 and 3, but are estimated separately for stocks sorted annually on variables that potentially proxy for the firm's information environment. Panels A, B, and C present results for size quintiles based on prior year-end market capitalization, book value of total assets, and book value of equity, respectively. Panel D presents results for quintiles based on the prior year-end market-to-book ratio, panel E presents results for quintiles based on the prior year-end debt-to-equity ratio (defined as the book value of total long-term debt divided by the book value of equity), and panel F presents results for firms classified by one-digit SIC code. The table reports the means and medians of estimates across the yearly regressions. The p-values and abnormal R^2 are as defined in tables 2 and 3. Returns are arithmetic.

smallest-size quintile exhibits the *lowest* abnormal R^2 value: 5.6%, 5.5%, and 5.2%. The largest-size quintile exhibits the second-lowest abnormal R^2 value for two proxies and the third-lowest for the other. Similar concavity is observed in the size quintiles' medians, suggesting it is not due to outliers. Thus, while small stocks exhibit higher return volatility at earnings announcements, their announcements appear to contribute a lower proportion of their annual return volatility.

These results could be affected by three-day returns for small firms being noisier, due to market pricing issues such as bid–ask bounce. However, in the following subsection we report a similar concavity for portfolios formed on market-to-book ratios.

4.10 EFFECT OF THE MARKET-TO-BOOK RATIO, LEVERAGE, AND INDUSTRY

The informativeness of earnings is likely to depend on a variety of firm characteristics. We study market-to-book (MTB) ratios, leverage, and industry, using arithmetic returns. The likely effect of MTB is unclear. To the extent that MTB reflects "unbooked" growth options, earnings are likely to be *less* informative about changes in firm value, which predicts that the abnormal R^2 decreases with MTB. To the extent that MTB reflects the "unbooked" intellectual property of mature, nongrowth businesses with long-term earnings streams, such as Coca Cola and Microsoft, earnings are likely to be *more* informative about changes in firm value, which predicts that the abnormal R^2 increases with MTB. Panel D of table 7 reports results for MTB quintiles. The relation between MTB and abnormal R^2 appears concave, consistent with both of the above effects existing in the data.

Panel E of table 7 reports results for quintiles formed on book leverage, defined as the book value of long-term debt divided by the book value of equity. There is no evident relation between book leverage and abnormal R^2, possibly because leverage has a similar effect on the volatilities of stock returns and earnings. The largest leverage quintile exhibits the *lowest* abnormal R^2 value, 4.8%.

To provide better insight into the effects of firm characteristics on earnings informativeness, we also study industry effects. It seems plausible that informativeness differs between (say) manufacturing and finance, due to a greater proportion of transitory earnings components in the latter. Panel F of table 7 reports results for seven broad industry groupings based on one-digit Standard Industrial Classification (SIC) codes. Wholesale and retail firms exhibit the highest abnormal R^2 values, and transportation, communication, and utilities exhibit the lowest. The surprising result is the consistency of the relative informativeness of earnings across industries: The range of abnormal R^2 values is only 5.6% to 8.1%.

4.11 TIME-SERIES REGRESSIONS

As a specification check, we also estimate firm-level time-series regressions. When the minimum required number of years with return data is set to 20, the sample size is 1,427 firms and the mean (median) firm's estimated abnormal R^2 is 8.9% (6.5%) for arithmetic returns and 9.7% (7.6%) for logarithmic returns. These results could be affected by survivor bias, though similar results are obtained for larger samples when the data requirement is reduced to 15 or 10 years. Overall, the results are not substantially different from those of the cross-sectional regressions.

4.12 DIFFERENT EVENT WINDOWS

The results are not sensitive to the length of the chosen event window. For example, with a two-day window (day 0 and day +1, where day 0 is the Compustat earnings-announcement date), the average abnormal R^2 over the full period 1972 to 2006 is 4.5% for arithmetic returns (compared to 5.9% in table 2 for a three-day window) and 7.2% for logarithmic returns (compared to 9.3% in table 3). The reduction occurs because, as reported in the following section, there is a negative abnormal R^2 value on day −1, which is dropped from this calculation.[14] Lower abnormal R^2 values also are observed when the event window is extended to 5 days (−2 to +2).

5. *Information in Adjacent Nonevent Windows*

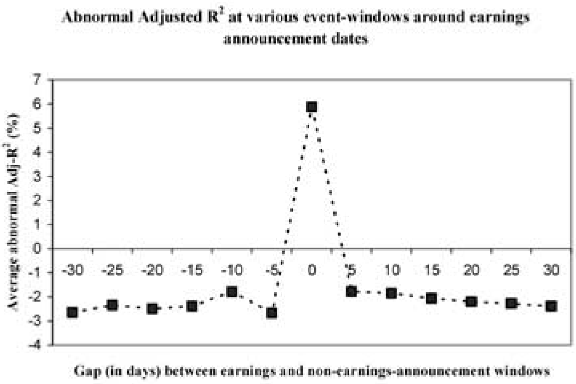
We next examine information flows in the periods surrounding the earnings-announcement windows. We study various event-time windows that are distanced in event time from the earnings-announcement windows by plus or minus 0, 5, 10, 15, 20, 25, or 30 trading days. For example, when the distance from the earnings-announcement window is +10 trading days, the calendar-year return is regressed annually on returns in the four non-earnings-announcement windows comprising days +9 to +11 relative to the four annual Compustat earnings-announcement dates. The period studied is approximately the six weeks before, the week of, and the six weeks after the quarterly earnings announcement—a period of approximately one quarter in length, centered on the announcement day. As previously, only firms with exactly four earnings announcements in a calendar year are included, and we require the three-day event windows to lie entirely within the calendar year.

The regressions are estimated annually from arithmetic returns, and the average of the abnormal adjusted R^2 values and slope coefficients are plotted in figure 2. Not surprisingly, the abnormal adjusted R^2 in panel A of figure 2 is highest when the three-day event window corresponds to the earnings-announcement window. It is slightly negative in each of the six weeks before and six weeks after the announcement.[15] It is lowest immediately prior to the earnings-announcement window, that is, during the three-day window commencing five trading days before the earnings-announcement window.

[14] It is well known that many earnings announcements occur after the close of trading on the Compustat announcement date, so the window must include both days 0 and 1 to avoid biasing the estimated abnormal R^2 downward. Berkman and Truong [2008] report that the frequency of after-hours earnings announcements exceeds 40% in recent years.

[15] If returns are i.i.d. and hence the regression slopes are unity, the positive abnormal R^2 value in the event week would mechanically induce a small negative abnormal R^2 value in the average nonevent week. The comparatively small abnormal R^2 values in the adjacent nonevent windows explain why the event-window abnormal R^2 is relatively insensitive to the event window width—as the window widens, the contribution of the window to annual return volatility rises at approximately the same rate as its i.i.d. benchmark. Our results are similar to those in Beaver [1968] and Morse [1981], who employ different but related research designs and study earlier and smaller samples.

Panel A: Average abnormal adjusted R^2 in event time



Panel B: Average slope coefficients in event time

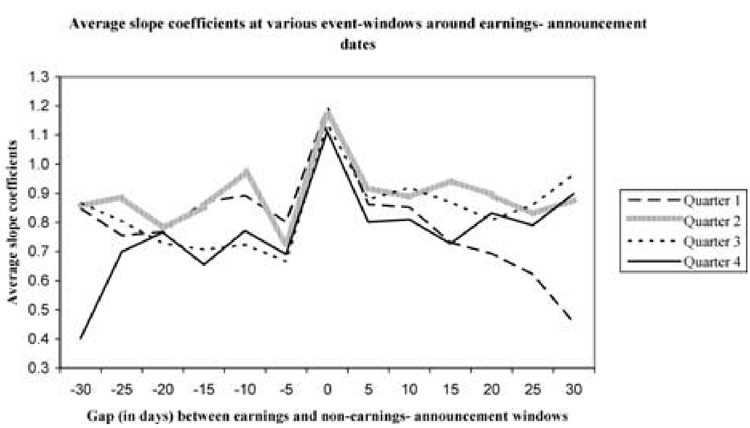


FIG. 2.—Average slope coefficients and adjusted abnormal R^2 values from annual regressions of calendar-year arithmetic returns on arithmetic returns in four three-day windows that vary in event time relative to the four quarterly earnings-announcement windows. The event-time windows are distanced in event time from the earnings-announcement windows by plus or minus 0, 5, 10, 15, 20, 25, or 30 trading days. For example, when the distance from the earnings-announcement window is +10 trading days, the calendar-year return is regressed annually on returns in the four non-earnings-announcement windows comprising days +9 to +11 relative to the four annual Compustat earnings-announcement dates. When the distance from the announcement window is 0 trading days, calendar-year return is regressed annually on returns in the four earnings-announcement windows themselves. Statistics are averages of regression parameters across years. Calendar-year arithmetic buy-and-hold returns are computed from daily CRSP returns. Earnings-announcement window returns and non-announcement window returns are arithmetic buy-and-hold returns over the three days. The sample is all firm-years with available data on the quarterly Compustat and daily CRSP files. Firm-years with other than four earnings announcements or with daily returns data for fewer than 240 trading days are excluded. The abnormal adjusted R^2 is the regression adjusted R^2 minus its expectation assuming i.i.d. daily returns.

This result holds in both the 1972 to 1989 and the 1990 to 2005 periods, and for logarithmic as well as arithmetic returns. The result is consistent with private information production being comparatively depressed immediately around earnings announcements, for example, because public announcements decrease investors' incentives to produce new information (i.e., "crowd it out"), because firms impose restrictions on insider trading or on earnings guidance updates around earnings announcements, or simply because information production opportunities are reduced in that period.[16]

Panel B of figure 2 reports the average slope coefficients from three-day event windows around the earnings-announcement dates. The coefficients for all the non-earnings-announcement windows are substantially less than unity, implying systematic reversals, consistent with initial market overreaction. The average quarter's slope coefficient is lowest for the three-day event window in the week immediately before the earnings-announcement window, which seems to be the period when returns are more driven by liquidity and other transitory shocks than by price-relevant information.[17]

6. *Analyst Earnings Forecasts and Management Forecasts*

Our regression design can be adapted to quantify the relative informativeness of some other variables, such as dividends, 10-Q filings, and earnings forecasts. This section reports some results on earnings forecasts by analysts and managers.

The evidence that information arrival appears slightly lower than normal both before and after earnings announcements seems somewhat inconsistent with the view that security analysts produce substantial new information. In the weeks prior to earnings announcements, analysts might be expected to release above-normal amounts of information. In the weeks following earnings announcements, analysts commonly revise their forecasts of future earnings. Our results suggest that much forecast revision immediately after earnings announcements consists of incorporating the new information in the announcement into the forecasts, rather than producing new information.

6.1 EARLIEST POSTANNOUNCEMENT ANALYST FORECAST REVISION

We initially investigate abnormal price volatility at the earliest analyst forecast revision after each of the four quarterly earnings announcements. The

[16] See, for example, Kim and Verrecchia [1997].

[17] The higher abnormal R^2 values and slope coefficients in regressions based on earnings-announcement windows relative to those based on non-earnings-announcement windows could potentially reflect differences in return-measurement errors across these event windows. If returns in non-earnings-announcement windows are more affected by stale prices, bid–ask bounce, or other noise then the slope coefficients and adjusted R^2 values would be more attenuated in these periods.

objective is to better understand the result that information arrival appears to be slightly lower than normal after earnings announcements, a period when analysts might be expected to revise their forecasts of future earnings in light of the earnings outcome and other information released in the announcement window.

Analyst forecast data are available from the I/B/E/S detailed unadjusted data set from 1985 onwards, and 2006 is the last year with sufficient data. Forecast event-window returns are arithmetic buy-and-hold returns for the three days surrounding the first analyst forecast revision after the previous quarter's earnings announcement. There must be at least one forecast revision in each calendar quarter for a firm/year to be included in the sample. Forecasts issued within two trading days after the earnings announcement are excluded, to avoid overlap between the three-day earnings and three-day forecast windows. Results are sensitive to a small number of extreme outliers, so we report results for a sample that excludes, in each calendar year, the extreme 1% on either side of the calendar-year returns, earnings-announcement returns, and forecast event-window returns. Deletion of an individual quarter requires deletion of the entire firm/year from the regression. The resulting sample size peaks at 1,112 in 1992, falls substantially over time, and averages 477 firms per year.

Table 8, panel A reports that the average abnormal adjusted R^2 value from annual regressions of calendar-year returns on the four forecast revision window returns is -0.4%. The earliest forecast revision after earnings announcements therefore is not a period of unusual price volatility, consistent with the evidence in figure 2. One possibility is that the first postannouncement forecast revision typically incorporates the old information released in earnings, not new information, though we note that (particularly for small stocks) many of the first postannouncement revisions occur considerably later. Each of the four regression slopes is less than unity, though none is significantly less.

Panel B presents results for the earnings-announcement windows of the same sample of firms/years as in panel A. The average abnormal adjusted R^2 for this sample is lower than for the full sample (4.5% vs. 5.8% in table 2 for 1985 to 2006), suggesting that firms receiving forecast revisions each quarter are those whose earnings are slightly less informative than usual.

To include forecasts issued on the first trading day after the earnings announcement, we reduce the forecast event window to its announcement day. Forecasts on the same day as earnings announcements are excluded. In all other respects the analysis is as reported in table 8. The untabulated results are similar to those for three-day windows. The sample size increases slightly, from an average of 477 firms per year to 556. The average abnormal adjusted R^2 from annual regressions of calendar-year returns on forecast revision returns is 0.0%. Caution is advised in interpreting results from single-day windows, because the events could have occurred after the close of trading.

TABLE 8

Annual Regressions of Arithmetic Calendar-Year Returns on Arithmetic Returns in the Window Surrounding the Earliest Earnings Analyst-Forecast Revision Each Quarter and on Earnings-Announcement Window Returns for the Same Sample

Period	Intercept	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Abnormal R^2 %	No. of Obs.
Panel A: Calendar-year returns regressed on the earliest analyst quarterly forecast revision window returns							
1985–2006 mean	0.160	0.802	0.913	0.803	0.989	−0.4	477
p-value ($H_0 = 1$)		0.12	0.61	0.23	0.96		
1985–2006 median	0.173	0.863	0.850	0.706	1.090	−0.8	369
p-value ($H_0 = 1$)		0.40	0.10	0.10	0.40		
1985–1995 mean	0.151	0.639	0.952	0.814	0.847	−1.3	686
1996–2006 mean	0.170	0.965	0.874	0.793	1.132	0.6	269
Panel B: Calendar-year returns regressed on earnings-announcement window returns, analyst earnings forecast sample							
1985–2006 mean	0.144	1.069	1.078	0.926	1.051	4.5	477
p-value ($H_0 = 1$)		0.56	0.55	0.52	0.67		
1985–2006 median	0.151	0.987	1.092	1.041	0.958	5.2	369
p-value ($H_0 = 1$)		1.00	0.10	0.40	0.40		
1985–1995 mean	0.144	1.006	1.049	1.052	1.008	4.7	686
1996–2006 mean	0.145	1.132	1.108	0.800	1.094	4.3	269

This table presents estimates from annual regressions of arithmetic calendar-year returns on arithmetic returns in the window surrounding the earliest earnings analyst-forecast revision each quarter and on earnings-announcement window returns for the same sample. Event-window returns are arithmetic buy-and-hold returns for the three days surrounding the first analyst earnings forecast revision after the previous quarter's earnings announcement, and surrounding the Compustat earnings announcement date. Analyst forecast data are from the I/B/E/S detailed unadjusted data set. Overlapping forecast and earnings-announcement windows are excluded, as are firm-years with other than four earnings announcements, four forecast event windows, or daily returns data in fewer than 240 trading days. The sample excludes, in each calendar year, the extreme 1% on either side of the calendar-year returns, earnings-announcement window returns, and forecast window returns. Deletion of an individual quarter requires deletion of the entire firm/year. Panel A presents results for forecast event-window returns, while panel B presents results for earnings-announcement returns with the same sample. The table presents means across years, Fama–MacBeth t-statistics, and p-values from F-tests that the mean coefficient is 1.0 and sign tests that the frequency of coefficients exceeding 1.0 is 0.5. Abnormal R^2 is the regression adjusted R^2 value minus its expectation assuming i.i.d. daily returns.

6.2 LATEST PREANNOUNCEMENT ANALYST FORECAST REVISION

Forecast revisions made before earnings announcements appear to be associated with more price revision than those made after. Table 9 investigates abnormal price volatility at the latest analyst forecast revision to take before each of the four quarterly earnings announcements. The procedure followed is the same as for postannouncement forecasts as reported in table 8. Here too the sample size peaks in 1992. There are insufficient observations in 2000 to 2002 to estimate regressions.

In contrast with the postannouncement forecasts, in panel A the four latest forecast revisions before earnings announcements exhibit an average abnormal adjusted R^2 of 4.7%. This increases substantially in recent years, indicating that reduced analyst activity is not an explanation for the increase in relative informativeness of earnings reported above. Panel B reports a comparatively large average earnings-announcement day abnormal R^2 for this sample of 9.3%.

TABLE 9

Annual Regressions of Arithmetic Calendar-Year Returns on Arithmetic Returns in the Window Surrounding the Latest Analyst Earnings-Forecast Revision Each Quarter and on Earnings-Announcement Window Returns for the Same Sample

Period	Intercept	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Abnormal R^2 %	No. of Obs.
Panel A: Calendar-year returns regressed on the latest analyst forecast revision window returns							
1985–2006 mean	0.168	1.288	1.629	1.226	1.124	4.7	513
p-value ($H_0 = 1$)		0.31	0.14	0.32	0.61		
1985–2006 median	0.176	1.073	1.490	1.287	1.009	4.4	381
p-value ($H_0 = 1$)		1.00	0.08	1.00	0.37		
1985–1995 mean	0.139	1.232	1.159	1.200	1.103	3.0	671
1996–2006 mean	0.207	1.363	2.275	1.262	1.154	7.0	296
Panel B: Calendar-year returns regressed on earnings-announcement window returns, analyst earnings forecast sample							
1985–2006 mean	0.170	1.198	1.471	1.403	1.263	9.3	513
p-value ($H_0 = 1$)		0.07	0.02	0.07	0.20		
1985–2006 median	0.158	1.177	1.298	1.368	1.091	8.3	381
p-value ($H_0 = 1$)		0.37	0.01	0.37	0.37		
1985–1995 mean	0.149	1.108	1.446	1.601	1.305	10.5	671
1996–2006 mean	0.198	1.321	1.506	1.132	1.205	7.6	296

This table presents estimates from annual regressions of arithmetic calendar-year returns on arithmetic returns in the window surrounding the latest analyst earnings-forecast revision each quarter and on earnings-announcement window returns for the same sample. Forecast event-window returns are arithmetic buy-and-hold returns for the three days surrounding the latest analyst earnings forecast revision after the previous quarter's earnings announcement. Earnings-announcement returns are similarly estimated for the three-day window around the Compustat earnings announcement date. Analyst forecast data are from the I/B/E/S detailed unadjusted data set. Forecasts whose window overlaps the earnings window are excluded, as are firm-years with other than four earnings announcements, four forecast event windows, or daily returns data for fewer than 240 trading days. There are fewer than 12 observations in 2000, 2001, and 2002, so these years are excluded. Panel A presents results for forecast event-window returns, while panel B presents results for earnings-announcement returns with the same sample. The table presents means across years, Fama–MacBeth t-statistics, and p-values from F-tests that the mean coefficient is 1.0 and sign tests that the frequency of coefficients exceeding 1.0 is 0.5. Abnormal R^2 is the regression adjusted R^2 value minus its expectation assuming i.i.d. daily returns.

6.3 MANAGEMENT FORECASTS

The results reported in table 6 indicate that abnormal R^2 values for earnings-announcement windows decline when concurrent management forecasts are excluded, implying that management forecasts are likely to be informative. To examine the relative informativeness of management forecasts, we modify regression (1) to a quarterly setting, as there are very few firm-years with management forecasts in every calendar quarter. We regress calendar-quarter returns on returns in the three-day windows surrounding management forecast dates obtained from the First Call database. To avoid confounding effects, we consider only management forecasts released outside the three-day earnings-announcement windows and only the last forecast in the firm-quarter, if multiple forecasts are issued. A potential limitation of the quarterly regressions is that any initial under- or overreaction is assumed to be corrected by the end of that calendar quarter.

TABLE 10

Regressions of Quarterly Returns on Returns in the Management Forecast Window

	Arithmetic Returns				Logarithmic Returns			
Calendar Year and Quarter	Intercept	Mgmt Forecast Return	Abnormal R^2 (%)	No. of Obs.	Intercept	Mgmt Forecast Return	Abnormal R^2 (%)	No. of Obs.
19981	0.114	1.177	25.6	449	0.088	1.204	35.3	449
19982	−0.076	1.130	32.7	493	−0.107	1.260	34.1	493
19983	−0.235	0.880	34.8	546	−0.310	1.221	38.4	546
19984	0.169	0.973	16.7	738	0.121	0.920	22.1	738
19991	−0.045	1.061	8.0	720	−0.102	1.166	27.8	720
19992	0.141	1.096	22.3	596	0.100	0.944	27.4	596
19993	−0.077	1.122	23.5	576	−0.123	1.235	27.3	576
19994	0.196	1.555	11.6	609	0.084	1.126	22.7	609
20001	0.106	1.232	14.3	571	0.036	1.060	21.0	571
20002	−0.083	1.002	22.4	454	−0.140	1.151	24.8	454
20003	0.020	1.205	26.3	543	−0.019	1.411	42.3	543
20004	−0.096	0.850	15.5	900	−0.163	1.432	27.6	900
20011	−0.001	0.861	8.3	1,210	−0.051	1.187	19.5	1,210
20012	0.173	0.964	7.5	993	0.118	0.837	11.5	993
20013	−0.187	0.948	16.8	956	−0.250	1.485	23.9	956
20014	0.287	1.609	12.3	1,143	0.208	1.059	11.7	1,143
20021	0.053	1.191	35.3	1,046	0.029	1.254	32.6	1,046
20022	−0.071	1.362	24.9	969	−0.118	1.511	30.6	969
20023	−0.202	0.815	23.1	1,004	−0.259	1.150	28.7	1,004
20024	0.103	0.939	8.6	1,230	0.071	0.809	17.7	1,230
20031	−0.026	0.983	14.6	989	−0.050	1.075	19.2	989
20032	0.261	1.738	20.0	1,028	0.211	1.187	19.6	1,028
20033	0.112	1.218	18.9	909	0.090	1.028	24.0	909
20034	0.147	1.288	22.5	1,162	0.125	1.088	25.3	1,162
20041	0.055	1.151	23.9	1,152	0.041	1.106	24.8	1,152
20042	0.017	1.181	29.6	928	0.004	1.150	31.7	928
20043	−0.048	0.894	20.6	1,033	−0.063	1.014	24.5	1,033
20044	0.146	1.111	18.0	1,263	0.126	0.904	20.4	1,263
20051	−0.042	1.112	25.0	1,010	−0.057	1.193	25.9	1,010
20052	0.029	1.131	24.9	978	0.017	1.118	24.0	978
20053	0.036	1.040	20.9	895	0.024	1.063	24.5	895
20054	0.028	1.031	21.4	1,260	0.018	1.039	26.5	1,260
20061	0.118	1.224	20.6	1,043	0.101	1.065	22.4	1,043
20062	−0.055	1.040	21.7	978	−0.069	1.133	24.9	978
20063	0.022	0.849	23.2	977	0.013	0.857	26.2	977
20064	0.089	1.044	18.9	1,266	0.078	0.989	21.2	1,266
Mean	0.033	1.111	20.4	906	−0.005	1.123	25.3	906
p-value ($H_0 = 1$)		0.00				0.00		
Median	0.029	1.103	21.2	978	0.017	1.122	24.8	978
p-value ($H_0 = 1$)		0.00				0.00		

Calendar-quarter returns from 1998 to 2006 are regressed each quarter on three-day returns around the last management forecast in First Call issued in the quarter. Forecasts issued within a three-day earnings-announcement window are excluded. Calendar-quarter arithmetic buy-and-hold or logarithmic returns are computed from daily CRSP returns. Firm-quarters with daily returns data available for fewer than 59 trading days are excluded. Management forecast returns are arithmetic buy-and-hold (or logarithmic) returns for the three-day forecast window. The p-values are from F-tests that the mean coefficient is 1.0 and sign tests that the frequency of coefficients exceeding 1.0 is 0.5. Abnormal adjusted R^2 is the regression adjusted R^2 value minus its expectation assuming i.i.d. daily returns.

Table 10 reports average abnormal R^2 values of 20% to 25% for arithmetic and logarithmic returns. For comparability, regressions of calendar-quarter returns on earnings-announcement returns in that quarter show average abnormal R^2 values of 3.5% for arithmetic returns and 4.5% for

TABLE 11
Summary Statistics for Abnormal Volume at Earnings Announcements

	Year	Mean (%)	10th Percentile (%)	25th Percentile (%)	50th Percentile (%)	75th Percentile (%)	90th Percentile (%)
All firms	1972–2006 mean	1.80	−1.43	−0.33	1.11	3.07	5.63
	1972–1989 mean	1.45	−1.45	−0.48	0.81	2.58	4.95
	1990–2006 mean	2.18	−1.40	−0.16	1.43	3.58	6.35
December fiscal year-end firms	1972–2006 mean	1.55	−1.48	−0.44	0.89	2.72	5.15
	1972–1989 mean	1.24	−1.49	−0.57	0.63	2.27	4.52
	1990–2006 mean	1.88	−1.47	−0.31	1.17	3.20	5.82
Non-December fiscal year-end firms	1972–2006 mean	2.26	−1.30	−0.03	1.56	3.65	6.39
	1972–1989 mean	1.76	−1.39	−0.32	1.11	3.04	5.52
	1990–2006 mean	2.79	−1.20	0.27	2.04	4.31	7.30

Abnormal volume is total volume in the four earnings-announcement windows as a percentage of annual volume, minus its expectation assuming daily volume is i.i.d. Announcement windows are days −1 to +1, where day 0 is the Compustat announcement date. Firm-years with other than four earnings announcements or with daily volume data for fewer than 240 trading days are excluded. The table presents time-series averages of annual summary statistics for abnormal volume. The results are presented for the full sample and separately for firms with December and non-December fiscal year-ends.

logarithmic returns—results that are comparable to those obtained above from regressions of annual returns on the four event-window returns. The comparison of the informativeness of management forecasts with earnings announcements is striking and informative. Earnings announcements are required quarterly, and are based largely on backward-looking events. In contrast, managers presumably self-select to issue forecasts when they believe they contain substantial forward-looking information. Consequently, management forecasts are less frequent but, when made, they are considerably more informative than earnings announcements.

7. *Trading Volume Results*

We also examine the abnormal trading volume during the earnings-announcement windows. For each firm-year, we first compute the trading volume at each of the four quarterly earnings announcements as a percentage of total annual trading volume. We then subtract an estimated 4.8% "normal" volume, assuming that daily trading volume is i.i.d. across time. We take no position on the interpretation of abnormal volume.[18]

Table 11 reports summary statistics for this abnormal trading volume measure. The mean across all years of abnormal volume during the four three-day event windows taken together is 1.80% of annual volume, or only 0.45% per individual quarterly announcement window. The median abnormal volume during the four three-day event windows taken together is even lower, at

[18] See, for example, Beaver [1968], Karpoff [1987], Holthausen and Verrecchia [1990], Kim and Verrecchia [1991a, b, 1994], Lee [1992], Harris and Raviv [1993], Kandel and Pearson [1995], Bamber, Barron, and Stober [1999], Odean [1999], Baker and Stein [2004], and Dey and Radhakrishna [2007].

1.11% (0.28% per quarter), consistent with right skew in volume (Bamber, Christensen, and Gaver [2000]). The small average percentage increase in volume at earnings announcements could indicate that earning announcements are not a major source of new information to investors, but it also is consistent with other explanations—for example, that most trading during the year occurs for reasons unrelated to new information, such as liquidity, taxes, and portfolio rebalancing.

The mean abnormal volume increases between subperiods from 1.45% of annual volume to 2.18%; for the average quarterly announcement, this is an increase from 0.36% to 0.55% of annual volume. In untabulated results, the 16 post-1990 years exhibit the 13 highest mean proportions of annual volume. More specifically, consistent with the results in tables 2 and 3, the years with the highest abnormal volume are the last three sample years, 2004 to 2006. In these years, the average abnormal trading volumes are 2.69%, 2.95%, and 3.10%, respectively. These results could imply that earnings announcements have increased in importance as a source of information.

Table 11 also reports statistics for firms with and without December fiscal year-ends. Consistent with the results of Bamber, Christensen, and Gaver [2000], the mean (median) abnormal volume at the four earnings releases is 1.55% (0.89%) of the annual volume for December fiscal year-end firms, compared with 2.26% (1.56%) for non-December fiscal year-end firms.

8. *Conclusions and Some Implications*

While there is ample reason and evidence to believe that earnings are a source of some but not substantial new information, no study to our knowledge has quantified the relative importance of earnings announcements in the total information environment. To do so, we estimate the R^2 from a regression of securities' calendar-year returns on their four earnings-announcement window returns to measure relative informativeness. This measure allows the full reaction to earnings news to occur outside the announcement window, and hence does not assume market efficiency.

Our principal result is that the average quarterly earnings announcement is associated with abnormal price volatility of only 1% to 2%, approximately, of total annual volatility. We also report a sharp increase during recent years in the proportion of annual information released in the earnings event windows. The increase occurs perhaps as far back as 2000, and is particularly acute in the last three years of our sample, 2004 to 2006. It could be due to increased financial reporting quality subsequent to Enron/Sarbanes-Oxley, a reduction in analyst forecast activity, Regulation FD, chance, product or factor market conditions, or a combination of factors. It does not appear to be caused by a change in sample composition. An increase in management forecasts released concurrently with earnings (Anilowski, Feng, and Skinner [2007]) explains only part of the change.

Information arrival is slightly lower than normal both before and after earnings announcements, which is somewhat surprising. In the weeks prior to earnings announcements, one might expect information production by managers, analysts, and investors (e.g., Kim and Verrecchia [1997]), but we find no evidence of unusual price activity. In the weeks following earnings announcements, one might expect analysts to revise their forecasts, but the evidence suggests that the earliest postannouncement revisions consist largely of incorporating the new information in the earnings announcements, rather than producing new information. In contrast, the latest forecast revision before the earnings announcements is associated with abnormal volatility, which increases substantially in recent years. We also find that management forecasts, which unlike earnings announcements are discretionary, occur less frequently, and are forward looking, are associated with substantial information.

The proportion of annual information associated with earnings event windows appears to be a concave function of firm size, in contrast with the evidence Atiase [1985] obtained from a small sample of firms and quarters. A similar result is obtained for market-to-book ratio. There is a surprising degree of similarity in results across industries.

The results we report on the amount of *new* information released at earnings announcements have several interesting implications. They are consistent with the hypothesis that the primary economic role of accounting earnings is not to provide new information to the share market. By inference, they point more to the use of financial statements in periodic contract settlements, notably debt and compensation (Watts and Zimmerman [1986], Holthausen and Watts [2001], Ball, Robin, and Sadka [2008]) and in confirmation of prior information (Gigler and Hemmer [1998], Ball [2001]). Earnings, and other financial statement variables affected by earnings such as leverage and distributable capital, affect outcomes in debt and compensation contracts. These contracts do not provide for settlement on a continuous basis, but with annual or other discrete frequencies. The short-term timeliness of earnings, in the sense of whether the information in earnings is anticipated by the stock market during the year, is not of primary importance in these uses.[19] Similarly, because accounting earnings primarily report actual outcomes, it plays an economic role in the confirmation of prior, expectational information. Accurate reporting of actual earnings outcomes exerts an accountability discipline on managers' and analysts' more-timely expectational statements, such as growth prospects and earnings forecasts. To the extent that managers can be viewed as having an implicit contract with investors to be truthful in such statements, this also is a type of contract settlement role for earnings. Here too, the role of earnings is not to be timely. Its role is to increase the veracity of more timely sources of information.

[19] Our research design focuses on timeliness on a daily basis, and hence is less appropriate for assessing usefulness in contracting contexts, where settlement is on an annual basis, than annual-return studies such as Basu [1997]. However, one could argue that the lack of earnings timeliness is the reason these contracts are settled only annually.

The results help with interpreting calls to increase timeliness, such as Lev [1989], or to incorporate more "fair value" information based on managers' expectations into the financial statements. The evidence that announcement windows have contributed more to return volatility in recent years could indicate that earnings has increased in importance as a source of new information.

Our findings that earnings are largely anticipated potentially explain the generally low magnitudes of analysts' forecast errors. The evidence suggests that analyst forecasts issued before earnings announcements are associated with new information to the market, but immediate postannouncement forecasts are not. These results help with interpreting the economic role of analysts' forecasts. Is the primary economic role of analysts to produce new information, or is it to distill the implications for expected earnings of the information that is already incorporated in prices, or both?

Beaver, Lambert, and Morse [1980] address the issue of bidirectional causality between earnings and returns, an issue that is central to the Dietrich, Muller, and Riedl [2007] commentary on estimating the Basu [1997] model. Our results imply that earnings do not exert a substantial causal influence on annual returns.

The results we report on relative price volatility associated with earnings announcements also help interpret the source and magnitude of the "earnings announcement premium" reported in Chari, Jagannathan, and Ofer [1988], Ball and Kothari [1991], Lamont [1998], Cohen et al. [2007], and Lamont and Frazzini [2007].

This research design is simple, but we believe it sheds much light on the issue of the amount of new information conveyed in earnings and thus—indirectly—on the role accounting earnings plays in the economy.

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