Why Returns on Earnings Announcement Days are More Informative than Other Days

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November 2010

Abstract

We analyze the contribution of returns around earnings announcements to typical estimates of the "prices lead earnings" relation. We find that prior returns' ability to explain earnings is concentrated disproportionally in returns on earnings announcement dates, suggesting that a substantial portion of the estimated timeliness of returns in previous studies is empirically indistinguishable from the information content of earnings. Nevertheless, realized returns around earnings announcements are more informative than inter-announcement returns even after controlling for the information content of earnings. We investigate two explanations for these results that are suggested by the prior literature; delayed price responses to prior earnings news and market responses to information asymmetry around anticipated firm disclosures. We find little support for the first explanation and strong support for the second one. The results suggest that some evidence previously construed as support for the information content of earnings may be a reflection how information asymmetry alters price discovery around earnings announcements.

1. Introduction

The idea that returns reflect information about future cash flows in a timelier manner than earnings has been entrenched in the accounting and finance literatures since the publication of Ball and Brown (1968). The "prices lead earnings" relation has intuitive appeal and substantial empirical support (see, also, Beaver, Lambert and Morse 1980, Beaver, Lambert and Ryan 1987, Collins, Kothari and Rayburn 1987, Basu 1997, and Ryan and Zarowin 2003). At the same time, a robust literature beginning with Beaver (1968) analyzes the extent to which earnings have information content about future cash flows, suggesting that information in realized earnings actually leads prices (see, also, Francis, Schipper and Vincent 2002a, 2002b, Landsman and Maydew 2002, and Collins, Li and Xie 2009). In this paper we analyze how the informativeness of returns around earnings announcements impacts inferences in both literatures. We find that the information content of quarterly earnings realized within annual return windows typically used to estimate the timeliness of returns accounts disproportionally for the ability of returns to explain earnings. Nevertheless, after controlling for the news in earnings we find that earnings announcement returns (EAR) are more informative about current and future earnings than inter-announcement returns (IAR), suggesting that factors other than the news in realized earnings significantly alter the flow of information around earnings announcements.[1]

We investigate two explanations suggested by the prior literature for the superior informativeness of EAR relative to IAR; delayed price responses to earnings news and changes in information asymmetry around earnings announcements. We find little support for the former explanation and strong support for the latter explanation. Together with analyses of returns over short event windows our results suggest that pre-announcement information asymmetry that reduces the flow of private information before an earnings announcement for some firms and increased informed trading that increases the level of information asymmetry after earnings announcements

[1] The information content of earnings is measured in the literature using both market-based approaches (e.g., estimated ERCs or abnormal price variability on earnings announcement dates) and fundamentals-based approaches (e.g., the ability of current earnings news to explain future earnings and cash flows). In this paper we rely necessarily on the latter approach because of the nature of the literature we are addressing (i.e., timeliness studies in which fundamentals such as earnings and cash flows serve as the dependent variable), and because we seek to identify factors in addition to the information earnings directly conveys to the market that can affect price behavior on announcement dates.

for other firms is partially responsible for evidence previously construed as support for the information content of earnings.

Annual returns realized prior to the announcement of annual earnings serve as the independent variable in the typical empirical estimation of the prices lead earnings relation. The interpretation of results in these studies is based on the assumption that returns impound all new information about firm fundamentals over a given event window up to and including the date of an earnings realization. A parallel literature beginning with Beaver (1968) provides evidence of abnormal price and volume reactions to earnings announcements that supports the view that earnings realizations have information content about cash flows and/or alter investors' perception of firm risk. If earnings do have information content and investors immediately and correctly respond to it, then some portion of the returns that serve as the independent variable in a timeliness test is, albeit briefly, *less timely* than earnings news, leading to an overstatement of the extent to which returns lead earnings.[2]

Removing EAR from windows that include quarterly announcements will eliminate possible overstatement of the timeliness of returns resulting from the failure to control for the information content of earnings. However, because there is no guarantee that earnings announcement returns are entirely attributable to what investors learn directly from announced earnings, it could also lead to an understatement of the timeliness of returns. Accordingly, our analysis includes both EAR and IAR and employs various techniques to parse out the news in realized earnings.

We begin our analysis of the timeliness of returns with benchmark R^2s and slope coefficients from regressions of current annual earnings levels (earnings changes) on annual returns (abnormal returns). We then repeat the analysis after decomposing annual returns into EAR and IAR components to assess their relative contributions to the average timeless of returns for earnings. We find that EAR contribute, on average, 33% (32%) of the explanatory power of a typical reverse regression of annual earnings (earnings changes) on annual returns (abnormal returns). This is over six times what would be expected if EAR and IAR contributed equally to empirical estimates of the timeliness of returns. We confirm the conclusion after employing a bootstrapping methodology that

[2] That is, the slope coefficient on returns and associated R^2 from a regression of annual earnings on annual returns are larger than the coefficient on returns and associated *incremental* R^2 in a regression of annual earnings on annual returns and earnings news as a result of an omitted variable in the first specification.

compares 3-day EAR to randomly selected 3-day IAR, and after decomposing quarterly returns into their EAR_q and IAR_q (q=1, 2, 3 and 4) components.[3] This circumstantial evidence is consistent with an overstatement of the timeliness of returns owing to failure to control for the information content of earnings.

We assess the *direct* impact of the information content of earnings on empirical estimates of the timeliness of returns and test of the relative informativeness of EAR and IAR by exploiting the implied cross-sectional estimates of the coefficient on quarterly earnings surprises to separate the portion of returns that is associated with earnings realizations from the residual component that is independent of the predictive content of earnings news. We find that the explanatory power of EAR_q (abnormal EAR_q) for current earnings (earnings changes) is reduced substantially after controlling for earnings news, providing direct evidence that a significant part of the apparent timeliness of annual returns for current and future annual earnings documented in prior studies is a reflection of the information content of quarterly earnings realizations. Nevertheless, after controlling for quarterly earnings surprises, the *residual* component of EAR_q remains significant and more informative than IAR_q in all fiscal quarters.

We explore two possible explanations for the superior informativeness of residual EAR_q that are suggested by evidence from the prior literature. The first explanation is delayed price responses to earnings news. Conclusions drawn in the prior literature regarding the timeliness of returns and the relative informativeness of EAR and IAR depend on the assumption of market efficiency (alternatively, no omitted risk factors in models of expected returns). However, evidence from the pricing anomalies literature appears to contradict this assumption. For example, to the extent that delayed price responses to quarterly earnings surprises are partially or completely corrected by the

[3] Annual earnings are approximately equal to the sum of quarterly earnings. Returns realized in the first fiscal quarter of the fiscal year have the potential to be informative about events that can affect all four quarterly earnings numbers that comprise the annual earnings number, whereas if the identical information had been captured in returns realized in the second fiscal quarter, then that return will only have the potential to be informative about three of the quarterly earnings that comprise that same annual earnings number, and so on. In contrast, returns realized in any fiscal quarter of the current year will have the potential to be informative about an equal number of quarterly earnings in future fiscal years. This mechanical quarterly effect has the potential to bias in favor of superior informativeness of IAR relative to EAR. However, there is also a countervailing effect that occurs at the point where earnings begin, on average, to “catch up” to returns, which will bias in favor of superior informativeness of EAR relative to IAR. The question of when the average timeless of returns reaches a maximum and then tails off is an empirical one. Together with additional analyses of quarterly earnings and earnings changes, we estimate that, on average, the timeliness of returns reaches a maximum in less than one year and then drops off rapidly thereafter.

end of the fiscal year analyzed in an annual timeliness regression, this maintained assumption is violated (see, e.g., Bernard and Thomas 1990). Moreover, studies that identify pricing anomalies and investigate limits to arbitrage and other omitted risk factors commonly document a concentration of predictable returns around earnings announcements (see, e.g., Bernard and Thomas 1990, Sloan 1996, Abarbanell and Bushee 1998, and Ali, Hwang and Trombley 2003). These findings suggest the possibility that the greater informativeness of the EAR relative to IAR is attributable to larger price corrections around earnings announcements than on other days.[4]

To test for the impact of delayed price reaction on the timeliness of returns and the apparent superior informativeness of EAR relative to IAR, we control for lagged quarterly earnings surprises. We find a statistically significant but economically negligible reduction in the explanatory power of both residual EAR and IAR for both earnings and earnings changes. We obtain similar results when we substitute lagged EARs for lagged earnings surprises.

The second explanation for the superior informativeness of EAR is suggested by the literatures on information asymmetry around anticipated firm disclosures. For example, the models in Indjejikian (1991) and Kim and Verrecchia (1994) provide theoretical support for an increase in information asymmetry when firms provide material disclosures. In the equilibrium analyzed in the latter study it is possible for traders making informed judgments after earnings are announced to increase trading volume by more than the amount their presence drives out. More important, in such cases, prices will be more informative on earnings announcement dates than at other times because of an increase in new information production. As a result, average EAR will be *ceteris paribus* more informative than average IAR.

Alternatively, if information asymmetry is high and common information is low in the days or weeks leading up to an announcement, liquidity and trading volume will decline in advance of earnings announcements (see, e.g., Admati and Pfleiderer 1988, Kim and Verrecchia 1991 and Atiase and Bamber 1994). If the decline in liquidity is sufficiently large it is possible that informed trading will also be temporarily attenuated, which would lower *ceteris paribus* the average

[4] Note also that any price correction that occurs in subsequent inter-announcement windows will increase the apparent ability of annual returns to explain annual earnings in a typical timeliness test when in fact such returns would be *less timely* than the quarterly earnings realizations that comprise the annual earnings number.

informativeness of IAR_q relative to EAR_q and contribute to the apparent superior informativeness of earnings announcement returns. Moreover, if earnings announcements substantially reduce information asymmetry then liquidity could increase on earnings announcement dates, resulting in an increase in trading volume and the level of informed trading (see, e.g., George, Kaul and Nimalendran 1994 and Chae 2005). In summary, a temporary attenuation of the flow of existing private information or incentives to acquire new information followed by a reversal on earnings announcement dates would reinforce the likelihood that EAR_q are more informative than IAR_q.

To assess the possible role market responses to information asymmetry around earnings announcements play in explaining the superior informativeness of EAR relative to IAR, we examine the informativeness of residual returns (i.e., returns orthogonal to earnings surprises), abnormal trading volume and bid-ask spreads from the period immediately prior to the previous earnings announcement to immediately following the current period earnings announcement. We find, on average, that the informativeness of residual returns and abnormal trading volume are greater on and immediately following earnings announcement dates, while bid-ask spreads decline. These preliminary results are consistent with an increase in pre-announcement information asymmetry leading up to earnings announcements that temporarily attenuates the flow of information into prices; a process that is reversed when earnings are announced and information asymmetry is reduced (see, e.g., Chae 2005). However, further analysis indicates this scenario plays out only for firms in low analyst following and small firm size partitions of the sample. In contrast, we find bid-ask spreads increase on announcement dates for firms with high analyst following and large firms, suggesting information asymmetry actually increases with increased trading by informed traders for these firms on earnings announcement dates (see, e.g., Kim and Verrecchia 1994). Overall, the evidence indicates that greater new information production for some firms and a reversal of previously attenuated privately informed trading on earnings announcement dates for other firms both contribute to the apparent superiority of EAR relative to IAR.

Our study exploits a number of theoretical and empirical threads in earnings-returns literature to provide a more comprehensive view of the timeliness of returns than has previously been contemplated. While we find that a significant portion of annual returns' ability to explain annual earnings cannot be attributed to their superior timeliness relative to earnings, we also find that returns on earnings announcement dates, nevertheless, provide a larger contribution to the average timeliness of returns than returns realized on other days. Supplemental tests we perform document a link between information asymmetry and the superior informativeness of returns realized on dates when firms release scheduled management forecasts between earnings announcements. Robustness tests confirm our main findings for 1) a sample of firms that provide additional disclosures on earnings announcement dates, 2) tests that employ current cash flows and cash flow changes as the dependent variable and 3) tests that employ one-year-ahead earnings (earnings changes) and one-year-ahead cash flows (cash flow changes) as the dependent variable.

We motivate our hypotheses, describe sample selection procedures, and define variables used in our empirical tests in the next section. We present our findings on the impact of information overlap on the timeliness of returns and the relative informativeness of EAR and IAR in section 3. Section 4 presents tests of the alternative explanations for the superior informativeness of residual EAR relative to IAR and section 5 discusses various robustness tests. We summarize our findings and provide concluding remarks in section 6.

2. The Prices Lead Earnings Relation and the Relative Contributions of Earnings Announcement and Inter-Announcement Returns

2.1 Empirical Hypotheses

Equations (1) and (2) below are straightforward representations of the prices lead earnings relation found in the prior literature (see, e.g., Ball and Brown 1968, Beaver, Lambert and Morse 1980, and Basu 1997):

$$\frac{X_{i,t}}{P_{it-1}} = \alpha_0 + \beta_0 \cdot RET_{i,t} + \epsilon_{i,t} \qquad (1)$$

$$\frac{X_{i,t}-X_{i,t-1}}{P_{it-1}} = \alpha_0 + \beta_0 \cdot ARET_{i,t} + \epsilon_{i,t} \qquad (2)$$

where,

$X_{i,t}$ = annual earnings reported by firm i in year t,
$RET_{i,t}$ = annual stock return for firm i in year t,

$ARET_{i,t}$ = annual abnormal stock return for firm i in year t, and,
$P_{i,t-1}$ = stock price for firm i at the end of year t-1.

On the one hand, if returns are indeed timelier than earnings, then returns realized earlier in the current year will be more informative about current earnings than returns realized later in the year. On the other hand, when earnings, on average, "catch up" with returns, then returns realized earlier in the year will begin to become less informative about future earnings than returns realized later in the year (see footnote 3). Note that in the absence of variation over time in the average persistence of earnings these effects are not present in tests of the relative information content of earnings that rely on price-based dependent variable.[5] To account for confounding effects of variation in the timeliness of returns over an annual horizon we refine equations (1) and (2) to allow the coefficients on returns to vary by fiscal quarter.[6] In a subsequent section we will allow coefficients to vary over even shorter intervals to provide evidence on competing explanations for our initial findings.

$$\frac{X_{i,t}}{P_{it-1}} = \alpha_0 + \sum_{q=1}^{4} \beta_{1,q} \cdot RET_{i,q,t} + \epsilon_{i,t} \qquad (3)$$

$$\frac{X_{i,t} - X_{i,t-1}}{P_{it-1}} = \alpha_0 + \sum_{q=1}^{4} \beta_{1,q} \cdot ARET_{i,q,t} + \epsilon_{i,t} \qquad (4)$$

where,

$X_{i,t}$ = annual earnings reported by firm i in year t,
$RET_{i,q,t}$ = quarterly stock returns realized for firm i in quarter q of year t,
$ARET_{i,q,t}$ = quarterly abnormal stock returns realized for firm i in quarter q of year t, and,
$P_{i,t-1}$ = stock price for firm i at the end of year t-1.

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[5] For example, in the absence of variation in the persistence of earnings, this issue does not affect inferences in percentage contribution tests introduced by Ball and Shivakumar (2008) or event window return variance comparison tests introduced by Beaver (1968), which are also used to assess the relative information content of EAR and IAR. A disadvantage of these tests, however, is that they are not well-suited for directly discriminating reasons other than the information content of earnings for differences in the informativeness of EAR and IAR.

[6] We extend the analysis of differences in the timeliness of returns over the horizon by estimating regressions of one-year-ahead earnings and earnings changes on measures of current returns in section 5. Additional tests that regress quarterly earnings and earnings changes on quarterly returns for up to 8 prior quarters are used to identify the point at which the average timeliness of returns reaches the maximum value (see Appendix).

Beginning with Ball and Brown (1968) studies have consistently reported a strong positive relation between *ex post* earnings (earnings changes) and the annual returns (abnormal returns) leading up to the realization of earnings. Cumulative returns and abnormal returns from the beginning to the end of annual event windows appear to be monotonically increasing in the sign and magnitude of the earnings news (see Ball and Brown 1968, figure 1). Much of the literature that documents the prices lead earnings relation attributes the ability of returns to reflect new information about fundamentals in a timelier manner than earnings to accounting rules that delay full recognition of value-relevant information, especially good news.[7]

A robust literature on the information content of earnings has developed in parallel with the timeliness literature. Inferences concerning the information content of earnings are frequently based on evidence of differential return variability, abnormal absolute price changes, and abnormal trading volume around earnings announcements (see Beaver 1968, Francis, Schipper and Vincent 2002a, 2002b, Landsman and Maydew 2002, DeFond *et al*., and Collins, Li and Xie 2009). However, other studies have challenged prior conclusions about the significance of the information content of earnings (see, e.g., Atiase and Bamber 1994, Bamber, Christensen and Gaver 2000, and Ball and Shivakumar 2008). For example, Ball and Shivakumar (2008), using a "percentage contribution to total returns" approach, assess the contribution of earnings announcement returns to annual returns. They argue that robust information environments and other firm disclosures make it unlikely that earnings announcements provide substantial new information to the market and present evidence that they interpret as consistent with this argument.[8]

Studies in both the information content and returns timeliness literatures assume market efficiency (or to the extent that markets are not efficient, pricing mistakes are distributed randomly over possible event windows and over time). We combine the two streams with the following equations,

[7] It is also possible that the timeliness of returns reflects mangers' reporting incentives relative to uncertain events that characterize a firm's economic environment and are independent of biases embedded in accounting rules (e.g., incentives related to managerial reputation or legal liability). The discrete nature of earnings announcements compared to the near continuous realization of returns also contributes mechanically to empirical estimates of the timeliness of returns.

[8] In contrast, Basu *et al.*, who also employ a percentage contribution test, refine the methodology of Ball and Shivakumar and conclude that earnings announcement returns are more informative than non-earnings announcement returns. Basu *et al.* limit their investigation of this apparent superiority to other firm disclosures.

$$\frac{X_{i,t}}{P_{it-1}} = \alpha_0 + \beta_1 \cdot EAR_{i,t} + \beta_2 \cdot IAR_{i,t} + \epsilon_{i,t} \quad (5)$$

$$\frac{X_{i,t}-X_{i,t-1}}{P_{it-1}} = \alpha_0 + \beta_1 \cdot AEAR_{i,t} + \beta_2 \cdot AIAR_{i,t} + \epsilon_{i,t} \quad (6)$$

where,

$EAR_{i,t}$ = stock returns realized over earnings announcement periods for firm i in year t,
$IAR_{i,t}$ = stock returns realized over inter-announcement periods for firm i in year t,
$AEAR_{i,t}$ = abnormal stock returns realized over earnings announcement periods for firm i in year t, and,
$AIAR_{i,t}$ = abnormal stock returns realized over inter-announcement periods for firm i in year t.

If earnings realizations have information content in their own right, then, in an efficient market, returns on earnings announcement dates should have a greater ability to explain current and future annual earnings than returns realized on randomly selected non-earnings announcement dates when firm disclosures are less likely to occur. We state the hypothesis formally in alternative form:

H1: Earnings announcement returns are more informative about current and future earnings than inter-announcement returns.

We expect that the timeliness of returns to vary over the annual horizon but we have no theoretical prediction about when, over the horizon, the informativeness of returns will reach a maximum (see footnote 3). Therefore, to control for this possible confounding effect in testing hypothesis 1 we employ data from individual fiscal quarters within the annual horizon using the following equations:

$$\frac{X_{i,t}}{P_{it-1}} = \alpha_0 + \sum_{q=1}^{4} \beta_{1,q} \cdot EAR_{i,q,t} + \sum_{q=1}^{4} \beta_{2,q} \cdot IAR_{i,q,t} + \epsilon_{i,t} \quad (7)$$

$$\frac{X_{i,t}-X_{i,t-1}}{P_{it-1}} = \alpha_0 + \sum_{q=1}^{4} \beta_{1,q} \cdot AEAR_{i,q,t} + \sum_{q=1}^{4} \beta_{2,q} \cdot AIAR_{i,q,t} + \epsilon_{i,t} \quad (8)$$

where,

$X_{i,t}$ = annual earnings reported by firm i in year t,
$EAR_{i,q,t}$ = stock returns realized over earnings announcement periods for firm i in quarter q of year t,
$IAR_{i,q,t}$ = stock returns realized over inter-announcement periods for firm i in quarter q of year t,
$AEAR_{i,q,t}$ = abnormal stock returns realized over earnings announcement periods for firm i in quarter q of year t,
$AIAR_{i,q,t}$ = abnormal stock returns realized over inter-announcement periods for firm i in quarter q of year t, and,
$P_{i,t-1}$ = stock price for firm i at the end of year t-1.

It is possible for EAR to be more informative about earnings than IAR for reasons that are independent of the news conveyed in earnings announcements. However, to the extent that price discovery is a direct consequence of the information content of announced earnings, traditional timeliness tests and percentage contribution tests will not detect this fact. Therefore, not only will some portion of EAR be more informative than IAR *without being timelier* than the interim earnings realizations that comprise the annual number, but other factors that contribute to the superiority of EAR to IAR will be obscured.

To analyze how the information content of earnings affects empirical estimates of the timeliness of returns we extend equations (1) and (2) by including the sum of $SUE_{i,q,t}$ (equal to the standardized unexpected earnings for firm i in quarter q of year t, q=1, 2, 3 and 4) to both equations. Similarly, we refine equations (3) and (4) by including individual $SUE_{i,q,t}$.[9] The potential for overlapping information in earnings and returns leads to our second hypothesis stated in alternative form:

H2: The estimated timeliness of returns will be lower after controlling for quarterly earnings surprises realized within the annual event window.

The primary motivations for tests of the informativeness of EAR relative to IAR in prior studies has been to determine whether earnings have information content, whether firm characteristics affect the information content of earnings, and whether the information content of earnings has changed over time. However, it is possible that there are other factors that contribute to a difference in the informativeness of EAR and IAR. For example, if prices reflect information in prior earnings with a delay, then it is also possible that there is more price correction on earnings announcement

[9] We estimate the refined versions of equations (1) through (4) using the implicit cross-sectional estimates of the price response to quarterly earnings surprises. In section 5 we repeat these tests using analysts' forecast errors based on the consensus forecast outstanding before an announcement and further refine these tests by estimating firm-specific time-series estimates of the price response to earnings.

dates than on randomly selected non-earnings announcement dates, which would contribute to greater *apparent* informativeness of returns realized around earnings announcements (see, e.g., Bernard and Thomas 1990).

Another possibility is that information asymmetry systematically alters the flow and/or amount of informed trading that takes place around earnings announcement dates. One way this could occur is if market makers increase spreads to prohibitively high levels in anticipation of an earnings announcement to protect against traders with superior information (e.g., Diamond and Verrecchia 1991). Consistent with this argument, Skinner (1993) reports that bid-ask spreads are abnormally high on earnings announcement when earnings surprises are unusually large. If, in addition, discretionary liquidity traders postpone their trades until after earnings announcements (see, e.g., Admati and Pfleiderer 1988), informed traders could also reduce their trading because it is more difficult for them to disguise their information when liquidity is especially low. One consequence of reduced informed trading in the days leading up to an earnings announcement is that average IAR_q will be lower than what would have been expected given the amount of private information that was actually present in the market in that period. Furthermore, should such a situation prevail before an announcement and announced earnings subsequently reduce information asymmetry, then liquidity could improve, leading to reversal in trading volume (see, e.g., George, Kaul and Nimalendran 1994, and Chae 2005). If the increase in trading volume includes a proportional increase in privately informed trading, then EAR_q would be more informative than average IAR_q because information that would otherwise have entered prices before an earnings announcement is instead impounded on the earnings announcement date.

It is also possible for abnormally high levels of private information to be impounded in prices immediately *after* earnings are announced even when liquidity declines. This could occur with an influx of traders who make informed judgments when firms make public disclosures. The presence of these expert traders increases information asymmetry and lowers liquidity. However, in this equilibrium the trading volume generated by traders making informed judgments is greater than the volume they drive out (see Kim and Verrecchia 1994). As a consequence, EAR_q are more informative than IAR_q because of the presence of sophisticated traders that "produce" new information after observing the realization of earnings.

To test whether the informativeness of EAR relative to IAR depends on more than just the information content of earnings we extend equations (7) and (8) to include SUEs realized in each quarter.

$$\frac{X_{i,t}}{P_{it-1}} = \alpha_0 + \sum_{q=1}^{4} \beta_{1,q} \cdot EAR_{i,q,t} + \sum_{q=1}^{4} \beta_{2,q} \cdot IAR_{i,q,t} + \sum_{q=1}^{4} \beta_{3,q} \cdot SUE_{i,q,t} + \epsilon_{i,t} \quad (9)$$

$$\frac{X_{i,t} - X_{i,t}}{P_{it-1}} = \alpha_0 + \sum_{q=1}^{4} \beta_{1,q} \cdot EAR_{i,q,t} + \sum_{q=1}^{4} \beta_{2,q} \cdot IAR_{i,q,t} + \sum_{q=1}^{4} \beta_{3,q} \cdot SUE_{i,q,t} + \epsilon_{i,t} \quad (10)$$

Formally, we hypothesize that:

H3: EAR is more informative about earnings than IAR after controlling for the information content of earnings.

To summarize, hypotheses 2 posits that the timeliness of returns is overstated in a traditional timeliness test because of the omission of controls for the information content of quarterly earnings realized within the annual event window. Hypothesis 3 incorporates controls for the information content of earnings and posits that the residual component of EAR will still be more informative than IAR. If so, this *residual* component of EAR can be exploited to discriminate among possible explanations for greater information flow on earnings announcement dates.[10]

2.2 Data and Sample Selection

The sample begins with the intersection of the COMPUSTAT fundamentals annual and quarterly files and the Center for Research in Security Prices (CRSP) daily stock return file during

[10] Note that the delayed response to earnings news motivation for hypothesis 3 implies that estimates of the timeliness of returns are overstated because of a failure to control for the information content of *both* current and prior earnings news; i.e., some returns are actually considerably *less* timely than earnings. The informed trading explanation motivation for hypothesis 3 does not imply an overstatement of the timelessness of returns, but posits that the informativeness of returns about current and future earnings is concentrated disproportionally around earnings announcements.

the period 1974-2008.[11] Our sample firm-years consist of the listed firms on the New York Stock Exchange (NYSE) or American Stock Exchange (AMEX) with available common stocks (CRSP share codes of 10 or 11). A firm-year is included in our sample only if it has all four quarterly earnings announcement dates in a give fiscal year with sufficient price and financial statement data on CRSP and COMPUSTAT.

We use earnings before extraordinary items (COMPUSTAT item *IB*) deflated by the beginning fiscal year's market value of common equity (COMPUSTAT item *PRCC_F* multiplied by COMPUSTAT item *CSHO*) as the current annual earnings level variable. Similarly, we use the first difference of earnings before extraordinary items scaled by the beginning market value of equity in the annual earnings changes specifications.[12]

For tests that assess the impact of information content of earnings we use the standardized unexpected earnings (SUE) as a proxy for interim quarter's earnings surprises. SUE is the difference between quarterly reported earnings before extraordinary items (COMPUSTAT item *IBQ*) and estimated expected earnings based on a seasonal random walk with drift model. The resulting forecast error is then scaled by the standard deviation of historical forecast errors over which drift terms are estimated. We use a maximum of 36 quarters of firm-specific time-series of historical earnings realizations to estimate the drift term in the model with a minimum of 16 quarter requirement. If fewer than 16 observations are available for a given quarterly earnings announcement, we assume that quarterly earnings follow a seasonal random walk with no drift (Bernard and Thomas 1989, footnote 10). Tests described in section 5 employ forecast errors based on analysts' consensus forecasts of quarterly earnings from I/B/E/S and First Call.

Finally, to mitigate the effect of outliers, all scaled regression variables are truncated at the extreme 1% and 99% levels of each year. The resulting sample includes 49,809 (48,158) firm-years with 5,091 (4,882) distinct firms for the current earnings (earnings changes) specifications between

[11] The first year that both quarterly standardized unexpected earnings (SUE) and corresponding earnings announcement dates are fully available in COMPUSTAT is 1974 (see, Foster, Olsen and Shevlin 1984 and Bernard and Thomas 1989, 1990).

[12] The dependent variables in all of our specifications are scaled by market value of equity at the beginning of the annual or quarterly periods under examination. None of the qualitative conclusions drawn in this study are altered when these variables are not scaled and extreme observations are truncated.

1974 and 2008. Sample size differences imposed by data availability in tests performed in section 4 are described as necessary.

2.3 Returns estimation procedure

We employ both a conventional cross-sectional estimation and a simulation methodology to obtain incremental R^2s and the slope coefficients of each variable in our returns timeliness regressions. Specifically, tests of hypotheses involve the comparison of the 3-day earnings announcement returns (EAR) with the corresponding (either annual or fiscal quarter window) inter-earnings announcement returns (IAR) that are also measured over the 3-day interval centered on a randomly determined date. To carry out this comparison, we repeat the bootstrapping procedure described below 1,000 times, and base our inferences on the empirically generated distributions of regression summary statistics, including adjusted R^2s and slope coefficients.

First, we generate a random number from the uniform distribution for each observation and then the independently-generated random number is adjusted to fit into the length of the corresponding return measurement horizon. For example, in equations (1) and (2), we generate a random number for each firm-year observation in our sample. We then adjust this number to fall into the annual return horizon of each observation because the number of trading days that comprise the annual horizon varies by firm as well as by time. In the case of quarterly period specifications, we generate four independent series of random numbers for each firm-year observation. The four independently-generated numbers from the uniform distribution are then transformed into the four integer values that fit into their respective quarterly inter-announcement periods.[13] To avoid the overlap of randomly selected 3-day IAR windows with the 3-day EAR windows, we exclude the first (last) trading date in any of the inter-announcement period as a candidate for random IAR days.[14]

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[13] This procedure is necessary to account for differences in the number of trading days in each quarterly inter-announcement interval that does not overlap with the 3-day EAR windows. Relevant differences are discussed in section 4.

[14] An advantage of the bootstrapping approach we adopt here is that it takes into account the multiple event days (e.g., interim earnings announcements or fiscal period end dates) simultaneously and subsequently generates 3-day IARs with *ex ante* uniform frequencies which, by construction, avoids any confounding effects that may arise from the determination of *relative* event days that bias test statistics. See, for example, Thomas (1999) and Lys and Soffer (1999) for further discussion of this issue.

Second, we construct 3-day cumulative returns (abnormal returns) centered on each quarterly earnings announcement date and on each randomly selected inter-announcement date. Cumulative abnormal returns are the cumulative 3-day raw returns adjusted for the corresponding returns of size-matched decile portfolios to which the firm belongs at the beginning of the each calendar year. For example, in equations (1) and (2), RET (ARET) is the 3-day cumulative return (abnormal return) centered on a randomly selected trading date in the annual return period, which begins two days after the previous fiscal year's fourth quarter announcement and ends the day after the current fiscal year's fourth quarter announcement. In equations (3) and (4), we use four separate RET_q ($ARET_q$), which are the 3-day cumulative returns (abnormal returns) randomly selected from the fiscal quarter windows q (q=1, 2, 3 and 4). The procedure in this case allows for selection of returns from the respective quarterly earnings announcement windows to ensure the quarterly windows collectively comprise the full annual return period. In equations (7) and (8) (or other quarterly period specifications), EAR_q ($AEAR_q$) is the 3-day cumulative return (abnormal return) centered on the earnings announcement pertaining to fiscal quarter q (q=1, 2, 3 and 4) that occur within annual return windows. In equations (7) and (8) IAR_q ($AIAR_q$) is the 3-day cumulative return (abnormal return) centered on a randomly selected inter-announcement date that precedes the subsequent EAR windows of quarter q (q=1, 2, 3 and 4). That is, the four individual IAR windows do not overlap with any of the 3-day EAR intervals within annual return measurement horizon.

Finally, we draw statistical inferences pertaining to adjusted R^2s and the slope coefficients with the dataset generated through the aforementioned simulation procedure. For example, in equations (7) and (8) we assess the relative importance of EAR_q and IAR_q over the annual return horizon by estimating the regression with and without SUE_q. The bootstrapping procedure allows us to evaluate the relative contribution of EAR_q and IAR_q, and the relative reduction in EAR_q's and IAR_q's abilities to explain current and future earnings after controlling for the information content of earnings with formal statistical tests.

3. Results

3.1 Preliminary evidence on the timeliness of returns

Table 1 presents results of benchmark timeliness regressions represented by equations (1) and (2). The dependent variables in equations (1) and (2) are current annual earnings and annual earnings changes, and the independent variables are annual returns and abnormal returns, respectively. Panel A reports the coefficient on annual returns (abnormal returns) is .082 (.099), with a regression R^2 of 7.59% (8.79%), consistent with evidence in the prior literature that investigates the timeliness of annual returns (see, e.g., Ball and Brown 1968, Beaver, Lambert and Morse 1980, Basu 1997, and Givoly, Hayn and Natarajan 2007).

The tests reported in panel A do not account for differences in the number of trading days in the earnings announcement and non-earnings announcement windows that potentially contribute to estimates of the timeliness of returns. To create a benchmark for tests of our hypotheses based on the bootstrapping methodology employed throughout the paper, we use randomly selected 3-day returns (abnormal returns) as the independent variable for estimating equation (1) (equation (2)). The results are reported in panel B of table 1. Statistical inferences are based on distributional data obtained from a bootstrap methodology that samples 3-day returns 1,000 times with replacement. For current earnings, the estimated coefficient on 3-day returns is .048, with a regression R^2 of .07%. For current year earnings changes the coefficients on 3-day abnormal returns is .062, with a regression R^2 of .07%. The bootstrapped results are qualitatively similar to those from regressions based on total annual returns or annual abnormal returns, although the analogous slope coefficients and R^2s are lower in these specification as intuition would suggest.

Panel C of table 1 presents results from the estimation of equations (3) and (4), where the independent variable is 3-day returns randomly selected from each fiscal quarter and the dependent variables are current earnings and earnings changes. Column 2 reports that the incremental R^2 and slope coefficient associated with the first fiscal quarter returns are not statistically larger than the respective estimates for the second fiscal quarter. However, they are larger than the respective estimates for the third and fourth fiscal quarters. Similarly, the incremental R^2 and slope coefficients associated with the second fiscal quarter return are significantly larger than the respective estimates for the third and fourth fiscal quarter and the incremental R^2 and slope coefficient associated with the third fiscal quarter return are, in turn, significantly larger than the respective estimates for fourth fiscal quarter. The results in column 2 confirm the expectation that returns from earlier in the annual horizon are generally more informative about current earnings than returns from later in the horizon. Results reported in column 4 of panel C indicate that there is a monotonic decline in the informativeness of abnormal returns for current earnings changes from the first fiscal quarter to the fourth.

3.2 The relative informativeness of earnings announcement returns

Figure 1 depicts the relation between ranked earnings changes and cumulative abnormal returns in the year leading up to annual earnings announcement. The figure plots the average 3-day abnormal returns around fiscal quarter earnings announcements and the points in between depict the average accumulation of 3-day inter-announcement abnormal returns. Note the sharp increases in the 3-day abnormal returns on earnings announcement dates in the direction of the ranked earnings changes in all four fiscal quarters; especially in the extreme deciles. No such discontinuity is observed for randomly selected inter-announcement abnormal returns after ranking observations by *ex post* earnings changes.[15] The visual evidence in figure 1 strongly suggests that announcement abnormal returns are more informative about earnings changes than inter-announcement returns, consistent with hypothesis 1.

The top half of table 2, panel A presents slope coefficients and related incremental R^2s from estimating equations (5) and (6); regressions of current earnings (earnings changes) on EAR (AEAR) and IAR (AIAR) within the annual return window. For the current earnings regression, the slope coefficient on EAR is roughly twice as large as the coefficient on IAR and the incremental R^2 associated with EAR is nearly half of that estimated for IAR. If returns are assumed to be *i.i.d* and IAR are as informative about earnings as EAR, then we would have expected the incremental R^2 to be (12/252) or approximately one twentieth of that estimated for IAR. Similarly, for current

[15] While the graphical evidence in figure 1 (and figure 1 of Ball and Brown) is based on partitions of ranked *ex post* earnings changes as opposed to *ex ante* abnormal returns (the independent variable in a timeliness test), evidence of abnormally larger (smaller) returns on announcement dates for the most extreme positive (negative) earnings changes is consistent with the hypotheses tested in this paper.

earnings changes regression, the slope coefficient on AEAR is roughly two times larger than the coefficient on AIAR and the incremental R^2 associated with AEAR is 80% of that calculated for AIAR.

Finally, a comparison of the adjusted R^2s from the cross-sectional estimates in the top half of panel A of table 2 to the corresponding adjusted R^2s from panel A of table 1 indicates an improvement in explanatory power in both specification after allowing coefficients to vary by announcement and non-announcement windows in a traditional timeliness test.

The bootstrapping methodology described earlier provides an alternative view of the relative informativeness of EAR and IAR based on the actual distribution of returns, which provides a direct estimate of the average 3-day contributions of both sets of returns to estimates of timeliness. Results for the estimation of a regression of current earnings (earnings changes) on the sum of four 3-day EAR (AEAR) and the sum of four randomly selected 3-day IAR (AIAR) are presented in the bottom half of panel A of table 2. The slope coefficient for EAR (AEAR) in the current earnings (earnings changes) regression is roughly 3 times that of IAR (AIAR). The incremental R^2 of EAR (AEAR) is 10 (20) times that associated with IAR (AIAR). Once again, the adjusted R^2s from these regressions are substantially improved compared to those associated with the bootstrapping methodology reported in the columns 1 and 3 of panel C of table 1. These results also strongly support hypothesis 1.

As demonstrated earlier, the timeliness of returns varies by fiscal quarter of the annual horizon, which has the potential to confound comparison of the informativeness of EAR and IAR.[16] Accordingly, we estimate equations (7) and (8) and repeat our tests of hypothesis 1 by individual fiscal quarter. For these tests we ensure 3-day EAR_q ($AEAR_q$) are realized *after* their corresponding 3-day IAR_q ($AEAR_q$). Given evidence presented in panel C of table 1 this implies the approach biases against hypothesis 1 (with the exception of the first fiscal quarter for current earnings).

Panel B of table 2 summarizes the results from the estimation of equations (7) and (8). Inferences are again based on the distributional statistics generated from the bootstrapping

[16] For example, because quarterly EAR_q are always realized subsequent to corresponding quarterly IAR_q, when the informativeness of returns in a given period is increasing during the horizon, the tests in panel A of table 2 will be biased in favor of hypothesis 1 and when the informativeness of returns is decreasing in a given period tests will be biased against hypothesis 1.

technique described earlier. As expected, the pattern of decreasing timeliness of returns in later quarters is observed in both the EAR_q and IAR_q variables. The pattern is monotonic in the case of the EAR_q but not IAR_q, suggesting that the IAR_q in the first fiscal quarter is responsible for the lack of monotonicity in the RET_q reported in panel C of table 1. More important, the coefficient estimates for each EAR_q are significantly larger than the coefficients on their corresponding IAR_q in every fiscal quarter for both current earnings and earnings changes. The same inferences follow from comparisons of the incremental R^2 associated with each EAR_q ($AEAR_q$) and the incremental R^2 of its corresponding IAR_q ($AIAR_q$) in each fiscal quarter. Notably, slope coefficient and incremental R^2 comparisons indicate that the informativeness of the EAR_4 ($AEAR_4$) is greater than IAR_q ($AIAR_q$) in the three other fiscal quarters even though returns realized later in the horizon are less informative about current earnings and earnings changes than those realized early in the horizon.

Overall, the results in table 2 strongly support hypothesis 1. They are also consistent with findings from event window return variance comparison tests (see, e.g., Beaver 1968) and some findings from percentage contribution tests (see, e.g., Basu *et al*.), while inconsistent with the general conclusions drawn in Ball and Shivakumar (2008).

3.3 The information content of earnings and the timeliness of returns

While the possibility that some portion of returns in an annual event window is attributable to the information content of interim earnings realizations has been acknowledged in the prior literature on the timeliness of returns, there is a dearth of evidence of its impact on the empirical estimates of the prices lead earnings relation. Analogously, studies that seek to infer the information content of realized earnings fixate, by design, on the behavior of returns or trading volume around earnings announcement dates and compare it to hypothesized or empirically estimated benchmarks. Such studies often control for differences in firm risk or *ex ante* precision of information but do not explicitly account for how such factors can affect the flow of private information and price discovery in the days leading up to and immediately after earnings announcement dates. The remainder of this section addresses both deficiencies.

Hypothesis 2 predicts that the estimated timeliness of returns will be overstated by the failure to account for the information content of earnings realized within the return window used to estimate equations (1) and (2). There is substantial evidence in the empirical literature that prior prices lead earnings surprises based on expectations from time-series models and analysts' forecasts of earnings (see, e.g., Collins and Kothari 1989, Lys and Sohn 1990, Abarbanell 1991, and Abarbanell and Lehavy 2003). One potential reason for the observed correlation, which is explicitly tested in section 4, is that returns drift following earnings news realizations. This would represent a potentially serious violation of the maintained assumption of market efficiency underlying timeliness tests, which, in turn, inflates empirical estimates of timeliness of returns. If so, controlling for current SUE (which is known to be serially correlated with prior SUE) would (appropriately) generate evidence that supports hypothesis 2 – in this case because a portion of the information content of current earnings is actually available to investors earlier than the current period.[17]

A second reason for the observed correlation is that earnings surprises based on times-series models are stale with respect to the information actually embedded in prior return realizations. If so, the measurement error in SUE introduced by the researcher would be correlated with prior returns, which, in principle, could generate evidence biased in favor of hypothesis 2. Note, however, that if this is a serious problem, then the adjusted R^2s of the timeliness regression should not increase with the inclusion of SUE in equations (1) through (4). That is, if adjusted R^2s associated with the augmented equations are *no lower* than those observed for original equations, then it is unlikely that a reduction in the *incremental* R^2s associated with returns that results from including SUE is attributable to this possible source of bias.[18]

[17] It is also possible that information about the realization of earnings news in the current period "leaks" into stock price in the days immediately preceding the actual public announcements (Malatesta and Thompson 1985). Again, to the extent this occurs, controlling for SUE in a timeliness test does not bias in favor of hypothesis 2.

[18] There is also evidence in the literature that current EAR_q are positively associated with future EAR_q; i.e., a form of delayed price response (see, e.g., Chan, Jegadeesh and Lakonishok 1996 and Brandt *et al.*) even after controlling for SUE. We examine this issue in more detail in section 4. Note, however, that to the extent adding prior announcement returns to traditional timeliness test specifications leads to an attenuation of slope coefficients or incremental R^2s associated with returns, this too would constitute evidence of an overstatement of the timeliness of returns, consistent with hypothesis 2.

Table 3 presents the results of regressions of current earnings (earnings changes) on annual returns (abnormal returns) and the sum of the four, current year SUE_q. The cross-sectional coefficients on the sum of SUE_q are positive and highly significant for both earnings and earnings changes. Note that the inclusion of the sum of SUE_q leads to a substantial increase in the adjusted R^2s of equations (1) and (2) relative to the numbers reported in the columns 1 and 2 of table 1, panel A. More important, the inclusion of the sum of SUE_q leads to a significantly lower slope coefficient and *incremental* R^2 associated with returns (abnormal returns) when compared to the original slope coefficient and adjusted R^2 for equation (1) (equation (2)). The incremental R^2 associated with returns (abnormal returns) in column 1 (column 2) is nearly 50% (87%) lower than the adjusted R^2 in column 1 (column 2) in table 1, panel A. This evidence strongly supports hypothesis 2.[19]

3.4 The informativeness of the residual component of earnings announcement returns

Table 4 presents results of tests of hypothesis 3. Results from the estimation of equation (9) are presented in the top half of the table. Slope coefficients and incremental R^2s from estimation of equation (7) are enclosed in boxes to facilitate comparisons. Consistent with the evidence in table 3, we find that controlling for SUE_q significantly reduces both the EAR_q and IAR_q coefficients in the annual earnings specification in all fiscal quarters, although all remain positive and significant with the exception of the coefficient on IAR_4. However, the declines in incremental R^2s associated with the EAR_q are relatively larger than those for the corresponding IAR_q. Note also that the *incremental* R^2 associated with all returns in equation (9) is .83% while the *adjusted* R^2 from equation (7), which excludes the individual SUE_q, is 2.57%. Thus, the decline in the explanatory power of EAR_q (1.59%) represents 92% of the total decline (1.73%) in the power of the average 3-day returns to explain current earnings. These results reinforce the conclusion drawn from the evidence in table 3 that earnings have substantial information content and demonstrate that the impact of controlling for the information content of earnings is greatest on returns realized in the 3-day earnings announcement window.

[19] In untabled results we find that the incremental R^2 associated with randomly selected 3-day returns (abnormal returns) in the earnings (earnings changes) regressions is 67% (87%) lower after including the sum of SUE_q than the R^2 when the sum of SUE_q is excluded from the regression.

More relevant to hypothesis 3, the coefficients on all of the *residual* EAR_q, and their associated incremental R^2s are all significantly larger than the coefficients and incremental R^2s associated with corresponding IAR_q in every fiscal quarter. Thus, even after accounting for news in quarterly earnings surprises, the informativeness of earning announcement returns for current year earnings exceeds that of the average 3-day inter-announcement date returns. A similar conclusion holds for the analysis of current earnings changes reported in the lower half of table 4.[20]

Overall, the results in table 4 provide strong support for the hypothesis that the superior informativeness of EAR relative to IAR is attributed to factors in addition to the information content of realized earnings. We turn next to an analysis of those additional factors.

4. Beyond the Information Content of Earnings.

4.1 The impact of delayed price responses to earnings news

In this section we explore two explanations for the significance of the residual component of earnings announcement returns, as well as its superior informativeness relative to inter-announcement returns. The first explanation is suggested by evidence from the pricing anomalies literature, which documents the existence of drift in stock returns following quarterly earnings announcements (see, e.g., Ball and Brown 1968, Foster, Olsen and Shevlin 1984, and Bernard and Thomas 1989). Clearly, if returns are associated with uncontrolled delayed responses to information in prior earnings realizations, estimates of the timeliness of returns in prior studies would be overstated in the same way that they are overstated by the failure to control for the contemporaneous information content of earnings. Furthermore, because there is substantial evidence from pricing anomalies and limits to arbitrage studies that price corrections are larger on earnings announcement dates than on inter-announcement dates, it is also possible that delayed

[20] The evidence in table 4 indicates that controlling for SUE_q results in a statistically significant reduction in informativeness of IAR_q, which would not be expected under the assumption of market efficiency and if SUE_q were measured without error. While the correlation between IAR_q ($AIAR_q$) and SUE_q does not create a bias in favor of finding significant coefficients on residual EAR_q ($AEAR_q$), it could contribute to the finding that residual EAR_q ($AEAR_q$) are more informative that IAR_q ($AIAR_q$). However, it is evident from the table that the informativeness of the EAR_q *after* controlling for SUE_q exceeds the informativeness of the corresponding IAR_q estimated *before* controlling for the information content of earnings, suggesting that the positive association between IAR_q and subsequent earnings surprises does not play a substantial role in producing evidence in support of hypothesis 3.

responses to earnings news is associated with the finding that EAR_q are more informative than IAR_q.

To assess the impact of delayed response to earnings news we estimate equations (11) and (12):

$$\frac{Q_{i,q}}{P_{i,q-1}} = \alpha_0 + \beta_1 \cdot EAR_{i,q} + \beta_2 \cdot IAR_{i,q} + \sum_{j=1}^{4} \beta_{q-j} \cdot SUE_{i,q-j} + \epsilon_{i,q} \qquad (11)$$

$$\frac{Q_{i,q} - Q_{i,q-4}}{P_{i,q-4}} = \alpha_0 + \beta_1 \cdot AEAR_{i,q} + \beta_2 \cdot AIAR_{i,q} + \sum_{j=1}^{4} \beta_{q-j} \cdot SUE_{i,q-j} + \epsilon_{i,q} \qquad (12)$$

where,

$Q_{i,q}$ = quarterly earnings reported by firm i in quarter q.

We include four lagged values of SUE_{q-j} (j=1, 2, 3 and 4) to account for the (+, +, +, -) serial correlation pattern in quarterly earnings surprises (see, e.g., Foster 1977 and Brown, Hagerman, Griffin and Zmijewski 1987). Bernard and Thomas (1990) attributes evidence of post-earnings announcement drift to investors' inability to fully recognize this serial correlation pattern in quarterly earnings surprises. We carry out the regressions in equations (11) and (12) on quarterly earnings and seasonal quarterly earnings changes, respectively, to avoid introducing multicollinearity in lagged earnings surprises that would occur if annual earnings and earnings changes were employed as the dependent variable.

Table 5 presents the results of tests of delayed responses to earnings news. Panel A reports results from benchmark regressions of the informativeness of 3-day EAR and IAR (model 1). Results for model 2 pertain to the estimation of equation (11). The coefficients on lagged values of SUE_q are all significant. The evidence is consistent with some delayed price response to prior earnings news because scaling earnings on the LHS by beginning of the quarter price does not render the coefficients on lagged earnings insignificant.[21] However, although difference in coefficients and incremental R^2s are significant, the inclusion of lagged values of SUE_q has a

[21] Earnings and earnings changes are scaled by beginning of the event window price in all of our specifications, which in principle controls for the informativeness of returns in all prior quarters (see Ryan and Zarowin 2003 for additional discussion of this issue).

negligible impact on the EAR_q and IAR_q coefficients or their related incremental R^2s. Similar results were observed after estimating equation (11) by fiscal quarter (results omitted from the table for the sake of brevity).

Panel B of table 5 presents the results for the benchmark regression (model 1) and estimation of equation (12), in which quarterly earnings changes serve as the dependent variable. Note that signs of the coefficients on lagged SUE_q follow the familiar (+, +, +, -) serial correlation pattern identified in the previous literature as is expected given the dependent variable in this regression is also a common measure of earnings surprise. While differences in coefficients and incremental R^2 reported are all significant, once again the overall impact of these measures of informativeness is negligible.

Overall, the results in table 5 indicate that while estimates of the timeliness of returns are potentially affected by market mispricing, the impact is not substantial. More important, the evidence provides little support for the argument that delayed responses to earnings news make an economically significant contribution to the apparent superior informativeness of the residual component of EAR_q relative to IAR_q.

Although there is disagreement in the literature on the question of whether observed serial correlation in earnings announcement returns in the pattern of (+, +, +, +) is evidence of market inefficiency, we nevertheless assess its impact on estimates of the informativeness of residual EAR_q.[22] The tests are based on equations similar to (11) and (12), with lagged values of earnings announcement returns, EAR_{q-j} (q=1, 2, 3 and 4), substituted for lagged values of earning surprises, SUE_{q-j}. The alternative regressions are labeled model 3 in panels A and B of table 5. The coefficients on EAR_{q-j} are all positive and significant in panel A, but similar to the findings for model 2, the inclusion of lagged announcement returns has little impact on the EAR_q or IAR_q coefficients or incremental R^2s for the level of quarterly earnings. Qualitatively similar results are reported in panel B for quarterly earnings changes. Again, there is little support for the possibility

[22] See, for example, Foster, Olsen and Shevlin (1984), Chan, Jegadeesh and Lakonishok (1996), and Brandt *et al*. for further discussion. Differences in conclusions drawn on this issue in the prior literature appear to hinge on whether or not returns on announcement dates are scaled by prior price volatility.

that delayed price responses substantially affect estimates of the timeliness of returns or inference regarding the relative informativeness of EAR relative to IAR in prior studies.

4.2 The role of information asymmetry around earnings announcements

A second explanation for the superior informativeness of residual EAR relative to IAR is suggested by the market microstructure literature on liquidity and information asymmetry around anticipated firm disclosures. As discussed in the section 2, studies in this literature suggest a number of ways in which information asymmetry could affect prices, trading volume and bid-ask spreads around anticipated firm disclosures. We investigate, in turn, how it may affect the flow of existing or the amount of new information that enters stock price leading up to and around earnings announcements.

To illuminate the potential market microstructure factors that contribute to the superior informativeness of residual EAR relative to IAR documented in the previous section, we analyze the informativeness of residual returns (R^2_RRET), abnormal trading volume (AV), and bid-ask spreads (SPREAD) over the period that begins one day before the prior quarter earnings announcement and ends one day after the current quarter earnings announcement.[23] Following Chae (2005), AV is calculated as the difference between log turnover over the event period and average log turnover over the estimation period. Turnover is defined as the ratio of daily trading volume to common shares outstanding on the corresponding date. The estimation period begins day -110 and ends day -11 relative to previous quarterly earnings announcement date (i.e., 100-trading-day window). SPREAD is a daily relative bid-ask spread using daily closing asks and bids. The difference between closing daily asks and closing daily bids is divided by the average of closing daily asks and bids over the event periods. Both trading volume and ask and bid price data are extracted from the CRSP daily file.

A complicating factor in the analysis is variation across in the number of trading days between earnings announcement dates. For example, as seen in panel A of table 6, the median

[23] The informativeness of residual returns (i.e., the incremental R^2) is estimated from regressions of current quarterly earnings on 3-day returns (from various intervals) and current quarter SUE. That is, the residual returns are analogous to the 3-day residual EAR_q and IAR_q calculated in the previous section.

number of days between 3rd and 4th quarter announcements is 70, while the median number of days between 4th and 1st quarter announcements is 49. The result is almost entirely attributable to the external audit requirements. Additional variation in the number of days between earnings announcements is introduced by systematic factors such as leap years and holidays, as well as firm-specific reasons, including occasional reporting delays.

We "standardize" the event period using a two-step procedure. First, we define six 3-day windows anchored on earnings announcement dates for all firm/quarter observations. The first three windows are [-1, +1], [+2, +4] and [+5, +7] relative to the prior quarter earnings announcement. The second three windows are days [-7, -5], [-4, -2] and [-1, +1] relative to the current quarter earnings announcement. The second step in the procedure creates three approximately equal size partitions of the remaining inter-announcement days for each firm/quarter observation.[24] We then randomly select 3-day intervals in each of the three partitions. In all, there are nine chronologically ordered 3-day event windows for each firm/quarter observation.

Panel B of table 6 presents the values of R^2_RRET as well as average daily values of AV and SPREAD in each of the nine 3-day event windows. Event windows anchored on the prior quarter are denoted q(-1) in the table and event windows anchored on the current quarter are denoted q(0). The middle three event windows are labeled chronologically periods 1, 2 and 3, respectively. The statistics in the panel are summarized graphically in panel A-C of figure 2. It is evident from panel A of figure 2 that the informativeness of residual returns, R^2_RRET, spikes in the 3-day event windows centered on the prior and current earnings announcement dates, consistent with evidence presented in the previous section. It is notable that *within* quarter residual return informativeness is, on average, increasing. This is in contrast to the decreasing informativeness of returns for current annual earnings over the annual horizon that is attributable to the fiscal quarter effect in annual timeliness regressions alluded to in footnote 3. The mechanical fiscal quarter affect is eliminated by construction in the current test design. The increasing informativeness of residual returns within quarter is consistent with the intuition of increasing precision of information about current earnings as the earnings announcement nears (due, for example, to information leakage

[24] The number of remaining days in the inter-announcement period is distributed approximately normally with a mean (median) of 48 (48) days and a standard deviation of 11 days.

about upcoming earnings). The evidence is inconsistent with the conclusions drawn in Ball and Easton (2010), who posit that the informativeness of returns will be decreasing over any horizon because returns realized earlier in the event window are associated with uncertain events that more likely to be resolved and recognized in earnings by the end of that window.[25]

It is evident in panel B of figure 2 that abnormal trading volume (AV) also spikes in the 3-day event windows centered on the earnings announcement dates. Furthermore, we find that AV is generally decreasing, on average, as the current earnings announcement date approaches, consistent with the findings in Chae (2005), who attributes the result to increased pre-announcement information asymmetry leading up to earnings announcements.

It is also evident in panel C of figure 2 that bid-ask spreads rise, on average, between earnings announcements but then decline to levels considerably below those observed during the inter-announcement period as the earnings announcement date approaches. This result suggests, paradoxically, that liquidity is increasing or that information asymmetry is decreasing as the announcement date nears, which is inconsistent with the argument that pre-announcement information asymmetry is driving down trading volume in this window. In general the evidence in panel B of table 6 presents something of a puzzle as spreads and trading volume leading into earnings announcements decrease, on average, while the informativeness of residual returns increases. We attempt to sort out this puzzle by examining potential sources of cross-sectional variation in the results reported in panel B of table 6 that are suggested by additional theories and findings in the market microstructure literature.

At first glance a spike in abnormal trading volume accompanied by generally lower bid-ask spreads on earnings announcement dates appears to support the possibility of a reversal on earnings announcement dates of previously attenuated trading volume (see, e.g., George, Kaul, and

[25] Ball and Easton (2010) predict and find evidence of decreasing informativeness of returns for current earnings over the annual horizon. Their main tests include indicators for 3-day earnings announcement windows, which only partially controls for the fiscal quarter effect in annual timeliness regressions documented earlier. Furthermore, every event window examined in Ball and Easton extends back from the date of the current fiscal year or quarter-end rather than the date of the current annual or quarterly earnings announcement. As a result, each window examined includes returns associated with an earlier quarterly earnings announcement and excludes returns of the most recent quarterly earnings announcement. The systematic exclusion of EAR at the end of a given window combined with the inclusion of the EAR at the beginning of that same window will contribute to the appearance of a downward slope in the informativeness of returns over any chosen horizon.

Nimalendran 1994 and Chae 2005). If informed trading is also attenuated and then reverses, this would be consistent with spike in the informativeness of residual returns on earnings announcement dates. As suggested earlier, attenuation in informed trading leading up to an earnings announcement could occur if discretionary liquidity traders postpone trades in anticipation of earnings announcements, making it more difficult for privately informed traders to disguise their trades, or if market markers set bid-ask spreads to protect against privately informed traders at temporarily prohibitive levels. In this scenario an interruption in the flow of existing private information or the incentive to collect new private information before announcements is removed when earnings are announced and information asymmetry declines, explaining why, on average, IAR are less informative than residual EAR.[26]

In contrast to studies that predict a decline in trading volume before earnings announcements resulting from an increase in *pre-announcement* information asymmetry that is subsequently reversed when earnings are announced, Kim and Verrecchia (1994) posit the possibility that information asymmetry actually increases on earnings announcement dates. Increased *post-announcement* information asymmetry accompanied by lower liquidity in this setting derives from traders in a position to exploit announced earnings to make profitable informed judgments. The volume generated by these traders after the earnings announcement (more than) offsets the information asymmetry-induced reductions in volume of other traders in equilibrium, implying that the informativeness of returns, abnormal trading volume and bid-ask spreads would *all* be expected to increase after earnings are announced. This scenario could also explain why residual EAR is more informative than IAR; i.e., there is greater *new* information production by expert traders in the trading windows immediately surrounding earnings announcements.[27]

[26] The association between trading volume and price discovery analyzed in the microstructure literature depends on many model-specific factors and there is no clear consensus on which factors prevail empirically. Clearly it is possible for informed trading to occur without interruption even when bid-ask spreads increase. For example, if spreads are set so that losses suffered by market makers in trades with the privately informed are offset by profits from uniformed traders, there would be no observable difference in the informativeness of returns as a function of bid-ask spreads (see, e.g., Kyle 1985). Similarly, while there is general agreement that trading volume decreases and bid-ask spreads are higher when discretionary liquidity traders postpone their trades before firm disclosures, there is no consensus on how this behavior will affect the overall flow of private information into prices around earnings announcements.

[27] Whether information asymmetry declines or increases on earnings announcement dates, tests that analyze the behavior of returns and trading volume around earnings announcements to assess the information content of earnings will be confounded by the failure to control for changes in information asymmetry around earnings announcements (see, e.g., Beaver 1968, Landsman and Maydew 2002, DeFond *et al*., and Collins, Li and Xie 2009).

Panels A and B of table 7 report the results of replicating the tests described in panel B of table 6 after partitioning the data by analyst following and firm size, respectively. These two variables are employed by Chae (2005) to proxy for pre-earnings announcement information asymmetry.[28] Panel A of table 7 reports results for the sample partitioned by analyst following. The evidence is summarized graphically in panels A-C of figure 3.

Note first in panel A of figure 3 that the informativeness of returns spikes on earnings announcement dates in all partitions of analyst following, although the increase is considerably smaller for medium analyst following firms and even smaller for high following firms. Furthermore, firms with low analyst following show no indication of an increase in the informativeness of residual returns leading up to an earnings announcement that is observed, on average, in figure 2. Panel B of figure 3 indicates that abnormal trading volume spikes around earnings announcements and persists at relatively high levels for the next few days in each partition of analyst following, consistent with scenarios described by both Chae (2005) and Kim and Verrecchia (1994). However, in contrast to the finding in panel B of table 6 (see figure 2) of decreasing abnormal volume in the inter-announcement period, AV is increasing for firms with high analyst following. This result is notable because of the muted spike in the informativeness of residual returns for high following firms on earnings announcement dates compared to medium and low following firms. That is, pre-earnings announcement information asymmetry does not appear to attenuate trading volume or the informativeness of returns for high analyst following firms in the same way it does for low analyst following firms. As seen in panel C of figure 3, this conclusion is further supported by the fact that bid-ask spreads are significantly lower throughout the inter-announcement period than on earnings announcement dates for high analyst following firms; exactly the opposite of the conclusion drawn from the cross-sectional average evidence depicted in figure 2.

Overall, the results for high following firms appear to be more consistent with the equilibrium described in Kim and Verrecchia, suggesting that to the extent that residual EAR are more informative than IAR for high analyst following firms, the result is associated with an increase

[28] In motivating their analysis Kim and Verrecchia (1994) identify financial analysts as an example of expert traders. Institutional traders and hedge fund managers (who also have swift private access to information from financial analysts) who trade, on average, in larger firms represent an extension of the idea of expert traders whose decisions move trading volume and prices.

in post-announcement information asymmetry that accompanies new information production by sophisticated traders. The evidence related to the large firm size partition reported in panel B of table 7 and depicted in panels A-C of figure 4 leads to qualitatively similar conclusions.

Returning to the results for low analyst following firms reported in panel A of table 7 and depicted in panels A-C of figure 3, we observe that the informativeness of residual returns and trading volume both decline in the inter-announcement period, consistent with increasing pre-announcement information asymmetry. Furthermore, a reduction in bid-ask spreads on earnings announcement dates for these firms accompanied by a spike in trading volume and the informativeness of residual returns after earnings are announced is consistent with a reversal of previously attenuated informed trading when liquidity improves with an earnings announcement.[29] Overall, the results for low and, to some extent, medium analyst following firms, appear to be consistent with (responsible for) the general inferences drawn by Chae (2005). The evidence is consistent with increased pre-announcement information asymmetry that is reduced when earnings are announced for these firms, drawing more uninformed *and* informed trading, which could account for the inferior informativeness of IAR relative to EAR. The evidence related to the small firm size partition reported in panel B table 7 and depicted in panels A-C of figure 4 leads to qualitatively similar conclusions.

4.3 Supplemental results for anticipated disclosures between earnings announcements

The evidence reported thus far raises the question of whether variation in information asymmetry around other scheduled firm disclosures is associated with the relative informativeness of returns for earnings in these event windows. For example, firms frequently provide management forecasts of upcoming earnings between earnings announcements that could be as informative as the disclosure of earnings. If information asymmetry affects trading and prices around the date of management forecasts, then we expect to observe the same lumpy timeliness and superior

[29] The reduction in bid-ask spreads in the period leading up to the announcement date (observed in all three analyst following partitions) in the case of low following firms remains a puzzle given that trading volume is also attenuated in this period.

informativeness of management disclosure date returns relative to other inter-announcement date returns observed around earnings announcement dates.

To test this conjecture we select a sample of management forecasts obtained from the First Call database that are issued at least 30 trading days after the previous quarterly earnings announcement to ensure there is no overlap with prior earnings announcement windows and no closer than 3 trading days before the next quarterly earnings announcement to ensure no overlap with the current earnings announcement window. We control for the information content of management forecasts by including the difference between management forecasts of the next quarterly earnings and the outstanding consensus analyst forecast (also obtained from First Call) on that date, scaled by the stock price on day -10 relative to the date of the consensus forecast. We denote the management forecast surprise, MFS.

Panel A of table 8 presents incremental R^2s associated with regressions of the realized quarterly earnings on the MFS that preceded it and the sequence of 3-day returns from days -28 to +1 relative to the management forecast date (day 0). Controlling for the MFS leads to a nearly three-fold increase in the regression R^2. Note also that, consistent with the evidence in figure 2, the informativeness of residual returns as measured by incremental R^2 is generally increasing from the beginning to the end of the event window. While there is a decline in the informativeness of returns in the window just prior to the management forecast date, the informativeness of residual returns for the 3-day window centered on the date of the management forecast is substantially larger than any value in the earlier period. This evidence supports the conjecture that *residual* returns on dates that firms issue managerial forecasts are more informative than returns on other inter-announcement dates, consistent with possibility that information asymmetry systematically affects the flow and/or production of information around management forecasts in the same fashion it affects them on earnings announcement dates.

Panel A of table 8 also reports that abnormal trading volume, AV, is negative until the window prior to the scheduled issuance of the management forecast and it spikes on the date of the forecast, generally consistent with the evidence in figure 2 for earnings announcements. However, in contrast to the evidence that bid-ask spreads decline, on average, leading up to earnings announcements observed in figure 2, we find the opposite pattern in SPREAD leading up to management forecasts. The fact that trading volume is decreasing while the bid-ask spread is increasing leading up to a management forecast is consistent with decreasing liquidity and increasing information asymmetry. Once again, however, the fact that the informativeness of returns is generally increasing in this same interval presents something of a puzzle.

Panels B and C of table 8 shed additional light on the cross-sectional findings in panel A. Panel B reports results analogous to those reported in panel A of table 7 after partitioning the sample of inter-announcement management forecasts by analyst following. Similar to the case of earnings announcement dates, abnormal trading volume and the informativeness of returns spikes on the date that firms issue management forecasts in all analyst following partitions. However, bid-ask spreads increase substantially on the forecast date for firms with a high analyst following. Furthermore, there is no indication of systematically negative abnormal trading volume leading up to the managerial forecasts found in the cross-section (see panel A of table 8) for firms with high analyst following.

On balance, the results for high analyst following firms appear to be primarily responsible for the cross-sectional findings for bid-ask spreads and the informativeness of returns around management forecasts. While low analyst following firms appear to be responsible for the average negative abnormal trading volume leading up to management forecasts, if increasing information asymmetry accounts for lower abnormal trading volume, it is puzzling that there is no indication that bid-ask spreads are substantially attenuated on the date management issues forecasts for these firms.[30] Thus, to the extent that information asymmetry plays a role in explaining the superior informativeness of returns on dates that firms issue management forecasts relative to returns on

[30] One possible reason we do not observe an increase in bid-ask spreads before an announcement followed by a decline after the forecast announcement for firms with low analyst following is that information asymmetry is not changing around the issuance of management forecasts. That is, the scenario described by Chae (2005) for earnings announcements does not apply to managerial forecasts for these firms. Another potential reason is that firms that provide management forecasts are also more likely to have a high analyst following. That is, the firms that placed in the low analyst following partition in this sample are similar to firms placed in the high or medium analyst following partition in the earnings announcement sample. Untabulated results indicate that the mean (median) analyst following for the management forecast sample is 10.87 (10). By comparison, the mean (median) number of analysts for firms placed in the medium analyst following partition for the earnings announcement sample is 7.24 (7), and 18.4 (17) for firms in the high analyst following partition.

other inter-announcement dates in this subsample, it appears that it does so in the manner suggested by the analysis in Kim and Verrecchia (1994). The evidence presented in panel C of table 8 for firm size partitions leads to a similar conclusion.

5. Robustness tests

5.1 Timeliness and relative informativeness for Future Earnings and Cash flows

One drawback of timeliness tests is that only a single accounting period is used to draw inferences about the timeliness of returns and the relative informativeness of EAR and IAR. However, evidence presented earlier indicates that the timeliness of returns varies mechanically with fiscal quarter in the current year as well as the point at which earnings begin to catch up with returns. Additional complications arise in panel data if earnings persistence is not stable over time. To ensure that our results are not an artifact of limiting our analysis to a single "slice" of the future earnings about which returns can be informative, all of the tests performed in sections 3 and 4 were repeated after substituting one-year-ahead earnings and earnings changes for the dependent variable.

For the sake of brevity we report the results of estimation of equations (7)-(10) replacing current earnings and earnings changes with one-year-ahead earnings and earnings changes, respectively. Panel A of table 9 presents the results for one-year-ahead earnings. Note first, in contrast to the findings when current earnings are the dependent variable, slope coefficients and incremental R^2s are greater in later fiscal quarters of the current year than in earlier fiscal quarters. In the case of one-year-ahead earnings, the informativeness of EAR_q is monotonically increasing in the fiscal quarter.[31] Second, the informativeness of EAR_q is greater than IAR_q for all fiscal quarters, consistent with hypothesis 1 and the timeliness of returns for one-year-ahead earnings is significantly reduced with the inclusion of earnings surprises for the current year, consistent with hypothesis 2. More important, *residual* EAR_q is greater than IAR_q for all fiscal quarters, consistent

[31] Coefficient estimates and R^2s are attenuated when one-year-ahead earnings replace current year earnings in the timeliness regressions. This result is consistent with the intuition that earnings catch up to returns. Together with results from regressions of current and one-year-ahead annual earnings on returns, results for quarterly earnings and quarterly earnings changes presented in the appendix indicate that the average timeliness of returns for earnings is at a maximum two fiscal quarters before the announcement of earnings.

with hypothesis 3.[32] Panel B of table 9 reports results from the estimation of equations (8) and (10) where one-year-ahead earnings changes serve as the dependent variables. The evidence leads to inferences that are identical to those for one-year-ahead earnings.

When one-year-ahead eearnings and arnings changes serve as the dependent variable, we again find that lagged earnings surprises and lagged earnings announcement returns have incremental explanatory power, but have a negligible effect on residual returns. Findings pertaining to the impact of information asymmetry around earnings announcements observed for current earnings and earnings changes are qualitatively similar for one-year-ahead earnings and earnings changes (results available upon request).

While timeliness regressions have been employed in recent years to assess properties of accounting systems, (e.g., conservative bias), the logic underlying them relies on an assumed positive association between earnings and cash flows. Accordingly, we validate our findings by substituting cash flow and cash flow changes as the dependent variable in all of our tests. Qualitative conclusions for current and one-year-ahead cash flows and cash flow changes mirror those drawn for current and one-year-ahead earnings and earnings changes (results available upon request).

5.2 Refinements to measures and methods used to estimate the information content of earnings.

As discussed in the previous section, it is possible that SUE_q are measured with error with respect to the market's actual expectations of earnings. If so, one possible consequence would be an understatement of the informativeness of IAR, which, in turn, could bias in favor of hypothesis 3. Therefore, we replicate all relevant tests after substituting scaled (by beginning of the quarter stock price) consensus analyst forecast errors for SUE_q. We extract consensus analyst forecast data from the stock-split unadjusted summary file from I/B/E/S. All of the qualitative conclusions drawn in sections 3 and 4 are unaltered.

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[32] We repeated the tests for one-year-ahead earnings and earnings changes substituting randomly selected 3-day returns from the trading days between the current quarter, q, and the following quarter, q+1, to account for the fact that the timeliness of returns for *future* earnings is increasing as the current earnings announcement date approaches. The results are qualitatively similar to those reported in the table.

Regressions performed in the paper that control for earnings news implicitly restrict the price response to earnings news to a cross-sectional constant. We allow the coefficient to vary by firms by employing a firm-specific time-series regression approach and draw statistical inferences with generated distributions of regression summary statistics of firm-specific regressions (see, e.g., Collins and Kothari 1989, Easton and Zmijewski 1989, and Givoly, Hayn and Natarajan 2007). This approach assumes a constant relation between short-window stock price response and earnings news at the firm-level. To carry out the test, we use annual time-series of firms for which at least ten years of earnings and return data are available in consecutive years. We also use quarterly time-series of firms for which at least twenty consecutive quarterly earnings and return observations are available. Again, all of the qualitative conclusions drawn in sections 3 and 4 are unaltered (results available upon request).

5.3. Controlling for additional firm disclosures on earnings announcement days

The tests in sections 3 and 4 do not take into account the fact that some firms make additional disclosures on earnings announcement dates. If additional disclosures on earnings announcement dates are especially informative, this could account for results reported earlier that support hypotheses 1 and 3.[33] For example, if firms tend to issue management forecasts on earnings announcement dates that the market deems credible, this would generate evidence consistent with hypothesis 1 even when the information content of realized earnings is negligible. Moreover, if the propensity to issue management forecasts on earnings announcement dates is endogenously determined along with, say, analyst following, this could have contributed to findings in support of a greater informativeness of returns around earnings announcement dates than the returns on other dates that fall within the inter-announcement period.

To analyze the impact of additional disclosures on our results we reran our tests with indicator variables for firms that provide management forecasts on earnings announcement dates. In untabled results we find that EAR_q remain significantly positive after controlling for the information content

[33] Additional firm disclosures would have no impact on inferences regarding hypothesis 2 under the usual maintained assumptions of timeliness tests. That is, even though the source of price discovery is readily observable and may well be associated with the information content of yet-to-be-reported earnings in this case, it cannot be assumed that it is directly attributable to the information content of earnings.

of managerial forecasts of next quarter's earnings (similar to the MFS variable described earlier) as well as the information content in the current earnings surprise. The degree to which residual EAR_q are more informative than IAR_q is substantially attenuated for firms providing managerial forecasts, however, residual EAR_q remain, on average, more informative than IAR_q. Furthermore, consistent with the evidence in section 3, we find that the superior informativeness of residual EAR_q relative to IAR_q is strongest for firms with low analyst following and small firms.

6. Summary and Conclusions

In this paper we analyze the contribution of returns around earnings announcements to typical estimates of the "prices lead earnings" relation. We find that failure to account for the information content of earnings results in an overstatement of the average timeliness of annual returns for annual earnings. We estimate that the average timeliness of returns reaches a maximum (alternatively, earnings to begin to catch up with returns) within the four fiscal quarters that comprise a fiscal year.

Although controlling for the information content of earnings attenuates estimates of the average timeliness of returns, we find, nevertheless, that realized returns around earnings announcements explain a larger portion of the variance in current and future earnings and cash flows than returns realized in inter-announcement periods. Thus, factors other than news directly revealed in earnings realizations systematically contribute to inferences in the previous literature that earnings have information content. These results highlight the drawbacks of tests that compare the variance of returns or abnormal trading volume around earnings announcements to analogous measures in non-earnings announcement periods to infer the existence of, as well as the cross-sectional variation and longitudinal change in the information content of earnings.

We find little support for the argument that delayed price response to prior earnings news explains the lumpy timeliness of returns or the superior informativeness of earnings announcement returns relative to non-announcement returns. However, we find substantial support for the argument that the market response to information asymmetry is associated with less (more) informed trading for firms with low analyst following and small firms (firms with high analyst following and large firms) in the days leading up to (on the day of) earnings announcements.

Our results are qualitatively similar after controlling for additional disclosures on earnings announcement dates, although attenuated for firms that do provide additional disclosures. The results suggest that, possibly endogenously-determined, firm disclosure policies have an important impact on cross-sectional analysis of the timeliness of returns and tests of the relative informativeness of returns in different event windows.

Appendix

Taken together the evidence in panel C of table 1 (panel A of table 9) indicates that the informativeness of current year returns for current (one-year-ahead) earnings is greater earlier (later) in the annual horizon. We argue that this finding is a combination of the mechanical fiscal quarter effect when annual earnings or earnings changes serve as the dependent variable in a timeliness regression and the fact that earnings eventually begin to catch up with returns. To isolate the latter effect we estimate the following equations:

$$\frac{Q_{i,q}}{P_{i,q-4}} = \alpha_0 + \sum_{j=0}^{8} \beta_{q-j} \cdot RET_{i,q-j} + \epsilon_{i,q} \qquad \text{(A1)}$$

$$\frac{Q_{i,q}}{P_{i,q-4}} = \alpha_0 + \sum_{j=0}^{8} \beta_{q-j} \cdot RET_{i,q-j} + \sum_{j=0}^{8} \beta_{q-j}^{Q1} \cdot RET_{i,q-j} \times Q1_{i,q-j} + \sum_{j=0}^{8} \beta_{q-j}^{Q4} \cdot RET_{i,q-j} \times Q4_{i,q-j} + \epsilon_{i,q} \qquad \text{(A2)}$$

We employ quarterly earnings as the dependent variable in equation (A1) to eliminate the fiscal quarter effect induced by the use of annual earnings as the dependent variable, and estimate the average timeliness of returns for a thinner "slice" of the future earnings. Because prior evidence indicates that the association between lagged quarterly earnings surprises declines at the cusp of a fiscal period change (see, e.g., Rangan and Sloan 1998), we add indicator variables for lagged returns from fiscal first or fourth quarters to account for this effect in equation (A2).

Appendix table 1 presents the results from estimating equations (A1) and (A2) for eight prior quarters. The evidence indicates that the informativeness of returns for quarterly earnings reaches a maximum around two quarters prior to the announcement of earnings in both specifications.

Figure 1: Cumulative abnormal returns (%) for portfolios based on the decile ranking of annual earnings changes

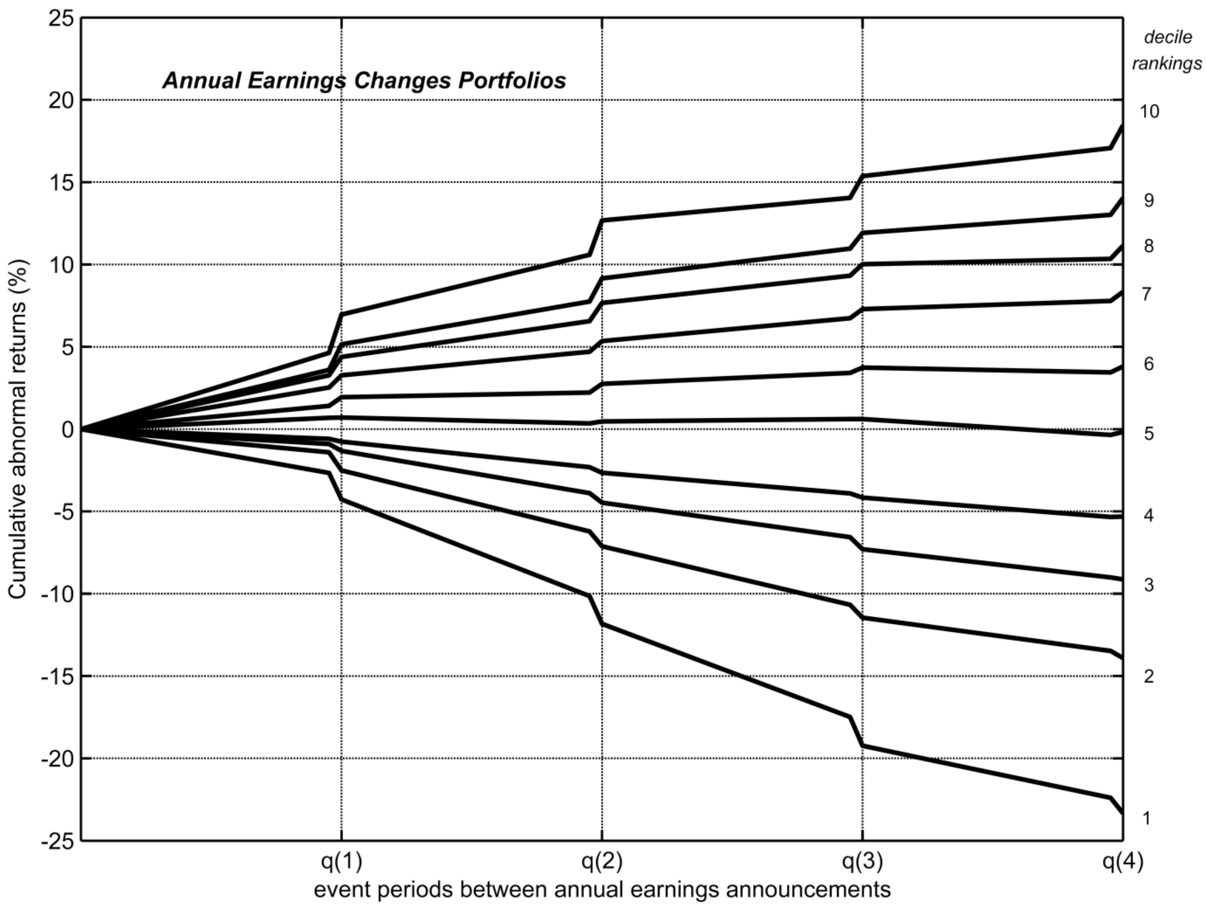
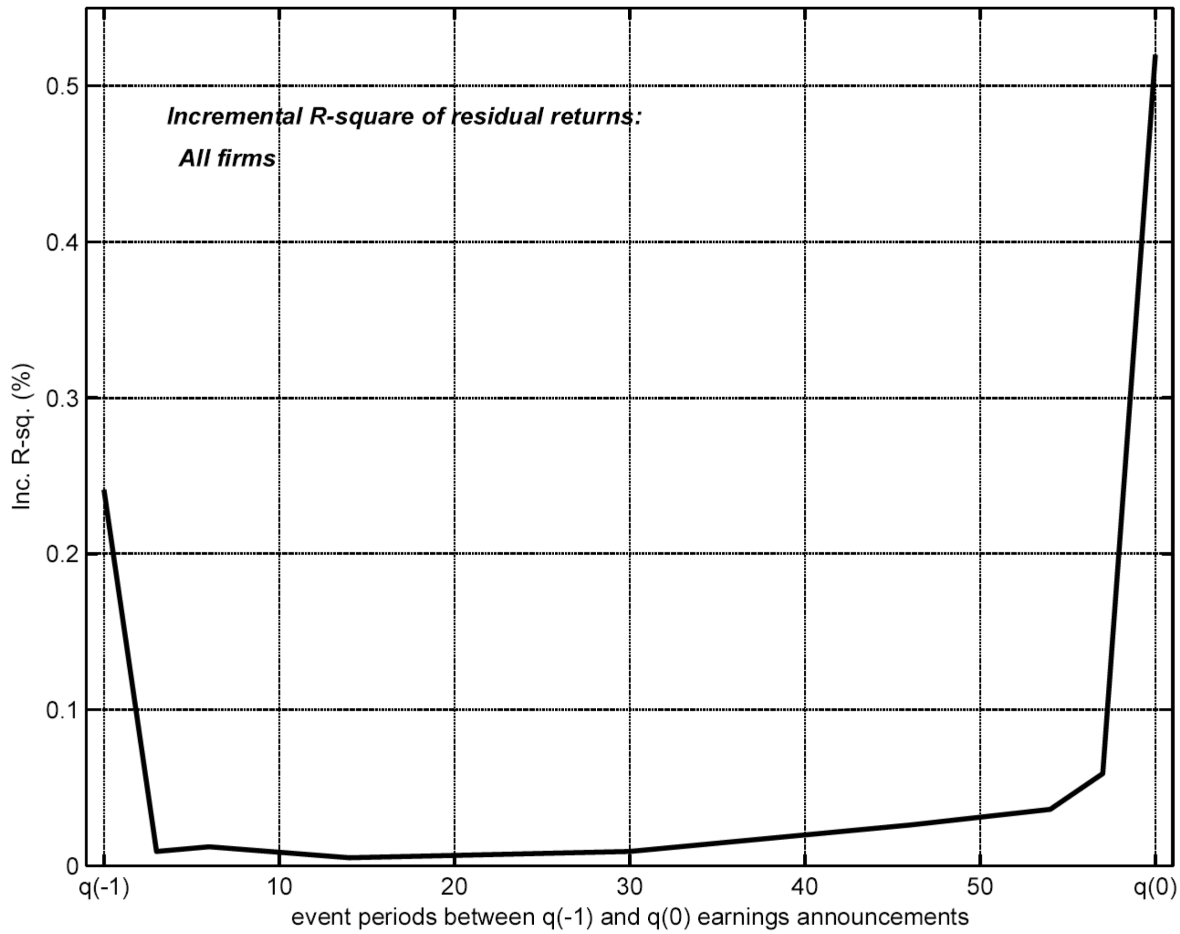


Figure 1 depicts the relation between ranked earnings changes and cumulative abnormal returns in the year leading up to annual earnings announcement date. The figure plots the average 3-day abnormal returns around interim quarters' earnings announcements and the points in between depict the average accumulation of 3-day inter-announcement abnormal returns. q(j) represents the date of interim earnings announcement date of fiscal quarter j (j=1, 2, 3 and 4). Cumulative abnormal returns are the cumulative raw returns adjusted for the corresponding returns of size-matched decile portfolios to which the firm belongs at the beginning of the each calendar year.

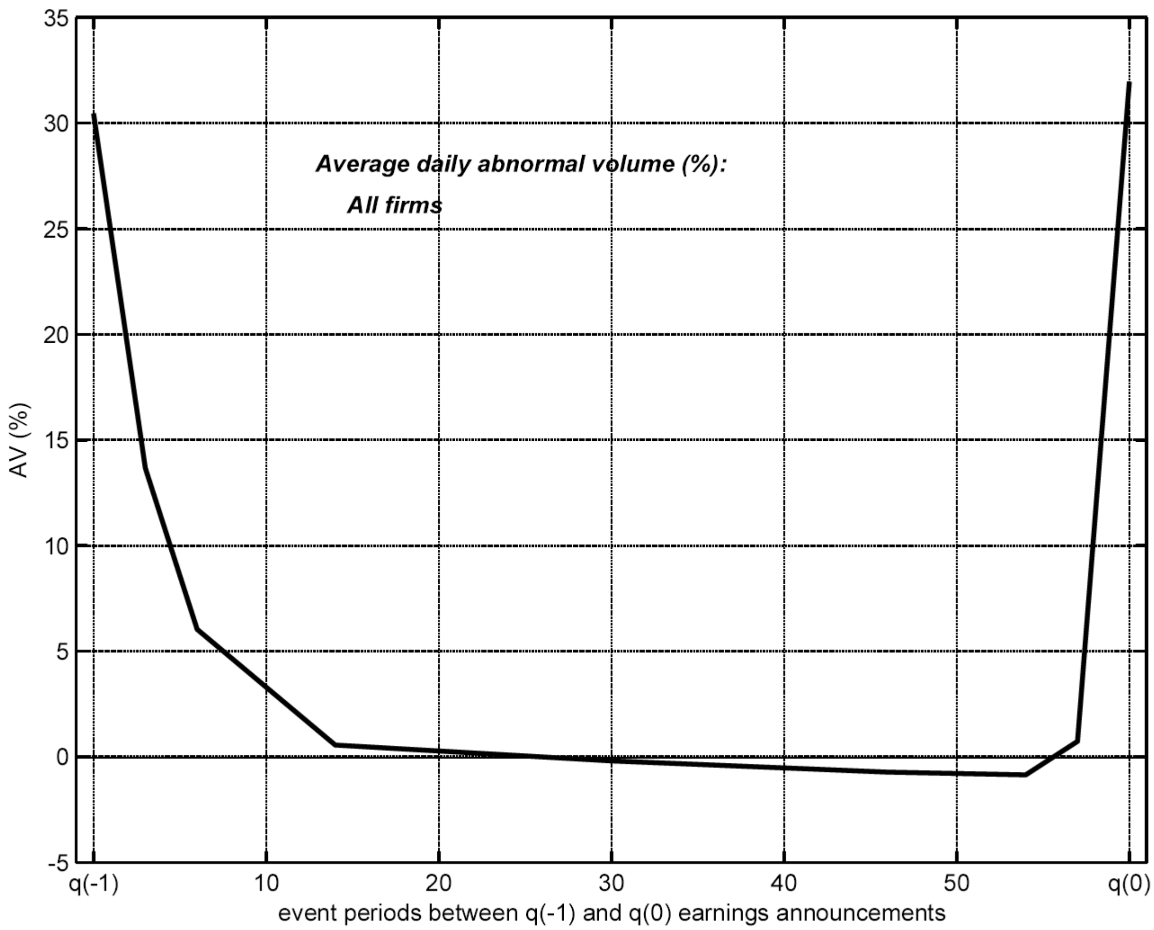
Figure 2: Informativeness of residual returns, abnormal volume, and bid-ask spread around earnings announcements



Panel A: Incremental R^2 of residual returns (R^2_RRET) over the event periods including previous and current quarterly earnings announcement dates, all firms

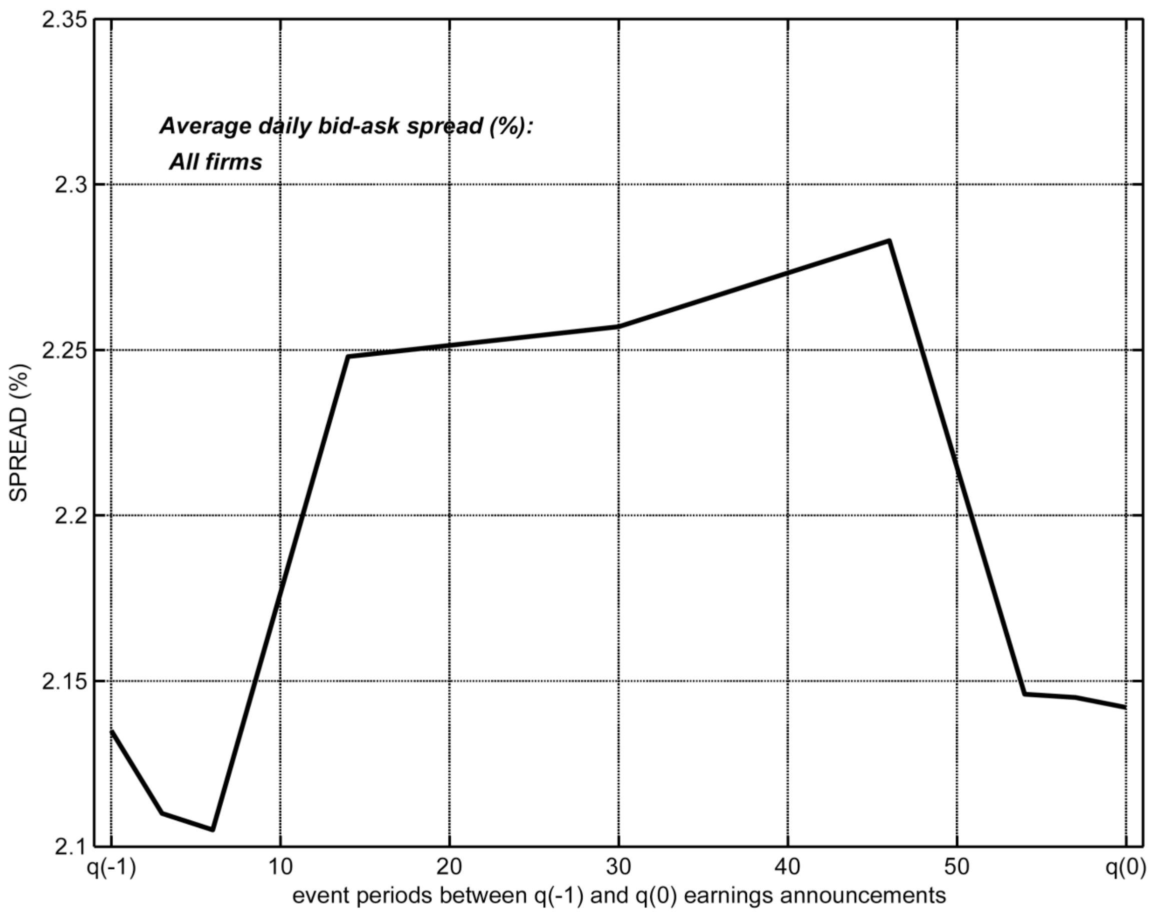
Panel A plots the incremental R^2 of residual returns (R^2_RRET) over the event periods including both previous quarterly earnings announcement date, denoted q(-1), and current quarterly earnings announcement date, denoted q(0). Panel B and Panel C plot average daily abnormal volume (AV) and average daily bid-ask spread (SPREAD), respectively. [q(-1)-1, q(-1)+1], [q(-1)+2, q(-1)+4], and [q(-1)+5, q(-1)+7] are three-day windows relative to previous quarterly earnings announcement date. Similarly, [q(0)-7, q(0)-5], [q(0)-4, q(0)-2], and [q(0)-1, q(0)+1] are three-day windows relative to current quarterly earnings announcement date. Periods 1, 2 and 3 represent three approximately equal size partitions of the remaining inter-announcement days for each observation. Randomly selected 3-day intervals in each of the three partitions are used to draw statistical inferences. R^2_RRET (%) is estimated from regressions of current quarterly earnings on 3-day returns (from the 9 intervals defined above) and current quarter SUE. AV (%) is the difference between log turnover over the event period and average log turnover over the estimation period. Turnover is defined as the ratio of daily trading volume to common shares outstanding on the corresponding date. The estimation period begins day -110 and ends day -11 relative to previous quarterly earnings announcement date (i.e., 100-trading-day window). SPREAD (%) is a relative bid-ask spread using daily closing asks and bids. The difference between closing daily asks and closing daily bids is divided by the average of closing daily asks and bids over the event periods.

(Figure 2 continued)



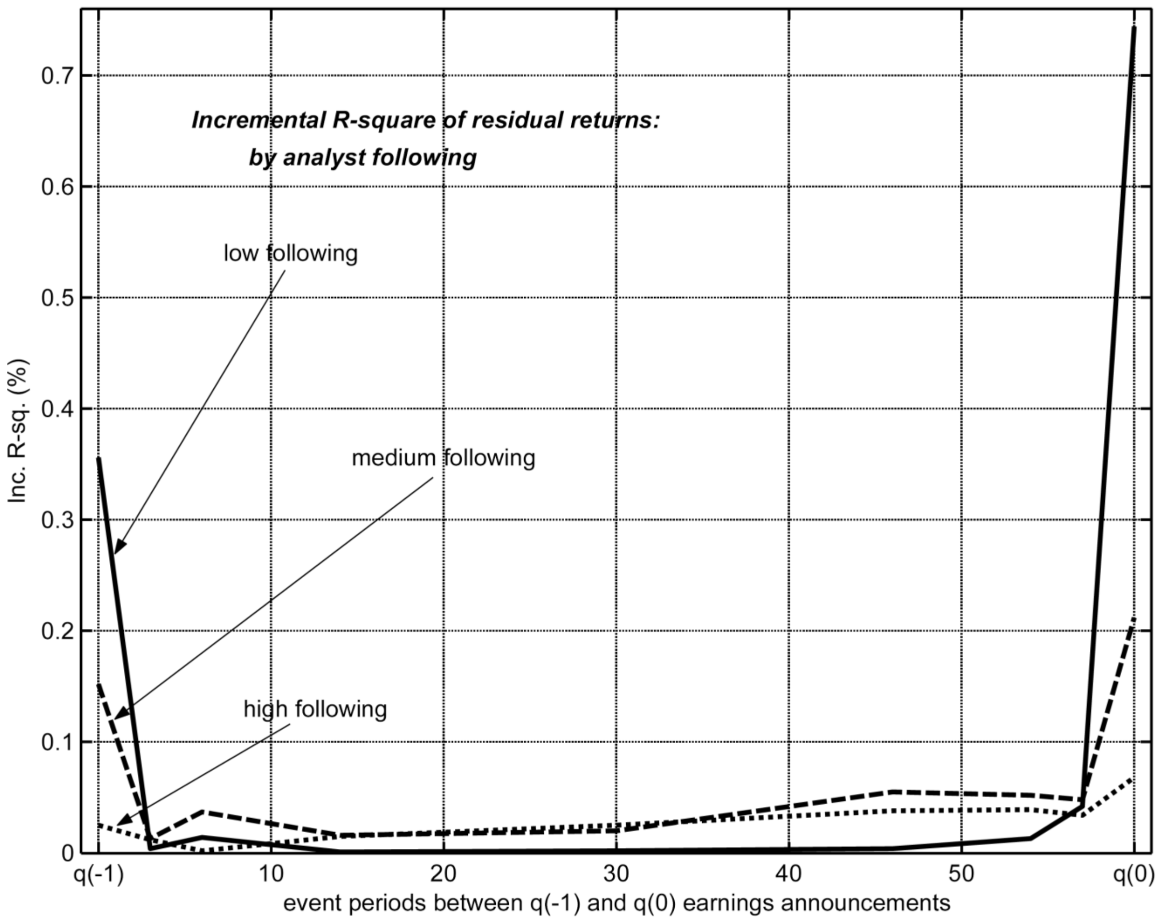
Panel B: Average daily abnormal volume (AV) over the event periods including previous and current quarterly earnings announcement dates, all firms

(Figure 2 continued)



Panel C: Average daily bid-ask spread (SPREAD) over the event periods including previous and current quarterly earnings announcement dates, all firms

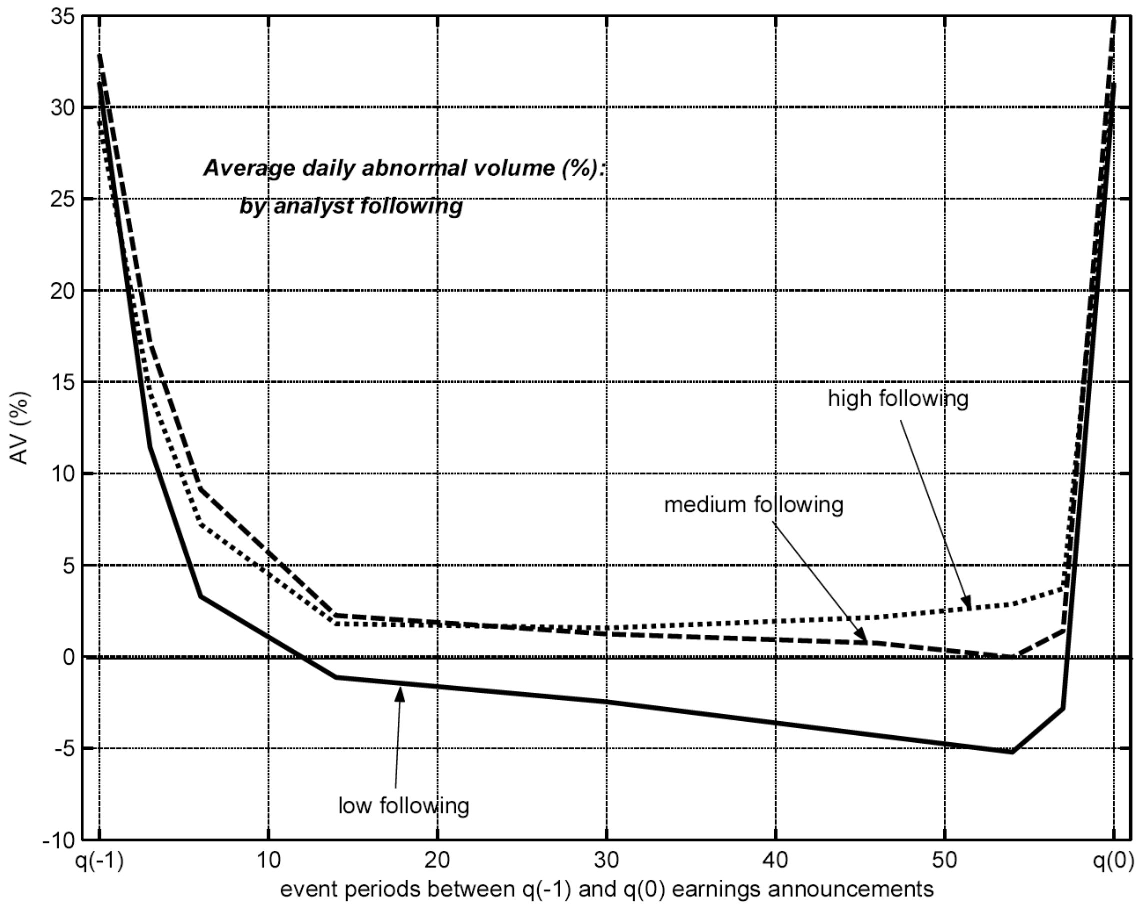
Figure 3: Informativeness of residual returns, abnormal volume, and bid-ask spread around earnings announcements by analyst following partitions



Panel A: Incremental R^2 of residual returns (R^2_RRET) over the event periods including previous and current quarterly earnings announcement dates, by analyst following partitions

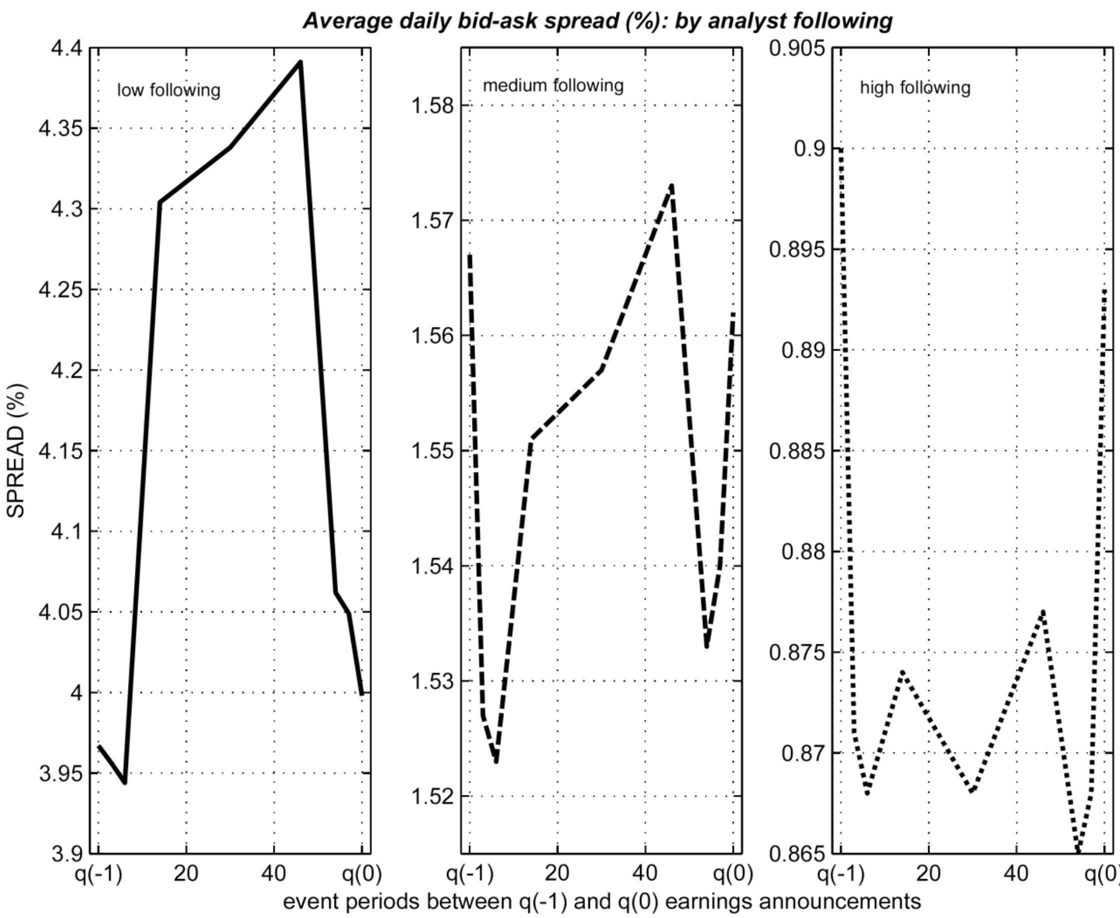
Panel A plots the incremental R^2 of residual returns (R^2_RRET) over the event periods including both previous quarterly earnings announcement date, denoted q(-1), and current quarterly earnings announcement date, denoted q(0). Panel B and Panel C plot average daily abnormal volume (AV) and average daily bid-ask spread (SPREAD), respectively. In each panel, results are illustrated by analyst following partitions. [q(-1)-1, q(-1)+1], [q(-1)+2, q(-1)+4], and [q(-1)+5, q(-1)+7] are three-day windows relative to previous quarterly earnings announcement date. Similarly, [q(0)-7, q(0)-5], [q(0)-4, q(0)-2], and [q(0)-1, q(0)+1] are three-day windows relative to current quarterly earnings announcement date. Periods 1, 2 and 3 represent three approximately equal size partitions of the remaining inter-announcement days for each observation. Randomly selected 3-day intervals in each of the three partitions are used to draw statistical inferences. R^2_RRET (%) is estimated from regressions of current quarterly earnings on 3-day returns (from the 9 intervals defined above) and current quarter SUE. AV (%) is the difference between log turnover over the event period and average log turnover over the estimation period. Turnover is defined as the ratio of daily trading volume to common shares outstanding on the corresponding date. The estimation period begins day -110 and ends day -11 relative to previous quarterly earnings announcement date (i.e., 100-trading-day window). SPREAD (%) is a relative bid-ask spread using daily closing asks and bids. The difference between closing daily asks

(Figure 3 continued)



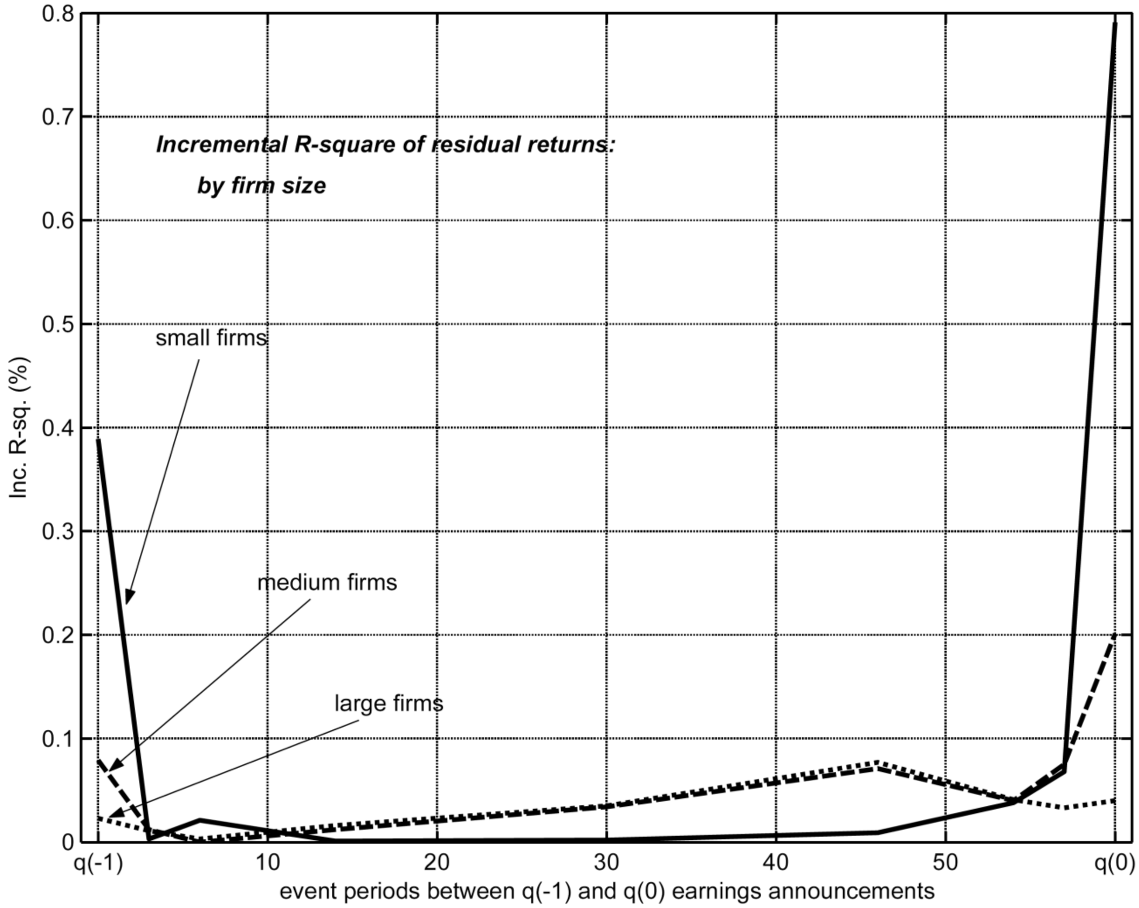
Panel B: Average daily abnormal volume (AV) over the event periods including previous and current quarterly earnings announcement dates, by analyst following partitions

(Figure 3 continued)



Panel C: Average daily bid-ask spread (SPREAD) over the event periods including previous and current quarterly earnings announcement dates, by analyst following partitions

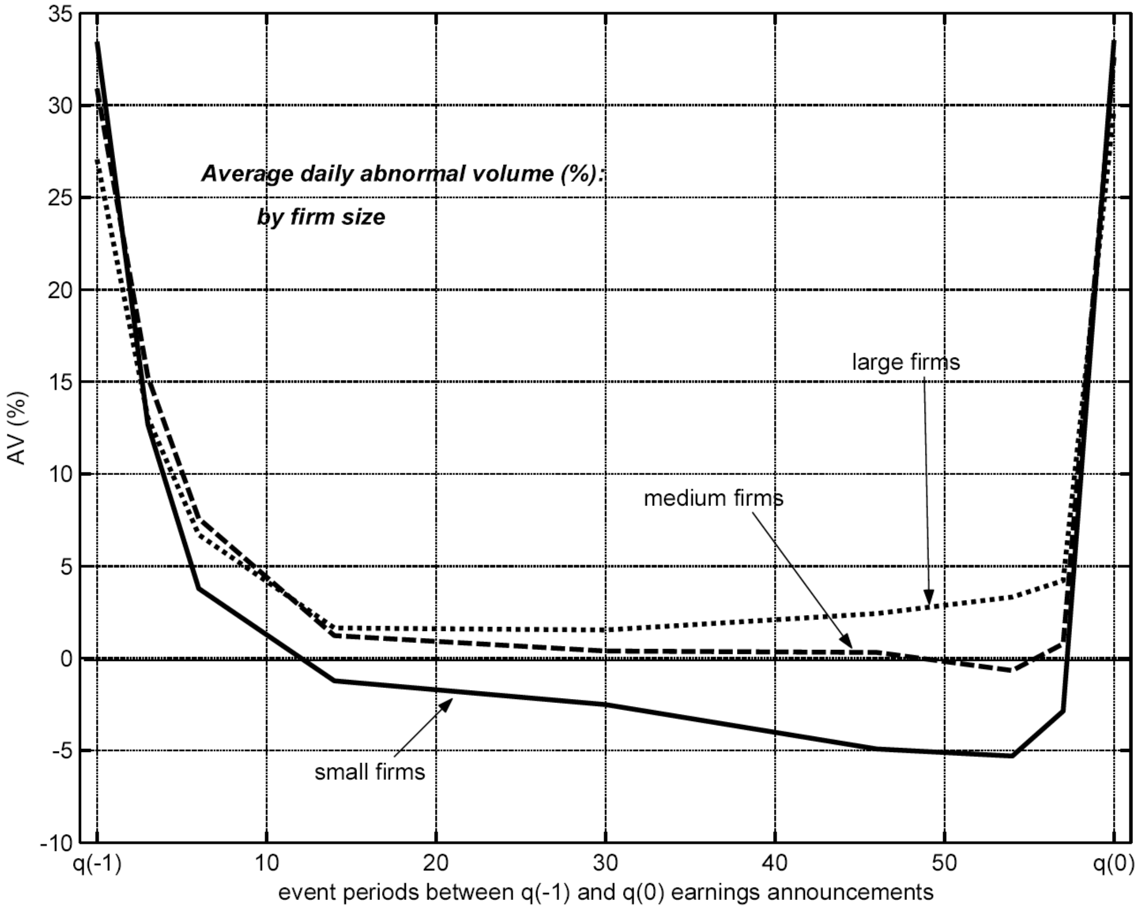
Figure 4: Informativeness of residual returns, abnormal volume, and bid-ask spread around earnings announcements by firm size partitions



Panel A: Incremental R^2 of residual returns (R^2_RRET) over the event periods including previous and current quarterly earnings announcement dates, by firm size partitions

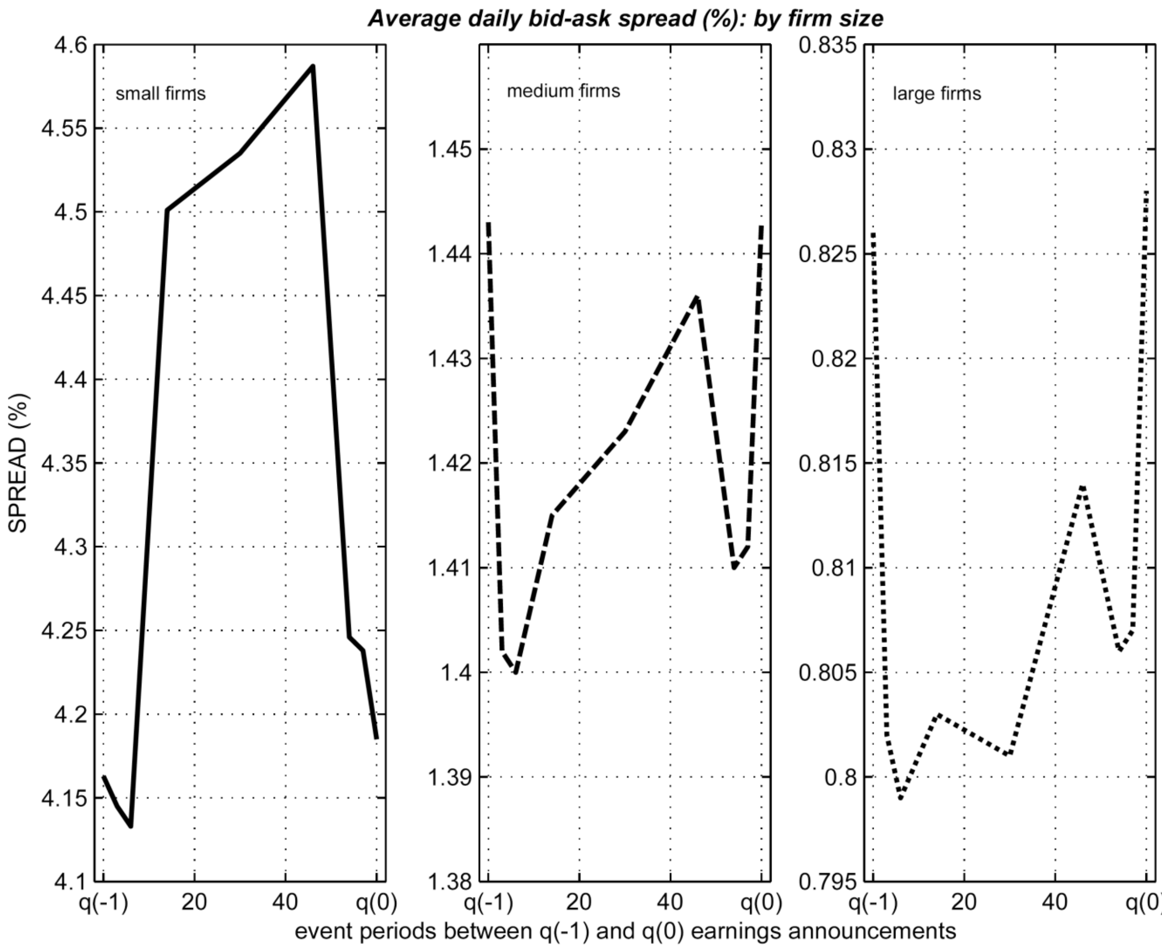
Panel A plots the incremental R^2 of residual returns (R^2_RRET) over the event periods including both previous quarterly earnings announcement date, denoted q(-1), and current quarterly earnings announcement date, denoted q(0). Panel B and Panel C plot average daily abnormal volume (AV) and average daily bid-ask spread (SPREAD), respectively. In each panel, results are illustrated by firm size partitions. [q(-1)-1, q(-1)+1], [q(-1)+2, q(-1)+4], and [q(-1)+5, q(-1)+7] are three-day windows relative to previous quarterly earnings announcement date. Similarly, [q(0)-7, q(0)-5], [q(0)-4, q(0)-2], and [q(0)-1, q(0)+1] are three-day windows relative to current quarterly earnings announcement date. Periods 1, 2 and 3 represent three approximately equal size partitions of the remaining inter-announcement days for each observation. Randomly selected 3-day intervals in each of the three partitions are used to draw statistical inferences. R^2_RRET (%) is estimated from regressions of current quarterly earnings on 3-day returns (from the 9 intervals defined above) and current quarter SUE. AV (%) is the difference between log turnover over the event period and average log turnover over the estimation period. Turnover is defined as the ratio of daily trading volume to common shares outstanding on the corresponding date. The estimation period begins day -110 and ends day -11 relative to previous quarterly earnings announcement date (i.e., 100-trading-day window). SPREAD (%) is a relative bid-ask spread using daily closing asks and bids. The difference between closing daily asks and closing daily bids is divided by the average of closing daily asks and bids over the event periods.

(Figure 4 continued)



Panel B: Average daily abnormal volume (AV) over the event periods including previous and current quarterly earnings announcement dates, by firm size partitions

(Figure 4 continued)



Panel C: Average daily bid-ask spread (SPREAD) over the event periods including previous and current quarterly earnings announcement dates, by firm size partitions

Table 1: Regression of annual earnings (earnings changes) on returns (abnormal returns) with pooled cross-sectional and bootstrapping estimations

Panel A presents regression summary statistics from the pooled cross-sectional estimation of equations (1) and (2). Regression standard errors are clustered by firms and year fixed effects are included. All R^2 statistics are reported based on regressions without the year fixed effects.

$$\frac{X_{i,t}}{P_{it-1}} = \alpha_0 + \beta_0 \cdot RET_{i,t} + \epsilon_{i,t} \quad (1)$$

$$\frac{X_{i,t} - X_{i,t-1}}{P_{it-1}} = \alpha_0 + \beta_0 \cdot ARET_{i,t} + \epsilon_{i,t} \quad (2)$$

where $X_{i,t}$ is annual earnings reported by firm i in year t, $RET_{i,t}$ ($ARET_{i,t}$) is annual stock return (abnormal stock returns) for firm i in year t and $P_{i,t-1}$ is stock price for firm i at the end of year t-1.

Panel B (Panel C) presents regression summary statistics from the bootstrapping estimation of equations (1) and (2) with year-fixed effects. Regression slope coefficients and the standard errors are based on empirically generated distribution comprised of 1,000 simulations. All R^2 statistics are reported based on regressions without the year fixed effects.

$$\frac{X_{i,t}}{P_{it-1}} = \alpha_0 + \sum_{q=1}^{4} \beta_{1,q} \cdot RET_{i,q,t} + \epsilon_{i,t} \quad (3)$$

$$\frac{X_{i,t} - X_{i,t-1}}{P_{it-1}} = \alpha_0 + \sum_{q=1}^{4} \beta_{1,q} \cdot ARET_{i,q,t} + \epsilon_{i,t} \quad (4)$$

where $X_{i,t}$ is annual earnings reported by firm i in year t, $RET_{i,t}$ ($ARET_{i,t}$) is 3-day cumulative stock return (abnormal stock returns) measured on a randomly selected date within an annual inter-announcement period for firm i in year t, $RET_{i,q,t}$ ($ARET_{i,q,t}$) is 3-day cumulative stock returns (abnormal stock returns) centered on a randomly selected date within a quarterly inter-announcement period for firm i in quarter q of year t, and $P_{i,t-1}$ is stock price for firm i at the end of year t-1. Cumulative abnormal returns are the cumulative 3-day raw returns adjusted for the corresponding returns of size-matched decile portfolios to which the firm belongs at the beginning of the each calendar year. * and ** represent statistical significance at the 5% and 1% levels, respectively (two-tailed). "a" indicates that a statistic of fiscal quarter q (q=1, 2 and 3) is statistically greater than the corresponding statistic of fiscal quarter q+1 at the 1% level (one-tailed).

Panel A: Regression with pooled cross-sectional estimation

	(1)				(2)			
Dep. Var.:	***current E***				***current ΔE***			
	coef		p-value	t-stat	coef		p-value	t-stat
RET (annual)	0.082	**	0.000	38.66				
ARET (annual)					0.099	**	0.000	48.09
N	49,809				48,158			
Adj. R^2	7.59%				8.79%			

Panel B: Regression with bootstrapping estimation

	(1)				(2)			
Dep. Var.:	***current E***				***current ΔE***			
	coef		p-val	t-stat	coef		p-val	t-stat
RET (3-day)	0.048	**	0.000	64.07				
ARET (3-day)					0.062	**	0.000	93.72
Mean adj. R^2	0.07%	**	0.000	41.53	0.07%	**	0.000	46.61

(Table 1 continued)

Panel C: Regression with bootstrapping estimation across fiscal quarters within an annual horizon

	(1)			(2)					(3)			(4)				
Dep. Var.:	***current E***			***current E***					***current ΔE***			***current ΔE***				
	coef		p-value	coef		p-value	Inc. R^2		coef		p-value	coef		p-value	Inc. R^2	
RET (12-day)	0.051	**	0.000													
RET1 (3-day)				0.074	**	0.000	0.09%	**								
RET2 (3-day)				0.084	**,a	0.000	0.16%	**,a								
RET3 (3-day)				0.050	**,a	0.000	0.08%	**,a								
RET4 (3-day)				0.008	**	0.000	0.01%	**								
ARET (12-day)									0.067	**	0.000					
ARET1 (3-day)												0.092	**,a	0.000	0.14%	**,a
ARET2 (3-day)												0.090	**,a	0.000	0.13%	**,a
ARET3 (3-day)												0.060	**,a	0.000	0.06%	**,a
ARET4 (3-day)												0.028	**	0.000	0.02%	**
Mean adj. R^2	0.28%	**	0.000	0.35%	**	0.000			0.30%	**	0.000	0.35%	**	0.000		

Table 2: Regression of annual earnings (earnings changes) on returns (abnormal returns) over EAR and IAR windows with pooled cross-sectional and bootstrapping estimations

Panel A presents regression summary statistics from the pooled cross-sectional estimation (in the upper half), and from the bootstrapping estimation (in the bottom half) of equations (5) and (6). In the cross-sectional estimation, regression standard errors are clustered by firms and year fixed effects are included. In the bootstrapping estimation, regression slope coefficients and the standard errors are based on empirically generated distribution comprised of 1,000 simulations. All R^2 statistics are reported based on regressions without the year fixed effects.

$$\frac{X_{i,t}}{P_{it-1}} = \alpha_0 + \beta_1 \cdot EAR_{i,t} + \beta_2 \cdot IAR_{i,t} + \epsilon_{i,t} \quad (5)$$

$$\frac{X_{i,t} - X_{i,t-1}}{P_{it-1}} = \alpha_0 + \beta_1 \cdot AEAR_{i,t} + \beta_2 \cdot AIAR_{i,t} + \epsilon_{i,t} \quad (6)$$

where $X_{i,t}$ is annual earnings reported by firm i in year t, $EAR_{i,t}$ ($AEAR_{i,t}$) is the sum of four 3-day quarterly earnings announcement stock returns (abnormal stock returns) within an annual period for firm i in year t, and $P_{i,t-1}$ is stock price for firm i at the end of year t-1. In the cross-sectional estimation, $IAR_{i,t}$ ($AIAR_{i,t}$) is the sum of four quarterly inter-announcement stock returns (abnormal stock returns) for firm i in year t. In the bootstrapping estimation, $IAR_{i,t}$ ($AIAR_{i,t}$) is the sum of four 3-day stock returns (abnormal stock returns) centered on a randomly selected date in each quarterly inter-announcement periods for firm i in year t. Cumulative abnormal returns are the cumulative raw returns adjusted for the corresponding returns of size-matched decile portfolios to which the firm belongs at the beginning of the each calendar year.

Panel B presents regression summary statistics from the bootstrapping estimation of equations (7) and (8).

$$\frac{X_{i,t}}{P_{it-1}} = \alpha_0 + \sum_{q=1}^{4} \beta_{1,q} \cdot EAR_{i,q,t} + \sum_{q=1}^{4} \beta_{2,q} \cdot IAR_{i,q,t} + \epsilon_{i,t} \quad (7)$$

$$\frac{X_{i,t} - X_{i,t-1}}{P_{it-1}} = \alpha_0 + \sum_{q=1}^{4} \beta_{1,q} \cdot AEAR_{i,q,t} + \sum_{q=1}^{4} \beta_{2,q} \cdot AIAR_{i,q,t} + \epsilon_{i,t} \quad (8)$$

where $EAR_{i,q,t}$ ($AEAR_{i,q,t}$) is the 3-day quarterly earnings announcement stock returns (abnormal stock returns) within an annual period for firm i in quarter q of year t, and $IAR_{i,q,t}$ ($AIAR_{i,q,t}$) is the 3-day stock returns (abnormal stock returns) centered on a randomly selected date in each quarterly periods for firm i in quarter q of year t. * and ** represent statistical significance at the 5% and 1% levels, respectively (two-tailed). # indicates that a statistic associated with EAR is statistically different from the corresponding fiscal quarter statistic associated with IAR at the 1% level (two-tailed).

Panel A: Regression with pooled cross-sectional and bootstrapping estimations

Cross-sectional estimation	(1)				(2)			
Dep. Var.:	***current E***				***current ΔE***			
	coef		Inc. R^2		coef		Inc. R^2	
EAR (12-day)	0.148	**,#	2.66%					
IAR (annual)	0.072	**	5.83%					
AEAR (12-day)					0.172	**,#	4.61%	
AIAR (annual)					0.081	**	5.80%	
Adj. R^2	8.01%				9.79%			
Bootstrapped estimation	(1)				(2)			
Dep. Var.:	***current E***				***current ΔE***			
	coef		Inc. R^2		coef		Inc. R^2	
EAR (12-day)	0.134	**,#	2.19%	**,#				
IAR (12-day)	0.044	**	0.22%	**				
AEAR (12-day)					0.168	**,#	4.38%	**,#
AIAR (12-day)					0.056	**	0.20%	**
Mean adj. R^2	2.40%	**			4.56%	**		

(Table 2 continued)

Panel B: Regression with bootstrapping estimation by fiscal quarters within an annual horizon

	(1)					
Dep. Var.:	***current E***		Indivi.		sub-gp.	
	coef		Inc. R^2		Inc. R^2	
EAR1 (3-day)	0.174	**,#	0.73%	**,#	2.29%	**,#
EAR2 (3-day)	0.163	**,#	0.82%	**,#		
EAR3 (3-day)	0.122	**,#	0.53%	**,#		
EAR4 (3-day)	0.086	**,#	0.29%	**,#		
IAR1 (3-day)	0.062	**	0.06%	**	0.28%	**
IAR2 (3-day)	0.075	**	0.14%	**		
IAR3 (3-day)	0.045	**	0.07%	**		
IAR4 (3-day)	0.004	**	0.01%	**		
Mean adj. R^2	2.56%	**				
	(2)					
Dep. Var.:	***current ΔE***					
AEAR1 (3-day)	0.233	**,#	2.00%	**,#	4.71%	**,#
AEAR2 (3-day)	0.202	**,#	1.53%	**,#		
AEAR3 (3-day)	0.134	**,#	0.83%	**,#		
AEAR4 (3-day)	0.118	**,#	0.56%	**,#		
AIAR1 (3-day)	0.077	**	0.09%	**	0.23%	**
AIAR2 (3-day)	0.078	**	0.09%	**		
AIAR3 (3-day)	0.052	**	0.04%	**		
AIAR4 (3-day)	0.024	**	0.01%	**		
Mean adj. R^2	4.93%	**				

Table 3: Regression of annual earnings (earnings changes) on returns (abnormal returns) with pooled cross-sectional estimations, controlling for SUEs

Table 3 presents regression summary statistics from the pooled cross-sectional estimation of augmented versions of equations (1) and (2), which control for the sum of 4 SUEs realized over the annual return horizon. SUE is the difference between quarterly reported earnings before extraordinary items and the estimated expected earnings based on a seasonal random walk with drift model. The resulting forecast error is then scaled by the standard deviation of historical forecast errors over which drift terms are estimated. Regression standard errors are clustered by firms and year fixed effects are included. All R^2 statistics are reported based on regressions without the year fixed effects.

$$\frac{X_{i,t}}{P_{it-1}} = \alpha_0 + \beta_0 \cdot RET_{i,t} + \beta_1 \cdot \sum_{q=1}^{4} SUE_{i,q,t} + \epsilon_{i,t} \qquad \textit{aug. } (1)$$

$$\frac{X_{i,t}-X_{i,t-1}}{P_{it-1}} = \alpha_0 + \beta_0 \cdot ARET_{i,t} + \beta_1 \cdot \sum_{q=1}^{4} SUE_{i,q,t} + \epsilon_{i,t} \qquad \textit{aug. } (2)$$

where $X_{i,t}$ is annual earnings reported by firm i in year t, $RET_{i,t}$ ($ARET_{i,t}$) is annual stock return (abnormal stock returns) for firm i in year t, $SUE_{i,q,t}$ is standardized unexpected earnings by firm i in quarter q of year t, and $P_{i,t-1}$ is stock price for firm i at the end of year t-1. Cumulative abnormal returns are the cumulative 3-day raw returns adjusted for the corresponding returns of size-matched decile portfolios to which the firm belongs at the beginning of the each calendar year. * and ** represent statistical significance at the 5% and 1% levels, respectively (two-tailed).

	(1)				(2)			
Dep. Var.:	***current E***				***current ΔE***			
	coef		p-value	Inc. R^2	coef		p-value	Inc. R^2
RET (annual)	0.057	**	0.000	3.64%				
ARET (annual)					0.040	**	0.000	1.14%
SUE (annual)	0.006	**	0.000	5.38%	0.013	**	0.000	25.81%
N	49,809				48,158			
Adj. R^2	12.97%				34.60%			

Table 4: **Regression of annual earnings (earnings changes) on returns (abnormal returns) by fiscal quarters over EAR and IAR windows with bootstrapping estimations, controlling for SUEs**

Dep. Var.:	*current E*													
					Indivi.	Indivi.		diff. in		sub-gp.	sub-gp.		diff. in	
	coef	coef		diff. p-val.	Inc. R^2	Inc. R^2		Inc. R^2		Inc. R^2	Inc. R^2		Inc. R^2	
EAR1 (3-day)	0.174	0.099	**,#	0.000	0.73%	0.27%	**,#	0.46%	**	2.29%	0.70%	**,#	1.59%	**
EAR2 (3-day)	0.163	0.107	**,#	0.000	0.82%	0.32%	**,#	0.50%	**					
EAR3 (3-day)	0.122	0.083	**,#	0.000	0.53%	0.18%	**,#	0.35%	**					
EAR4 (3-day)	0.086	0.054	**,#	0.000	0.29%	0.04%	**,#	0.25%	**					
IAR1 (3-day)	0.062	0.040	**	0.000	0.06%	0.04%	**	0.02%	**	0.28%	0.13%	**	0.14%	**
IAR2 (3-day)	0.075	0.053	**	0.000	0.14%	0.10%	**	0.04%	**					
IAR3 (3-day)	0.045	0.032	**	0.000	0.07%	0.05%	**	0.02%	**					
IAR4 (3-day)	0.004	0.000		0.807	0.01%	0.00%		0.01%	*					
SUE1		0.009	**											
SUE2		0.007	**											
SUE3		0.006	**											
SUE4		0.008	**											
Mean adj. R^2		10.2%	**											
Dep. Var.:	*current ΔE*													
AEAR1 (3-day)	0.233	0.091	**,#	0.000	2.00%	0.65%	**,#	1.35%	**	4.71%	0.57%	**,#	4.13%	**
AEAR2 (3-day)	0.202	0.079	**,#	0.000	1.53%	0.33%	**,#	1.20%	**					
AEAR3 (3-day)	0.134	0.046	**,#	0.000	0.83%	0.06%	**,#	0.77%	**					
AEAR4 (3-day)	0.118	0.042	**,#	0.000	0.56%	0.00%		0.56%	**					
AIAR1 (3-day)	0.077	0.029	**	0.000	0.09%	0.04%	**	0.05%	**	0.23%	0.03%	**	0.20%	**
AIAR2 (3-day)	0.078	0.027	**	0.000	0.09%	0.04%	**	0.05%	**					
AIAR3 (3-day)	0.052	0.016	**	0.000	0.04%	0.01%	**	0.03%	**					
AIAR4 (3-day)	0.024	0.009	**	0.000	0.01%	0.00%		0.01%	**					
SUE1		0.012	**											
SUE2		0.013	**											
SUE3		0.012	**											
SUE4		0.017	**											
Mean adj. R^2		34.4%	**											

Table 4 presents regression summary statistics from the bootstrapping estimation of equations (9) and (10). Slope coefficients and incremental R^2s from the estimation of equations (7) and (8) (reported in panel B of table 2) are enclosed in bold boxes to facilitate comparisons. In the bootstrapping estimation, regression slope coefficients and the standard errors are based on empirically generated distribution comprised of 1,000 simulations. All R^2 statistics are reported based on regressions without the year fixed effects.

$$\frac{X_{i,t}}{P_{it-1}} = \alpha_0 + \sum_{q=1}^{4} \beta_{1,q} \cdot EAR_{i,q,t} + \sum_{q=1}^{4} \beta_{2,q} \cdot IAR_{i,q,t} + \sum_{q=1}^{4} \beta_{3,q} \cdot SUE_{i,q,t} + \epsilon_{i,t} \qquad (9)$$

$$\frac{X_{i,t}-X_{i,t}}{P_{it-1}} = \alpha_0 + \sum_{q=1}^{4} \beta_{1,q} \cdot EAR_{i,q,t} + \sum_{q=1}^{4} \beta_{2,q} \cdot IAR_{i,q,t} + \sum_{q=1}^{4} \beta_{3,q} \cdot SUE_{i,q,t} + \epsilon_{i,t} \qquad (10)$$

where $X_{i,t}$ is annual earnings reported by firm i in year t, $EAR_{i,q,t}$ ($AEAR_{i,q,t}$) is the 3-day quarterly earnings announcement stock returns (abnormal stock returns) within an annual inter-announcement period for firm i in quarter q of year t, $IAR_{i,q,t}$ ($AIAR_{i,q,t}$) is the 3-day stock returns (abnormal stock returns) centered on a randomly selected date in each quarterly inter-announcement periods for firm i in quarter q of year t, and $P_{i,t-1}$ is stock price for firm i at the end of year t-1. $SUE_{i,q,t}$ is the difference between quarterly reported earnings before extraordinary items and the estimated expected earnings for firm i in quarter q of year t based on a seasonal random walk with drift model. The resulting forecast error is then scaled by the standard deviation of historical forecast errors over which drift terms are estimated. Cumulative abnormal returns are the cumulative raw returns adjusted for the corresponding returns of size-matched decile portfolios to which the firm belongs at the beginning of the each calendar year. * and ** represent statistical significance at the 5% and 1% levels, respectively (two-tailed). # indicates that a statistic associated with EAR is statistically different from the corresponding fiscal quarter statistic associated with IAR at the 1% level (two-tailed).

Table 5: Regression of quarterly earnings (earnings changes) on EAR (AEAR) and IAR (AIAR) with bootstrapping estimations, controlling for past four SUEs

Panel A (Panel B) presents regression summary statistics from the bootstrapping estimation of equation (11) (equation (12)). In the bootstrapping estimation, regression slope coefficients and the standard errors are based on empirically generated distribution comprised of 1,000 simulations. All R^2 statistics are reported based on regressions without the year fixed effects.

$$\frac{Q_{i,q}}{P_{i,q-1}} = \alpha_0 + \beta_1 \cdot EAR_{i,q} + \beta_2 \cdot IAR_{i,q} + \sum_{j=1}^{4} \beta_{\ q-j} \cdot SUE_{\ i,q-j} + \epsilon_{i,q} \qquad (11)$$

$$\frac{Q_{i,q} - Q_{i,q-4}}{P_{i,q-4}} = \alpha_0 + \beta_1 \cdot AEAR_{i,q} + \beta_2 \cdot AIAR_{i,q} + \sum_{j=1}^{4} \beta_{\ q-j} \cdot SUE_{\ i,q-j} + \epsilon_{i,q} \qquad (12)$$

where $Q_{i,q}$ is quarterly earnings reported by firm i in quarter q, $EAR_{i,q}$ ($AEAR_{i,q}$) is the 3-day quarterly earnings announcement stock returns (abnormal stock returns) within an annual inter-announcement period for firm i in quarter q, $IAR_{i,q}$ ($AIAR_{i,q}$) is the 3-day stock returns (abnormal stock returns) centered on a randomly selected date in each quarterly inter-announcement periods for firm i in quarter q, and $P_{i,q,t}$ is stock price for firm i at the end of quarter q of year t. $SUE_{i,q}$ is the difference between quarterly reported earnings before extraordinary items and the estimated expected earnings for firm i in quarter q based on a seasonal random walk with drift model. The resulting forecast error is then scaled by the standard deviation of historical forecast errors over which drift terms are estimated. Cumulative abnormal returns are the cumulative raw returns adjusted for the corresponding returns of size-matched decile portfolios to which the firm belongs at the beginning of the each calendar year. * and ** represent statistical significance at the 5% and 1% levels, respectively (two-tailed).

Panel A: Regression with bootstrapping estimations (quarterly earnings levels specification)

Dep. Var.:	**E (quarterly)**									
	(model 1)		*(model 2)*				*(model 3)*			
	coef	Inc. R^2	coef	Inc. R^3	***diff in coef* : (2)-(1)**	***diff in inc. R^3* : (2)-(1)**	coef	Inc. R^3	***diff in coef* : (3)-(1)**	***diff in inc. R^3* : (3)-(1)**
EAR (q)	0.068 **	1.61% **	0.067 **	1.55% **	0.001 **	0.06% **	0.066 **	1.53% **	0.002 **	0.08% **
IAR (q)	0.012 **	0.05% **	0.011 **	0.04% **	0.0009 **	0.008% **	0.012 **	0.04% **	0.0005 **	0.005% **
SUE (q-1)			0.003 **							
SUE (q-2)			0.001 **							
SUE (q-3)			0.001 **							
SUE (q-4)			0.002 **							
EAR (q-1)							0.044 **			
EAR (q-2)							0.039 **			
EAR (q-3)							0.033 **			
EAR (q-4)							0.051 **			
Mean adj. R^2	1.7% **		6.9% **				4.1% **			

(Table 5 continued)

Panel B: Regression with bootstrapping estimations (quarterly earnings changes specification)

Dep. Var.:	**ΔE (quarterly)** *(model 1)*		*(model 2)*				*(model 3)*			
					diff in coef	***diff in inc. R^3***			***diff in coef***	***diff in inc. R^3***
	coef	Inc. R^2	coef	Inc. R^3	**: (2)-(1)**	**: (2)-(1)**	coef	Inc. R^3	**: (3)-(1)**	**: (3)-(1)**
AEAR (q)	0.079 **	2.50% **	0.073 **	2.12% **	0.006 **	0.37% **	0.077 **	2.35% **	0.002 **	0.14% **
AIAR (q)	0.019 **	0.06% **	0.016 **	0.05% **	0.002 **	0.02% **	0.018 **	0.05% **	0.001 **	0.01% **
SUE (q-1)			0.005 **							
SUE (q-2)			0.002 **							
SUE (q-3)			0.002 **							
SUE (q-4)			-0.006 **							
AEAR (q-1)							0.052 **			
AEAR (q-2)							0.032 **			
AEAR (q-3)							0.044 **			
AEAR (q-4)							-0.018 **			
Mean adj. R^2	2.6% **		14.3% **				5.0% **			

Table 6: Event periods between quarterly earnings announcement dates and the informativeness of residual returns, abnormal volume, and bid-ask spread around earnings announcements

Panel A presents the descriptive statistics of number of trading days from the day +2 relative to previous quarterly earnings announcement date to the day -2 relative to current quarterly earnings announcement date. Panel B presents the incremental R^2 (R^2_RRET) of residual returns, average daily abnormal volume (AV), and average daily bid-ask spread (SPREAD) over the event periods including both previous quarterly earnings announcement date, denoted q(-1), and current quarterly earnings announcement date, denoted q(0). [q(-1)-1, q(-1)+1], [q(-1)+2, q(-1)+4], and [q(-1)+5, q(-1)+7] are three-day windows relative to previous quarterly earnings announcement date. Similarly, [q(0)-7, q(0)-5], [q(0)-4, q(0)-2], and [q(0)-1, q(0)+1] are three-day windows relative to current quarterly earnings announcement date. Periods 1, 2 and 3 represent three approximately equal size partitions of the remaining inter-announcement days for each observation. Randomly selected 3-day intervals in each of the three partitions are used to draw statistical inferences. R^2_RRET (%) is estimated from regressions of current quarterly earnings on 3-day returns (from the 9 intervals defined above) and current quarter SUE. AV (%) is the difference between log turnover over the event period and average log turnover over the estimation period. Turnover is defined as the ratio of daily trading volume to common shares outstanding on the corresponding date. The estimation period begins day -110 and ends day -11 relative to previous quarterly earnings announcement date (i.e., 100-trading-day window). SPREAD (%) is a relative bid-ask spread using daily closing asks and bids. The difference between closing daily asks and closing daily bids is divided by the average of closing daily asks and bids over the event periods. Both trading volume and ask and bid price data are obtained from the CRSP daily file. “a”, “b” and “c” (“d”, “e” and “f”) indicate that AV and SPREAD over the six windows around previous and current quarterly earnings announcements are statistically greater (smaller) than the corresponding statistics over the periods 1, 2 and 3, respectively, at the 1% level.

Panel A: Descriptive statistics of number of trading days between quarterly announcements

	Mean	Standard **Deviation**	**Min**	**Q1**	**Median**	**Q3**	**Max**
all firm-quarters	59.84	11.22	21	56	60	64	106
1st fiscal quarter	47.56	10.09	21	41	49	56	104
2nd fiscal quarter	59.97	4.23	21	59	60	61	100
3rd fiscal quarter	60.76	4.13	21	59	61	62	105
4th fiscal quarter	71.38	9.71	22	64	70	78	106

Panel B: R^2_RRET, AV and SPREAD over the event periods including previous and current quarterly earnings announcement dates, all firms

windows	**Inc. R^2 of residual returns (*R^2_RRET*)**	**Average daily abnormal volume (*AV*) (%)**		**Average daily bid-ask spread (*SPREAD*) (%)**	
[q(-1)-1, q(-1)+1]	0.241%	30.46	a,b,c	2.135	d,e,f
[q(-1)+2, q(-1)+4]	0.009%	13.66	a,b,c	2.110	d,e,f
[q(-1)+5,q(-1)+7]	0.012%	6.03	a,b,c	2.105	d,e,f
period 1	0.005%	0.55		2.248	
period 2	0.009%	-0.20		2.257	
period 3	0.026%	-0.73		2.283	
[q(0)-7, q(0)-5]	0.036%	-0.86	d,e	2.146	d,e,f
[q(0)-4, q(0)-2]	0.059%	0.73	b,c	2.145	d,e,f
[q(0)-1, q(0)+1]	0.520%	31.96	a,b,c	2.142	d,e,f

Table 7: Informativeness of residual returns, abnormal volume, and bid-ask spread around earnings announcements, by analyst following and firm size partitions

Panel A (Panel B) presents the incremental R^2 (R^2_RRET) of residual returns, average daily abnormal volume (AV), and average daily bid-ask spread (SPREAD) over the event periods including both previous quarterly earnings announcement date, denoted q(-1), and current quarterly earnings announcement date, denoted q(0). [q(-1)-1, q(-1)+1], [q(-1)+2, q(-1)+4], and [q(-1)+5, q(-1)+7] are three-day windows relative to previous quarterly earnings announcement date. Similarly, [q(0)-7, q(0)-5], [q(0)-4, q(0)-2], and [q(0)-1, q(0)+1] are three-day windows relative to current quarterly earnings announcement date. Periods 1, 2 and 3 represent three approximately equal size partitions of the remaining inter-announcement days for each observation. Randomly selected 3-day intervals in each of the three partitions are used to draw statistical inferences. R^2_RRET (%) is estimated from regressions of current quarterly earnings on 3-day returns (from the 9 intervals defined above) and current quarter SUE. AV (%) is the difference between log turnover over the event period and average log turnover over the estimation period. Turnover is defined as the ratio of daily trading volume to common shares outstanding on the corresponding date. The estimation period begins day -110 and ends day -11 relative to previous quarterly earnings announcement date (i.e., 100-trading-day window). SPREAD (%) is a relative bid-ask spread using daily closing asks and bids. The difference between closing daily asks and closing daily bids is divided by the average of closing daily asks and bids over the event periods. Both trading volume and ask and bid price data are obtained from the CRSP daily file. "a", "b" and "c" ("d", "e" and "f") indicate that AV and SPREAD over the six windows around previous and current quarterly earnings announcements are statistically greater (smaller) than the corresponding statistics over the periods 1, 2 and 3, respectively, at the 1% level.

Panel A: R^2_RRET, AV and SPREAD over the event periods including previous and current quarterly earnings announcement dates, by analyst following partitions

analyst following portfolios	**Inc. R^2 (*R^2_RRET*) (%)**			**Average daily abnormal volume (*AV*) (%)**						**Average daily bid-ask spread (*SPREAD*) (%)**					
windows	*low*	*medium*	*high*	*low*		*medium*		*high*		*low*		*medium*		*high*	
[q(-1)-1, q(-1)+1]	0.356%	0.152%	0.025%	31.36	a,b,c	32.89	a,b,c	29.24	a,b,c	3.967	d,e,f	1.567		0.900	a,b,c
[q(-1)+2, q(-1)+4]	0.004%	0.013%	0.012%	11.44	a,b,c	17.15	a,b,c	14.40	a,b,c	3.956	d,e,f	1.527	d,e,f	0.871	
[q(-1)+5,q(-1)+7]	0.014%	0.037%	0.002%	3.28	a,b,c	9.12	a,b,c	7.22	a,b,c	3.944	d,e,f	1.523	d,e,f	0.868	f
period 1	0.001%	0.016%	0.015%	-1.14		2.24		1.79		4.304		1.551		0.874	
period 2	0.002%	0.020%	0.025%	-2.47		1.23		1.56		4.338		1.557		0.868	
period 3	0.004%	0.055%	0.038%	-4.31		0.73		2.14		4.391		1.573		0.877	
[q(0)-7, q(0)-5]	0.013%	0.052%	0.039%	-5.22	d,e,f	-0.04	d,e,f	2.86	a,b,c	4.062	d,e,f	1.533	e,f	0.865	f
[q(0)-4, q(0)-2]	0.042%	0.048%	0.034%	-2.83	d,c	1.39	d,c	3.71	a,b,c	4.049	d,e,f	1.540	f	0.868	f
[q(0)-1, q(0)+1]	0.744%	0.212%	0.068%	31.19	a,b,c	34.75	a,b,c	31.33	a,b,c	3.998	d,e,f	1.562		0.893	a,b,c

(Table 7 continued)

Panel B: R^2_RRET, AV and SPREAD over the event periods including previous and current quarterly earnings announcement dates, by firm size partitions

firm size portfolios															
	Inc. R^2 (R^2_RRET) (%)			**Average daily abnormal volume (*AV*) (%)**						**Average daily bid-ask spread (*SPREAD*) (%)**					
windows	*small*	*medium*	*large*	*small*		*medium*		*large*		*small*		*medium*		*large*	
[q(-1)-1, q(-1)+1]	0.389%	0.079%	0.023%	33.45	a,b,c	30.90	a,b,c	27.06	a,b,c	4.163	d,e,f	1.443	a,b	0.826	a,b,c
[q(-1)+2, q(-1)+4]	0.003%	0.012%	0.011%	12.67	a,b,c	15.26	a,b,c	13.04	a,b,c	4.145	d,e,f	1.402	e,f	0.802	f
[q(-1)+5,q(-1)+7]	0.021%	0.000%	0.003%	3.78	a,b,c	7.57	a,b,c	6.70	a,b,c	4.133	d,e,f	1.400	e,f	0.799	f
period 1	0.001%	0.012%	0.016%	-1.23		1.22		1.64		4.501		1.415		0.803	
period 2	0.002%	0.034%	0.035%	-2.52		0.39		1.53		4.535		1.423		0.801	
period 3	0.009%	0.071%	0.077%	-4.93		0.31		2.42		4.587		1.436		0.814	
[q(0)-7, q(0)-5]	0.038%	0.040%	0.041%	-5.31	d,e	-0.67	d,e,f	3.32	a,b,c	4.246	d,e,f	1.410	f	0.806	
[q(0)-4, q(0)-2]	0.068%	0.075%	0.033%	-2.87	d,c	0.78	d,c	4.21	a,b,c	4.238	d,e,f	1.412	f	0.807	
[q(0)-1, q(0)+1]	0.791%	0.201%	0.040%	33.53	a,b,c	32.60	a,b,c	29.77	a,b,c	4.185	d,e,f	1.443	a,b	0.828	a,b,c

Table 8: Informativeness of residual returns, abnormal volume, and bid-ask spread around management forecast date

Data on management EPS forecasts are obtained from the First Call database that are issued at least 30 trading days after the previous quarterly earnings announcement date and no closer than 3 trading days before the current quarterly earnings announcement. R^2_RRET (%) is estimated from regressions of current quarterly earnings on ten 3-day returns (nine pre-announcement intervals and one announcement interval) and management forecast surprise denoted MFS. MFS is the difference between management forecasts of the upcoming quarterly earnings and the consensus analyst forecasts before the management forecast date (also obtained from the First Call database), scaled by the stock price on day -10 relative to the date of consensus forecast date. AV (%) is the difference between log turnover over the event period and average log turnover over the estimation period. Turnover is defined as the ratio of daily trading volume to common shares outstanding on the corresponding date. The estimation period begins day -110 and ends day -11 relative to previous quarterly earnings announcement date (i.e., 100-trading-day window). SPREAD (%) is a relative bid-ask spread using daily closing asks and bids. The difference between closing daily asks and closing daily bids is divided by the average of closing daily asks and bids over the event periods. Both trading volume and ask and bid price data are obtained from the CRSP daily file. Panel A present results for all firms in the management forecast sample (12,783 firm/quarter observations) Panel B (Panel C) presents the results from samples partitioned by analyst following (firm size). * and ** represent statistical significance at the 5% and 1% levels, respectively (two-tailed). # indicates that abnormal volume and bid-ask spread on pre-management forecast intervals (i.e., t-28 to t-2) are statistically different from the corresponding statistics on the management forecast interval (i.e., t-1 to t+1) at the 1% level (two-tailed).

Panel A: R^2_RRET, AV and SPREAD over the event periods leading up to management forecast date

windows	Inc. R^2 of residual returns (R^2_RRET)	Average daily abnormal volume (*AV*) (%)		Average daily bid-ask spread (*SPREAD*) (%)	
[*t*-28, *t*-26]	0.017%	-3.85	**,#	1.223	**,#
[*t*-25, *t*-23]	0.032%	-3.07	**,#	1.207	**,#
[*t*-22, *t*-20]	0.004%	-2.68	**,#	1.228	**,#
[*t*-19, *t*-17]	0.123%	-2.94	**,#	1.237	**,#
[*t*-16, *t*-14]	0.149%	-2.94	**,#	1.234	**,#
[*t*-13, *t*-11]	0.112%	-3.61	**,#	1.253	**,#
[*t*-10, *t*-8]	0.168%	-3.51	**,#	1.263	**,#
[*t*-7, *t*-5]	0.206%	-2.32	**,#	1.270	**,#
[*t*-4, *t*-2]	0.001%	2.12	**,#	1.290	**
[*t*-1, *t*+1]	1.455%	60.20	**	1.315	**

(Table 8 continued)

Panel B: R^2_RRET, AV and SPREAD over the event periods leading up to management forecast date, by analyst following partitions

Analyst following portfolios															
	Inc. R^2 (*R^2_RRET*) (%)			**Average daily abnormal volume (*AV*) (%)**						**Average daily bid-ask spread (*SPREAD*) (%)**					
windows	*low*	*medium*	*high*	*low*		*medium*		*high*		*low*		*medium*		*high*	
[*t*-28, *t*-26]	0.067%	0.034%	0.001%	-6.32	**,#	-2.51	**,#	-2.60	**,#	1.883	**,#	1.066	**,#	0.677	**,#
[*t*-25, *t*-23]	0.094%	0.049%	0.039%	-6.17	**,#	-1.43	#	-1.46	#	1.848	**,#	1.048	**,#	0.685	**,#
[*t*-22, *t*-20]	0.021%	0.009%	0.080%	-7.18	**,#	-1.44	#	0.81	#	1.896	**,#	1.066	**,#	0.679	**,#
[*t*-19, *t*-17]	0.063%	0.236%	0.232%	-7.27	**,#	-1.52	#	0.16	#	1.918	**,#	1.066	**,#	0.684	**,#
[*t*-16, *t*-14]	0.393%	0.013%	0.079%	-5.08	**,#	-2.61	**,#	-1.04	#	1.900	**,#	1.083	**,#	0.679	**,#
[*t*-13, *t*-11]	0.095%	0.205%	0.202%	-7.09	**,#	-1.84	#	-1.73	*,#	1.933	**,#	1.090	**,#	0.693	**,#
[*t*-10, *t*-8]	0.153%	0.101%	0.162%	-7.12	**,#	-2.22	**,#	-1.00	#	1.962	**	1.091	**,#	0.692	**,#
[*t*-7, *t*-5]	0.003%	0.364%	0.479%	-6.47	**,#	-1.29	#	0.99	#	1.963	**	1.105	**	0.700	**,#
[*t*-4, *t*-2]	0.000%	0.053%	0.025%	-2.27	*,#	3.19	**,#	5.64	**,#	2.006	**	1.110	**	0.711	**
[*t*-1, *t*+1]	2.120%	1.535%	1.702%	61.42	**	65.54	**	53.70	**	2.017	**	1.140	**	0.743	**

(Table 8 continued)

Panel C: R^2_RRET, AV and SPREAD over the event periods leading up to management forecast date, by firm size partitions

Firm size portfolios															
	Inc. R^2 (R^2_RRET) (%)			**Average daily abnormal volume (*AV*) (%)**						**Average daily bid-ask spread (*SPREAD*) (%)**					
windows	*small*	*medium*	*large*	*small*		*medium*		*large*		*small*		*medium*		*large*	
[*t*-28, *t*-26]	0.045%	0.092%	0.096%	-8.56	**,#	-2.46	**,#	-0.37	#	1.982	**,#	0.978	**,#	0.661	**,#
[*t*-25, *t*-23]	0.077%	0.037%	0.027%	-8.76	**,#	-1.49	#	1.01	#	1.948	**,#	0.966	**,#	0.668	**,#
[*t*-22, *t*-20]	0.065%	0.052%	0.079%	-8.76	**,#	-0.89	#	2.01	**,#	1.988	**,#	0.984	**,#	0.668	**,#
[*t*-19, *t*-17]	0.029%	0.396%	0.352%	-9.32	**,#	-0.82	#	1.43	**,#	2.003	**,#	0.992	**,#	0.677	**,#
[*t*-16, *t*-14]	0.163%	0.225%	0.064%	-7.66	**,#	-2.07	**,#	0.96	#	2.006	**,#	0.989	**,#	0.672	**,#
[*t*-13, *t*-11]	0.180%	0.057%	0.125%	-9.50	**,#	-1.46	#	-0.03	#	2.026	**,#	1.013	**,#	0.684	**,#
[*t*-10, *t*-8]	0.219%	0.077%	0.109%	-10.79	**,#	-0.82	#	0.66	#	2.054	**	1.013	**,#	0.683	**,#
[*t*-7, *t*-5]	0.027%	0.375%	0.478%	-10.88	**,#	0.83	#	2.77	**,#	2.062	**	1.019	**,#	0.690	**,#
[*t*-4, *t*-2]	0.001%	0.022%	0.070%	-6.04	**,#	5.17	**,#	6.76	**,#	2.109	**	1.031	**	0.689	**,#
[*t*-1, *t*+1]	2.156%	2.004%	1.297%	60.17	**	66.12	**	54.06	**	2.112	**	1.067	**	0.724	**

Table 9: Regression of one-year-ahead earnings (earnings changes) on returns (abnormal returns) by fiscal quarters over EAR and IAR windows with bootstrapping estimations, controlling for SUEs

Panel A (Panel B) presents regression summary statistics from the bootstrapping estimation of equations (9) (equation (10)) after substituting one-year-ahead earnings (earnings changes) for the dependent variable. Slope coefficients and incremental R^2s from estimation of equation (7) (equation (8)) after substituting one-year-ahead earnings (earnings changes) are enclosed in bold boxes to facilitate comparisons. In the bootstrapping estimation, regression slope coefficients and the standard errors are based on empirically generated distribution comprised of 1,000 simulations. All R^2 statistics are reported based on regressions without the year fixed effects.

$$\frac{X_{i,t}}{P_{it-1}} = \alpha_0 + \sum_{q=1}^{4} \beta_{1,q} \cdot EAR_{i,q,t} + \sum_{q=1}^{4} \beta_{2,q} \cdot IAR_{i,q,t} + \sum_{q=1}^{4} \beta_{3,q} \cdot SUE_{i,q,t} + \epsilon_{i,t} \qquad (9)$$

$$\frac{X_{i,t} - X_{i,t}}{P_{it-1}} = \alpha_0 + \sum_{q=1}^{4} \beta_{1,q} \cdot EAR_{i,q,t} + \sum_{q=1}^{4} \beta_{2,q} \cdot IAR_{i,q,t} + \sum_{q=1}^{4} \beta_{3,q} \cdot SUE_{i,q,t} + \epsilon_{i,t} \qquad (10)$$

where $X_{i,t}$ is annual earnings reported by firm i in year t, $EAR_{i,q,t}$ ($AEAR_{i,q,t}$) is the 3-day quarterly earnings announcement stock returns (abnormal stock returns) within an annual inter-announcement period for firm i in quarter q of year t, $IAR_{i,q,t}$ ($AIAR_{i,q,t}$) is the 3-day stock returns (abnormal stock returns) centered on a randomly selected date in each quarterly inter-announcement periods for firm i in quarter q of year t, and $P_{i,t-1}$ is stock price for firm i at the end of year t-1. $SUE_{i,q,t}$ is the difference between quarterly reported earnings before extraordinary items and the estimated expected earnings for firm i in quarter q of year t based on a seasonal random walk with drift model. The resulting forecast error is then scaled by the standard deviation of historical forecast errors over which drift terms are estimated. Cumulative abnormal returns are the cumulative raw returns adjusted for the corresponding returns of size-matched decile portfolios to which the firm belongs at the beginning of the each calendar year. * and ** represent statistical significance at the 5% and 1% levels, respectively (two-tailed). # indicates that a statistic associated with EAR is statistically different from the corresponding statistic associated with IAR at the 1% level (two-tailed).

Panel A: Regression of one-year-ahead earnings on disaggregated returns over the annual return horizon, controlling for SUEs

Dep. Var.:	*one-year-ahead E*								
				Indivi.	Indivi.	diff. in	sub-gp.	sub-gp.	diff. in
	coef	coef	diff. p-val.	Inc. R^2	Inc. R^2	Inc. R^2	Inc. R^2	Inc. R^2	Inc. R^2
EAR1 (3-day)	0.064	0.031 **,#	0.000	0.07%	0.01% **,#	0.06% **	1.53%	0.83% **,#	0.70% **
EAR2 (3-day)	0.110	0.083 **,#	0.000	0.31%	0.17% **,#	0.14% **			
EAR3 (3-day)	0.116	0.094 **,#	0.000	0.37%	0.20% **,#	0.17% **			
EAR4 (3-day)	0.170	0.144 **,#	0.000	0.81%	0.45% **,#	0.36% **			
IAR1 (3-day)	0.024	0.013 **	0.000	0.01%	0.00% *	0.01% *	0.13%	0.08% **	0.06% **
IAR2 (3-day)	0.050	0.039 **	0.000	0.05%	0.04% **	0.01% **			
IAR3 (3-day)	0.036	0.028 **	0.000	0.04%	0.03% **	0.01% **			
IAR4 (3-day)	0.034	0.030 **	0.000	0.04%	0.03% **	0.01% *			
SUE1		0.004 **							
SUE2		0.002 **							
SUE3		0.002 **							
SUE4		0.006 **							
Mean adj. R^2		3.95% **							

(Table 9 continued)

Panel B: Regression of one-year-ahead earnings changes on disaggregated abnormal returns over the annual return horizon, controlling for SUEs

Dep. Var.:	***one-year-ahead ΔE***														
					Indivi.	Indivi.		diff. in		sub-gp.	sub-gp.		diff. in	
	coef	coef		diff. p-val.	Inc. R^2	Inc. R^2		Inc. R^2		Inc. R^2	Inc. R^2		Inc. R^2	
AEAR1 (3-day)	-0.027	-0.014	**	0.000	0.02%	0.00%		0.02%	**	0.58%	0.44%	**,#	0.14%	**
AEAR2 (3-day)	0.012	0.016	**,#	0.000	0.00%	0.01%	*	-0.01%	*					
AEAR3 (3-day)	0.047	0.042	**,#	0.000	0.10%	0.10%	**,#	0.00%						
AEAR4 (3-day)	0.104	0.098	**,#	0.000	0.46%	0.39%	**,#	0.07%	**					
AIAR1 (3-day)	0.006	0.008	**	0.198	0.00%	0.00%		0.00%		0.05%	0.04%	**	0.01%	*
AIAR2 (3-day)	0.011	0.012	**	0.117	0.00%	0.00%		0.00%						
AIAR3 (3-day)	0.030	0.029	**	0.026	0.01%	0.01%	**	0.00%						
AIAR4 (3-day)	0.049	0.047	**	0.052	0.04%	0.04%	**	0.00%						
SUE1		-0.003	**											
SUE2		-0.002	**											
SUE3		0.001	**											
SUE4		0.001	**											
Mean adj. R^2		1.07%	**											

Appendix Table 1: Regression of quarterly earnings on returns over eight prior quarters with pooled cross-sectional estimation

This table presents regression summary statistics from the pooled cross-sectional estimation of equations (A1) and (A2). Regression standard errors are clustered by firms and year fixed effects are included. All R^2 statistics are reported based on regressions without the year fixed effects.

$$\frac{Q_{i,q}}{P_{i,q-4}} = \alpha_0 + \sum_{j=0}^{8} \beta_{q-j} \cdot RET_{i,q-j} + \epsilon_{i,q} \quad \text{(A1)}$$

$$\frac{Q_{i,q}}{P_{i,q-4}} = \alpha_0 + \sum_{j=0}^{8} \beta_{q-j} \cdot RET_{i,q-j} + \sum_{j=0}^{8} \beta_{q-j}^{Q1} \cdot RET_{i,q-j} \times Q1_{i,q-j} + \sum_{j=0}^{8} \beta_{q-j}^{Q4} \cdot RET_{i,q-j} \times Q4_{i,q-j} + \epsilon_{i,q} \quad \text{(A2)}$$

where $Q_{i,q}$ is quarterly earnings reported by firm i in quarter q, $RET_{i,q}$ is the cumulative quarterly stock returns over the period from two days after the quarter q-1 earnings announcement to the day after quarter q earnings announcement for firm i, $Q1_{i,q}$ ($Q4_{i,q}$) is an indicator variable equal to one if $RET_{i,q}$ belongs to the first (fourth) fiscal quarter of firm i and zero otherwise, and $P_{i,q}$ is stock price for firm i at the end of quarter q.

	(1)		(2)	
Dep. Var.:	***E (quarterly)***		***E (quarterly)***	
	coef	t-stat	coef	t-stat
RET (q)	0.023	27.63	0.024	19.06
RET (q-1)	0.026	22.23	0.032	32.45
RET (q-2)	0.028	23.71	0.031	31.95
RET (q-3)	0.026	31.05	0.027	31.84
RET (q-4)	0.020	31.11	0.022	26.49
RET (q-5)	0.011	18.03	0.016	18.61
RET (q-6)	0.009	14.79	0.010	12.29
RET (q-7)	0.006	10.73	0.006	8.09
RET (q-8)	0.005	7.70	0.007	9.06
RET (q)***Q1** (q)			-0.001	-0.69
RET (q)***Q4** (q)			0.000	0.12
RET (q-1)***Q1** (q-1)			-0.002	-1.38
RET (q-1)***Q4** (q-1)			-0.018	-8.11
RET (q-2)***Q1** (q-2)			0.003	1.63
RET (q-2)***Q4** (q-2)			-0.010	-4.15
RET (q-3)***Q1** (q-3)			0.002	1.35
RET (q-3)***Q4** (q-3)			-0.006	-3.42
RET (q-4)***Q1** (q-4)			-0.001	-1.07
RET (q-4)***Q4** (q-4)			-0.004	-2.43
RET (q-5)***Q1** (q-5)			-0.001	-0.81
RET (q-5)***Q4** (q-5)			-0.012	-10.02
RET (q-6)***Q1** (q-6)			0.002	1.35
RET (q-6)***Q4** (q-6)			-0.005	-3.98
RET (q-7)***Q1** (q-7)			0.002	1.24
RET (q-7)***Q4** (q-7)			-0.002	-1.59
RET (q-8)***Q1** (q-8)			0.001	1.18
RET (q-8)***Q4** (q-8)			-0.007	-4.71
N	185,835		185,835	
Adj. R^2	10.69%		11.26%	

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