The Earnings Announcement Return Cycle*

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Abstract

Stocks earn significantly negative abnormal returns before earnings announcements and positive after them. This "earnings announcement return cycle" (EARC) is unrelated to the earnings announcement premium, and it is a feature of stocks *widely* covered by analysts. Analysts' forecasts follow the same pattern as returns: analysts' forecasts become more optimistic after an earnings announcement and more pessimistic as the next one draws near. We attribute one-half of the earnings announcement return cycle to this optimism cycle. The EARC may stem from mispricing: both the return and optimism patterns are stronger among high-uncertainty and difficult-to-arbitrage stocks, and the EARC strategy is more profitable on days when it would accommodate larger amounts of arbitrage capital.

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1 Introduction

Many return anomalies relate to earnings announcements. Stock prices tend to move in the direction of recent earnings surprises[1] and returns are higher in the months in which firms report earnings than in those they do not.[2] So and Wang (2014) and Engelberg, McLean, and Pontiff (2018b) find that earnings announcements amplify anomaly returns by a factor of six or seven. Kim and So (2018) show that firms earn low returns before, and high returns during, earnings announcements because firms typically manage expectations down before the announcements. The competing explanations for price patterns such as these relate to risk, mispricing, and illiquidity. In this paper we present new evidence that suggests that biases in investors' expectations generate return predictability around earnings announcements.

We first document a new stock return regularity, the earnings announcement return cycle (EARC). The term "cycle" refers to the period between two consecutive quarterly earnings announcements. We show that stocks widely followed by analysts earn positive abnormal returns early in the cycle and negative returns late in the cycle. This pattern is distinct from the earnings announcement premium, that is, the tendency of stocks to earn high returns around their earnings announcements. Our trading rule is neither long nor short stocks around the earnings announcement dates themselves.

Figure 1 illustrates our key result. We center the graph around a quarterly earnings announcement and plot (1) the average market-adjusted returns (solid line) and (2) the percentage of positive forecast revisions by analysts (dashed line) for a six-month period around this date. The sample includes U.S. common stocks followed by at least five analysts. The x-axis counts trading days. The vertical line at $t = -63$ is the typical date of the previous earnings announcement; the line at $t = 0$ is the current announcement; and the line at $t = 63$ is the expected date of the next announcement.

Figure 1 shows that, apart from the earnings announcement premium period, which we define as running from two weeks before an announcement to a week after it, stocks continue to outperform the market by about three basis points per day for the remainder of the first month. After this point,

[1]See, for example, Ball and Brown (1968), Beaver (1968), Foster, Olsen, and Shevlin (1984), Bernard and Thomas (1989, 1990), and Daniel, Hirshleifer, and Subrahmanyam (1998).

[2]See, for example, Chari, Jagannathan, and Ofer (1988), Ball and Kothari (1991), Cohen, Dey, Lys, and Sunder (2007), Frazzini and Lamont (2007), Barber, De George, Lehavy, and Trueman (2013) and Savor and Wilson (2016).

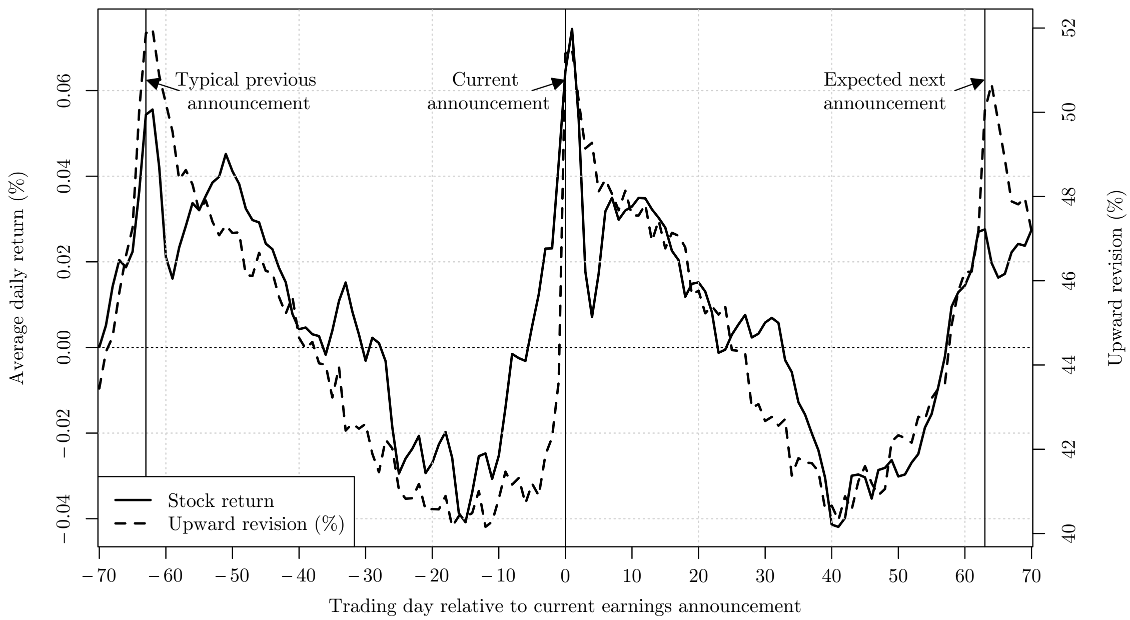


Figure 1: **Earnings announcement return cycle and analyst optimism.** This figure plots the average daily market-adjusted return (solid line) and the percentage of positive forecast revisions by analysts (dashed line) for common stocks traded on the NYSE, Nasdaq and Amex for a six-month period centered around a firm's quarterly earnings announcement. The sample begins in January 1985 and ends in December 2016 and includes stocks covered by at least five analysts over the previous quarter. A stock's market-adjusted return is its return minus the equal-weighted market return; we report three-day moving averages of these returns. The vertical line at $t = -63$ is the typical date of the previous earnings announcement; the line at $t = 0$ is the current announcement; and the line at $t = 63$ is the expected date of the next announcement.

they go on to earn the market premium for about six weeks before beginning to underperform the market by two to three basis points per day for about a month as the next earnings announcement draws close.[3]

Both the positive returns in the early phase and the negative returns in the late phase are statistically significant. A long-short strategy that buys stocks in the early phase (excluding the earnings announcement period) and sells those in the late phase earns a monthly four-factor model alpha of 71 basis points (t-value = 6.02). This alpha remains at 68 basis points (t-value = 5.89) when we also include the earnings announcement premium factor that is long stocks inside the earnings announcement window and short those outside it.

We apply a bootstrapping procedure in the spirit of White (2000) and Stambaugh, Yu, and Yuan (2014) to verify that the earnings announcement return cycle is unlikely an artifact of data-

[3]The two cycles in Figure 1—the one before the current announcement at date $t = 0$ and the one after it—are not identical because we have a limited number of earnings announcements for each firm and because firms do not always announce their earnings exactly every 63 trading days. The two cycles in the figure slightly differ because each firm's first quarterly announcement in the sample can only appear on the left-hand side of the graph and the last one can only appear on its right-hand side.

mining. The actual EARC strategy is long stocks in the early part of the cycle and short those in the late part. We generate 100,000 strategies that resample the positions of this strategy without replacement. That is, whereas the original strategy has positions $L, L, L, \ldots, S, S, S$ over a combined 30-day period over the earnings cycle—where L and S stand for long and short positions—one of the randomized strategies might take positions $L, S, S, \ldots, L, S, L$. By bootstrapping without replacement, both the actual and bootstrapped strategies are long and short each stock the same number of days in the cycle. If the earnings announcement return cycle was an artifact of data-mining, we would expect a number of the randomized trading rules to outperform the actual rule. The data do not support to this view; only 0.004% of the randomized strategies outperform the actual EARC strategy.

What is remarkable in Figure 1 is the synchronization between the average returns and analysts' forecast revisions. During the earnings announcement periods, the majority of earnings forecast revisions are positive. This percentage, however, promptly falls below 50% and reaches a low point of 37% eight weeks after the announcement. This low point coincides with the period during which stocks earn their lowest returns during the cycle. As the next earnings announcement draws closer, the proportion of positive forecast revisions begins to increase.

To explain a periodic pattern in stock returns, such as the earnings announcement return cycle, the drivers of this pattern must also be periodic. Figure 1 suggests that the analyst optimism cycle may be a key driver of the pattern in average returns. We measure the connection between the patterns in average returns and forecast revisions using a counterfactual portfolio approach. In this test we contrast the EARC strategy with a modified strategy that excludes stock-days associated with analyst forecast revisions or recommendation changes. That is, when an analyst revises his forecast or recommendation, we remove the target stock from the long and short portfolios for a three-day window around this event. The counterfactual portfolio's monthly alpha of 38 basis points (t-value = 3.22) is 55% of the original alpha of 68 basis points (t-value = 6.10). The difference between the two is statistically significant with a t-value of 5.81. The EARC strategy therefore earns approximately one-half of its returns by being long or short in stocks when analysts revise their forecasts or recommendations.

This test does not establish causality from forecast revisions to returns; both the returns and forecasts may respond to the same omitted variable.[4] An unusual property of the earnings announcement return cycle, however, is important to bear in mind. An investor can capture the EARC effect by using information only on the distance from the previous earnings announcement; it uses no information on realized earnings or analyst forecasts. Our counterfactual portfolio approach shows that, whatever mechanism generates the profits of the EARC strategy, an investor earns one-half of these profits exactly when analysts revise their forecasts or recommendations. We interpret these results as suggesting that the optimism cycle is an important factor of the earnings announcement return cycle. This statement holds without taking any stance on the causality between analyst actions and returns.

Our results confirm the key findings of Kim and So (2018). Stock returns are low before announcements, and these low returns seem to stem from changes in expectations. The actual EARC strategy earns a daily alpha of -0.73 basis points before an earnings announcement, but the counterfactual strategy that excludes analyst-days has an alpha of 0.63 basis points. The difference between the two alphas has a t-value of -7.44, indicating that the forecast-revision days explain all of the low pre-announcement returns. This difference is consistent with Kim and So's (2018) suggestion that firms guide market expectations down before announcements. Our estimates show that when firms do not do so, and analysts do not revise their forecasts, firms earn high returns before announcements.

Although forecast revisions explain all of the negative returns before announcements, they do not explain why returns are high after firms have announced their earnings. Analyst actions explain only between 4% and 14% of the high post-announcement returns. That is, analysts explain all of the low returns before announcements but almost none of the high returns after announcements. The mechanism that drives stock prices up for weeks after announcements must therefore be different from the one that drives them down before the announcements. If this part of the cycle is about changing expectations, analysts do not appear to share the same expectations as those who set the prices. Moreover, the fact that stocks earn significantly positive abnormal returns for a long time after firms have announced their earnings casts some uncertainty on the risk-based explanations[5] for this part of the cycle. Because these firms have already announced their earnings, these returns

[4] Bradley, Clarke, Lee, and Ornthanalai (2014) use intraday data on analyst forecast revisions to suggest that the association between revisions and stock returns is causal; they show that stock returns move in response to forecast revisions.

[5] See, for example, Savor and Wilson (2016).

cannot be due to non-announcing firms being riskier at times they are expected to announce their earnings.

If the earnings announcement return cycle is about mispricing, the literature provides guidance on when this pattern should be weaker or stronger. Hirshleifer (2001) and Daniel, Hirshleifer, and Subrahmanyam (1998, 2001), for example, suggest that behavioral biases should be more pronounced when uncertainty is high. Uncertainty, in the context of the earnings announcement return cycle, should change almost deterministically; market participants' uncertainty about a firm's next-quarter earnings should decrease over time as investors acquire more information. Overoptimism, if any, should therefore be the most pronounced when the next earnings announcement is as far in the future as possible. Figure 1 is consistent with this prediction. Analysts tend to be the most optimistic at the beginning of the earnings cycle and become less so over time.

Both the earnings announcement return cycle and the pattern in analysts' forecasts are more pronounced among high-uncertainty stocks, as measured by size, age, idiosyncratic volatility, and cash-flow volatility. The EARC strategy earns a monthly four-factor model alpha of 147 basis points (t-value = 4.34) among firms in the top-uncertainty quintile; among the low-uncertainty stocks, this strategy's alpha is 35 basis points is not statistically different from zero. We also find that the EARC pattern is more pronounced among unprofitable growth firms. This finding is consistent with Baker and Wurgler (2006), who suggest that variation in investor sentiment has a greater effect on the prices of unprofitable growth firms. Taken together, our results suggest that the cyclical pattern in returns around earnings announcements may stem from mispricing.

The earnings announcement return cycle is unlikely to emanate from systematic risk factors. The EARC strategy is long and short the same stocks but at different times; it is long a stock after an earnings announcement and short as the next announcement draws close. For a risk-based explanation to apply, firms' systematic risks would therefore need to vary significantly based solely on the amount of time that has passed after the previous earnings announcement. An analysis of how the EARC varies between firms with low and high analyst coverage also provides a test of the risk-based explanation. Under the risk story, the EARC should not depend on the level of analyst coverage—the behavior of analysts should be unrelated to the risk dynamics. In the data, however, the EARC pattern is absent among stocks with low analyst coverage.

If the EARC is due to mispricing, why it not arbitraged away? One possibility is the difficulty in arbitraging away this form of mispricing. To capture the abnormal returns associated with the earnings announcement cycle, an investor would have to switch between long and short positions in individual stocks on almost a daily basis. Moreover, the amount of capital that this trade could accommodate varies significantly as well: the number of firms announcing their earnings ranges from 0 to over 180 per day over our sample. If a fund has a fixed amount of capital allocated to this strategy, it might fully correct mispricing when only a few firms announce earnings. However, when hundreds of firms announce, the fund may have no meaningful impact on mispricing due to limited capital (Shleifer and Vishny, 1997). Conversely, if the fund has enough capital to fully eliminate mispricing even at the height of the earnings season, it would have large amounts of idle capital at times when only a few firms announce earnings; this idle capital, in turn, would lower the fund's average return on capital and render the trade unattractive.

This limits-to-arbitrage argument implies that the abnormal return associated with the earnings announcement cycle strategy should be higher among firms that announce their earnings on days when many others do so as well. Consistent with this prediction, we show that the abnormal returns are 30% to 70% higher in event-time than in calendar-time. That is, the average returns are higher when the strategy holds more stocks—but these are also the days when the would-be arbitrageurs would need to commit more capital.[6]

Two studies closely relate to ours. Grinblatt, Jostova, and Philipov (2016) show that a predictable component in analysts' optimism forecasts the cross section of stock returns. Our results suggest that the dynamics of investors' biases lead to a cyclical pattern in stock returns, the earnings announcement return cycle. An investor can capture the return associated with the earnings announcement cycle without directly conditioning on, for example, analyst optimism—they only need to condition on the amount of time that has elapsed since the previous earnings announcement. Kim and So (2018) examine the link between stock returns and management guidance. Our results are consistent with their findings on low returns before firms announce their earnings, and the fact that these returns seem to stem from managers guiding market expectations down. We show that firms earn significantly positive abnormal returns for weeks after announcing their earnings, and that analyst actions cannot explain this part of the pattern.

[6] Savor and Wilson (2016) find the opposite result for the earnings announcement premium: the earnings announcement premium is lower when more firms announce their earnings. This discrepancy further suggests that the earnings announcement premium is disconnected from the earnings announcement return cycle.

2 Data

We use data from four sources:

1. **Monthly and daily CRSP**: monthly and daily stocks returns, industry classifications, and the number of shares outstanding.
2. **Annual and quarterly Compustat**: book value of equity, operating profitability, and quarterly earnings announcement dates.
3. **Thomson Reuters I/B/E/S**: analyst coverage, annual earnings forecasts, quarterly earnings forecasts at one- to four-quarter horizons, and recommendations.
4. **Ravenpack**: news and media coverage data.

In our main tests we include firms covered by at least five analysts. We measure analyst coverage at the time of each earnings announcement by counting the number of analysts in the I/B/E/S detail file who issued at least one annual earnings forecast over the three-month period prior to the earnings announcement.

We limit the sample to the common stock of U.S. firms listed on the NYSE, AMEX, and Nasdaq. We drop all firm-quarters with missing quarterly earnings announcement dates. We identify earnings announcement dates using the *rdq* variable in the quarterly Compustat. We also require firms to have, at the time of an earnings announcement, at least four earnings announcement dates over the prior 400-calendar day period and the gap to the last earnings announcement to be between 70 and 110 calendar days. These screens ensure that our sample includes firms that have followed, up to the current announcement, regular schedules in reporting quarterly earnings. Our sample period runs from January 1985 to December 2016. Data limitations determine the starting data; analyst coverage is sparse before 1985. The media coverage data start in 2001.

Table 1 shows the descriptive statistics for the main sample and compares this sample to firms not widely covered by analysts. The unit of observation is a firm-earnings announcement pair. The statistics we report are time-series averages of quarterly cross-sectional statistics; the average size of $7.4 billion, for example, is the size of the average firm in the average quarter.

A comparison between the main sample and the excluded firms shows that the sample firms (1) are significantly larger by market value; (2) have lower book-to-market ratios; (3) are more profitable; (4) are more likely to pay dividends; and (5) receive greater amounts of media coverage.

The main sample includes approximately 25% of the total number of CRSP stocks and 74% of the total market capitalization.

Panel B summarizes the key variables related to analysts' forecasts and recommendations. "Number of analysts" is the number of analysts that issued forecasts in the previous quarter; the sample includes firms covered by at least five analysts. The average firm in the sample is covered by 10.6 analysts. We compute the other analyst variables using data between two consecutive earnings announcements; we exclude the earnings announcement period itself and consider forecasts and recommendations issued between two and ten weeks after the most recent quarterly earnings announcement. Analysts issue 6.1 forecast revisions and 0.6 recommendation changes for the average firm during this period.[7] A breakdown into positive and negative changes shows that downward forecast revisions outnumber upward revisions at 3.6 to 2.5. This pattern is consistent with analysts being, on average, initially too optimistic (Ertimur et al., 2011). Analysts' recommendation changes, by contrast, are evenly split between upgrades and downgrades.

3 Empirical results

3.1 The earnings announcement return cycle

We use the term "earnings announcement return cycle" to refer to the pattern in average stock returns between two consecutive quarterly earnings announcements, excluding the periods immediately around earnings announcements. Figure 2 illustrates this cycle by plotting the average market-adjusted buy-and-hold returns around earnings announcements. These estimates correspond to those reported in Figure 1 except that here we measure *cumulative returns*. We begin computing returns two weeks before an earnings announcement and end the computation 13 weeks after the announcement. This period covers the expected gap between consecutive earnings announcements; the typical gap is $t = 63$ trading days.

Figure 2 shows the earnings announcement premium. The average stock outperforms the market by 20 basis points over the period from two weeks prior to an earnings announcement to a week after it. Following this earnings announcement period, stocks continue to outperform the market

[7] The data on stock recommendations become available in late 1993; Malmendier and Shanthikumar (2014), however, show that these data are not reliable prior to February 1994. We therefore use post-February 1994 data to compute the statistics associated with analyst recommendations.

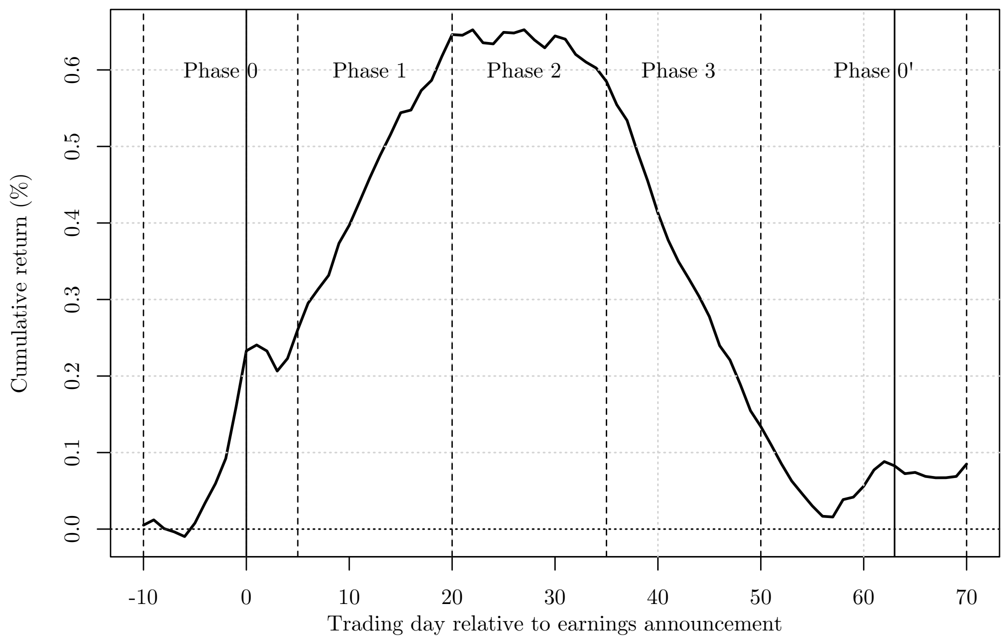


Figure 2: **Earnings announcement return cycle: Cumulative market-adjusted returns.** This figure shows the average cumulative market-adjusted buy-and-hold returns between two consecutive quarterly earnings announcements. The sample includes common stocks traded on the NYSE, Nasdaq and Amex. A stock is included if it is covered by at least five analysts over a three-month period prior to the current earnings announcement. The sample begins in January 1985 and ends in December 2016. We begin computing returns two weeks ($t = -10$) before an earnings announcement and end the computation 13 weeks ($t = 70$) after the announcement. A stock's market-adjusted buy-and-hold return for a stock-earnings announcement pair i at time T is

$$\text{Buy-and-hold return}_{i,T} = \prod_{t=-10}^{T} (1 + r_{i,t}) - \prod_{t=-10}^{T} (1 + r_{m,t}),$$

where $r_{i,t}$ is stock i's return on day t relative to the announcement and $r_{m,t}$ is the equal-weighted market return on the same day.

for three more weeks. At the peak between two consecutive earnings announcements, firms are valued 0.65% higher relative to the week before the earnings announcement. After this point, stock prices remain flat relative to the market for about two to three weeks before starting their decline relative to the market.

Table 2 examines the performance of a long-short strategy that captures the earnings announcement return cycle. This strategy is long stocks that announced their earnings one to four weeks ago; we label this period as "Phase 1" in Figure 2. It is short stocks that announced their earnings seven to ten weeks ago; this period is "Phase 3" in the figure. We consider an equal-weighted strategy that is rebalanced daily; we later partition the sample by firm size.

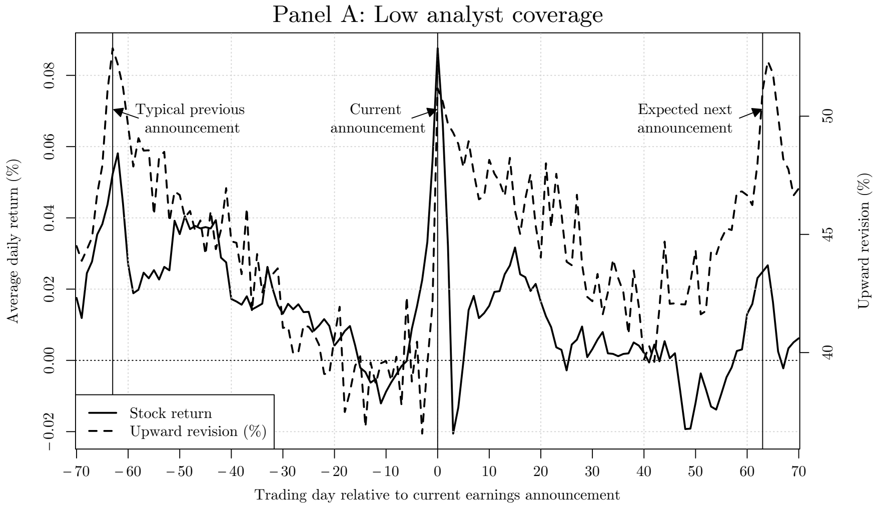
We regress the excess returns of the long- and short-portfolios and those of the long-short strategy against the CAPM, the four-factor model (Carhart, 1997), and a five-factor model that adds the earnings announcement premium (EAP) factor to the four-factor model. The earnings announcement premium factor is long stocks from two weeks before an earnings announcement to a week after it—this period is labeled "Phase 0" in Figure 2—and short stocks outside this window. In constructing this factor, we either forecast the date of the next earnings announcement ("real-time EAP") or assume that investors know the date of the next earnings announcement at least two weeks prior to it ("perfect-foresight EAP"). In forecast the next earnings announcement, we expect firms to announce their quarterly earnings on the same weekday as they did a year ago.

The results in Table 2 show that the alphas are significantly different from zero in all factor models. The long-short portfolio earns a CAPM alpha of 3.3 basis points (t-value = 5.95) per day; the four-factor model alpha is 3.4 basis points (t-value = 6.12). Because the earnings announcement return cycle strategy takes long and short positions in stocks outside the earnings announcement period, its correlation with the earnings announcement premium is economically small. In the five-factor models that include one of the earnings announcement premium factors, the t-values associated with alphas are 6.04 (real-time EAP) and 5.89 (perfect-foresight EAP).

3.1.1 Limited analyst coverage and the earnings announcement return cycle

Our main sample consists of firms covered by at least five analysts over a 30-day period before the current earnings announcement. Figure 3 shows the earnings announcement return cycle for firms with limited analyst coverage. We retain all the other filters—such as those relating to the number of earnings announcements over the prior 400-calendar day period—but limit the sample to firms that were covered by at least one but no more than four analysts over the prior quarter (Panel A) or those that were not covered by any analyst (Panel B). Figure 3 is the same as Figure 1 except for changing this analyst-coverage requirement.

Figure 3 shows that the earnings announcement return cycle is largely absent among low-coverage firms and firms with no analyst coverage. These findings show that the earnings announcement return cycle behaves differently from many other anomalies, such as momentum, which are stronger for firms with low analyst coverage Hong et al. (2000). At the same time, these results appear to support the mispricing interpretation. Engelberg, McLean, and Pontiff (2018a), for example, suggest that investors who follow analysts' price targets and recommendations may contribute to mispricing. If so, the earnings announcement return cycle may be stronger among



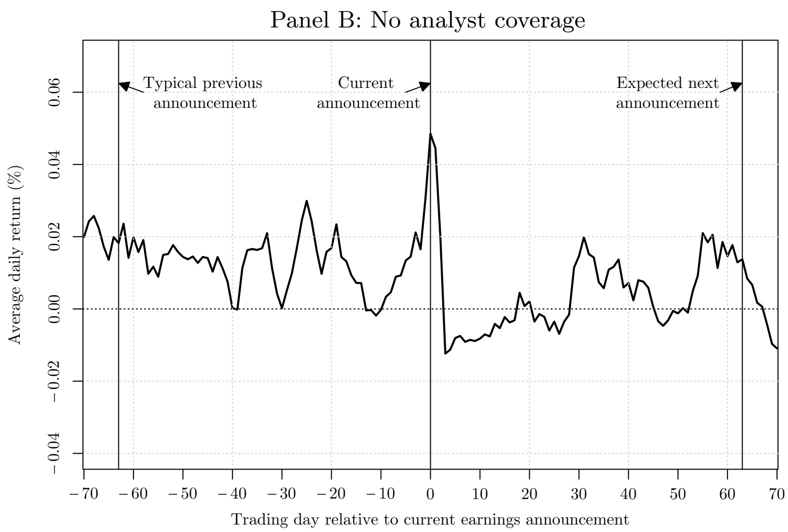


Figure 3: **Earnings announcement return cycle for firms with limited or no analyst coverage.** This figure plots the average daily market-adjusted return (solid line) and the percentage of positive forecast revisions by analysts (dashed line) for common stocks traded on the NYSE, Nasdaq and Amex for a six-month period centered around a firm's quarterly earnings announcement. This figure is the same as Figure 1 except that it only includes stocks covered by at least one but no more than four analysts (Panel A) or those not covered by any analyst (Panel B); the sample in Figure 1 consists of stocks covered by at least five analysts.

stocks widely covered by analysts because a larger number of analysts reaches a larger pool of investors.

3.1.2 Data-mining and the earnings announcement return cycle

The actual earnings announcement return cycle strategy is long each stock for a 15-day period from one week after an earnings announcement to four weeks after it; it is short the same stock for another 15-day period from seven weeks after the announcement to ten weeks after it. A concern

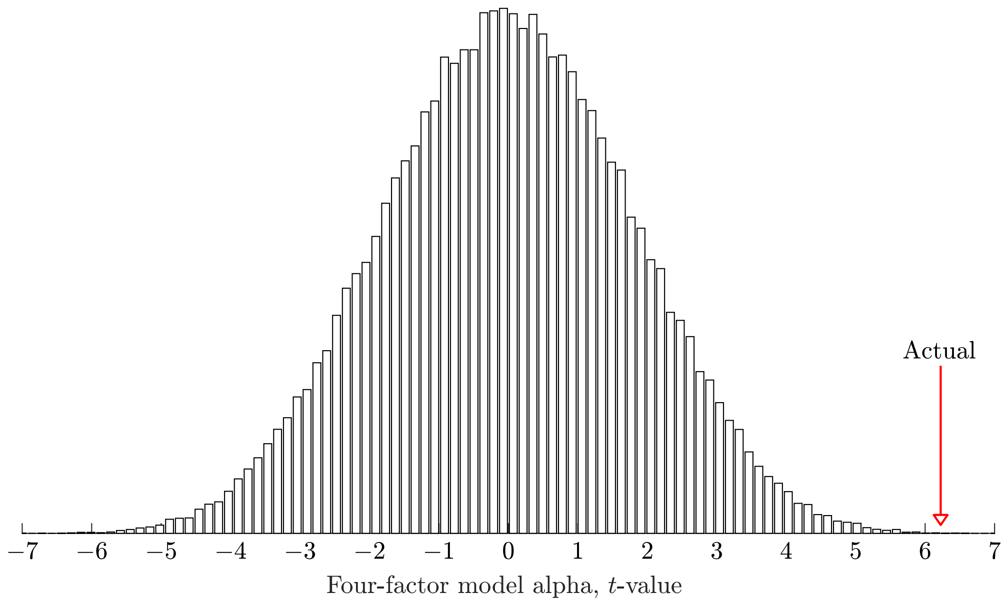


Figure 4: **Bootstrapped distribution of t-values associated four-factor model alphas.** The actual earnings announcement return cycle strategy is long stocks that announced quarterly earnings between one and four weeks ago and short stocks that announced earnings between seven and ten weeks ago. The strategy is therefore long each stock for 15 days and short another 15 days. In this figure we construct 100,000 strategies that randomly choose which days, over the combined 30-day window, to be long or short. We estimate the daily four-factor model regression for each strategy and record the t-values associated with the alphas. This figure plots the distribution of these bootstrapped t-values. The red arrow at t-value $= 6.22$ denotes the t-value associated with the actual earnings announcement return cycle strategy.

about the profitability of this trading rule is that it might be due to luck; if we were to try enough many trading rules similar to this strategy, we might expect to find many others that display comparable or even better performance. In Figure 4 we address this concern by comparing the performance of the actual strategy to a large number of alternative trading rules.

We construct 100,000 trading rules that randomly choose when to be long and short each stock. We can characterize the actual strategy as a 30-element sequence $L, L, L, \ldots, S, S, S$ over the earnings cycle, where L and S stand for long and short positions. We generate each randomized strategy by reordering this sequence so that the strategy is still short and long each stock for 15 days each. We compute the daily return series associated with each randomized strategy, estimate the four-factor model regression, and record the t-value associated with the alpha. A comparison of t-values is appropriate; these t-values are proportional to the strategies' information ratios, that is, their alphas divided by the standard deviation of the residuals.

Figure 4 shows the bootstrapped distribution of the t-values. By the virtues of randomization

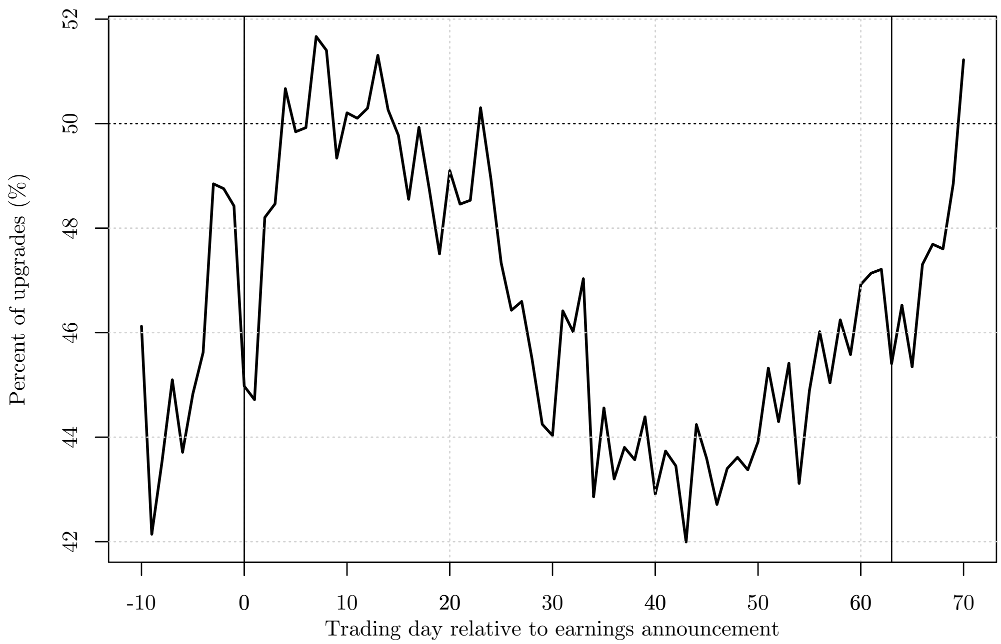


Figure 5: **The proportion of analyst recommendation upgrades around earnings announcements.** This figure shows the average proportion of analysts' stock recommendation upgrades from two weeks before an earnings announcement to 13 weeks after it. The proportion of upgrades is the total number of upgrades across all stocks divided by the total number of recommendation changes.

and for being long and short each stock for the same number of days, the mean of this distribution is close to zero at t-value $= -0.01$. The actual strategy's t-value of 6.22 stands out as an outlier; the 99.9th percentile of the bootstrapped distribution, for example, lies at 5.19. Indeed, just 0.004% of the 100,000 bootstrapped strategies return t-values that exceed that of the actual strategy. This estimate of 0.004% is also the bootstrapped p-value associated with the actual strategy; it suggests that it would improbable to identify a trading rule as profitable as the earnings announcement return cycle by luck.

3.2 Analysts' optimism cycle

The pattern in average returns around earnings announcements aligns with those in analysts' forecast revisions and recommendation changes. Figure 1 shows that, as measured by the fraction of positive forecast revisions, analysts are the most optimistic around and immediately following an earnings announcement; they are the most pessimistic close to the midpoint between two earnings announcements. Figure 5 is similar to Figure 1 except that it shows the fraction of analyst recommendation upgrades. The resulting pattern is similar to that in forecast revisions. After an earnings announcement, approximately 50% of all recommendation changes are upgrades; before the next earnings announcement, this fraction is just 44%. Figures 1 and 5 show that there is a predictable *unconditional* difference in analyst behavior that depends only on the distance from the firm's previous earnings announcement, and that this pattern aligns with a similar pattern in average returns.

In Table 3 we report estimates from panel regressions to assess the economic magnitude of the patterns shown in Figures 1 and 5. The dependent variable is either the proportion of positive forecast changes or recommendation upgrades ("Proportion") or an indicator variable that takes the value of one if the number of positive changes exceeds the number of negative changes and zero otherwise ("Up − Down"). We again exclude from the analysis all forecasts and recommendations issued around earnings announcement, and consider the period that runs from one week after an announcement to 13 weeks after it. The main regressors in Table 3 are indicator variables for Phases 1 and 3. Phase 1 is the three-week period from one week after an earnings announcement to four weeks after it; Phase 3 is the three-week period from seven weeks after an announcement to ten weeks after it. The period in the middle, Phase 2, is the omitted category. We include in the regressions firm-earnings announcement fixed effects; we therefore identify differences in analyst behavior from within-earnings announcement time-series variation alone.

Table 3 shows that, relative to the period in the middle of two earnings announcements, the proportion of positive forecast revisions is 3.5% higher (t-value = 7.67) immediately after earnings announcements and 2.4% lower (t-value = −5.59) as the next earnings announcement draws close. The results for recommendation changes are similar albeit weaker. In the regression in with indicator variables, the t-values associated with the two indicator variables are 2.12 and −2.16. Both the average return (Table 2) and optimism patterns (Table 3) are therefore statistically significant.

3.3 Measuring the association between the EARC and optimism: The counterfactual portfolio methodology

We use a counterfactual portfolio methodology to measure the association between the earnings announcement return cycle and the analyst optimism pattern. This methodology measures how much of the earnings announcement return cycle can be attributed to days surrounding analyst actions. In this analysis we create an alternative (counterfactual) strategy that removes all stock-days in the vicinity of analysts' forecast revisions and recommendation changes. If the actual strategy is long or short a stock in the vicinity of an analyst event, we remove this position from the portfolios. We then measure the return difference between the actual and counterfactual strategies. If this difference is small, the excluded set of events are not important in generating the profits of the anomaly; if the difference is large, a large proportion of the anomaly profits derives from these events.[8]

This methodology is well-suited for assessing the extent to which a strategy derives its alpha from the excluded set of events. Suppose that the strategy's alpha is unrelated to the analyst events, and that the strategy derives its alpha from the differential exposures that the long and short legs have to some factors. In our computation, we, in effect, replace an excluded stock's actual return with the cross-sectional average of the other stocks. If the events do not correlate with risk exposures—that is, that a stock's HML beta, for example, is not higher or lower on days analysts issue revised forecasts—then the excluded stock's expected return is equal to this average plus measurement error. The actual strategy's average return should then be close to that of the counterfactual strategy; after all, under the null, we merely drop a handful of random stocks from the portfolios that still remain well-diversified.

Assuming that the returns on the actual and counterfactual strategies follow factor structures, these processes can be written as:

$$r_t^{\text{actual}} = \alpha_t^{\text{actual}} + \boldsymbol{\beta}^{\text{actual}}\mathbf{F}_t + e_t^{\text{actual}}, \tag{1}$$

$$r_t^{\text{cf}} = \alpha_t^{\text{cf}} + \boldsymbol{\beta}^{\text{cf}}\mathbf{F}_t + e_t^{\text{cf}}, \tag{2}$$

where $\boldsymbol{\beta}^{\text{actual}}$ and $\boldsymbol{\beta}^{\text{cf}}$ are $1 \times K$ vectors of factor loadings and $\mathbf{F}_t$ is a $K \times 1$ vector of factor returns. Our tests are about the difference in the strategy returns,

$$r_t^{\text{actual}} - r_t^{\text{cf}} = \left(\alpha_t^{\text{actual}} - \alpha_t^{\text{cf}}\right) + \left(\boldsymbol{\beta}^{\text{actual}} - \boldsymbol{\beta}^{\text{cf}}\right)\mathbf{F}_t + \left(e_t^{\text{actual}} - e_t^{\text{cf}}\right). \tag{3}$$

Under the null hypothesis that the strategy's alpha is unrelated to the excluded events, $\alpha_t^{\text{actual}} - \alpha_t^{\text{cf}} \approx 0$. Moreover, if the factor loadings also are unrelated to the events—that is, they are not

[8] This analysis is similar to that in Engelberg, McLean, and Pontiff (2018b), who measure differences in anomaly returns between news and no-news days. Our methodology is the same in spirit, but we implement it by comparing the returns on two strategies.

different on analyst and non-analyst days—then $|\boldsymbol{\beta}^{\text{actual}} - \boldsymbol{\beta}^{\text{cf}}| \approx \mathbf{0}$. A time-series regression of the difference between the actual and counterfactual strategy returns against factors therefore measures the extent to which the actual strategy's alpha stems from the excluded events, and the extent to which factor loadings vary between days when analysts revise their forecasts and non-analyst days.

Table 4 reports estimates from time-series regressions that compare the actual strategy to the counterfactual strategy. We estimate five-factor model regressions that include the earnings announcement premium factor. Panel A defines an analyst event as a forecast change; that is, when an analyst revises his forecast, we remove the stock from the long and short portfolios, when applicable, for a three-day window around this event. If an analyst, for example, issues a forecast revision about a stock in the long-portfolio on May 5, 2005, we replace this stock's return from May 4 to May 6, 2005 with the average return on the other stocks in the long portfolio on these three days. We use a three-day window to ensure that the window captures the effects of the forecast revision even if the forecast is issued after-hours. One-fifth of stocks that are either on the long or short side of the actual strategy experience at least one forecast revision on a typical day.

Panel A shows that the actual long-short strategy that trades the earnings announcement return cycle earns a daily alpha of 3.2 basis points (t-value $= 5.89$). The estimates for the "counterfactual" long-short strategy show that this alpha falls to 1.8 basis points (t-value $= 3.22$) when we remove stocks from the portfolios around analyst forecast revisions. This reduction of 45% in the point estimates is statistically significant; the rightmost column shows that the alpha of the difference between the actual and counterfactual long-short strategies has a t-value of 5.81.

The decomposition of the long-short strategy in the other columns shows that the removal of analyst events alters the returns on the short side significantly more than those on the long side. Whereas the alphas of the actual and counterfactual strategies are almost the same for the long portfolio—the difference of 0.08 basis points is less than one standard error away from zero—the alpha of the short side increases from -0.73 basis points per day to 0.63 basis points when we remove the analyst events. The earnings announcement return cycle strategy therefore derives a disproportionate amount of its profits by being short stocks on days when analysts lower their forecasts.

Panel B of Table 4 uses the post-1994 to examine the roles of both analyst forecast revisions and recommendation changes. When an analyst issues a revised forecast or a recommendation, we again remove the stock from the portfolios for a three-day window around this event. In this analysis the alpha associated with the long-short strategy falls from 3.4 basis points per day to 1.4, and this reduction of 58% is significant with a t-value of 6.34. Almost all of the reduction in alphas is again concentrated on the short side.

Table 4 provides no evidence to suggest that stocks' factor exposures vary significantly between days when analysts revise their forecasts and no-analyst days. The factor loadings in the three rightmost columns, both in Panel A and B, are all close to zero. Although analyst event contribute significant to alphas, they do not meaningfully alter the factor exposures.

3.4 Forecast revisions, recommendation changes, and stock returns after and before earnings announcements

Table 4 shows that analyst-days—that is, analysts' forecast revisions and recommendation changes—explain between 45% and 58% of the total earnings announcement return cycle. The importance of this mechanism, however, differs significant between the early and late parts of the cycle. Because the EARC strategy is long stocks that have recently announced their earnings and short those that are expected to announce their earnings, we can compare the long and short legs in Table 4 to assess the importance of analyst days.

Panel A of Table 4 shows that the actual EARC strategy earns a daily alpha of -0.73 basis points before an earnings announcement (column "short"). The counterfactual strategy that excludes analyst-days, however, has an alpha of 0.63 basis points, and the difference between the two alphas has a t-value of -7.44. The forecast-revision days therefore explain all of the low pre-announcement returns. This finding is consistent with the analysis of Kim and So (2018): stock returns are low before announcements, and these low returns seem to stem from changes in expectations.

Neither forecast revisions nor recommendation changes, however, explain why firms earn high returns well after they have announced their earnings. A comparison of the "long" column in Panel A of Table 4 shows that analyst forecast revisions explain only 4% of the high post-announcement returns; Panel B, which also excludes days with recommendation changes, moves this estimate up, but only to 14%. That is, the comparison of the "long" and "short" columns shows that analyst actions fully explain the low returns before firms announce earnings—but almost none of the high returns after they have done so.

In a supplementary analysis (Table A1 in the appendix), we follow Kim and So (2018) and, instead of measuring the analysts' effect of the earnings announcement return cycle, we examine the role of management guidance. Similar to Table 4, we construct a counterfactual strategy that excludes a three-day window for each stock around a day when the management issues guidance. The sample period in this analysis begins in January 2002, which is the start date of the guidance data. Consistent with Kim and So (2018), we find that management guidance alone explains a significant part of the returns in late part of the cycle. The alpha increases from -1.39 basis points per day to -0.58 when we exclude these days, and this change is statistically significant with a t-value of 4.64. At the same time, management guidance is unrelated to the significantly positive returns that firms earn in the early part of the cycle. The alpha falls from 1.56 to 1.49, and this change within one standard error from zero. Taken together, Tables 4 and A1 show that the actions taken neither by analysts nor the management can explain why stock prices drift up well after firms have disclosed their earnings to the public.

3.5 Cross-sectional variation in the earnings announcement return cycle

3.5.1 Analyst optimism by uncertainty and forecast horizon

Hirshleifer (2001) and Daniel, Hirshleifer, and Subrahmanyam (1998, 2001) suggest that if an anomaly stems from mispricing, it should be stronger in a high-uncertainty environment. Ackert and Athanassakos (1997) and Zhang (2006a) find empirical support for this conjecture; they show that the dispersion in analysts' forecasts positively correlates with analysts' optimism and underreaction to new information. We first test whether analyst optimism correlates with firm size, age, idiosyncratic volatility, and cash-flow volatility, which are the uncertainty measures used in Zhang (2006b). We then test whether these measures positively correlate with the earnings announcement return cycle.

Figure 6 shows that analyst optimism significantly varies by the amount of idiosyncratic volatility. We consider analysts' one- to four-quarter ahead forecasts. We report the cross-sectional median forecast error, which is defined as the difference between the analyst forecast and the actual quarterly earnings, divided by the closing stock price on the day of the previous earnings announcement. We assign firms into quintiles based on the standard deviation of the residuals from the four-factor

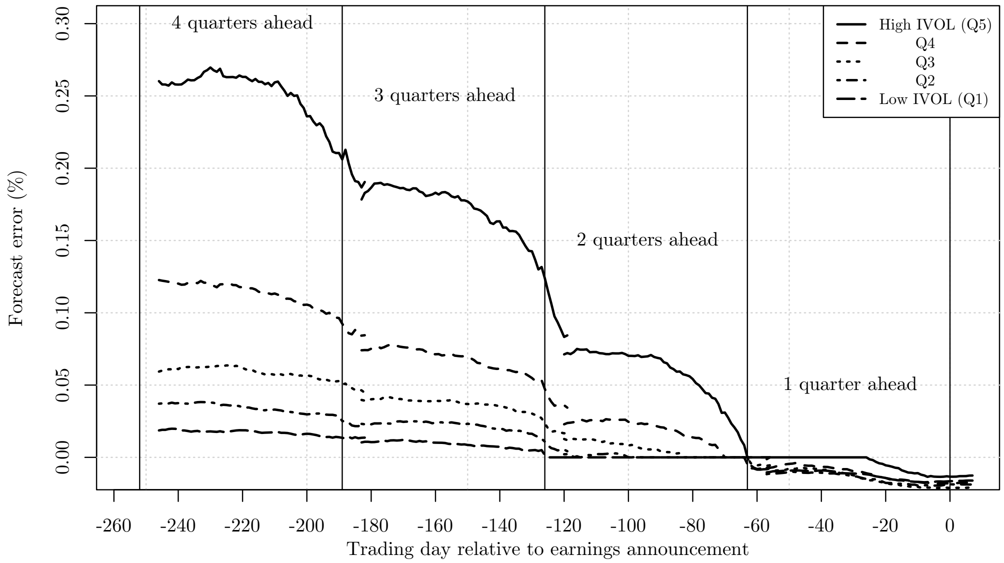


Figure 6: **Forecast optimism by forecast horizon and idiosyncratic volatility.** This figure plots median analyst forecast errors in event time around earnings announcements. We partition analysts' forecasts by forecast horizon (one to four quarters ahead) and stocks by idiosyncratic volatility quintile. Forecast error is the difference between the forecasted and actual quarterly earnings divided by the closing stock price on the day of the previous earnings announcement. Firm i's forecast error on day t is the last non-missing forecast error. Idiosyncratic volatility is the standard deviation of the residuals from the four-factor model (Carhart, 1997). We compute idiosyncratic volatility using one year of daily data. We update the idiosyncratic volatility measures and rebalance the corresponding quintiles at the end of each quarter. The vertical lines denote the dates of earnings announcement. The line to the left from each point is the date of the previous earnings announcement; the line to the right is the expected date of the next announcement. We assume that the gap between two consecutive quarterly earnings announcements is 63 trading days.

model (Carhart, 1997). We divide the graph into four regions to delineate between the four forecast horizons. The leftmost region, labeled "4 quarters ahead," shows how analysts' forecasts of quarter $q+4$ earnings change between quarter q and $q+1$ earnings announcements.

Two patterns stand out in Figure 6. First, analysts' optimism decreases from one earnings announcement to the next. Analysts are the most optimistic about quarter $q+4$ earnings, then about $q+3$ earnings, and so forth, and the amount of optimism decreases monotonically between earnings announcements. Second, analysts are significantly more optimistic about high-idiosyncratic volatility firms that those of low volatility. It is also among the high-idiosyncratic volatility firms that the analysts walk down their forecasts the most. Whereas analysts overestimate the four-quarters ahead earnings yield by over 0.25% among the high-idiosyncratic volatility firms, the median forecast error at this horizon is 0.02% among low-volatility firms. The average actual earnings yield in the sample is 0.88%, and so an error of 0.25% corresponds, in percentage terms, to analysts being overly optimistic about the earnings yield by 28%. Analysts are therefore excessively optimistic about these firms' future prospects by an economically significant margin. As the date of the actual earnings draws close—this is the "1 quarter ahead" region in Figure 6—analysts' median forecasts are consistently below the actual value. This reversal in expectations is consistent with the finding that management has incentives guide analysts down so that they can beat analyst estimates (Kim and So, 2018; Richardson et al., 2004).

Table 5 reports the correlation coefficients between analysts' next period optimism and lagged measures of uncertainty. We define two measures of analyst optimism. "Early optimism" is the difference between the analyst forecast of quarterly earnings and the actual earnings, divided by the closing stock price at the time of the previous earnings announcement. We average across the one to four quarters ahead forecasts, and measure optimism over the two-week period after the previous quarterly earnings announcement. "Optimism Walkdown" is the difference between "Early optimism" and "Late optimism," where late optimism is defined the same way as early optimism except that it is measured over a period from seven to ten weeks after the previous quarterly earnings announcement.

Table 5 shows that firm size, firm age, idiosyncratic volatility and cash-flow volatility all positively correlate with both early optimism and optimism walkdown. Firm size and idiosyncratic volatility are the strongest predictors; their correlations with early optimism and optimism walkdown are approximately 20 percent and 10 percent, respectively.

3.5.2 Uncertainty and the earnings announcement return cycle

Table 6 partitions the sample by firm-level uncertainty and reports daily four-factor model alphas for portfolios associated with the earnings announcement return cycle. We measure uncertainty either by firm size or by the first principal component of the four measures examined in Table 5: firm size, firm age, idiosyncratic volatility, and cash-flow volatility. We cross-sectionally standardize these four variables each quarter to be mean-zero with unit standard deviations before extracting the first principal component. The resulting principal component's weights on these four variables are:

$$\mathbf{w} = (w_{\text{firm size}}, w_{\text{firm age}}, w_{\text{ivol}}, w_{\text{cvol}}) = (-0.532, -0.461, 0.576, 0.415). \tag{4}$$

We compute this composite uncertainty measure for each firm-earnings announcement observation as the product of these weights and the standardized variables.

We sort stocks into quintiles at the end of each quarter and hold the assignments fixed over the following quarter. The long-portfolio again consists of stocks that announced their quarterly earnings between one and four weeks ago; those in the short-portfolio announced earnings between seven and ten weeks ago.

The alpha estimates in Table 6 show that the earnings announcement return cycle is stronger among high-uncertainty stocks. Using the first principal component to measure uncertainty, the first row shows that the alpha of the long-portfolio increases from 1.8 to 4.3 basis points from the bottom to the top quintile. A strategy that is long the top-uncertainty long-portfolio and short the bottom-uncertainty long-portfolio returns 2.7 basis points (t-value = 1.92). Short-portfolios display the same pattern. The alpha decreases from a statistically insignificant 0.3 basis points to -2.7 basis points from the low- to the high-uncertainty quintile, and the difference has a t-value of -2.10. The estimates for the long and short portfolios imply that the alpha associated with the long-short strategy must increase significantly as well; indeed, the "hedge" row shows that while the earnings announcement return cycle strategy has an alpha of 1.7 basis points (t-value = 1.63) per day among low-uncertainty stocks, this alpha is 7.0 basis points (t-value = 4.34) among the high-uncertainty stocks. The difference between the high- and low-uncertainty strategies is statistically significant with a t-value of 2.81.

The lower part of Table 6 sorts stocks into portfolios by the inverse of firm size. The estimates on the hedge-row show that the earnings announcement return cycle is more pronounced among the smaller stocks in the sample. In the two highest quintiles—which correspond to *smaller* firms—the alphas of the earnings announcement return cycle strategy have t-values of 4.56 and 5.61; among larger firms, the t-values range from 0.75 to 1.56. These estimates do not imply that the earnings announcement return cycle exists only among tiny stocks—our sample, after all, excludes stocks not widely covered by analysts. The descriptive statistics in Table 1 show that even the firm at the 25th percentile in our sample has a market value of $0.7 billion.

Figure 7 illustrates the relation between idiosyncratic volatility and the earnings announcement return cycle. Each line in this figure represents the average market-adjusted buy-and-hold return for an earnings announcement return cycle strategy. We assign stocks into quintiles at the end of

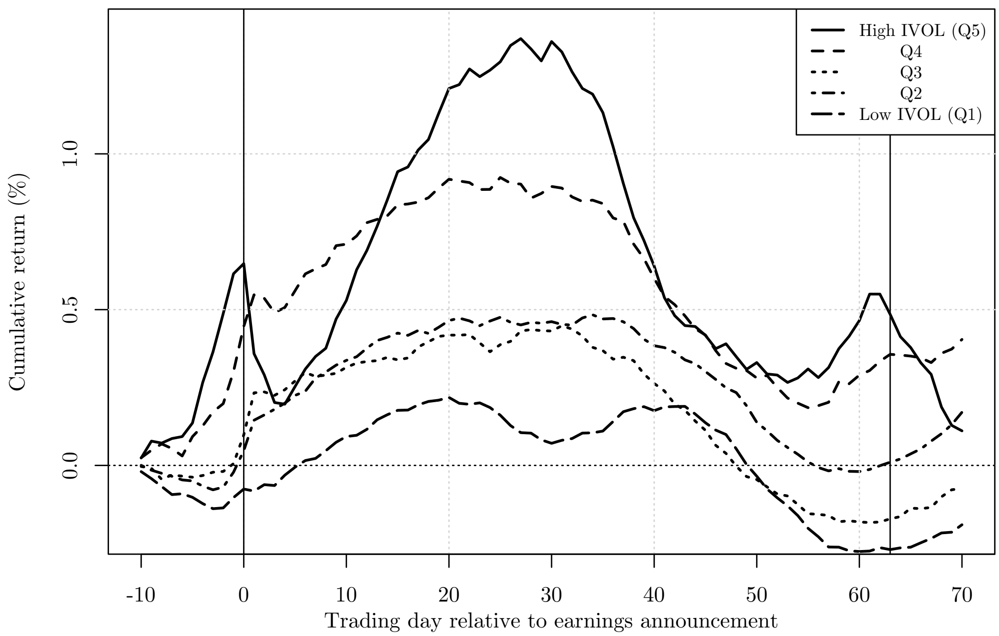


Figure 7: **Earnings announcement return cycle and idiosyncratic volatility.** This figure shows the average cumulative market-adjusted buy-and-hold returns between two consecutive quarterly earnings announcements. The sample includes U.S. common stocks traded on the NYSE, Nasdaq and Amex. A firm is included if it was covered by at least five analysts over the three-month period prior to the previous earnings announcement. The sample begins in January 1985 and ends in December 2016. We assign stocks into quintiles at the end of each quarter by idiosyncratic volatility; these portfolios are held constant over the following quarter. Idiosyncratic volatility is measured as the standard deviation of residuals from the four-factor model regression that uses daily returns over the prior year. We begin computing returns two weeks ($t = -10$) before an earnings announcement and end the computation 13 weeks ($t = 70$) after the announcement. A stock's market-adjusted buy-and-hold return for a stock-earnings announcement pair i at time T is

$$\text{Buy-and-hold return}_{i,T} = \prod_{t=-10}^{T} (1 + r_{i,t}) - \prod_{t=-10}^{T} (1 + r_{m,t}),$$

where $r_{i,t}$ is the daily stock return on day t relative to the announcement and $r_{m,t}$ is the equal-weighted market return on the same day.

each quarter based on idiosyncratic volatility, and held these assignment constant over the following quarter. Figure 2 is the unconditional version of this figure; it does not partition the sample by idiosyncratic volatility.

As suggested by the alpha estimates in Table 6, the earnings announcement return cycle is more pronounced among high-uncertainty firms. Among the firms in the highest idiosyncratic volatility quintiles, cumulative returns peak at approximately 1.3%. That is, the firms in this top quintile are typically priced 1.3% higher four weeks after the earnings announcement relative to one week before it. Among the firms in the lowest quintile, the cumulative return at the four-week mark is just 0.2%. The results in Table 6 and Figure 7 are consistent with those in Stambaugh, Yu, and

Yuan (2015) on asset pricing anomalies being stronger among high-idiosyncratic volatility stocks.

3.5.3 Valuation subjectivity

Barberis and Shleifer (2003), Barberis, Shleifer, and Wurgler (2005), Baker and Wurgler (2006), and others suggest that the prices of unprofitable growth (or "glamour") stocks likely fluctuate more with investor sentiment than those of profitable value firms. If the earnings announcement return cycle relates to analyst optimism, and analyst optimism, in turn, relates to investor sentiment, we would expect to find a stronger effect among unprofitable growth stocks.

Table 7 partitions stocks by book-to-market and profitability, and reports average abnormal returns for long- and short-portfolios based on the earnings announcement return cycle. Abnormal returns are the highest for stocks with low book-to-market ratios and for those with low profitability. The average daily market-adjusted return for the long-short portfolios increases from 3.5 basis points per day to 7.6 when we move from value stocks to growth stocks. Similarly, the return increases from 4.4 basis points to 8.1 basis points when we move from high- to low-profitability stocks. These differences are statistically significant with t-values of 2.39 and 2.81.

The results in Table 7 are consistent with the view of that investor sentiment affects the prices of unprofitable stocks with low book-to-market more than those of profitable stocks with high book-to-market ratios (Baker and Wurgler, 2006). If the cycle in optimism contributes to the earnings announcement return cycle, then this variation in optimism should have a disproportionate effect on the returns of unprofitable growth stocks.

3.6 Earnings announcement return cycle and limits to arbitrage

If the earnings announcement return cycle stems from mispricing, its persistence points to severe limits to arbitrage. We examine the association between the earnings announcement return cycle and limits to arbitrage in both the cross section and time series. First, in our cross-sectional analysis we measure and sort stocks by illiquidity. We expect the EARC to be stronger among stocks that are more expensive to trade; rational arbitrageurs will trade against the EARC only up to the point where it is profitable to do so. Second, in our time-series analysis, we measure how the strength of the EARC varies by the intensity of the earnings season. When only a handful of companies announce earnings, arbitrageurs would require relatively little capital to trade against the EARC;

but far more capital would be needed when hundreds of companies announced their earnings at the same time. Event intensity is important if a fund's amount of arbitrage capital is fixed. If a fund has enough capital to eliminate mispricing even at the height of the earnings season, it will have large amounts of idle capital at times when only a few firms announce earnings. The optimal amount of capital allocated to this trade, to maximize the return on capital, would therefore be such that it leaves some arbitrage profits on the table towards the peak of the earnings season.

Table 8 presents the results. The first block of numbers sort stocks into quintiles based on Amihud's (2002) illiquidity measure. The average return on the long-portfolio is significantly higher for illiquid stocks. The 2.5 basis point difference per day between the top and bottom quintiles is significant with a t-value of 2.16. The average return on the short-portfolio, by contrast, does not vary as greatly based on stock-level illiquidity; the difference between the top and the bottom quintiles is within one standard error from zero. As a consequence, the average return on the long-short portfolio increases modestly in illiquidity.

The second block of numbers in Table 8 sorts *trading days* into quintiles based on event intensity. We define event intensity as a firm-level variable that counts the number of firms that announced their earnings on the same day. Each quintile therefore has the same number of trading days in it; but, because the days are partitioned by event intensity, the portfolios in the top quintile contain many more stocks than those in the bottom quintile.

The average return estimates in Table 8 show that the earnings announcement return cycle significantly correlates with event intensity. The average return on the long-portfolio increases by 3.2 basis points per day (t-value = 2.13) from the bottom to the top quintile, and that on the short-portfolio decreases by 4.6 basis points (t-value = -3.44). As a consequence, the long-short strategy yields 7.3 basis points more per day (t-value = 3.73) in the top quintile. In the bottom quintile, which represents times when arbitrage capital would be spread out over a small number stocks, the average return on the earnings announcement return cycle strategy is negative at -1 basis points per day and statistically insignificant. These estimates are consistent with the earnings announcement return cycle stemming from mispricing; when the number of arbitrage opportunities is greater, more of the mispricing persists.

Figure 8 assign stocks into quintiles by event intensity—for example, a stock is assigned into the top quintile if many other stocks announced their earnings on the same day it did—and plots

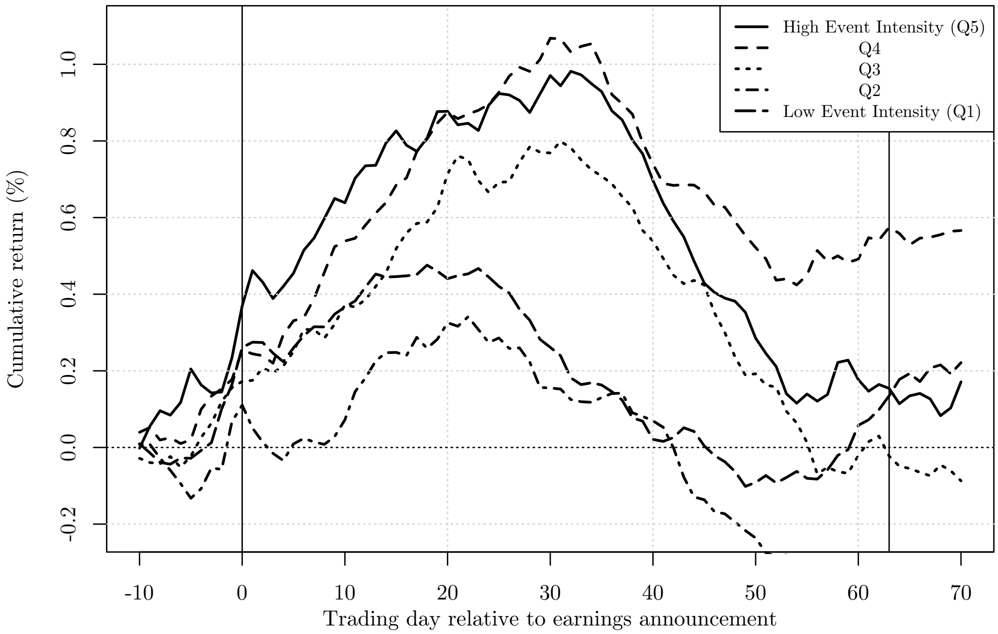


Figure 8: **Earnings announcement return cycle and event intensity.** This figure plots the average buy-and-hold market-adjusted returns in event time between two consecutive quarterly earnings announcements. The sample includes U.S. common stocks traded on the NYSE, Nasdaq and Amex. A firm is included if it was covered by at least five analysts over the three-month period prior to the previous earnings announcement. The sample begins in January 1985 and ends in December 2016. Event intensity is a firm-level measure that counts the number of firms that announce their quarterly earnings on the same day. We first assign stocks into portfolios based on event intensity and then construct the long-short earnings announcement return cycle strategies within each quintile. The top quintile includes those stocks that announced their earnings on days when many others did so as well.

the average returns on the earnings announcement return cycle strategies within each quintile. The resulting pattern is similar to that in Figure 7 for idiosyncratic volatility. This figure shows that the firms announcing earnings close to the peak of the earnings season have approximately 1% higher valuations a month after an earnings announcement relative to their valuations a week before it. Among firms that announce their earnings when relatively few others do, the average difference between the pre- and post-announcement valuations is less than 0.4%.

The estimates in Table 8 and Figure 8 support the limits to arbitrage hypothesis. Abnormal returns positively correlate with event intensity and, to a lesser extent, with stock-level illiquidity. The earnings announcement return cycle is more pronounced for firms that announce their earnings close to the peak of the earnings season, that is, at times when arbitrage capital would be spread out more thinly.

The results on the correlation between event intensity and the earnings announcement return cycle relate to the event-time versus calendar-time measurement of returns on the long-term performance of initial public offerings. The long-term performance of IPOs is significantly worse when measured in event time because a greater number of IPOs occur at times of high valuations Schultz (2003)—similar to earnings (although at a different frequency), IPOs come in waves. The event-intensity results in Table 8 and Figure 8 are similar: the returns on the earnings announcement return cycle are higher when a greater number of firms announce their earnings. We can therefore alternatively quantify the association between event intensity and the earnings announcement return cycle by comparing event- and calendar-time returns.

Table 9 compares market-adjusted returns between event- and calendar-time portfolios. We sort stocks into portfolios by firm-level uncertainty—we use the same first-principal component measure as in Table 6—and then measure average returns over equal-weighted market returns. The event-time portfolios, similar to the calendar-time portfolios, are long stocks that announced their quarterly earnings between one and four weeks ago, and short stocks that announced their earnings between seven and ten weeks ago. The two event- and calendar-time computations are therefore the same in every dimension except in how they weight the data.

The estimates in Table 9 show that the abnormal returns associated with the earnings announcement return cycle are significantly higher in event-time than in calendar-time. For the top-uncertainty quintile, the average market-adjusted long-short return is 10.8 basis points per day (t-value = 7.13) in event time; in calendar time, this average return is 6.8 basis points (t-value = 4.40). This difference between two measures is consistent with the event-intensity results. An arbitrageur who invests the same amount of capital into each *stock* would earn significantly higher returns than one who commits the same amount of capital to the earnings announcement return cycle each *day*.

3.7 Earnings announcement return cycle in Fama-MacBeth regressions

Our results on the earnings announcement return cycle above are based on univariate portfolio sorts; we have sorted, in turn, by firm-level uncertainty, valuation subjectivity (as measured by book-to-market and profitability), and measures of limits to arbitrage. In this section we estimate Fama and MacBeth (1973) regressions that predict the cross section of quarterly stock returns using these three measures at the same time.

We define the dependent variable in three ways. First, the *long*-return component in quarter q is the stock's average "phase 1" return, that is, its average return from one week after the quarterly earnings announcement to four weeks after it. Second, the *short*-return component is the stock's average "phase 3" return, that is, its average return from seven weeks after the announcement to ten weeks after it. Third, the *long-short* return is the difference between these two components. Every stock in the sample has both long- and short-return components each quarter. We use Fama-MacBeth regressions to examine the extent to which firm characteristics explain cross-sectional variation in these return components.

The explanatory variables represent the same factors we examine above. Each is defined for firm i at the start of quarter q. The first is firm-level uncertainty, which is the same first principal component of firm size, firm age, idiosyncratic volatility, and cash-flow volatility examined in Table 6. The second is event intensity, which is defined as the log-number of firms that announced earnings on the same day as firm i. We cross-sectionally standardize both of these variables each quarter so that they have a mean of zero and a standard deviation of one. The third and fourth are similarly cross-sectionally standardized book-to-market ratios and profitability.

Because we standardize the explanatory variables to be mean-zero, the intercepts in these regressions measure the average long- and short-return components over the earnings announcement return cycle for the "average" firm, that is, for the firm that is of average uncertainty, event intensity, book-to-market, and profitability. Because the explanatory variables have unit standard deviations, the slopes in the Fama-MacBeth regressions measure the changes in average returns when the explanatory variables move by one standard deviation in the distribution.

Table 10 presents the results. Each row represents estimates from one set of Fama-MacBeth regressions. Both the univariate and multivariate regressions are consistent with the patterns documented above. First, uncertainty positively correlates with analyst optimism, and therefore the long-return components increase and the short-return components decrease in uncertainty. The point estimate for the difference between the long and short return components (row 9) shows that a one-standard deviation increase in uncertainty increases the earnings announcement return cycle by 50%.

Second, event intensity, which plausibly measures limits to arbitrage, also amplifies the earnings announcement return cycle. The point estimate of 1.46 on row 10 indicates that a one-standard deviation shock to event intensity strengthens the return pattern by approximately one-third. Third, the earnings announcement return cycle significantly decreases in both book-to-market and profitability. A simultaneous one-standard deviation shock to both, on row 11, amplifies the earnings announcement return cycle by approximately 50%. The last regression shows that all these effects coexist. While the "average" firm earns a return of 5.80 basis points per day over the earnings announcement return cycle—this is the average daily return from being long a stock in weeks two through four after an earnings announcement and short in weeks seven through ten—this return effect is more than twice as high for stocks that lie one standard deviation above or below the average firm in terms of uncertainty, event intensity, book-to-market, and profitability.

Table 10 shows that uncertainty, event intensity, book-to-market, and profitability each capture cross-sectional variation in the earnings announcement return cycle strategy. Moreover, each of these variables point to the same behavioral explanation for the earnings announcement return cycle. The pattern in average returns is stronger in high-uncertainty stocks, at times when more capital would be required to eliminate mispricing, and among stocks whose prices we would expect to be more swayed by variation in investor sentiment.

4 Conclusions

In this paper we document a new regularity in stock returns, the earnings announcement return cycle. We show that stocks widely followed by analysts earn high returns in the weeks after announcing their quarterly earnings and low returns during the period leading up the next announcement. This pattern in average returns coincides with that in analyst optimism. Analysts become increasingly optimistic about firms' prospects after earnings announcements, and they revise their forecasts downwards as the next announcement draws close. The optimism cycle accounts for approximately one-half of the earnings announcement return cycle. Firm-level uncertainty positively correlates with *both* the analysts' optimism cycle and the earnings announcement return cycle.

Figure 9 illustrates the connection between the optimism cycle and the earnings announcement return cycle. As in Section 3.3 we compare the returns of the actual earnings announcement return cycle strategy against a counterfactual strategy; this counterfactual strategy removes stocks from portfolios for three-day windows around analyst forecast revisions. The shaded area in the figure denotes the amount of the earnings announcement return cycle that accrues around the days revise

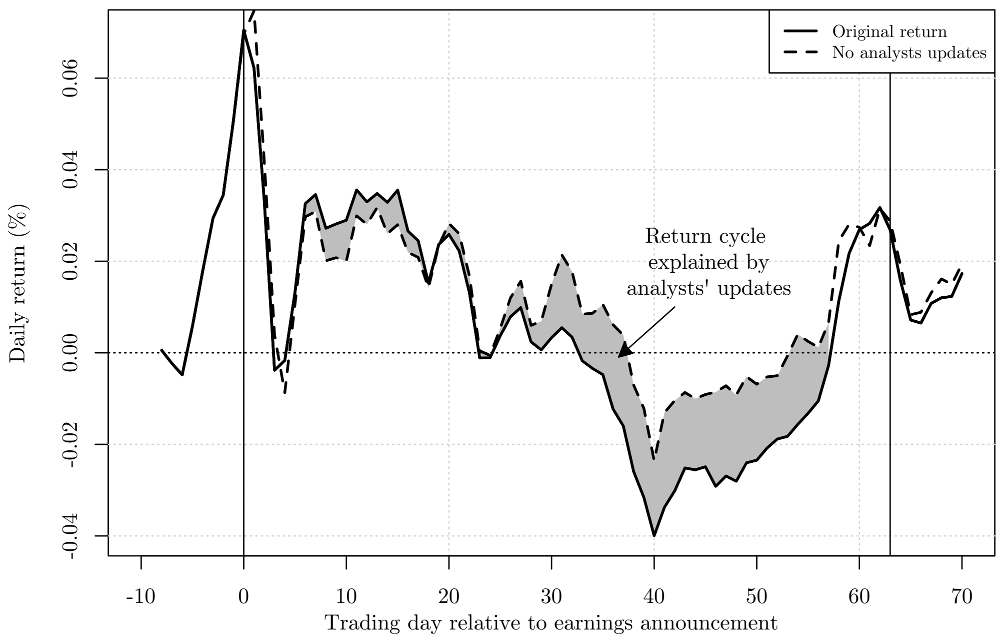


Figure 9: **Earnings announcement return cycle and analyst optimism.** This figure plots the three-day moving average of average daily market-adjusted return from seven trading days before a quarterly earnings announcement to 70 trading days after it. The sample contains all common stocks traded on the NYSE, Nasdaq, or Amex; a stock must have been covered by at least five analysts in the previous quarter. The sample begins in January 1985 and ends in December 2016. The solid line in this figure represents the return on the actual earnings announcement return cycle strategy; it is identical to that in Figure 1. The dashed line represents the return on the counterfactual strategy; it removes a stock from a portfolio for a three-day window around each analyst forecast revision. The shaded gap between the two lines represents the amount of the earnings announcement return cycle that is due to being long or short on stocks around analyst forecast revisions.

their forecasts. The estimates in Table 4 show approximately one-half of the profits to the earnings announcement return cycle disappear when the strategy does not take positions in stocks around analyst forecast revisions.

The explanatory power of analysts concentrates in the latter part of the cycle. By excluding analyst days, we can fully explain why firms earn low returns before earnings announcements. The result in this part of the cycle is consistent with guide-down mechanism of Kim and So (2018). At the same time, neither the actions of analysts nor management guidance can explain the high returns that firms earn well after they have announced earnings. In Figure 9, the shaded area shows up mostly in the period leading up to the next announcement. Why do stock prices drift upwards for weeks even after the uncertainty about their earnings has been resolved, and when at least analysts do not revise their expectations of these firms' prospects higher?

Our estimates of how much the optimism cycle contributes to the earnings announcement return cycle are plausibly conservative. Insofar as analyst forecast revisions do not perfectly correlate with changes in investor sentiment, our estimates of the role of investor sentiment are biased downwards. Indeed, when we consider both analyst forecast revisions and recommendation changes, our estimate of how much analyst events contribute to the return cycle increases by 13 percentage points. When available, it would be valuable to consider other measures of firm-level sentiment to revisit this computation. The investors who set the prices after earnings announcements, for example, may not share the same beliefs as analysts, and that may explain why the exclusion of analyst days does not explain away this part of cycle in average stock returns.

Our results on the connection between returns and sentiment could also be read in reverse. If one subscribes to our interpretation of these results—that the majority of the earnings announcement return cycle likely derives from predictable variation in sentiment—one could use the earnings announcement return cycle itself as a proxy for within-firm time-series variation in investor sentiment. The market participants who set prices are seemingly the most optimistic after a firm has released its earnings and the most pessimistic as the next announcement draws near.

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Table 1: Summary Statistics

This table reports summary statistics for U.S. common equities traded on the NYSE, Amex, and Nasdaq. Each observation is a firm-earnings announcement pair. In this table we report time-series averages of cross-sectional statistics. Panel A reports firm characteristics for the main sample and excluded sample due to low analyst coverage. The main sample includes firms covered by at least five analysts during the previous quarter; the excluded sample includes firms with a lower level of coverage. Panel B reports variables related to analysts for a period from 50 trading days prior to 6 trading days prior to each earnings announcement. The data begin in January 1985 and end in December 2016 except for the analyst recommendations in Panel B, for which the data begin in February 1994.

	Main sample (N =1,066)				Excluded firms (N =3,476)			
		Percentiles				Percentiles		
Variable	Mean	25th	50th	75th	Mean	25th	50th	75th
				Fundamental variables				
Market value, $ billions	7.43	0.67	1.83	5.62	0.79	0.04	0.14	0.50
Book-to-market	0.61	0.32	0.52	0.79	1.16	0.41	0.70	1.12
Profitability	6.8%	3.5%	6.4%	9.8%	2.3%	−0.2%	3.9%	7.7%
Dividend payer	54.2%	3.2%	51.6%	100.0%	31.4%	0.0%	0.0%	95.2%
No. of news articles	22.51	6.70	14.09	27.50	4.25	0.00	0.00	5.09
				Analyst forecasts and recommendations				
Number of analysts	10.57	6.14	8.68	13.16				
Forecast revisions	6.10	1.74	3.94	7.87				
Upward	2.51	0.15	1.29	3.07				
Downward	3.60	0.38	1.81	4.53				
Recommendation changes	0.56	0.00	0.06	0.90				
Upgrade	0.27	0.00	0.00	0.25				
Downgrade	0.29	0.00	0.01	0.32				

Table 2: Earnings announcement return cycle: Daily time-series regressions

This table reports alphas and factor loadings from daily time-series regressions in which the dependent variable is a return associated with a strategy that trades the earnings announcement return cycle. The long-portfolio holds stocks from one week after an earnings announcement to four weeks after it; the short-portfolio holds stocks from seven weeks after an earnings announcement to ten weeks after it; and the hedge-portfolio is the return difference between the long and short portfolios. The portfolios are equal-weighted and rebalanced daily. The returns are in basis points per day. The two rightmost columns add an earnings announcement premium (EAP) factor to Carhart's (1997) four-factor model. This factor is long stocks from two weeks before an earnings announcement to one week after it and short all other stocks. The real-time factor uses the predicted date of the next earnings announcement; the perfect-foresight factor assumes that investors know the date of the next earnings announcement two weeks prior to it. We report t-values associated with alphas in parentheses and the standard errors associated with the factor loadings in square brackets. The sample period begins in January 1985 and ends in December 2016.

							+ EAP factor	
	CAPM			Four-factor model			Real-time	Perfect foresight
Regressor	Long	Short	Hedge	Long	Short	Hedge	Hedge	Hedge
				Daily alpha (basis points)				
Constant	1.92	−1.36	3.27	2.47	−0.90	3.37	3.33	3.24
	(3.48)	(−2.36)	(5.95)	(6.02)	(−2.09)	(6.12)	(6.04)	(5.89)
				Factor loadings				
Market	1.07	1.11	−0.04	1.08	1.12	−0.04	−0.04	−0.04
	[0.01]	[0.01]	[0.01]	[0.00]	[0.00]	[0.01]	[0.01]	[0.01]
SMB				0.50	0.53	−0.03	−0.03	−0.03
				[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
HML				−0.02	0.01	−0.03	−0.03	−0.03
				[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
UMD				−0.19	−0.17	−0.02	−0.01	−0.01
				[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
EAP							0.02	0.07
							[0.01]	[0.01]
N	7,779	7,779	7,779	7,779	7,779	7,779	7,779	7,779
Adj. R^2	85.9%	85.7%	0.7%	92.2%	92.0%	0.9%	0.9%	1.2%

Table 3: Analysts' forecast revisions and recommendation changes around earnings announcements

This table reports estimates from panel regressions that explain optimism in analyst behavior between two consecutive quarterly earnings announcements. The dependent variable is either the proportion of positive forecast changes or recommendation upgrades ("Proportion") or an indicator variable that takes the value of one if the number of positive changes exceeds the number of negative changes and zero otherwise ("Up − Down"). "Phase 1" is an indicator variable that takes the value of one if the firm announced its earnings between one and four weeks ago and zero otherwise; "Phase 3" is an indicator variables that takes the value of one if the firm announced its earnings between seven and ten weeks ago and zero otherwise. "Phase 2," which identifies the period in the middle, is the omitted category. The sample excludes firms from two weeks before an earnings announcement to one week after it. The sample in the first two columns begins in January 1985 and ends in December 2016; in columns three and four, it begins in February 1994. We cluster standard errors by quarter and industry and report t-values in parentheses; we use the 49 Fama-French industries.

Explanatory variable	Forecast revisions		Recommendation changes	
	Proportion	Up − Down	Proportion	Up − Down
Phase 1	3.46	5.32	0.79	2.36
$(6 \leq t \leq 20)$	(7.67)	(8.82)	(0.29)	(2.16)
Phase 2	.	.	.	.
$(21 \leq t \leq 35)$	.	.	.	.
Phase 3	−2.38	−3.72	−2.21	−2.33
$(36 \leq t \leq 50)$	(−5.59)	(−5.24)	(−0.89)	(−2.18)
Firm-announcement FEs	Y	Y	Y	Y
N	249,845	348,225	42,248	98,652
Adj. R^2	42.0%	23.3%	3.0%	−0.2%

Table 4: Measuring the contribution of analyst-update days to the earnings announcement return cycle

This table reports alphas and factor loadings from daily time-series regressions in which the dependent variable is a return associated with a strategy that trades the earnings announcement return cycle. The long-portfolio holds stocks from one week after an earnings announcement to four weeks after it; the short-portfolio holds stocks from seven weeks after an earnings announcement to ten weeks after it; the hedge-portfolio is the return difference between the long and short portfolios. The portfolios are equal-weighted and rebalanced daily. The returns are in basis points per day. The "actual strategy" in columns one through three is the same as that examined in Table 2. The "counterfactual strategy" in columns four through six removes a stock from a portfolio for a three-day window around each analyst event. The dependent variable in columns seven through nine is the difference between the actual and counterfactual strategies. Panel A defines an analyst event as a forecast revision; Panel B defines an analyst event as a forecast revision or recommendation change. The earnings announcement premium (EAP) factor is long stocks from two weeks before the announcement to one week after and short all other stocks. This factor is computed by assuming that investors know the date of the next earnings announcement at least two weeks prior to it. We report t-values associated with alphas in parentheses and the standard errors associated with the factor loadings in square brackets. The sample period in Panel A begins in January 1985 and ends in December 2016; that in Panel B begins in February 1994.

Panel A: Removing stocks around analyst forecast revisions

	Actual strategy			Counterfactual strategy			Actual − Counterfactual		
Regressor	Long	Short	Hedge	Long	Short	Hedge	Long	Short	Hedge
				Daily alpha (basis points)					
Constant	2.51	−0.73	3.24	2.42	0.63	1.79	0.08	−1.36	1.45
	(6.10)	(−1.71)	(5.89)	(5.82)	(1.44)	(3.22)	(0.48)	(−7.44)	(5.81)
				Factor loadings					
Market	1.08	1.12	−0.04	1.07	1.11	−0.04	0.01	0.01	0.00
	[0.00]	[0.00]	[0.01]	[0.00]	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]
SMB	0.50	0.53	−0.03	0.52	0.55	−0.03	−0.02	−0.02	0.01
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.00]	[0.00]	[0.00]
HML	−0.02	0.01	−0.03	−0.02	0.01	−0.03	0.00	0.00	0.01
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.00]	[0.00]	[0.01]
UMD	−0.19	−0.17	−0.01	−0.18	−0.16	−0.01	−0.01	−0.01	0.00
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.00]	[0.00]	[0.00]
EAP	−0.02	−0.09	0.07	−0.02	−0.06	0.04	0.00	−0.03	0.03
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.00]	[0.00]	[0.01]
N	7,779	7,779	7,779	7,779	7,779	7,779	7,779	7,779	7,779
Adj. R^2	92.2%	92.1%	1.2%	91.8%	91.7%	1.1%	1.4%	1.8%	0.2%

Panel B: Removing stocks around analyst forecast revisions and recommendation changes

	Actual strategy			Counterfactual strategy			Actual − Counterfactual		
Regressor	Long	Short	Hedge	Long	Short	Hedge	Long	Short	Hedge
				Daily alpha (basis points)					
Constant	2.41	−0.95	3.36	2.08	0.67	1.41	0.33	−1.61	1.95
	(4.54)	(−1.71)	(4.72)	(3.97)	(1.20)	(2.03)	(1.65)	(−6.81)	(6.34)
				Factor loadings					
Market	1.07	1.10	−0.04	1.05	1.09	−0.04	0.01	0.01	0.00
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.00]	[0.00]	[0.00]
SMB	0.50	0.53	−0.03	0.52	0.55	−0.03	−0.02	−0.02	0.00
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.00]	[0.00]	[0.01]
HML	−0.01	0.02	−0.03	−0.02	0.02	−0.04	0.01	0.00	0.01
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.00]	[0.00]	[0.01]
UMD	−0.20	−0.19	−0.01	−0.19	−0.18	−0.01	−0.01	−0.01	0.00
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.00]	[0.00]	[0.00]
EAP	0.00	−0.08	0.08	0.00	−0.05	0.05	0.00	−0.03	0.03
	[0.01]	[0.01]	[0.02]	[0.01]	[0.01]	[0.02]	[0.00]	[0.01]	[0.01]
N	5,463	5,463	5,463	5,463	5,463	5,463	5,463	5,463	5,463
Adj. R^2	92.4%	92.2%	1.2%	92.4%	92.1%	1.0%	1.6%	1.8%	0.3%

Table 5: Analysts' optimism, walkdown, and firm-level uncertainty

This table reports regression-based estimates of the correlations between analyst optimism and four firm-level measures uncertainty. The unit of observation is a firm-quarterly earnings announcement pair. The dependent variable is either Early Optimism or Optimism Walkdown. Early Optimism is the analyst forecast minus the actual quarterly earnings divided by the closing stock price on the day of the previous earnings announcement. We average over the one- to four-quarter ahead forecasts, and measure optimism over a two-week period after the previous earnings announcement. Optimism Walkdown is the difference between Late Optimism and Early Optimism, where Late Optimism is defined the same way as Early Optimism except that it is measured from seven weeks after an announcement to ten weeks after it. The explanatory variables are firm size, firm age, idiosyncratic volatility, and cash-flow volatility. We standardize the dependent and explanatory variables each quarter to be mean-zero with unit standard deviations. The regressions include industry and year-quarter fixed effects, where the industries are the 49 Fama-French industries. The standard errors, which are reported in parentehses, also cluster by industry and year-quarter.

	Firm size	Firm age	Idiosyncratic volatility	Cash-flow volatility
	Dependent variable: **Early Optimism**			
Coefficient	−20.38	−7.49	26.67	10.99
S.E.	1.48	0.88	2.61	1.80
N	80,785	80,785	80,785	65,186
Adj. R^2	10.0%	7.0%	11.0%	7.0%
	Dependent variable: **Optimism Walkdown**			
Coefficient	−7.38	−2.29	11.82	5.28
S.E.	0.99	0.63	1.81	1.26
N	80,198	80,198	80,198	64,660
Adj. R^2	5.0%	4.0%	5.0%	5.0%

Table 6: Firm-level uncertainty and the earnings announcement return cycle

This table reports four-factor model alphas for long and short portfolios associated with the earnings announcement return cycle. The alphas are reported in basis points per day. Stocks are assigned into quintiles at the end of each quarter by either the first principal component of uncertainty or the inverse of firm size. Uncertainty increases from the low to the high quintile. The rightmost column shows the alphas associated with the strategy that is long the high-uncertainty portfolio and short the low-uncertainty strategy. The first principal component of uncertainty is that of cross-sectionally standardized firm size, firm age, idiosyncratic volatility, and cash-flow volatility. The long-portfolio contains stocks that announced their quarterly earnings between one and four weeks ago; the short portfolio contains stocks that announced their earnings seven to ten weeks ago; and the hedge portfolio is the difference between the two. We report t-values in parentheses.

	Quintile					High
Portfolio	Low	Q2	Q3	Q4	High	− Low
			Uncertainty measure: First principal component			
Long	1.82	1.18	2.09	4.11	4.32	2.71
	(2.52)	(1.81)	(2.95)	(4.58)	(3.70)	(1.92)
Short	0.25	−0.44	−0.84	−2.09	−2.72	−3.13
	(0.32)	(−0.62)	(−1.11)	(−2.27)	(−2.20)	(−2.10)
Hedge	1.67	1.68	2.98	6.22	7.02	5.59
	(1.63)	(1.86)	(3.03)	(5.06)	(4.34)	(2.81)
			Uncertainty measure: 1/Firm size			
Long	1.43	2.05	1.36	2.43	4.61	3.15
	(2.20)	(2.84)	(1.86)	(3.24)	(5.13)	(2.88)
Short	0.64	0.28	−0.23	−2.24	−2.30	−3.01
	(0.90)	(0.29)	(−0.29)	(−2.84)	(−2.44)	(−2.58)
Hedge	0.73	1.72	1.62	4.69	6.96	6.21
	(0.75)	(1.45)	(1.56)	(4.56)	(5.61)	(3.96)

Table 7: Earnings announcement return cycle, book-to-market, and profitability

This table reports average daily market-adjusted returns for long and short portfolios associated with the earnings announcement return cycle. The average returns are reported in basis points per day. The long-portfolio contains stocks that announced quarterly earnings between one and four weeks ago; the short portfolio contains stocks that announced quarterly earnings seven to ten weeks ago; and the hedge portfolio is the difference between the two. We compute returns over the equal-weighted market portfolio. We sort stocks into quintiles either by book-to-market ratio or profitability. Profitability is the operating profitability of Fama and French (2015); it is defined as the sales minus the cost of good sold minus selling, general and administrative expenses (if available), minus interest and related expense, all divided by the lagged book value of equity. We report t-values in parentheses.

	Quintile					High
Portfolio	Low	Q2	Q3	Q4	High	− Low
			Book-to-market			
Long	3.61	2.35	1.82	1.74	0.66	−2.95
	(2.43)	(3.02)	(2.37)	(2.75)	(1.03)	(−1.78)
Short	−3.77	−4.51	−3.46	−2.18	−2.38	1.39
	(−2.56)	(−4.26)	(−5.36)	(−3.31)	(−2.55)	(0.83)
Hedge	7.56	7.00	5.40	4.12	3.51	−4.05
	(5.37)	(6.67)	(5.55)	(4.66)	(3.15)	(−2.39)
			Profitability			
Long	1.21	1.50	1.92	2.16	3.08	1.87
	(0.77)	(2.33)	(2.91)	(2.70)	(4.06)	(1.12)
Short	−6.10	−4.33	−3.25	−2.29	−1.16	4.94
	(−3.49)	(−5.08)	(−5.54)	(−3.25)	(−1.37)	(3.49)
Hedge	8.12	5.96	5.23	4.46	4.35	−3.78
	(5.68)	(6.63)	(6.52)	(4.72)	(4.44)	(−2.81)

Table 8: Arbitrage difficulty and the earnings announcement return cycle

This table reports average daily market-adjusted returns for long and short portfolios associated with the earnings announcement return cycle. The average returns are reported in basis points per day. The long-portfolio contains stocks that announced quarterly earnings between one and four weeks ago; the short portfolio contains stocks that announced earnings seven to ten weeks ago. The first block of numbers assigns stocks into quintiles by Amihud's (2002) illiquidity measure; each quintile therefore contains the same number of stocks. The second block of numbers assigns trading days into quintiles based on event intensity; each quintile therefore contains the same number of trading days. Event intensity of stock i in quarter q is defined as the number of firms that announced their quarter $q-1$ earnings on the same day as stock i. We report t-values in parentheses.

	Quintile					High
Portfolio	Low	Q2	Q3	Q4	High	− Low
			Sort stocks by Amihud's (2002) illiquidity			
Long	0.59	2.41	1.80	2.38	3.09	2.50
	(0.52)	(3.39)	(2.38)	(3.63)	(4.49)	(2.16)
Short	−3.47	−3.08	−4.15	−3.05	−2.51	0.96
	(−2.55)	(−3.62)	(−5.57)	(−3.62)	(−2.78)	(0.59)
Hedge	4.09	5.55	6.14	5.68	6.24	2.15
	(3.89)	(5.14)	(6.88)	(5.81)	(5.56)	(1.65)
			Sort days by event intensity			
Long	−0.90	0.29	0.16	2.43	2.27	3.17
	(−0.76)	(0.35)	(0.24)	(3.30)	(2.77)	(2.13)
Short	0.72	−0.56	−2.31	−2.53	−3.86	−4.58
	(0.61)	(−0.56)	(−2.71)	(−3.64)	(−3.94)	(−3.44)
Hedge	−0.93	1.06	2.75	5.21	6.34	7.27
	(−0.57)	(0.72)	(2.62)	(4.58)	(6.20)	(3.73)

Table 9: Returns on the earnings announcement return cycle in event- and calendar-time

This table reports daily market-adjusted returns for long- and short-portfolios associated with the earnings announcement return cycle. The long-portfolio contains stocks that announced quarterly earnings between one and four weeks ago; the short-portfolio contains those that announced earnings between seven and ten weeks ago. We sort stocks into quintiles based on firm-level uncertainty, measured as of the end of the previous quarter. Uncertainty is the first principal component of cross-sectionally standardized firm size, firm age, idiosyncratic volatility, and cash-flow volatility. This table reports average returns computed in event- and calendar-time. The event-time averages are weighted towards stocks that announce their earnings at times when many other firms do so as well; the calendar-time averages weigh all days the same. We report t-values in parentheses.

	Uncertainty quintile					High
Portfolio	Low	Q2	Q3	Q4	High	− Low
			Event-time abnormal returns			
Long	1.07	1.25	1.92	2.81	4.78	3.70
	(1.24)	(1.93)	(2.13)	(2.49)	(3.73)	(2.20)
Short	−1.25	−2.64	−3.11	−4.25	−5.98	−4.73
	(−1.39)	(−3.34)	(−3.22)	(−3.19)	(−4.07)	(−2.64)
Hedge	2.32	3.89	5.03	7.05	10.76	8.44
	(2.40)	(3.82)	(4.62)	(6.02)	(7.13)	(4.43)
			Calendar-time abnormal returns			
Long	1.08	0.33	1.22	2.95	3.06	2.18
	(1.26)	(0.47)	(1.58)	(2.65)	(2.10)	(1.17)
Short	−0.68	−1.25	−1.71	−3.15	−3.92	−3.53
	(−0.74)	(−1.67)	(−2.03)	(−2.81)	(−2.42)	(−1.75)
Hedge	1.64	1.60	2.96	6.09	6.79	5.40
	(1.69)	(1.80)	(3.19)	(5.11)	(4.40)	(2.84)

Table 10: Earnings announcement return cycle in Fama-MacBeth regressions

This table reports average coefficients and t-values from Fama and MacBeth (1973) regressions that predict the cross section of quarterly stock returns. A stock's long-return component, r_{long}, in quarter q is its cumulative return over the equal-weighted market portfolio from one week after its quarterly earnings announcement to four weeks after it; the short-return component, r_{short}, is the stock's cumulative return over the equal-weighted market portfolio from seven weeks after the announcement to ten weeks after it; and $r_{\text{long}} - r_{\text{short}}$ is the difference between these two return components. The four explanatory variables for stock i in quarter q are defined as follows: (1) *uncertainty* is the first principal component of cross-sectionally standardized firm size, firm age, idiosyncratic volatility, and cash-flow volatility at the beginning of quarter q; (2) *event intensity* is the log-number of firms that announced their quarter $q-1$ earnings on the same day as firm i; (3) book-to-market ratio; and (4) profitability. Profitability is the operating profitability of Fama and French (2015); it is defined as the sales minus the cost of good sold minus selling, general and administrative expenses (if available), minus interest and related expense, all divided by the lagged book value of equity. All explanatory variables are cross-sectionally standardized each quarter to be mean-zero and with unit standard deviations; they are also winsorized at the 1st and 99th percentiles. We report t-values in parentheses. These t-values are Newey-West-adjusted using four quarterly lags.

Dep. variable	#	Constant $\hat{b}$	Constant t	Uncertainty $\hat{b}$	Uncertainty t	Event intensity $\hat{b}$	Event intensity t	BE/ME $\hat{b}$	BE/ME t	Profitability $\hat{b}$	Profitability t
r_{long}	1	2.37	3.46	1.30	2.11						
	2	2.26	3.63			0.63	1.96				
	3	2.16	3.27					−0.83	−1.60	0.01	0.01
	4	2.31	3.38	1.38	2.36	0.90	2.56	−0.88	−1.61	0.17	0.37
r_{short}	5	−3.45	−4.10	−1.61	−2.46						
	6	−3.27	−4.42			−0.82	−2.52				
	7	−3.36	−4.27					1.00	1.79	1.69	−1.68
	8	−3.49	−4.15	−1.46	−2.44	−1.05	−2.66	0.79	1.44	1.32	2.45
$r_{\text{long}} - r_{\text{short}}$	9	5.81	6.79	2.91	4.30						
	10	5.54	6.89			1.46	3.55				
	11	5.53	6.83					−1.84	−3.81	−1.68	−4.30
	12	5.80	6.76	2.83	4.14	1.96	3.74	−1.67	−3.52	−1.15	−2.89

Table A1: Measuring the contribution of management guidance to the earnings announcement return cycle

This table reports alphas and factor loadings from daily time-series regressions in which the dependent variable is a return associated with a strategy that trades the earnings announcement return cycle. The long-portfolio holds stocks from one week after an earnings announcement to four weeks after it; the short-portfolio holds stocks from seven weeks after an earnings announcement to ten weeks after it; the hedge-portfolio is the return difference between the long and short portfolios. The portfolios are equal-weighted and rebalanced daily. The analysis in this table is the same as that in Table 4 except that, instead of removing events relating to analysts, it conditions on management guidance. The "actual strategy" in columns one through three is the same as that examined in Table 2. The "counterfactual strategy" in columns four through six removes a stock from a portfolio for a three-day window around each day when management issues guidance. We report t-values associated with alphas in parentheses and the standard errors associated with the factor loadings in square brackets. The sample period begins in January 2002 and ends in December 2016.

	Actual strategy			Counterfactual strategy			Actual − Counterfactual		
Regressor	Long	Short	Hedge	Long	Short	Hedge	Long	Short	Hedge
				Daily alpha (basis points)					
Constant	1.56	−1.39	2.94	1.49	−0.58	2.07	0.07	−0.80	0.87
	(2.61)	(−2.19)	(3.51)	(2.51)	(−0.96)	(2.53)	(0.93)	(−4.64)	(4.67)
				Factor loadings					
Market	1.06	1.10	−0.04	1.07	1.11	−0.04	0.00	0.00	0.00
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.00]	[0.00]	[0.00]
SMB	0.54	0.56	−0.02	0.54	0.56	−0.02	0.00	0.01	−0.01
	[0.01]	[0.01]	[0.02]	[0.01]	[0.01]	[0.02]	[0.00]	[0.00]	[0.00]
HML	−0.02	0.01	−0.03	−0.02	0.01	−0.03	0.00	0.00	0.00
	[0.01]	[0.01]	[0.02]	[0.01]	[0.01]	[0.02]	[0.00]	[0.00]	[0.00]
UMD	−0.16	−0.15	−0.02	−0.16	−0.15	−0.02	0.00	0.00	0.00
	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]	[0.00]	[0.00]	[0.00]
EAP	−0.02	−0.10	0.08	−0.02	−0.10	0.09	0.00	0.00	0.00
	[0.01]	[0.01]	[0.02]	[0.01]	[0.01]	[0.02]	[0.00]	[0.00]	[0.00]
N	3,525	3,525	3,525	3,525	3,525	3,525	3,525	3,525	3,525
Adj. R^2	94.6%	94.3%	1.8%	94.6%	94.7%	1.8%	0.5%	0.0%	0.1%