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How important are earnings announcements as an information source?

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How important are earnings announcements as an information source?*

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ABSTRACT: In a competitive information market, a single information source can only dominate other sources individually, not collectively. We explore whether earnings announcements constitute such a dominant source using Ball and Shivakumar's (2008) R^2 metric: the proportion of the variation in annual returns explained by the four quarterly earnings announcement returns. We find that the earnings announcement days' R^2 is 11 percent—higher than the corresponding R^2 of days with dividend announcements, management forecasts, preannouncements, 10-K and 10-Q filings, and their amendments, and comparable to that of the four days with largest realized absolute return in a year. Additional analysis reveals that earnings announcements convey extreme bad news as often as management forecasts and preannouncements; for any other type of news earnings announcements are much more frequent. We conclude that earnings announcements are an important source of new information in the equity market.

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1. Introduction

Many accounting researchers have lamented the low information content of earnings announcements (e.g., Ball and Brown, 1968; Lev, 1989; Bamber, Christensen, and Gaver, 2000; Ball and Shivakumar, 2008; Beyer, Cohen, Lys, and Walther, 2010). Some have called for regulation to make earnings more informative (Lev, 1989), while others have inferred that the primary role of reported earnings is perhaps not to provide new information to the equity market (Ball and Shivakumar, 2008; Beyer et al., 2010). Market participants, however, track earnings announcement dates and discuss the contents of earnings releases in great depth in analyst reports, industry publications, and the like. Market participants' keen attention suggests that earnings releases convey a lot of new information.

We seek to reconcile these two divergent views. We suggest that the academic perspective is shaped by statistical comparisons of earnings announcements to other information sources collectively whereas the practitioner view is likely based on comparing earnings announcements to other information sources individually. We adapt Ball and Shivakumar's (2008) information content metric—the R^2 from a regression of calendar-year returns on the four quarterly earnings announcement returns—to test our basic hypothesis that earnings announcements dominate other information events individually.

Our empirical analyses explore whether earnings announcement days' R^2 is greater than that of other days associated with increased arrival of information. In particular, we compare it to three sets of benchmarks: the R^2s of (1) days on which firms announce dividends, (2) high-information arrival days, defined as days with the largest realized absolute returns in a firm-year, and (3) days on which firms disseminate earnings information through other channels: management forecasts, earnings preannouncements, initial 10-K and 10-Q filings, or 10-K and 10-Q amendments.[1] The second benchmark is especially pertinent for assessing whether earnings announcements are a superior information source; days with the largest realized absolute returns are the days on which the largest amounts of information arrive, from any source (or combination of sources) and of any type.

Ball and Shivakumar (2008) use management forecast days' R^2 as a benchmark, but they estimate this R^2 only using firm-quarters that contain management forecasts. Their approach ignores firm-quarters where the benchmark information source remains silent and does not contribute to the annual flow of information. In our view, the average R^2 using this approach greatly overstates the overall importance of sources that disseminate information

infrequently. We therefore present R^2s corresponding to two approaches: one in which we analyze only firm-years where a benchmark information source disseminated information in all four quarters, and another in which we "fill in" missing event returns with daily returns drawn randomly from the quarters in which that particular event is missing.

Our key findings are as follows: The mean earnings announcement days' R^2 of 11.08 percent, estimated on a sample of firm-years with exactly four earnings announcements per year, is economically larger than the average R^2 for four randomly chosen days of 2.97 percent and is virtually equivalent to that for 16 randomly chosen days, which suggests an earnings announcement day is four times as informative as a typical trading day. It is also economically larger than dividend announcement days' R^2 of 7.25 percent estimated on a sample of firm-years with exactly four dividend announcements. More importantly, the mean earnings announcement days' R^2 is virtually the same as that of high-information arrival days when the latter are chosen from all days including earnings announcement days (10.76 percent), and about 30 percent higher when earnings announcement days are excluded (8.50 percent). We infer that earnings announcements are a dominant source of information in the equity market because no other four days account for a larger proportion of the total variation in annual returns. However, because the R^2 of earnings announcement days is less than 50 percent, these events do not surpass all other information events collectively.

Management forecasts and earnings preannouncements appear to be superior sources of information when we analyze only the firm-years in which they occur, consistent with the findings of Ball and Shivakumar (2008). For the subsamples in which management forecasts and preannouncements occur, we document R^2s of 20.87 percent and 20.46 percent; but in the full sample that includes non-announcing firm-quarters, these R^2s drop steeply to 5.70 percent and 3.69 percent respectively. In sum, accounting for the lower frequency of earnings preannouncements and management forecasts reverses our inferences—preannouncements and management forecasts are now revealed to be inferior information sources.[2]

Finally, we explore how often earnings announcements, preannouncements, and management forecasts (when they occur) convey large amounts of information to the market.[3] We pool the distributions of earnings announcement returns, preannouncement returns, and management forecast returns to form a single return

distribution, and partition it into 30 bins of equal width. We then examine the relative frequencies of the three events in the outermost bins containing the largest price-impact announcements.

To our surprise, the frequency of earnings announcements in the leftmost bin (biggest negative returns) is comparable to that of preannouncements and management forecasts combined whereas earnings announcements in the rightmost bin (biggest positive returns) occur ten times as often as preannouncements and management forecasts combined. We conclude that earnings announcements are at least as important as preannouncements or management forecasts in delivering extreme bad news to the market; for any other type of news earnings announcements thoroughly dominate.[4]

Our study articulates and reconciles two opposing views about the importance of earnings announcements by showing that earnings announcements dominate other information sources individually, but not collectively. Our evidence counters academic claims that the purpose of reported earnings is not to provide new information, but to facilitate contracting (Ball and Shivakumar, 2008). In particular, the proportion of the total variation in annual returns accounted for by earnings announcement days, 11 percent, is nearly the same as that accounted for by the four days in a year with the largest realized absolute returns. This evidence suggests that a belief that earnings announcements are not important enough is virtually identical to a belief that the four most extreme returns in a year are not extreme enough, which we find somewhat absurd.[5]

Our study's basic point is that a competitive information market makes it impossible for earnings announcements, or any information source for that matter, to dominate other information sources collectively. However, earnings announcements might still dominate other sources individually, which is reminiscent of Patell's (1989) pointed critique of Lev (1989): The failure of earnings news to explain earnings announcement returns arises from the general difficulty of explaining daily returns, and thus, is not a symptom of a broken financial reporting model. From our perspective, earnings announcements appear unimportant in explaining annual returns precisely because the competitive equity market aggregates information produced, disseminated, and acted upon by all market participants (companies, investors, regulators, the media, etc.) in the economy (Hayek, 1945).

Our main point is also relevant to research on earnings timeliness. Typically, researchers document a weak long-window earnings-returns relation and conclude that earnings lack timeliness or have low quality (e.g., Lev,

1989). We suggest that the informativeness of earnings is best assessed against benchmarks that allow for the existence of a competitive information market.

The next section discusses conceptual and empirical challenges in assessing how informative earnings announcements are in a competitive information market, as well as how we resolve these challenges. Sections 3 and 4 compare the R^2 of earnings announcement days (EADs henceforth) to the R^2s of four typical days and of four high-information arrival days, respectively. Section 5 concludes our discussion.

2. Assessing the role of earnings announcements as an information source

2.1 The Ball and Shivakumar (2008) metric

Ball and Shivakumar (2008) conduct cross-sectional regressions of annual returns on the four quarterly earnings announcement returns. Specifically, their regression model is:

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

where R_i *(window j)* refers to the buy-and-hold return for firm *i* over a three-day window centered on the EAD in calendar quarter *j* of a given year, while R_i *(annual)* is the annual buy-and-hold return for firm *i* for the same calendar year.

As Ball and Shivakumar (2008) explain, "The regression adjusted R^2 measures the proportion of the annual return variability associated with the four earnings event windows." Intuitively, the R^2 reveals how much of the annual flow of information is accounted for by information arriving on EADs. This interpretation follows from the proposition that the variation in returns over a particular window reflects the variation in the amount of information arriving in this window (Beaver, 1968).[6]

The Ball and Shivakumar (2008) measure resembles one employed by Smith 2007: the ratio of the sum of squared announcement returns to the sum of squared daily returns for the whole year. This is because summing squared daily returns over EADs (over the calendar year) estimates the variance of earnings announcement returns (calendar-year returns). We favor the Ball and Shivakumar (2008) metric because it allows for non-zero covariances between returns on EADs and non-EADs. In particular, if returns on EADs do not fully impound information

arriving on these days (e.g., Bernard and Thomas, 1989, 1990), the resulting positive covariance with returns on non-EADs will lead to a higher R^2, with no effect on Smith's (2007) measure. Conversely, if returns on EADs are negatively correlated with returns on non-EADs, then the resulting R^2 would be lower, again with no effect on Smith's (2007) measure.[7] In the extreme case of zero serial correlation in daily returns, the Ball and Shivakumar (2008) R^2 metric converges to Smith's (2007) metric: the ratio of the variance of earnings announcement returns to the variance of annual returns. In this special case, all slope coefficients will converge to 1.

Both measures modify Beaver's (1968) research design, which seeks to measure the increase in return variance induced by the earnings announcement.[8] Beaver (1968) relates the return variance in annual earnings announcement weeks to the return variance in 16 nearby non-earnings announcement weeks, as well as a non-report period consisting of all other remaining weeks in the year. In contrast, by relating the variance of earnings announcement returns to the variance of annual return, Ball and Shivakumar (2008) and Smith (2007) seek to measure how much earnings announcements contribute to the (total) annual flow of information. The change in research objectives determines the different metrics used in these more recent papers.

2.2 Debate on the importance of earnings announcements

Ball and Shivakumar (2008) document an R^2 of 11 percent, larger than the 4.8 percent theoretical value under the hypothesis that the four quarterly EADs are informationally equivalent to four typical days, but much smaller than the 100 percent value consistent with a hypothesis that earnings announcements constitute the only source of information.[9] They also find that management earnings forecasts produce an R^2 that is more than twice that of earnings announcements. They attribute the higher R^2 to management forecasts being forward-looking and voluntary whereas earnings announcements are backward-looking and mandatory. Ball and Shivakumar (2008) conclude that earnings announcements are a marginal source of new information and that "the primary economic role of reported earnings is not to provide timely new information to the share market".

Many other researchers also conclude that earnings announcements convey little new information to the equity market. Ball and Brown (1968) find that 85 percent to 90 percent of the information in annual earnings is anticipated by the stock market before the earnings announcement month, and most of the earnings announcement month return is unrelated to earning news, leading them to infer that most of the information in annual earnings

announcements is not timely.[10] Lev (1989) finds that earnings news explains between 2 percent and 5 percent of the variation in earnings announcement returns and arrives at a similar conclusion.[11] Bamber et al. (2000) argue that Beaver's (1968) non-random sample overstates the importance of earnings announcements. They compute weekly return variances for the 17-week period centered on the annual earnings announcement week, and document that 10.8 percent of firms have their highest return variance in the earnings announcement week, and 7.5 percent of firms have their second highest return variance in the earnings announcement week. Bamber et al. (2000) interpret these two proportions as being economically indistinguishable from 5.8 percent (= 100 percent ÷ 17), the value expected under the null hypothesis that earnings announcement weeks are identical to other weeks.

The behavior of financial analysts, commentators, and reporters tacitly reveals a more favorable opinion of earnings announcements as an information source in the equity markets. Reported earnings and the market reactions they trigger are discussed *ad nauseum* in equity analyst research reports, commentaries in industry publications, and the financial press. Researchers also use earnings announcements to study a wide range of market phenomena.[12]

How can we resolve the contradiction between Ball and Shivakumar's (2008) view, shared by several prominent accounting researchers, of earnings announcements as a marginal source of new information and the attention market participants lavish on earnings releases? One possibility is that this attention is unwarranted. Another possibility is that earnings announcements are a superior information source that dominates all or most other information sources individually, but not necessarily collectively. As an analogy, *The New York Times* and *The Wall Street Journal* are widely regarded as influential newspapers, but their market shares of the U.S. daily newspaper industry are only 3 and 6 percent respectively. These newspapers are regarded as particularly influential and informative not because they have a monopoly of the news market but because their market shares exceed those of most other daily newspapers.[13]

Our working hypothesis is that earnings announcements dominate all or most alternative information sources individually and, thus, constitute an important information source. We regard the U.S. market for corporate information as being very competitive, with no single source likely to achieve the information monopoly benchmark R^2 of 100 percent. However, information sources can differ greatly in their market shares. Finding that earnings announcements dominate other information sources individually would explain why earnings announcements and

earnings announcement returns in particular are heavily discussed and analyzed by both market participants and academic researchers.

2.3 Our empirical approach

We compare EADs' R^2 to the R^2s of days associated with elevated levels of information arrival. In particular, we compare it to three sets of benchmarks: the R^2s of (1) days on which firms announce dividends, (2) high-information arrival days, defined as days with the largest realized absolute returns in a firm-year, and (3) days on which firms disseminate earnings information through other channels: earnings forecasts, preannouncements, or SEC filings. We choose (1) dividend announcements because they are a distinctly non-accounting information event initiated by firms with the same regularity as, and often used as benchmarks for, earnings announcements; (2) days with the largest absolute returns because they are likely to achieve the highest R^2s; and (3) days on which firms disseminate earnings information through other channels because firms are privileged suppliers of corporate information (we elaborate on these choices further in Section 4). While we primarily compare earnings announcements to other firm announcements, future research can examine non-firm sources of information to more completely characterize the supply-side of the corporate information market (Hopwood, 2009).

Because sources disseminate information at different frequencies, it is not straightforward to compare their contributions. For example, many firms do not issue management forecasts every quarter, if at all. Analyzing only those firm-quarters in which managers issue forecasts, as Ball and Shivakumar (2008) do, is likely to overstate the importance of management forecasts relative to earnings announcements. Intuitively, holding the quality of the disseminated information constant, an information source that distributes information in fewer quarters makes a smaller contribution to the average annual flow of information. Conversely, ignoring the fact that some quarters have more than one management forecast is likely to understate the importance of management forecasts as an information source if we study price reactions to only one management forecast per quarter (if there are multiple management forecasts in a calendar quarter, Ball and Shivakumar (2008) include only the last forecast).[14]

We address this empirical challenge as follows: When management forecasts occur K times per quarter, we sum returns over the corresponding K windows, in effect assuming that the total amount of information conveyed by these forecasts is the sum of the information impounded in prices on these days. The intuition is that the information

disseminated through two management forecasts in a quarter could have been disseminated through a single management forecast, whose price impact would have been the sum of the two price impacts.

When management forecasts are absent from a quarter, we include one randomly chosen three-day return from that quarter. Intuition suggests that the absence of a management forecast is equivalent to issuing a forecast that has no price impact: Not providing a signal and providing a signal with infinite variance are equivalent insofar as beliefs regarding economic outcomes are not revised.[15] Excluding observations when management forecasts are absent from a quarter, as Ball and Shivakumar (2008) do, amounts to excluding observations where uninformative forecasts are issued in a quarter—the end result is to overstate the importance of management forecasts as an information source.

We treat preannouncements similarly to management forecasts. Our approach modifies Ball and Shivakumar's (2008) approach of analyzing only firm-quarters with exactly one management forecast to yield an alternative empirical measure of importance of an information source that also depends on how often the source disseminates information.

3. EADs' R^2 estimations

3.1 Sample information and replication of Ball and Shivakumar's (2008) main result

Our primary sample includes all firm-year observations from 1972 to 2011 that satisfy two conditions. First, each calendar year must include exactly four quarterly earnings announcements. Second, calendar-year returns and three-day earnings announcement window returns must be available; the former are computed by compounding monthly returns and the latter by compounding daily returns over event days −1, 0, and 1, with day 0 being the day on which earnings is announced.[16] We impose these conditions so that we can measure the fraction of the annual flow of priced information attributable to EADs, consistent with Ball and Shivakumar (2008).

We estimate EADs' R^2 by estimating annual regressions of calendar-year returns on four earnings announcement three-day window returns. Panel A of Table 1 compares our sample estimates of EADs' R^2 to those from Table 2 of Ball and Shivakumar (2008).[17] From 1972 to 2006, the sample period of Ball and Shivakumar (2008), our time-series mean of EADs' R^2 is 10.77 percent, almost the same as the Ball and Shivakumar (2008) estimate of 10.69 percent; for our full sample period, the mean EADs' R^2 is 11.08 percent.[18] Our annual estimates

closely track the Ball and Shivakumar (2008) estimates—the correlation between the two is 0.9912; the maximum (minimum) of the difference between the annual estimates is 0.75 percent (−1.76 percent). Since our estimates are very close to those reported in Ball and Shivakumar (2008), we conclude that any differences in sample composition are insignificant. Thus, we expect our inferences are unlikely to differ from theirs purely because of data differences.

3.2 Distribution of EADs' R^2 under the null hypothesis that EADs are informationally equivalent to four typical days

We empirically explore the distribution of the EADs' R^2 under the null hypothesis that EADs are informationally equivalent to four typical trading days, which we refer to as the "Unimportance" null. From each firm-year, we randomly draw without replacement four days and estimate an annual regression of calendar-year returns on the four "announcement" returns whose three-day windows are centered on the randomly chosen event days. We choose these four days from two alternative samples of trading days: (1) the subsample that excludes earnings announcement window days, and (2) the full sample (which includes earnings announcement window days). This procedure is iterated 1,000 times to generate an annual R^2 distribution.

Our resampling approach differs from and extends Ball and Shivakumar's (2008) approach of exploiting the temporal variation in annual R^2s to test the null hypothesis that the time-series mean is equal to 4.8 percent—the expected R^2 if daily returns are *i.i.d.* over time. Our approach is useful because the significance of earnings announcements may be time-varying. Also, our approach does not assume daily returns are *i.i.d.* over time but rather uses the realized distribution of daily returns to develop the benchmark.

Summary statistics of the empirical distributions generated under sampling approaches (1) and (2) are reported in panels B and C of Table 1. Out of 40 years, we reject the null hypothesis at the one-tailed 10 percent (1 percent) significance level for 39 (36) years in panel B and 39 (35) years in panel C. The high frequency of rejections suggests that EADs are informative throughout our sample period. Also, the mean of the empirical R^2 distribution is less than 4.8 percent and the empirical benchmark of 3.8 percent reported in Ball and Shivakumar (2008) for every year in the sample period (untabulated for brevity). We infer that the theoretical benchmark R^2 of 4.8 percent is too high because daily returns are not *i.i.d.* (e.g., French and Roll, 1986; Schwert, 1989) as assumed. These findings hold even if we follow Ball and Shivakumar (2008) in requiring that each benchmark day comes from a 13-week period surrounding an EAD and is on the same day of the week that earnings is announced.[19]

In sum, we find that the proportion of the total variation in annual returns explained by EADs is consistently higher than that associated with four typical days, and that the theoretical benchmark of 4.8 percent considerably overestimates the 3 percent actual proportion of information contributed by four typical trading days in our sample (panel C).

3.3 Typical days' information content equivalent of EADs

We previously assessed the importance of EADs by estimating four typical days' R^2 to match the four EADs' R^2 and then evaluating the difference in these R^2s. An alternative approach is to determine how many typical days are needed to achieve an R^2 that equals the EADs' R^2 of 11.08 percent. This alternative approach lets us compare EADs to other information sources in units of average trading days (e.g., French and Roll, 1986). We randomly select K typical days (K = 4, 8, 12 or 16) from each firm-year, form three-day "announcement" window returns around them, and then regress calendar-year returns on these K typical days' returns. Panel D of Table 1 tabulates the R^2 distribution means for 4, 8, 12, and 16 typical days. As expected, the R^2 increases with the number of days: the time-series mean R^2 is 5.87 percent for 8 days, 8.69 percent for 12 days, and 11.44 percent for 16 days. Mean R^2s for EADs and 16 typical days differ by less than 0.5 percent, as do their medians, which suggest that the proportion of the annual information associated with the four EADs is nearly equivalent to that associated with 16 typical days. In other words, EADs are nearly four times as informative as the typical trading day.

4. Benchmarking EADs' R^2 against R^2 of atypical days

Our analyses in Section 3 compare EADs to typical trading days, and can be described as tests of the "Unimportance" null. In this section, we compare EADs to atypical days that are associated with increased arrival of information. These comparisons are motivated by our view that no information source is likely to achieve an R^2 approaching 100 percent but that some information sources contribute more to the annual flow of information than others. The null hypothesis guiding our analyses in this section is that earnings are important, which we refer to as the "Importance" null.

4.1 Dividend announcement days' R^2

4.1.1 Motivation

We select dividend announcement days because they are frequently used as benchmarks for EADs and also because dividend announcements are distinctly non-accounting events (e.g., Watts, 1973; Aharony and Swary, 1980; Damodaran, 1989; Sivakumar and Waymire, 1993). While we do not expect that dividend announcement days' R^2 will exceed that of EADs, this estimate is a useful point of reference for evaluating EADs. The closer the dividend announcement days' R^2 is to 3 percent (11 percent), the greater (less) the importance of earnings announcements relative to dividend announcements.

4.1.2 Results

Table 2 compares EADs' R^2s to dividend announcement days' R^2s for different samples of dividend announcement days. For each sample, we report the mean number of observations as well as summary statistics on the R^2 from the annual Ball and Shivakumar (2008) regressions. We reproduce the EADs' R^2 from Table 1 panel B as a benchmark in column 1 of Table 2. Columns 2 to 4 report results respectively for samples of (a) firms with exactly four ordinary (cash) dividend announcements per year, (b) firms with at least one ordinary dividend announcement in a year regardless of frequency (including announcements of special dividends), where we fill in for "missing" dividend announcements in a given calendar quarter with a randomly chosen day from that quarter and cumulate returns for all event days in quarters with multiple dividend announcements, and (c) all firm-years on CRSP, based on the preceding methodology where applicable.

Comparing columns 1 and 2 which have exactly four announcement days each, we observe that EADs' mean R^2 of 11.08 percent is over 50 percent higher than dividend announcement days' mean R^2 of 7.25 percent, and that EADs' R^2 is higher in 34 (out of 40) years.[20] We also find that the sample of dividend-announcing firms is smaller in every year, with the difference in number of observations widening from 1983, driven mainly by an increase in the EAD sample (not tabulated); this finding is consistent with the Fama and French (2001, 2004) observation that firms going public in recent decades are less likely to pay dividends. Notably, even though dividend announcements are voluntary compared to earnings announcements because firms do not have to pay common dividends, they appear to evoke a smaller market reaction conditional upon the announcement.

Column 3 expands the sample in column 2 to include all firms with at least one ordinary dividend announcement in a year. Comparing columns 2 and 3, we see that inclusion of firms with at least one ordinary dividend (and any special dividends) reduces the average dividend announcement day R^2 slightly from 7.25 percent to 6.83 percent. This small R^2 reduction suggests that the stock market reaction per dividend announcement day is greater for firms that pay dividends less frequently each year.[21]

Finally, column 4 expands the dividend announcement sample to include all firms on CRSP. This analysis enables us to compare earnings and dividends as directly competing information sources for individual firms across the equity market, explicitly taking into account the intuition that dividends cannot be informative for non-dividend-paying firms. We again "fill in" missing quarterly dividend announcement days with a randomly chosen trading day from that quarter. Consequently, the mean R^2 is reduced to 3.80 percent, which is smaller than even the minimum R^2 for the EAD sample in column 1. EADs are more informative than broadly defined dividend announcement days in every year except 1999 (39 out of 40 years).

In summary, the comparisons of earnings and dividend announcement days in Table 2 indicate that EADs' contribution to the annual flow of information is about 50 percent larger than that of dividend announcement days for ordinary-dividend-paying firms alone. Furthermore, earnings announcements are about three times as informative as dividend announcement days when we consider both dividend-paying and non-dividend-paying firms. Thus, earnings announcements are a far more important information source than dividend announcements.

4.2 High-information arrival days' R^2

4.2.1 Motivation

Days with the largest absolute realized returns in a calendar year are days on which the largest amount of priced information arrives, assuming that days with greater information arrival have higher return variance (Beaver, 1968). This information can be of any type, accounting or non-accounting, and originate from any information source, public or private. As a way to benchmark the economic importance of the market reaction to earnings announcements, Francis et al. (2002) examine the extent of overlap between extreme absolute returns and earnings announcements. They report that the median absolute earnings announcement return falls in the top decile of daily absolute returns, and they conclude that earnings announcements are highly significant events to the equity market.

Similar to Francis et al. (2002), we view days with extreme returns as a benchmark against which to judge the importance of EADs as an information source. In particular, by identifying the four days in a firm-year with the largest absolute returns and estimating their associated R^2, we get a sense for the maximum amount of new information that four event days can provide to the equity market. The R^2 of such high-information arrival days is a sensible empirical upper bound against which to test our "Importance" null rather than a purely theoretical upper bound of 100 percent.

We select four high-information arrival days (one from each quarter) in two different ways: by ranking the daily realized absolute returns of each firm-calendar year for (1) all trading days and (2) all trading days except those in the three-day earnings announcement windows.[22] Including EADs in the ranking identifies the four most important trading days, while excluding EADs identifies the four most important non-EADs. We then construct three-day "announcement" window returns centered on these high-information arrival days, and we estimate regressions of calendar-year returns on these "announcement" returns.

To get a better idea of the variability with which priced information arrives during a given year, we also estimate the proportion of the annual information flow associated with low-information arrival days, which are defined as days with the smallest realized absolute returns. We do not exclude EADs from the ranking of daily absolute returns in this case, as our primary focus is on characterizing information arrival during the year.[23]

4.2.2 Results

Table 3 reports R^2s for EADs and high-information arrival days (after excluding, and alternatively including, EADs in the ranking of daily returns). We find that the mean R^2 of high-information arrival days chosen among non-EADs is 8.50 percent, significantly lower than that of EADs, 11.08 percent. The mean R^2 of high-information arrival days chosen among all days, 10.76, is actually lower than that of EADs, but the difference between the two, 0.31 percent, is statistically and economically insignificant. We conclude that the contribution of EADs to the annual flow of information is unparalleled.

Also, we document that the mean R^2 of low-information arrival days is 2.43 percent, not much lower than the mean (median) R^2 of 2.97 percent (2.84 percent) for typical trading days reported in panel C of Table 1. Since the mean and median typical trading days' R^2s are much closer to the low-information arrival days' average R^2 of

2.43 percent than the high-information arrival days average R^2 of 10.76 percent, we infer that little information arrives on most trading days. In simple terms, these results confirm that the daily return distribution is fat-tailed (Fama, 1965), and that the few days with extremely large absolute daily returns explain a significant proportion of annual returns.

4.3 Other earnings information announcement days' R^2

4.3.1 Types of earnings information announcement days

Firms distribute potentially price-sensitive earnings information not only on the days they announce earnings but also on the days they issue management earnings forecasts (e.g., Foster, 1973; Patell, 1976), preannounce earnings (e.g., Baginski et al., 1994; Soffer et al., 2000), file 10-K and 10-Q forms with the SEC (e.g., Foster, Jenkins, and Vickrey, 1983; Stice, 1991; Easton and Zmijewski, 1993), and amend these filings.[24] We refer to these days as earnings information announcement days (EIADs henceforth). The nature of these information disclosures, however, varies substantially in terms of their content, timing, and consequence. For example, management forecasts, preannouncements, and even earnings announcements are best viewed as voluntary disclosures, while 10-K and 10-Q filings are mandated by the SEC. Also, earnings are typically announced with a press release, may be accompanied by the disclosure of some additional financial and non-financial information, and are invariably followed by the filing of 10-K and 10-Q forms that contain detailed financial and non-financial information. Thus, while the firm provides earnings information in all four cases, the nature and the circumstances of these disclosures vary so much that it is reasonable to view them as distinct types of information events or public sources of information. By assessing these events' individual contributions to the annual flow of information, we provide new evidence on their importance as distinct ways of disseminating earnings information with pricing consequences.

Ball and Shivakumar (2008) argue that the higher R^2 of management forecast days stems from the forecasts' voluntary nature in contrast to the mandated earnings announcements.[25] To shed more light on the importance of discretionary vs. mandatory announcements, we examine 10-K and 10-Q filings with the SEC. Arguably, these filing days are the bona fide mandatory earnings announcement days, while formal EADs are merely customary or traditional. Furthermore, earnings are sometimes revised between the earnings announcement

date and the 10-Q filing (Hollie, Livnat, and Segal, 2005), with the implication that the latter is more definitive. Early studies failed to find significant market reactions to 10-K and 10-Q filings, but more recent studies find that electronic filings under the EDGAR system are informative.[26] Thus, we examine how much information these mandatory quarterly filing days convey to the equity market. We differentiate between initial filings and later amendments because the latter are relatively infrequent and sometimes correct minor technical errors, even though they may also restate earnings.

4.3.2 Results

Table 4 reports evidence on the significance of management earnings forecast days (panel A), earnings preannouncement days (panel B), 10-K and 10-Q filing days (panel C), and 10-K and 10-Q amendment days (panel D). The difference between preannouncements and management forecasts is that preannouncements are company earnings guidelines issued after the end of the forecasted fiscal period but before earnings are announced. Management forecasts and preannouncements are drawn from First Call, which starts coverage in 1993. We collect 10-K and 10-Q filings and their amendments from EDGAR starting in 1994.

We regress calendar-year returns on four three-day announcement window returns centered on an event of interest—for example, a day on which a management forecast is issued—with the two modifications described in the empirical approach subsection of Section 2, and also applied in our earlier dividend announcement analysis. If a calendar quarter does not have a particular event of interest, then we randomly pick a day in that quarter and construct a three-day window return centered on it for use as an independent variable. If a quarter contains multiple days with the event of interest, then we sum their three-day announcement window returns.

First Call's incomplete coverage of management forecasts and preannouncements (Chuk, Matsumoto, and Miller, 2012) is an important concern given our interest in comparing earnings announcements to management forecasts and preannouncements. We address this concern by checking whether our results hold in the period after 1998, when coverage substantially improved, and in subsamples where coverage is likely more complete (firm-years with above-median analyst following, institutional ownership, and performance), as Chuk et al. (2012) recommend. In panels A and B of Table 4, we compare earnings announcements to management forecasts and preannouncements, respectively, over the period 1998-2011, and in a sample of firm-years with above-median analyst following.[27]

The first column in each panel reports EADs' R^2 for the same years to facilitate direct comparisons. Management forecasts are far less frequent than EADs, especially before 1998, although this difference may reflect gradual expansion of First Call coverage; however, even in the later period, only about one-third of firm-years contain any management forecasts (not reported in a table).[28] When we examine only firm-years that contain at least one management forecast, we find a mean R^2 of 20.87 percent, significantly higher than EADs' R^2. Since managers likely issue earnings forecasts only when the information is likely to change capital market beliefs (Ball and Shivakumar, 2008), it is not surprising that management forecast days' R^2 is high.

When we assess the significance of management forecasts as an information source without conditioning on the issuance of a forecast, we document a mean R^2 of 5.70 percent. The difference between the conditional mean R^2 of 20.87 percent and the unconditional mean R^2 of 5.70 percent is explained by the low frequency of management forecasts. Management forecasts make a substantial contribution to the annual flow of information only when they are disseminated. They are inferior to earnings announcements as an information source because of their lower frequency. The unconditional mean management forecast days' R^2 estimated on a sample of observations where First Call coverage is likely complete, firm-years with high (above-median) analyst coverage in the period from 1998 to 2011, is higher than 5.70 percent at 9.96 percent but still less than the mean EADs' R^2 of 12.14 percent. We conclude that incomplete coverage of management forecasts by First Call is an unlikely explanation for the difference in conditional R^2s.

Panel B conducts a similar comparison of earnings preannouncement days to EADs. The results are very similar to those reported in panel A, including the conditional mean R^2s (20.46 percent vs. 20.87 percent). However, preannouncements occur less than half as frequently as management forecasts, and the gap between mean unconditional R^2s (3.69 percent vs. 5.70 percent) is larger as a result. As in panel A, our conclusion is that firms choose to preannounce only when they have market-moving information, so we expect to find these days to be informationally important conditional on their occurrence. The unconditional mean preannouncement days' R^2 estimated on a sample of observations where First Call coverage is likely complete is higher at 5.98 percent but still much less than the mean EADs' R^2 of 12.14 percent. Incomplete coverage of preannouncements by First Call is therefore an unlikely explanation for the difference in conditional R^2s.

In comparing earnings announcements to 10-K and 10-Q filings, we consider only firm-years with four 10-K and 10-Q filings. We report the results from this comparison in Panel C of Table 4. We find that 10-K and 10-Q filing days are approximately half as informative as EADs (mean R^2 of 5.81 percent vs. 11.55 percent for EADs). Days when 10-K and 10-Q filings are amended convey even less information as evidenced by their mean R^2 of 3.75 percent (Panel D of Table 4).[29] Overall, as an information source EADs dominate management forecast days, preannouncement days, 10-K and 10-Q filings days, and 10-K and 10-Q filing amendments days individually.

4.4 Further analysis of the relative importance of earnings announcements

4.4.1 Motivation

We demonstrated that earnings announcements contribute more to the annual flow of information than management forecasts or preannouncements using Ball and Shivakumar's (2008) R^2 metric, mainly because earnings announcements vastly outnumber management forecasts and preannouncements. Earnings announcements are more prevalent because managers issue forecasts and preannounce earnings when their private information diverges sufficiently from the market's information, but announce earnings every quarter regardless of whether earnings are anticipated by the market. Furthermore, forecasting or preannouncing earnings likely diminishes the information content of subsequent earnings announcements. These differences suggest that the average earnings release contains little new information; while when they occur, the average management forecast and preannouncement convey much new information (Kasznik and Lev, 1995). However, not all earnings announcements have low information content. Because earnings announcements are far more frequent, it is possible that the *total* number of high-information-content earnings announcements exceeds the *total* number of high-information-content management forecasts and preannouncements.

To explore this possibility, we pool size-adjusted announcement returns to form a single distribution, which we then partition into 30 bins of equal return width (4.79 percent).[30] Each bin contains announcements with similar information levels. We use large event-day returns to identify announcements containing much information (Beaver, 1968). We compare the frequency of earnings announcement returns to the frequencies of management forecast returns and preannouncement returns in the leftmost and rightmost bins to draw inferences about their relative importance as a source of market-moving information.

4.4.2 Results

Panel A of Table 5 reports summary statistics for three-day-window size-adjusted returns for earnings announcements, management forecasts and earnings preannouncements, as well as for a combined sample in which days with multiple events are represented only once. The average three-day size-adjusted return for management forecasts and preannouncements are −0.69 percent and −3.73 percent, respectively, whereas the average earnings announcement return is 0.05 percent. The earnings announcement return distribution is slightly positively skewed (0.27) whereas the management forecast and preannouncement return distributions are equally negatively skewed (−0.54 and −0.63 respectively). These statistics are consistent with preannouncements and management forecasts being more likely to convey bad news to the market (e.g., Kasznik and Lev, 1995; Soffer et al., 2000; Hutton, Miller, and Skinner, 2003). The standard deviation of earnings announcement returns (8.29 percent) is less than that of management forecast returns (9.10 percent) and preannouncement returns (13.66 percent), consistent with earnings announcements on average containing less information than management forecasts and preannouncements. For our full sample period 1994-2011, the return distributions for preannouncements and management forecasts differ from the return distribution for earnings announcements in mean, standard deviation, skewness, and kurtosis at the 1 percent level.[31] Across subperiods, we find that the mean number of management forecasts and preannouncements increases but that the mean management forecast and the mean preannouncement returns decrease.

In panel B of Table 5 we repeat these analyses on the subsample of firms with above-median analyst coverage where First Call coverage of management forecasts is likely to be complete. We observe similar differences in the distributions of earnings announcement returns, management forecast returns, and preannouncement returns.

Panel C of Table 5 reports the absolute and relative frequencies of earnings announcement, management forecast, and preannouncement returns in each of the 30 return bins. Figure 1 displays the proportion of observations in each bin that are attributable to earnings announcements, management forecasts, and preannouncements. Earnings announcements account for approximately 50 percent of the observations in bin 1, which contains the most extreme bad news announcements, and 90% of the observations in bin 30, which contains the most extreme good news

announcements. As a source of extreme good news, earnings announcements utterly dominate management forecasts and preannouncements combined.

In Table 5 panel D we provide the same information for the subsample of firms with above-median analyst coverage during the period from 1998 to 2001 (where First Call coverage of management forecasts and preannouncements is more complete). Earnings announcements now account for 26.67 percent of the observations in bin 1 and 68.42% of the observations in bin 30. As a source of extreme good news, earnings announcements still dominate management forecasts and preannouncements combined. In passing, we note that preannouncements achieve their smallest share in bins 14 to 17, the bins with the smallest size-adjusted announcement returns, consistent with managers preannouncing *only* when they expect to move the market.

We conclude that the role of earnings announcements as a source of extreme bad news is comparable to that of management forecasts and preannouncements, while the role of earnings announcement as a source of any other news is unequalled. The academic perception that earnings announcements are less informative than management forecasts arises because many earnings announcements are confirmatory, and as a result have limited or no information content. This makes the average earnings announcement less informative than the average management forecast or preannouncement, and masks the fact that far more earnings announcements are informative than any other firm announcements.

4.5 R^2 of all EIADs

Next, we quantify the contribution of all earnings-related announcements to the annual flow of information. This is useful for two reasons. First, since these announcements are made by the firm, we are in effect assessing the role of the firm as a distributor of earnings information in the equity market. Second, by comparing EADs' R^2 to the R^2 of all EIADs, we shed light on how important earnings announcements are as an information channel relative to several other information channels (management forecasts, preannouncements, and 10-K and 10-Q filings and their amendments) that firms use to convey earnings information to investors. Third, our approach of estimating the incremental R^2s of non-EAD sources complements the Beyer et al. (2010) approach of allocating partial R^2s from an extended regression that includes multiple information sources.

We modify our approach of regressing calendar-year returns on four earnings announcement three-day window returns as follows: When a firm disseminates earnings information on multiple days in a given quarter, then we use the sum of the three-day window returns centered on these days as our independent variable for that quarter.

Results appear in Table 6, in which we only report findings for the period 1994 to 2011, when we have data on all the types of EIADs we consider. Column 1 reports EADs' R^2 after excluding observations where earnings announcements are accompanied by management forecasts, whereas column 2 includes these observations. Columns 3 through 5 report EIADs' R^2, with earnings information announcement returns progressively modified to include returns on days on which earnings are preannounced, days on which earnings are forecasted, and days when 10-K and 10-Q forms are filed or amended.

Comparing columns 1 and 2, we observe that EADs without concurrent management forecasts tend to have higher R^2s (mean of 11.96 percent vs. 11.55 percent), which suggests that firms issuing management forecasts in conjunction with their earnings announcements are likely those whose earnings announcements are less informative (e.g., firms whose announcement content is more easily anticipated by the market).[32] Column 3 has a mean R^2 of 12.61 percent, indicating that earnings preannouncements add 1.06 percent (= 12.61 – 11.55) R^2 in information content across all firms, or approximately an extra 9 percent (= 1.06/11.55) over EADs' information alone. Inclusion of management forecasts during the quarter increases R^2 by 1.08 percent (= 13.69 – 12.61) and SEC filings or amendments add another 1.19 percent (= 14.88 – 13.69).[33] In total, these other EIADs increase adjusted R^2 by 3.33 percent (= 14.88 – 11.55), or add about 29 percent (= 3.33/11.55) to EADs' information. Put differently, EADs alone provide about 78 percent (= 11.55/14.88) of the information of all EIADs that we analyze.[34]

In stark contrast, Beyer et al. (2010) estimate that earnings announcements provide 8 percent of accounting-related information to the market whereas management forecasts and preannouncements account for 55 percent and 11 percent, respectively, of the total accounting-related information flow. The large differences in estimates likely arise from a combination of Beyer et al. (2010) (a) restricting their analysis to about one-fourth of our sample with a likely bias towards large firms, (b) allocating common R^2 for different information sources using a different algorithm, and (c) imputing missing events with abnormal stock return of exactly 0 instead of the return for a randomly drawn day. At a minimum, Table 6 suggests that the Beyer et al. (2010) results are highly sensitive to reasonable changes in methodology, and that researchers should resist drawing strong inferences from their results.

5. Concluding remarks

We evaluate the informational role of earnings announcements in the equity market by comparing them to economically interesting benchmarks. We present evidence that earnings announcements explain a greater proportion of the variation in annual returns than dividend announcements, management forecasts, preannouncements, and 10-K and 10-Q filings and their amendments do after accounting for differences in event frequencies, and that no other four days in a year account for a larger proportion of the variation in annual returns than EADs. We infer that earnings announcements are a superior information source in the competitive corporate information market, in the sense that they convey more information than other information sources individually.

Our study complements the work of Bamber et al. (2000), Ball and Shivakumar (2008), and Beyer et al. (2010) to paint a more complete picture of the informational role of earnings announcements. In particular, our comparison of EADs to high-information arrival days (which effectively "bounds" EADs' R^2 from above) is a natural complement to Ball and Shivakumar's (2008) comparison of EADs to typical days (which effectively "bounds" the EADs' R^2 from below). In addition, we find that returns on management forecast days explain about 6 percent of the variation in annual returns in the full sample. Our result differs from, yet complements, Ball and Shivakumar's (2008) finding of an R^2 in excess of 20 percent, obtained for a sample in which management forecasts are always issued. In combination, our results suggest that management forecasts convey a lot of information when disseminated, but due to their low frequency, they are inferior to earnings announcements as a market-wide source of information. We also find that management forecasts and preannouncements are an important channel for disseminating extreme bad news, but that they play a much smaller role in disseminating extreme good news.

In closing, the value of an information source stems from the benefits information users derive from it. We suggest that this value is likely larger when an information source disseminates price-relevant information with high frequency, but do not advance a full-fledged theory on how these and other information source attributes map into information users' welfare. We leave it for future research to develop such theories and use them to compare information sources at the aggregate level.

Notes

[1] We partition company-issued guidelines from First Call based on whether they occur before or after the end of the fiscal quarter to which the guidance pertains; we call the former management forecasts and the latter preannouncements (Baginski, Hassell, and Waymire, 1994; Soffer, Thiagarajan, and Walther, 2000). 10-K and 10-Q amendments include earnings restatements but also include other minor corrections.

[2] Beyer et al. (2010) reach a conclusion similar to Ball and Shivakumar (2008) using a parallel research design. However, Beyer et al. (2010) analyze only 70,700 firm-quarter observations for 2,747 firms over the period from 1994 to 2007 while we analyze 276,180 firm-quarters for 11,823 firms over the same period, i.e., four times as many. Because Beyer et al. (2010) study only firms followed by financial analysts, their inferences likely apply primarily to large firms (e.g., Bhushan, 1989).

[3] Managers forecast and preannounce earnings primarily when their information differs sufficiently from the market's expectation, whereas they announce earnings regularly regardless of market expectations (e.g., Ball and Shivakumar, 2008). Thus, managers forecast and preannounce earnings occur less frequently than they announce earnings, but this raises the possibility that extreme good news and bad news preannouncements and management forecasts occur more often than similarly extreme good news and bad news earnings announcements.

[4] Intuitively, one can view management forecasts as conveying only timely information and earnings announcements as conveying sometimes timely information and sometimes stale information. Our findings suggest that the number of earnings announcements conveying timely information is at least as high as the number of management forecasts conveying timely information.

[5] Our evidence is consistent with Francis, Schipper, and Vincent's (2002) evidence that the majority of absolute earnings announcement returns fall in the top two deciles of daily absolute returns. We extend Francis et al. (2002) by using Ball and Shivakumar's (2008) approach to measure the proportions of the variation in annual returns explained by earnings announcement returns and the four most extreme returns in a year.

[6] The pricing effect of earnings announcements may be overstated under this approach if earnings releases are associated with increased production of information by market participants or increased dissemination of other financial or non-financial information by firms.

[7] EAD returns and non-EAD returns could be negatively correlated if investors overreact to earnings announcements (e.g., DeBondt and Thaler, 1985) or if transaction costs such as bid-ask spreads constrain daily price movements (e.g., French and Roll, 1986).

[8] In passing, we note that variance-based approaches in the tradition of Beaver (1968) do not require assumptions about how the market forms expectations about earnings—Earnings Response Coefficient-based approaches, however, require such assumptions.

[9] Ball and Shivakumar (2008) report that their results are robust to (a) return computation method (adding vs. multiplying), (b) outlier exclusion, (c) December fiscal year-end firms only, (d) annual return sign, (e) concurrent management earnings forecasts, (f) controls for size, market-to-book, leverage, and industry, (g) different announcement return windows, and (h) trading volume instead of returns.

[10] However, Abarbanell and Kim (2011) find that returns' ability to predict future earnings is concentrated disproportionately on earnings announcement days.

[11] Bathke and Lorek (1984) estimate that unexpected quarterly earnings account for only 15 percent of the information that reaches the market on EADs and conclude (p. 175) "the results also underscore a lack of monopolistic control by the accounting profession over the dissemination of firm-specific financial information".

[12] Examples include quality of financial reporting (Lev, 1989), information production in the preannouncement period by investors (Atiase, 1985), market efficiency (Bernard and Thomas, 1989, 1990), differential interpretation of information (Kandel and Pearson, 1995), disclosure practices in different countries (Bailey et al., 2003), and effects of changes in disclosure regulation (Heflin, Subramanyam, and Zhang, 2003).

[13] Their market shares are much smaller if one considers weekly and monthly magazines, radio, television, the internet, and gossip as competing suppliers in a more inclusive market for news.

[14] Ball and Shivakumar (2008) also examine the first (last) analyst earnings forecast revision after (before) each quarterly earnings announcement for the subsample of firms covered by I/B/E/S. They note that an advantage of their approach is that they can examine all forecast types, not just point and range forecasts.

[15] In contrast to our approach, Beyer et al. (2010) impute an abnormal stock return of exactly zero for every missing observation, which in our view artificially restricts the mean and variance of the signal on these days.

[16] If earnings are announced on a non-trading day, day 0 is the first trading day after the announcement. Day +1 is often included to account for earnings announcements made after trading hours, while day −1 is included to account for potential leakage of information. Earnings announcement dates are extracted from the COMPUSTAT quarterly file and return data from the CRSP monthly and daily files.

[17] To be precise, we add 4.8 percent to the abnormal R^2 numbers reported in Table 2 of Ball and Shivakumar (2008). They define abnormal R^2 as the regression adjusted R^2 value minus its expectation assuming *i.i.d.* daily returns, which they separately estimate as 4.8 percent.

[18] Dellavigna and Pollet (2009) find that, where I/B/E/S and COMPUSTAT earnings announcement dates differ, the earlier date is usually the actual date of the announcement. For the 1983-2011 subperiod, replacing the earnings announcement date from COMPUSTAT with an earlier one from I/B/E/S, when available, yields a marginally higher mean R^2 of 11.58 percent.

[19] We did not impose these requirements because their effect is to produce an atypical sample. The sample would contain few trading days in proximity to each other, e.g., days that occur in the same calendar week or month; it would also likely be skewed toward certain days of the week.

[20] These results are based on samples that do not exclude observations with overlapping dividend announcement days and EADs. In untabulated analyses, on average, 4.39 (10.51) percent of firm-quarters (firm-years) have overlapping earnings and dividend announcement windows; excluding observations with overlapping windows results in a lower mean dividend announcement days' R^2 of 6.44 percent, so the likely effect of not excluding these observations is to make it more difficult to detect a difference in the R^2s of EADs and dividend announcement days.

[21] Put differently, the conditional information content of dividend announcements by firms that pay dividends more frequently seems to be less than that for firms that pay dividends less frequently. Note that we "fill in" missing quarterly dividend announcement days with a randomly chosen trading day, which typically has a low R^2 (see Table 1). Including such random trading days in the second sample should have reduced the average R^2 unless the actual dividend announcement days were more informative on average than those in the first sample.

[22] On average, 4.86 (16.77) percent of firm-quarters (firm-years) have overlapping earnings announcement and high-information arrival windows.

[23] Moreover, the return distributions of low-information arrival days with and without the inclusion of EADs are likely to be very similar as the overlap between EADs and low-information arrival days is likely minimal (Francis et al., 2002).

[24] In addition to management guidance for interim quarter earnings, we include annual earnings guidance issued during or after the fiscal fourth quarter as such guidance is equivalent to fourth quarter earnings guidance.

[25] However, when annual earnings announcements were voluntary before the SEC was instituted, they were not very informative to the stock market (Sivakumar and Waymire, 1993). A possible reconciliation is that earnings reports have become more credible over the last century. Similarly, Butler, Kraft, and Weiss (2007) find that the earnings timeliness of firms that voluntarily reported quarterly was no greater than that of those that only reported at the mandatory semi-annual frequency during 1955-69. The latter result is consistent with a self-selection argument in that only firms that would otherwise experience low earnings timeliness find it desirable to report earnings more frequently.

[26] Foster et al. (1983), Stice (1991), and Easton and Zmijewski (1993), among others, failed to find significant market reactions to 10-K and 10-Q filings with the SEC. However, more recent studies of the EDGAR filing regime find significant market reactions (e.g., Qi, Wu, and Haw, 2000; Asthana and Balsam, 2001; Griffin, 2003). The differing results are likely due to at least two factors: potential problems with identifying effective filing dates for the paper filing regime (i.e., when investors could only get paper copies of the filings) and limited access to the paper filings relative to electronic filings due to a cumbersome process for obtaining hard copies.

[27] We also perform the same analyses on observations with above-median institutional ownership (from Thomson Financial) and below-median number of quarterly losses in the eight quarters prior to the event quarter. The results are similar and are available from the authors upon request.

[28] Because of this infrequency, Ball and Shivakumar (2008) modify their approach and estimate a regression of calendar-quarter returns on three-day management forecast or preannouncement returns. We continue with an annual regression to facilitate combining the annual estimates for different earnings information channels later.

[29] Panel D of Table 4 presents results for an analysis of filing amendments using the same procedure that generated panels A and B. Filing amendments appear to be less informative than the initial filings, with a conditional mean R^2

of only 3.75 percent. For robustness, we also assess the informativeness of restatements using announcement dates procured from the U. S. Government Accountability Office (GAO) for the 1997 to 2006 period. Compared with the results in panel D, the conditional mean R^2 using U.S. GAO data is much higher at 10 percent for samples of 134 firms on average, but the unconditional mean R^2 is very similar at 3.17 percent. For brevity, these restatement results are not reported, but are available from the authors upon request.

[30] Announcement returns are adjusted for the holding period return of the corresponding CRSP size decile portfolio. Also, we exclude the top and bottom 0.5 percent of the combined size-adjusted announcement return distribution.

[31] We compute the distributional parameters for each announcement type quarterly, and use the time-series distributions of the parameters to test for differences.

[32] Ball and Shivakumar (2008) report that the R^2 for a sample of EADs without contemporaneous management forecasts during 1994-2006 is slightly smaller than the R^2 for their main sample of EADs during 1972-2006. Because they do not report an R^2 comparison between all EADs and EADs excluding contemporaneous management forecasts for the same time period, their reported differences could reflect environmental changes during their sample period.

[33] We are likely understating the contribution of SEC filing days because we do not account for overlaps between SEC filing days and management earnings forecast days; i.e., to the extent they overlap, we assign all the explanatory power to management forecasts.

[34] Firms make other announcements that convey earnings information, such as writeoffs and restructurings (e.g., Bartov, Lindahl, and Ricks, 1998), mergers and acquisitions (e.g., Haw, Pastena, and Lilien, 1990), 8-K filings (e.g., Lerman and Livant, 2010), but these are relatively infrequent. In a few industries such as automobiles, firms release weekly sales numbers, while in a few other industries such as banking, railroads, and public utilities, there are additional mandatory regulatory filings. We expect these other announcements and filings to have minimal incremental impact on the total R^2 in Table 6.

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TABLE 1. Earnings announcement days' (EADs') R^2

Panel A compares sample estimates of EADs' R^2 to those from Table 2 of Ball and Shivakumar (2008), where the latter are obtained by adding 4.8 percent—the expected value under the null hypothesis that daily returns are identically and independently distributed over time—to abnormal R^2, defined in Ball and Shivakumar (2008) as R^2 minus 4.8 percent. Column 2 is based on the same sample period as that in Ball and Shivakumar (2008) whereas column 4 is based on our full sample period. R^2 is calculated from annual regressions of calendar-year returns on four earnings announcement three-day window returns. The sample comprises firm-years with available announcement dates in the COMPUSTAT quarterly file and return data in the CRSP monthly and daily files, and with exactly four announcements (four three-day window announcement returns). Calendar-year returns are computed by compounding monthly returns; announcement returns by compounding daily returns over the three-day window centered on the announcement day. Reported correlation is that between R^2 of columns 1 and 2.
Panels B and C juxtaposes our estimate of the EADs' R^2 and the empirical distribution (mean, median, 90th, 95th, and 99th percentiles) of the EADs' R^2 generated under the null hypothesis that EADs are informationally equivalent to typical days ("Unimportance" null). From each firm-year we randomly draw without replacement four days and estimate an annual regression of calendar-year returns on the four "announcement" returns whose three-day windows are centered on the randomly chosen days. This procedure is iterated 1,000 times to generate an annual R^2 distribution under the "Unimportance" null. In panel B, we sample only from days outside earnings announcement windows whereas we sample from all days in panel C. ***, **, * refer to one-tailed statistical significance at the 10 percent, 5 percent, and 1 percent level respectively.
Panel D investigates the number of typical days required to achieve the EADs' R^2. From all days in each firm-year, we randomly draw without replacement K days and construct three-day window returns centered on each of these days. We then estimate an annual regression of calendar-year returns on the K three-day window returns. This procedure is iterated 1,000 times and we report mean R^2 for every sample year and for K = 4, 8, 12, and 16.
For brevity, the regression results by year are not reported; instead, all panels present only the summary statistics for these results.

Panel A: Replicating Ball and Shivakumar's (2008) main result

	BS 2008 (1)	1972-2006 (2)	Difference (1 - 2)	1972-2011
Mean Obs	3682	3717	35	3845
Mean EAD R^2	10.69	10.77	0.08	11.08
Median EAD R^2	10.90	11.13	0.12	11.17
Min EAD R^2	3.70	3.85	-1.76	3.85
Max EAD R^2	18.70	18.91	0.75	18.91
Correlation		0.9912		

Panel B: Empirical distribution of EADs' R^2 under "Unimportance" null (sampled days exclude EADs)

		Distribution Statistics Under "Unimportance" Null				
	EAD R^2	Mean	Median	90th pctl	95th pctl	99th pctl
Mean	11.08	2.69	2.56	3.78	4.51	5.65
Median	11.17	2.72	2.60	3.77	4.32	5.19
Min	3.85	1.68	1.32	2.32	2.57	3.08
Max	18.91	3.69	3.64	5.14	14.92	21.55
Std Dev	3.52	0.49	0.56	0.63	1.85	2.92
No. of Sigf. Yrs (10%)	39					
No. of Sigf. Yrs (1%)	36					

Panel C: Empirical distribution of EADs' R^2 under "Unimportance" null (sampled days include EADs)

		Distribution Statistics Under "Unimportance" Null				
	EAD R^2	Mean	Median	90th pctl	95th pctl	99th pctl
Mean	11.08	2.97	2.84	4.15	4.84	6.08
Median	11.17	3.03	2.90	4.09	4.69	5.51
Min	3.85	1.85	1.44	2.51	2.74	3.18
Max	18.91	4.19	4.12	5.52	13.16	22.60
Std Dev	3.52	0.53	0.60	0.71	1.58	3.03
No. of Sigf. Yrs (10%)	39					
No. of Sigf. Yrs (1%)	35					

TABLE 1. Earnings announcement days' (EADs') R^2, cont.

Panel D: "Typical" days' information content equivalent of EADs

		Mean R^2 for K 3-day Windows			
	EAD R^2	K = 4	K = 8	K = 12	K = 16
Mean	11.08	2.97	5.87	8.69	11.44
Median	11.17	3.03	5.90	8.69	11.35
Min	3.85	1.85	3.64	5.44	7.24
Max	18.91	4.19	8.17	11.87	15.31
Std Dev	3.52	0.53	1.03	1.47	1.86

TABLE 2. Benchmarking EADs' R^2 against dividend announcement days' R^2

This table contrasts EADs' and dividend announcement days' R^2. Column 1 reproduces EADs' R^2 from Table 1. Column 2 analyzes firm-years with exactly four quarterly ordinary dividend announcements, and is based on R^2s from annual regressions of calendar-year returns on the four dividend announcement three-day window returns. Column 3 analyzes firm-years with at least one ordinary dividend announcement, regardless of payment frequency (and including announcements for special dividends). A quarter with a "missing" announcement is "filled in" by randomly selecting a day from that quarter, and constructing a three-day window return centered on it. Column 4 analyzes the sample of all firm-years. Where there are multiple announcements in a given quarter, we cumulate three-day window returns across all such events, and daily returns of events with overlapping windows are not double counted. We do not require that dividend-paying firms be on COMPUSTAT. For brevity, the regression results by year are not reported; instead, only the summary statistics for these results are presented.

	Earnings announcements	Dividend announcements		
	4 per year (1)	4 ordinary per year (2)	≥ 1 ordinary per year (3)	All firm-years (4)
Mean Obs	3845	1637	2779	5941
Mean R^2	11.08	7.25	6.83	3.80
Median R^2	11.17	7.55	6.80	3.88
Min R^2	3.85	3.39	3.45	1.62
Max R^2	18.91	11.65	12.98	6.80
Std Dev R^2	3.52	2.34	2.04	1.25
No. of Yrs < EAD R^2		34	35	39

TABLE 3. Benchmarking EADs' R^2 against high-information arrival days' R^2

This table benchmarks EADs' R^2 against those of high- and low-information arrival days. High-information arrival days are the four days in a firm-year with the largest absolute returns. We identify them in two ways—by ranking absolute daily returns in a firm-year after (1) excluding EADs and (2) including EADs. The R^2 of high-information arrival days is obtained from an annual regression of calendar-year returns on four three-day window returns centered on these days. Low-information arrival days are defined analogously. The reported *p*-values are for tests that the time-series mean R^2 of EADs does not differ from that of the corresponding benchmark. For brevity, the regression results by year are not reported; instead, only the summary statistics for these results are presented. The same sample was analyzed in column 4 of Table 1.

		High Info Arrival Days		Low Info Arrival Days
	EAD	Excl EAD	Incl EAD	Incl EAD
Mean R^2	11.08	8.50	10.76	2.43
Median R^2	11.17	8.51	11.04	2.23
Min R^2	3.85	0.26	0.65	0.53
Max R^2	18.91	23.22	26.91	4.77
Std Dev R^2	3.52	5.61	6.14	1.13
No. of Yrs < EAD R^2		26	22	40
Pairwise t-test p-value		0.0283	0.7780	0.0000

TABLE 4. R^2s of management earnings forecast days, earnings preannouncement days, days with 10-K and 10-Q filings, and days with filing amendments

This table compares the EADs' R^2 to the R^2 of days with management forecasts (panel A), preannouncements (panel B), 10-K and 10-Q filings (panel C), and filing amendments (panel D). The source of management forecasts and preannouncements is First Call. The difference between preannouncements and management forecasts is that preannouncements are company guidelines of quarterly earnings issued after the end of the forecasted fiscal quarter, but before earnings are announced. The source of 10-K and 10-Q filings is EDGAR. In panel A, we estimate management forecast days' R^2 on two samples. The first sample (column 3) includes those with exactly one EAD each quarter, whereas the second sample (column 4) includes only firm-years with management forecasts. We follow the same general approach of regressing calendar-year returns on four three-day announcement window returns centered on an event of interest—a day on which a management forecast is issued—with two modifications to account for the nature of the data. If a quarter does not have any management forecasts, then we randomly pick a day in that quarter and construct a three-day window return centered on it for use as an independent variable in our regression analysis. If a quarter has several management forecasts, then we sum their three-day window announcement returns. Panels B and D are constructed similar to panel A. For panels A and B, we further repeat the regression analyses on the two samples (columns 5 and 6) formed from applying the aforementioned sampling approaches to the subsample of firms in the 1998-2011 subperiod with above-median analyst coverage, where the source of analyst coverage is I/B/E/S. In panel C, we estimate the R^2 of filing days on a sample of firm-years with four filing days as very few firms have fewer than four events per year. Panels C and D are based on 1994-2011 data. For brevity, the regression results by year are not reported; instead, only the summary statistics for these results are presented.

Panel A: Management earnings forecast days

	Earnings announcements		Management forecasts (1993-2011)		Management forecasts (1998-2011) High analyst coverage subsample	
	1993-2011	1998-2011	All firm-years	Event firm-years	All firm-years	Event firm-years
Mean Obs	4757	4888	4757	1209	1825	932
Mean R2	11.57	12.14	5.70	20.87	9.96	18.21
Median R2	11.28	12.27	5.55	19.56	9.60	16.33
Min R2	4.32	4.32	3.45	6.46	5.70	6.01
Max R2	19.76	19.76	8.34	61.08	15.74	30.23
No. of Yrs < EAD R^2			18	1	9	2

Panel B: Earnings preannouncement days

	Earnings announcements		Preannouncements (1993-2011)		Preannouncements (1998-2011) High analyst coverage subsample	
	1993-2011	1998-2011	All firm-years	Event firm-years	All firm-years	Event firm-years
Mean Obs	4757	4888	4757	458	1825	305
Mean R2	11.57	12.14	3.69	20.46	5.98	18.48
Median R2	11.28	12.27	3.77	17.43	5.38	15.96
Min R2	4.32	4.32	1.34	7.57	0.80	10.60
Max R2	19.76	19.76	6.12	65.71	14.06	30.31
No. of Yrs < EAD R^2			19	1	12	1

Panel C: 10-K and 10-Q filing days

	Earnings announcements	10-K and 10-Q filings
Mean Obs	4825	3061
Mean R2	11.55	5.81
Median R2	10.81	4.61
Min R2	4.32	2.03
Max R2	19.76	10.43
No. of Yrs < EAD R^2		17

TABLE 4. R^2s of management earnings forecast days, earnings preannouncement days, days with 10-K and 10-Q filings, and days with filing amendments, cont.

Panel D: 10-K and 10-Q filing amendment days

		10-K and 10-Q filing amendments	
	Earnings announcements	All firm-years	Event firm-years
Mean Obs	4825	4825	955
Mean R2	11.55	3.03	3.75
Median R2	10.81	2.90	3.53
Min R2	4.32	1.78	1.40
Max R2	19.76	4.61	7.31
No. of Yrs < EAD R^2		18	17

TABLE 5. Descriptive statistics for empirical distributions of size-adjusted event returns

This table provides descriptive statistics for three-day-window size-adjusted returns associated with earnings announcements, management forecasts, and preannouncements, using the Table 4 samples for the respective events, conditional on observing the event. Announcement returns are adjusted for the holding period return for the corresponding CRSP size-decile portfolio. The "Combined" sample includes all firm-events, but firm-days on which multiple events occur are represented only once. Abnormal returns less than the 0.5th percentile or greater than the 99.5th percentile of each sample are omitted from the analyses. Panel A presents the median and the first four moments of the abnormal return distribution for each sample. The mean, median and standard deviation returns are reported as percentages, whereas skewness and kurtosis are numbers. ***, **, and * refer to statistical significance at the 10 percent, 5 percent, and 1 percent level respectively for two-tailed *t*-tests of equality of a moment for a given event return distribution and the corresponding moment for the earnings announcement return distribution, where these moments are estimated at the quarterly level. Panel C presents the absolute and relative frequencies corresponding to each of 30 equal-sized abnormal return bins, formed on the "Combined" sample. Lower and upper return bounds for each bin are percentages. Panels B and D are constructed analogously to panels A and C, respectively, but for the subsample of firms in the 1998-2011 subperiod with above-median analyst coverage, where the source of analyst coverage is I/B/E/S.

Panel A: Distribution properties

	Earnings Announcements						Management Forecasts					
Year	Obs	Mean	Median	Std Dev	Skewness	Kurtosis	Obs	Mean	Median	Std Dev	Skewness	Kurtosis
1994 - 2011	351808	0.05	-0.18	8.29	0.27	2.49	69778	-0.69 ***	-0.17 ***	9.10 ***	-0.54 ***	2.36 ***
1994 - 1997	278587	0.18	-0.23	7.17	0.34	3.37	2304	-4.00 ***	-1.82 ***	10.73 ***	-0.64 ***	1.22 ***
1998 - 2011	73221	0.02	-0.16	8.56	0.26	2.27	67474	-0.57 ***	-0.11 *	9.02 ***	-0.52 ***	2.39 *

	Preannouncements						Combined					
Year	Obs	Mean	Median	Std Dev	Skewness	Kurtosis	Obs	Mean	Median	Std Dev	Skewness	Kurtosis
1994 - 2011	11173	-3.73 ***	-1.78 ***	13.66 ***	-0.63 ***	1.69 ***	379297	-0.19 ***	-0.23 ***	8.58 ***	0.07 ***	2.59 ***
1994 - 1997	1319	-5.00 ***	-2.06 *	13.32 ***	-0.87 ***	1.60 ***	147755	-0.02 ***	-0.23 *	7.46 ***	0.10 ***	3.48 ***
1998 - 2011	9854	-3.57 ***	-1.75 ***	13.69 ***	-0.61 ***	1.70 ***	231542	-0.23 ***	-0.21 ***	8.84 ***	0.07 ***	2.38 ***

Panel B. Distribution properties for high analyst coverage subsample

	Earnings Announcements						Management Forecasts					
Year	Obs	Mean	Median	Std Dev	Skewness	Kurtosis	Obs	Mean	Median	Std Dev	Skewness	Kurtosis
1994 - 2011	125528	0.31	0.10	7.97	0.08	1.86	47110	-0.58 ***	-0.09 ***	8.73 ***	-0.57 ***	2.31 *
1994 - 1997	24491	0.31	0.07	6.59	0.05	3.14	1406	-3.93 ***	-1.84 ***	10.25 ***	-0.69 ***	1.17 ***
1998 - 2011	101037	0.30	0.10	8.27	0.08	1.61	45704	-0.47 ***	-0.05 ***	8.65 ***	-0.55 ***	2.33 *

	Preannouncements						Combined					
Year	Obs	Mean	Median	Std Dev	Skewness	Kurtosis	Obs	Mean	Median	Std Dev	Skewness	Kurtosis
1994 - 2011	6371	-3.58 ***	-1.45 ***	13.09 ***	-0.84 ***	1.87 ***	147087	-0.10 ***	-0.01 ***	8.39 ***	-0.23 ***	2.28 ***
1994 - 1997	682	-4.60 ***	-1.47	13.46 ***	-0.83 ***	1.50 ***	26363	-0.02 ***	0.01 ***	7.11 ***	-0.33 ***	3.55 ***
1998 - 2011	5689	-3.45 ***	-1.45 ***	13.04 ***	-0.84 ***	1.93	120724	-0.12 ***	-0.02 ***	8.65 ***	-0.21 ***	2.06 ***

TABLE 5. Descriptive statistics for empirical distributions of size-adjusted event returns, cont.

Panel C: Empirical distribution

Bin			Obs						
			Earnings announcements		Management forecasts		Pre-announcements		
No	Lower bound	Upper bound	Abs	Rel	Abs	Rel	Abs	Rel	Combined
1	-58.34	-53.55	75	53.19%	37	26.24%	29	20.57%	124
2	-53.55	-48.77	103	49.76%	57	27.54%	47	22.71%	188
3	-48.77	-43.98	175	49.44%	107	30.23%	72	20.34%	320
4	-43.98	-39.19	307	55.22%	151	27.16%	98	17.63%	503
5	-39.19	-34.41	511	55.60%	263	28.62%	145	15.78%	821
6	-34.41	-29.62	927	63.19%	366	24.95%	174	11.86%	1303
7	-29.62	-24.83	1825	64.92%	683	24.30%	303	10.78%	2473
8	-24.83	-20.05	3552	70.71%	1085	21.60%	386	7.68%	4472
9	-20.05	-15.26	7149	75.26%	1789	18.83%	561	5.91%	8441
10	-15.26	-10.47	15127	78.40%	3346	17.34%	822	4.26%	17149
11	-10.47	-5.69	34456	80.54%	7057	16.50%	1269	2.97%	37935
12	-5.69	-0.90	86155	82.31%	16366	15.64%	2150	2.05%	93580
13	-0.90	3.89	113139	82.72%	21214	15.51%	2427	1.77%	122741
14	3.89	8.68	45753	80.60%	9719	17.12%	1294	2.28%	49524
15	8.68	13.46	19566	80.00%	4245	17.36%	645	2.64%	21164
16	13.46	18.25	9318	80.11%	1978	17.00%	336	2.89%	10076
17	18.25	23.04	4611	80.99%	908	15.95%	174	3.06%	4989
18	23.04	27.82	2500	82.43%	436	14.38%	97	3.20%	2706
19	27.82	32.61	1425	83.73%	207	12.16%	70	4.11%	1557
20	32.61	37.40	899	84.65%	125	11.77%	38	3.58%	976
21	37.40	42.18	543	84.58%	76	11.84%	23	3.58%	588
22	42.18	46.97	332	85.79%	36	9.30%	19	4.91%	361
23	46.97	51.76	249	87.06%	26	9.09%	11	3.85%	269
24	51.76	56.54	171	85.07%	21	10.45%	9	4.48%	188
25	56.54	61.33	108	83.72%	13	10.08%	8	6.20%	122
26	61.33	66.12	88	88.89%	9	9.09%	2	2.02%	94
27	66.12	70.91	54	87.10%	7	11.29%	1	1.61%	61
28	70.91	75.69	59	86.76%	6	8.82%	3	4.41%	65
29	75.69	80.48	34	89.47%	3	7.89%	1	2.63%	38
30	80.48	85.27	30	90.91%	1	3.03%	2	6.06%	32

TABLE 5. Descriptive statistics for empirical distributions of size-adjusted event returns, cont.

Panel D: Empirical distribution for high analyst coverage subsample (1998-2011)

Bin			Obs						
			Earnings announcements		Management forecasts		Pre-announcements		
No	Lower bound	Upper bound	Abs	Rel	Abs	Rel	Abs	Rel	Combined
1	-58.99	-54.96	12	26.67%	19	42.22%	14	31.11%	37
2	-54.96	-50.92	34	49.28%	22	31.88%	13	18.84%	59
3	-50.92	-46.88	29	28.43%	43	42.16%	30	29.41%	89
4	-46.88	-42.84	59	44.03%	51	38.06%	24	17.91%	115
5	-42.84	-38.81	94	45.63%	69	33.50%	43	20.87%	182
6	-38.81	-34.77	128	41.42%	121	39.16%	60	19.42%	258
7	-34.77	-30.73	207	47.92%	165	38.19%	60	13.89%	360
8	-30.73	-26.69	371	50.48%	255	34.69%	109	14.83%	602
9	-26.69	-22.66	589	51.08%	432	37.47%	132	11.45%	916
10	-22.66	-18.62	1079	56.76%	646	33.98%	176	9.26%	1536
11	-18.62	-14.58	1998	62.87%	955	30.05%	225	7.08%	2560
12	-14.58	-10.54	3990	64.63%	1841	29.82%	343	5.56%	4915
13	-10.54	-6.51	8040	66.17%	3575	29.42%	536	4.41%	9609
14	-6.51	-2.47	16860	67.17%	7432	29.61%	808	3.22%	19860
15	-2.47	1.57	27528	66.29%	12824	30.88%	1172	2.82%	33201
16	1.57	5.61	19500	66.80%	8839	30.28%	853	2.92%	23071
17	5.61	9.64	10191	67.68%	4368	29.01%	499	3.31%	11649
18	9.64	13.68	5226	68.32%	2156	28.19%	267	3.49%	5926
19	13.68	17.72	2743	67.86%	1149	28.43%	150	3.71%	3105
20	17.72	21.75	1492	71.70%	517	24.84%	72	3.46%	1663
21	21.75	25.79	801	71.71%	270	24.17%	46	4.12%	894
22	25.79	29.83	416	70.51%	146	24.75%	28	4.75%	478
23	29.83	33.87	283	72.94%	78	20.10%	27	6.96%	329
24	33.87	37.90	177	74.06%	55	23.01%	7	2.93%	200
25	37.90	41.94	113	72.90%	33	21.29%	9	5.81%	132
26	41.94	45.98	69	75.82%	13	14.29%	9	9.89%	81
27	45.98	50.02	40	68.97%	15	25.86%	3	5.17%	49
28	50.02	54.05	45	83.33%	8	14.81%	1	1.85%	48
29	54.05	58.09	34	73.91%	9	19.57%	3	6.52%	40
30	58.09	62.13	13	68.42%	3	15.79%	3	15.79%	17

TABLE 6. EADs' R^2 improvement from including days with earnings forecasts, preannouncements, and 10-K and 10-Q filings or their amendments

This table reports EADs' R^2 after broadening the notion of earnings announcement days. Column 1 analyzes the sample of formal EAD but excludes observations where management forecasts occur concurrently on the announcement day, whereas column 2 includes these observations. Columns 3 through 5 progressively includes days on which earnings are preannounced, forecasted, and 10-K and 10-Q forms are filed or amended. We modify our approach of regressing calendar-year returns on four three-day window earnings announcement returns as follows: When earnings information is disseminated over multiple days in a given quarter, then we use the sum of the three-day window returns centered on these days as our independent variable. For brevity, the regression results by year are not reported; instead, only the summary statistics for these results are presented.

	Subsample	Full sample			
	Earnings announcements only (1)	Incl sim forecasts (2)	Incl preann (3)	Incl forecasts (4)	Incl filings/amends (5)
Mean Obs	4633	4825	4825	4825	4825
Mean R^2	11.96	11.55	12.61	13.69	14.88
Median R^2	10.72	10.81	11.73	13.19	15.29
Min R^2	4.13	4.32	5.06	5.93	6.84
Max R^2	21.25	19.76	20.41	21.18	21.54

Figure 1. Relative abnormal event return frequencies