Pre-Earnings Announcement Drift

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Abstract

We document that the quarterly earnings information from early announcers diffuses slowly into the returns of late announcers. A long-short equity portfolio strategy taking advantage of this slow information diffusion generates monthly returns of more than 100 basis points and an annual Sharpe ratio four times that of the market. The under-reaction to the earnings news is neither due to the well-known momentum effect nor a manifestation of post-earnings announcement drift; it is evident both *between* the early announcers' earnings announcement dates and the late announcers' earnings announcement dates and *at* the late announcers' earnings announcement dates. The continued under-reaction after the late announcers' earnings announcement dates is shown to be an under-reaction to the late announcers' own earnings announcement (that is, post-earnings announcement drift) rather than a continued under-reaction to the earnings news of the early announcers (that is, pre-earnings announcement drift). We show that transaction costs may help to explain the predictability of the returns of late announcers.

1. Introduction

Earnings announcements provide information about the earnings of the announcing firms themselves, of peer firms in the same industry, and of related firms in other industries.[1] This paper focuses on the dynamics of information transfer in a setting where firms within an industry make quarterly earnings announcements sequentially. The earnings news from the early announcers may contain information relevant to late announcers and, thus, this information may affect the prices of late announcers (see, Foster, 1981; Freeman and Tse, 1992; Ramnath, 2002).

In this paper, we investigate whether the market efficiently processes the information in earnings news. Within each of the thirty industries identified by Fama and French (1997), for a sample of stocks making regular earnings announcements in the past five years, we estimate the pair-wise correlations of three-day earnings-announcement-period abnormal returns.[2] We use the returns of the early announcers in the industry and these historical correlations to calculate firm-level future implied returns for each of the later announcers in the industry (we refer to these returns as "correlation implied returns").[3] We form portfolios based on the firm-level correlation implied returns and we conduct tests of efficient asset pricing.

Our primary observation is that the returns implicit in the correlations contain information about individual stock-level future returns. For example, a long-short portfolio strategy, which begins immediately after the early announcers' earnings announcements, that consists of buying the stocks with the highest correlation implied returns and short-selling the stocks with the lowest correlation implied returns earns 105 basis points per month (t-statistic of 4.02); the portfolio returns remain essentially the same after risk adjustment. The return spread of the long-short portfolio is evident both *between* the early announcers' earnings announcement dates and the late announcers' earnings announcement dates and *at* the late announcers' earnings announcement dates. There is only very limited evidence of return continuation or reversals after the earnings announcements of late announcers. In fact, we show that the continued under-reaction after the

[1] Beaver (1968) and Ball and Shivakumar (2008) provide evidence on information revealed by the quarterly earnings announcements. Cohen and Frazzini (2008), and Menzly and Ozbas (2007) show that earnings news from one industry may affect security returns in another industry.

[2] The correlations are based on the 16 earnings announcement period returns from the first four years of this five year period. We avoid the possibility of capturing earnings momentum effects by eliminating the fifth year (that is, the year prior to the current earnings announcement).

[3] The words like "early" or "late" in this paper describe the relative sequence of earnings announcements. They do not mean a firm announces earnings earlier or later than what is scheduled or usual.

late announcers' earnings announcement date is an under-reaction to the late announcers' own earnings announcement (that is, post-earnings announcement drift) rather than a continued under-reaction to the earnings news of the early announcers (that is, pre-earnings announcement drift).

We conduct numerous robustness checks. For instance, we address the concern that capturing the earnings news via correlations of announcement date returns is somewhat crude and our results may be a spurious effect of measurement error or data mining. Using simulated data in which we generate random correlations among earnings announcement period returns, we reject the hypothesis that spurious correlation may drive our empirical results. We attribute the slow information diffusion to transaction costs. We show that early announcers on average have lower transaction costs while the late announcers have substantially higher transaction costs. The time-series patterns of portfolio returns based on the correlation implied returns are consistent with this hypothesis. First, the observed returns to the long-short strategy are economically small and statistically weak for the sample of stocks with low transaction costs. The returns mainly come from the late announcers with large transaction costs. Second, the return predictability ceases to exist after the earnings announcements of the late announcers. This is consistent with the view that value relevant earnings news from early announcers is incorporated in the prices of late announcers only when the gains from trading on the cumulative effects of the news outweigh the associated transaction costs (Constantinides, 1986).

Our paper makes several additional contributions to the literature. First, prior studies document inefficiency in investors reactions to a firm's own past earnings information (Ball and Brown, 1968; Foster, Olsen, and Shevlin, 1984; Bernard and Thomas, 1989 and 1990; Mendenhall, 1991; and Chan, Jegadeesh, and Lakonishok, 1996); but there is little work that systematically investigates the efficiency with which investors incorporate earnings news into the prices of peer firms in the same industry prior to their (future) earnings announcements. The notable exception is Ramnath (2002), who investigates how information from the very first earnings announcer within each industry affects the prices of late announcers.[4] Using eleven quarters of data on 428 stocks

[4] Excluding the very first earnings announcers of each industry-group does not change our results. It follows that the cross-sectional return predictability derives from both the first announcer in the industry and from subsequent announcers. In addition, as we discuss later, our strongest return predictability occurs on the third month of each quarter, followed by the second month of each quarter, and the first month of each quarter; in other words, excluding first announcers does affect our results.

and adopting an event-time approach, Ramnath (2002) finds that the earnings information for the earliest announcing firm within an industry may be used to predict both the earnings surprise and the returns of other firms within the industry. Ramnath (2002) and our paper differ in terms of empirical research design, sample selection and coverage, and interpretation of results.[5]

Since Ramnath's (2002) paper is most closely related to ours, we provide further detail of the differences. First, Ramnath (2002) focuses on the first announcer's return implications for subsequent earnings announcers' earnings announcement period returns. In addition to an analysis of announcement period returns, we provide evidence on the evolution and resolution of the information transfer. We focus on pre-, during and post-earnings announcement period returns. We show the under-reaction is not just during the earnings announcement period, but prior to the earnings announcement date as well. Interestingly, the intra-industry information transfer resolves almost completely by the actual earnings announcement date, although there is some evidence of continuing under-reaction for a week after the earnings announcement date. Second, we provide evidence on why there is incomplete information transfer. We find that transaction costs are a valid explanation for the incomplete information transfer. Third, instead of relying on a sample of stocks followed by analysts, our research design/question allows us to use a much larger sample and a much longer time period. Fourth, Ramnath (2002) focuses on the first announcer's return implications for subsequent earnings announcers; we consider the effect of all earlier earnings announcers' information on the returns of all subsequent earnings announcers; the advantage of the use of correlation implied returns and the reason we choose to base our analyses on these returns is that it facilitates the analysis of all earlier announcers and all subsequent announcers rather than focusing on just one early announcer.

The paper proceeds as follows. Section 2 presents the concept of correlation implied returns, and describes the empirical tests based on these correlation implied returns. Section 3 discusses the data and sample selection. Section 4 analyses the performance of the portfolios constructed on the basis of the correlation implied returns. Section 5 explores transaction costs as a cause of slow

[5] On this aspect, our work is also related to Thomas and Zhang (2008). They find that late announcers' own earnings announcement period returns are on average negatively correlated with the late announcers' returns during the period of early announcers' announcement window. Essentially, Thomas and Zhang (2008) are concerned about a security's return at two windows: the firm's own earnings announcement window, and the early announcers' announcement window. Their results focus on the return autocorrelation at the individual stock level whereas we focus on return predictability from the cross-sectional correlations.

information diffusion. Section 6 concludes.

2. Correlation Implied Returns

In this section, we introduce the concept of correlation implied returns and show how the correlation implied returns for the late announcers are developed from the early announcers' earnings announcement period returns. This concept facilitates our analysis of all early announcers and all later announcers. We describe the formation of our portfolios based on these correlation implied returns, and we provide details of our asset pricing tests.

2.1. Correlation Implied Returns: Definition

We compute the correlation implied returns as follows. First, at the end of quarter T, for each pair of firms (*i, j*) within each of the Fama and French (1997) thirty-industry classifications, we estimate the sample covariance of daily average abnormal returns during three-day earnings announcement periods in the past *N* quarters:

$$\hat{C}_{i,j} = \frac{1}{N} \sum_{q=T-(N-1)}^{T} \left(R_{iq} - \overline{R}_i\right)\left(R_{jq} - \overline{R}_j\right) \quad (1)$$

where $\hat{C}_{i,j}$ is the sample covariance of the average abnormal return, R_{iq} is the average daily abnormal return of firm *i* in earnings announcement period for quarter *q*, $\overline{R}_i$ is the sample mean of the average abnormal daily returns for firms *i* in earnings announcement periods for the past *N* quarters,

$$\overline{R}_i = \frac{1}{N} \sum_{q=T-(N-1)}^{T} R_{iq}$$

Second, on each subsequent earnings announcement day during quarter *T+1,* we assume that the abnormal returns on the earnings announcement day for the early announcers contain useful information about the late announcers, and that this is captured in the abnormal return covariance (equation (1)). It follows that we can use the following approximation to estimate the abnormal return of a late announcer *j* in the same quarter:

$$\hat{C}_{i,j} = \left(ER_{i,T+1} - \overline{R}_i\right)\left(IR_{j,T+1} - \overline{R}_j\right) \quad (2)$$

where $\hat{C}_{i,j}$ is the sample covariance estimate from equation (1), $ER_{i,T+1}$ is the daily abnormal return of firm *i* on its earnings announcement day in quarter *T+1*, $IR_{j,T+1}$ is the implied abnormal return of firm j on an unknown later earnings announcement date in quarter $T+1$, $\overline{R}_i$ and $\overline{R}_j$ are the sample mean of the average abnormal daily returns for firms i and j in earnings announcement periods for the past N quarters, respectively. Thus, the correlation implied return ($IR_{j,T+1}$) for firm j is defined as:

$$IR_{j,T+1} = \frac{\hat{C}_{i,j}}{ER_{i,T+1} - \overline{R}_i} + \overline{R}_j \equiv \frac{1}{N} \sum_{q=T-(N-1)}^{T} \left(\frac{R_{iq} - \overline{R}_i}{ER_{i,T+1} - \overline{R}_i} \right) \left(R_{jq} - \overline{R}_j \right) + \overline{R}_j \qquad (3)$$

Note that ratio term within the summation operator, $\frac{R_{iq} - \overline{R}_i}{ER_{i,T+1} - \overline{R}_i}$, essentially compares an early earnings announcer's earnings announcement period return during the new quarter ($T+1$), $ER_{i,T+1} - \overline{R}_i$ to its historical earnings announcement period return, $R_{iq} - \overline{R}_i$. This ratio then serves as a scaling factor to scale the historical earnings announcement period return, $R_{jq} - \overline{R}_j$, of a later announcer.

On each earnings announcement date of the early announcers, we use the measure in equation (3) to compute the correlation implied returns of the firms which have not yet reported their earnings (the "late announcers").

2.2. Computing Correlation Implied Returns with Multiple Early Announcers

The discussion thus far assumes that there is only one firm announcing earnings on a particular date. In practice, however, there are typically multiple firms announcing earnings on the same day. To deal with this complication, we modify equation (3) by using the absolute values of the t-statistics of the covariance estimates as the weights to calculate the implied returns of the late announcers.[6] The t-statistic is derived under the null hypothesis that the covariance is equal to zero.[7]

For example, suppose that firms i and m have announced earnings on the same date, while firms j and n have not yet announced. Then the implied returns are calculated as:

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[6] This same weighting scheme is used to facilitate analysis of early earnings announcement intervals longer than a day. We expand the interval one day at a time up to 15 days. The results of all of our analyses are weaker when we use intervals longer than one day.

[7] The null hypothesis H_0 is: $\rho=0$ vs. H_1: $\rho \neq 0, t = r \frac{\sqrt{n-2}}{\sqrt{1-r^2}} \sim t_{n-2}$,, ρ is the estimated sample correlation coefficient and n is the sample size.

$$
\begin{aligned}
NR_{j,T+1} &= w_{ij}\left(\frac{\hat{C}_{i,j}}{ER_{i,T+1}-\overline{R}_i}+\overline{R}_j\right)+w_{mj}\left(\frac{\hat{C}_{m,j}}{ER_{m,T+1}-\overline{R}_m}+\overline{R}_j\right)\\
NR_{n,T+1} &= w_{ij}\left(\frac{\hat{C}_{i,n}}{ER_{i,T+1}-\overline{R}_i}+\overline{R}_n\right)+w_{mj}\left(\frac{\hat{C}_{m,n}}{ER_{m,T+1}-\overline{R}_m}+\overline{R}_n\right)
\end{aligned} \tag{4}
$$

where the weights w_{ij}, w_{mj}, w_{in} and w_{mn} are the weighted average of the *t*-statistics of the abnormal return covariance estimates across the pairs, or

$$
\begin{aligned}
w_{ij} &= \frac{|t_{ij}|}{|t_{ij}|+|t_{mj}|}, w_{mj} = \frac{|t_{mj}|}{|t_{ij}|+|t_{mj}|},\\
w_{in} &= \frac{|t_{in}|}{|t_{in}|+|t_{mn}|}, w_{mn} = \frac{|t_{mn}|}{|t_{in}|+|t_{mn}|}.
\end{aligned} \tag{5}
$$

Alternatively, we use the weighted average of the abnormal return covariances across the pairs to compute the weights, or

$$
\begin{aligned}
w_{ij} &= \frac{|\hat{C}_{ij}|}{|\hat{C}_{ij}|+|\hat{C}_{mj}|}, w_{mj} = \frac{|\hat{C}_{mj}|}{|\hat{C}_{ij}|+|\hat{C}_{mj}|},\\
w_{in} &= \frac{|\hat{C}_{in}|}{|\hat{C}_{in}|+|\hat{C}_{mn}|}, w_{mn} = \frac{|\hat{C}_{mn}|}{|\hat{C}_{in}|+|\hat{C}_{mn}|}.
\end{aligned} \tag{6}
$$

An advantage of the weighting scheme in (5), compared to (6), is that the t-statistics of the covariance estimates reflect the precision of the estimates assigning more weight to more precise estimates, and less weight to less precise estimates.[8]

2.3. Short-Term and Long-Term Abnormal Return and Correlation Implied Returns

As shown in equation (3), the total implied returns of late announcers *j* come from two components, $\frac{\hat{C}_{i,j}}{ER_{i,T+1}-\overline{R}_i}$ and $\overline{R}_j$. We call the first component the "covariance" term and the second component the "average abnormal return" term. Since our hypothesis is focused on investor reaction to the correlation and covariance (that is, the first component), we attempt to minimize the effect of the second component on the future returns. We do this because there is empirical evidence that past earnings have considerable predictive power for future returns, especially for average abnormal returns from the most recent four quarters' earnings announcements, which we refer to as the short-term average abnormal returns (ST-AAR).[9] To achieve this objective,

[8] Results using the weighting scheme in (6) are qualitatively similar to those using the weighting scheme in (5), but the portfolio returns produced by the *t*-statistics weighting approach are about ten to fifteen basis points higher per month.

[9] Chan, Jegadeesh, and Lakonishok (1996) show that an earnings momentum strategy based on the cumulative earnings announcement period abnormal returns is profitable within a one year horizon (see Table IV of their paper) but not

we skip the most recent four quarters when we compute the abnormal return correlations and means. In appendix A, we show that using only the average earnings announcement period abnormal returns during the past twenty quarters but skipping the most recent four quarters effectively removes the return predictability due to the past average abnormal returns.

2.4. Portfolio Construction based on the Correlation Implied Returns

For each firm satisfying the data requirements, we calculate the average abnormal return over the three-day event window, (-1, 0, +1), surrounding the earnings announcement date. We use the CRSP value-weighted market index to obtain the daily abnormal returns.[10] That is, we compute the average abnormal return as follows:

$$AAR_i = \frac{1}{3}\sum_{d=-1}^{+1}\left(R_{i,d} - BR_d\right)$$

where R_{id} is the daily stock return of the earnings announcement firm on day *d*, BR_d is the CRSP value-weight index return on day *d*.

After obtaining each firm's average abnormal returns in the 16 quarters of the four years prior to the previous year (in other words, we skip the prior year), we estimate the Pearson covariances and correlations of the average abnormal returns among the firms within the same industry and the long-term average abnormal return (LT-AAR).[11]

We examine the relation between the returns of early announcers and later announcers by constructing portfolios based on the correlation implied returns. Specifically, in each calendar quarter $Q+1$, we form portfolios immediately after the first earnings announcement in that quarter.[12] On each earnings announcement date τ, we compute, for each of the early announcing firm, the

beyond one year.

[10] Since the daily expected returns are close to zero, the choice of benchmark portfolio to adjust the return is less of an issue (Fama, 1998). We also skip the non-trading days when measuring the returns over an earnings announcement event window.

[11] At the end of each calendar quarter, when calculating the LT-AAR covariances between a firm with December as fiscal-year-end and another firm with non-December fiscal-year-end, we ensure that these two firms' fiscal quarters have at least one overlapping month in their operating calendar quarters by restricting the firms to have regular earnings announcements in the past. The precise definitions of regular and non-regular earnings announcers used in this paper are explained in next section.

[12] We repeat all analyses after eliminating all observations where the fiscal-quarter-end is other than March, June, September, or December. Since the SEC requires the form 10Q to be filed with 45 days of the fiscal-quarter-end and the form 10K to be filed within 90 days of the fiscal-year-end, this sample selection criterion ensures that the so-called early announcers are the early announcers for the fiscal quarter rather than just the early announcers for the calendar quarter. All results are very similar for this sub-sample of firms.

correlation implied returns for all late announcers based on equation (3), $R_{i,\tau}$.[13] We use these correlation implied returns to place each later announcer into one of the five portfolios as at the close of trading on date τ. The first portfolio ($p = 1$) consists of the later announcers with the lowest correlation implied returns, and the fifth portfolio ($p = 5$) consists of the later announcers with the highest correlation implied returns.

2.5. Calculation of Monthly Portfolio Returns

After determining the composition of each quintile portfolio as of the close of trading on date τ, we compute the value-weighted return for date τ+1. Each portfolio *p's* return on day $\tau+1$ is denoted as $R_{p\tau+1}$, and calculated as:

$$R_{p\tau+1} = \sum_{i=1}^{n_{p\tau}} \omega_{i\tau} R_{i\tau+1}$$

where $\omega_{i\tau}$ is the market capitalization for later announcer *i* as at the close of trading on date τ divided by the sum of market capitalization of all later announcers in portfolio *p* as at the close of trading on date τ; $R_{i\tau+1}$ is the return on the common stock of later announcer *i* on date $\tau+1$; and $n_{p\tau}$ is the number of later announcers in portfolio *p* at the close of trading on date τ. The daily buy-and-hold portfolio returns are accumulated into monthly returns.

We use value-weights instead of equal-weights in the calculation of daily portfolio returns for the following three reasons. First, equal-weighting of daily returns leads to portfolio returns that may be overstated because of the so-called "bid-ask bounce effect".[14] Second, equal-weighting of daily returns essentially assumes daily rebalancing of portfolios, which could further overstate the economic magnitude of the returns. Third, value-weighting of daily returns better captures the economic significance of the correlation implied returns because equal-weighting of returns over-represents smaller firms. Value-weighting may bias against finding any evidence of abnormal returns, as the markets for stocks with larger market capitalization are more likely to be informationally efficient -- including efficiency in the incorporation of information from the early announcers.

We hold the portfolios until the occurrence of a later earnings announcement, and rebalance

[13] If there are multiple early announcers, we use the weighting procedure described in equation (5) and equation (6).

[14] For a detailed discussion of the bid-ask bounce effect, see Blume and Stambaugh (1983), Barber and Lyon (1997), Canina et al. (1998), and Lyon, Barber and Tsai (1999). The approach of aggregating daily returns to obtain monthly portfolio returns is also adopted in Barber et al. (2001).

them at this later earnings announcement date. We rebalance for either of the following two reasons: (1) in order to completely remove the well known post-earnings announcement drift effect (Ball and Brown, 1968; Foster, Olsen, and Shevlin, 1984; Bernard and Thomas, 1989, 1990) on our inference, our strategy immediately excludes the early announcers when forming portfolios; and/or (2) the correlation implied returns -- and the ranking based on these correlation implied returns -- of the later announcers can change, so that some of the later announcers yet to announce their earnings, may move from one quintile to another upon a new earnings announcement.

We also maintain the following criteria in our portfolio strategy in order to continuously accumulate the daily returns: (1) if the first trading date in a three-month announcing period is not an earnings announcement date, we invest in T-bills until the first earnings announcement; (2) if on any particular earnings announcement date, we have less than five stocks in either the top or bottom quintile portfolio, we also invest in T-bills (this is more often seen at the beginning or towards the end of three-month earnings-reporting period); and, (3) we complete the portfolio strategy on the last trading date of the three-month announcing period.

2.6. Illustration of Implementation of Correlation Implied Returns Strategy

To illustrate the implementation of the correlation implied return portfolio strategy, we construct a hypothetical example in Figure 1. In this example, there are 11 firms from two industries with earnings announcements in October. Industry 1 contains firms "A", "B", "C", "D, "E", and "F", and industry 2 contains firms "u", "w", "x", "y", and "z".

- On the first earnings announcement date (10/3), firm "A" is an early announcer from industry 1. We calculate the implied returns for all late announcers based on the pair-wise LT-AAR covariances and A's abnormal earnings announcement day return. Then we form the quintile portfolios and hold them until the next earnings announcement event. There is no firm announcing earnings from industry 2.
- On the second earnings announcement date (10/6), firms "B" and "C" become early announcers in the industry 1, and firm "u" is an early announcer from industry 2. Again we first calculate the implied returns for late announcers within each industry. Computation of the correlation implied returns for industry 2 is straightforward; however, a complication arises for industry 1 because there are multiple (two) early announcers -- firm "B" and firm "C" -- making earnings announcements on the same day. As described in equations (3) and (4), we make use of the corresponding t-statistics as the weights to

compute the implied returns for firms "D, "E", and "F". Then we form the quintile portfolios based on the ranking of implied returns of all remaining later announcers across these two industries. In this case, we form the quintile portfolios using firms "D, "E", and "F" from industry 1, and firms "w", "x", "y", and "z" from industry 2.

- On the third earnings announcement date (10/7), firm "D" is the only firm announcing earnings. Thus, we calculate the implied returns for firms "E" and "F" from industry 1 and use the implied returns of firms from industry 2 calculated on the last earnings announcement date to form quintile portfolios. At that point, after the earnings announcement by firm "D", our portfolios contain firms "E" and "F" from industry 1, and firms "w", "x", "y", and "z" from industry 2.

On the last earnings announcement date in our example (10/11), firms "E" and "w" make their earnings announcements. We do not have enough stocks to form quintile portfolios, so we invest in T-bills from this point.

Figure 2 illustrates the calculation of the portfolio monthly returns during a three-month earnings announcement period from October to December. Because the first earnings announcement date is on October 3rd, we hold the T-bills until this date. Then, we start our correlation implied return strategy. On each earnings announcement date, we form the quintile portfolios and calculate the daily portfolio buy-and-hold returns. The portfolios are value-weighted based on the market capitalization at the time of portfolio formation. If on a particular earnings announcement date, we are not able to form quintile portfolios, we hold the T-bills. Similarly, we obtain the portfolio monthly return in October by cumulating the daily buy-and-hold returns within that month. Repeating the same procedure each month, we obtain a time-series of monthly returns for each quintile portfolio. The monthly returns of these quintile portfolios are the basis of our asset pricing tests.[15]

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[15] All of the analyses are repeated with daily returns to a portfolio strategy rather than monthly returns. The strategy is a follows. During the 45-days of the earnings announcement period (for fiscal quarters 1, 2 and 3) and during the 90-day earnings announcement period (for fiscal quarter 4) subsequent to the calculation of the correlation of the correlation implied returns, we implement the following correlation implied return strategy. On each earnings announcement date of early announcers, we compute the implied returns for all late announcers and rank them into quintile portfolios. Quintile 1 (5) contains the stocks with the lowest (highest) correlation implied returns, and the long/short hedge portfolio (5-1) is constructed by buying the stocks in Q5 and short-selling the stocks in Q1. We exclude all days when the number of stocks within the top and bottom quintile portfolio is less than thirty stocks. Results based on these daily returns are qualitatively very similar to those reported herein for monthly returns.

2.7. Estimation of Abnormal Returns

We calculate three estimates of abnormal returns for each of the five portfolios, as well as for a long-short portfolio. The long-short portfolio invests in the highest correlation implied return portfolio (portfolio 5); it short-sells the lowest correlation implied return portfolio (portfolio 1).

First, we use the Capital Asset Pricing Model (CAPM), and estimate the monthly time-series regressions:

$$R_{pt} - R_{RFt} = \alpha_p + \beta_p(R_{mt} - R_{RFt}) + \varepsilon_{pt}$$

where R_{pt} is the portfolio *p's* return on month *t*, R_{RFt} is the T-bill rate for month *t*, α_p is the estimated CAPM adjusted return, β_p is the estimated beta, $(R_{mt} - R_{RFt})$ is the market excess return, and ε_{pt} is the regression error.

Second, we use the three-factor model developed by Fama and French (1993). To evaluate the performance of each portfolio, we estimate the monthly time-series regressions:

$$R_{pt} - R_{RFt} = \alpha_p + \beta_p(R_{mt} - R_{RFt}) + s_pSMB_t + v_pHML_t + \varepsilon_{pt}$$

where SMB_t is the small minus big factor, the return of a spread portfolio during month *t* constructed by going long in the small market capitalization stocks ("small stock" portfolio) and short in the large market capitalization stocks ("big stock" portfolio); and HML_t is the value minus growth factor, which is the return of a spread portfolio during month t constructed by going long in the high book to market equity stocks and short in the low book to market equity stocks.

Third, we use the modification of the three-factor model by Carhart (1997), which adds a zero-investment portfolio related to the price momentum:

$$R_{pt} - R_{RFt} = \alpha_p + \beta_p(R_{mt} - R_{RFt}) + S_pSMB_t + v_pHML_t + m_pMOM_t + \varepsilon_{pt}$$

where MOM_t is the momentum factor, which is the return of a spread portfolio during month t constructed by going long in the stocks with high past eleven month returns ("winner stock" portfolio) and short in the stocks with the lowest past eleven month returns ("loser stock" portfolio).

3. Data, Sample Selection and Summary Statistics

3.1. Data and Sample Selection

Stock prices, number of shares outstanding, and stock returns are obtained from the Center for Research in Security Prices (CRSP) database. Our sample consists of common stocks (share code 10 or 11) traded on NYSE, AMEX, and NASDAQ with quarterly earnings announcement dates available from the Compustat quarterly files. We link the CRSP stock database with the

Compustat database using the CRSP-LINK database, which maintains the historical link between PERMNO (stock level identification code in CRSP) and GVKEY (company level unique identification code in Compustat).

To implement the portfolio strategy starting at the end of each calendar quarter from the third quarter of 1976 to first quarter of 2008, we require that the firms have stock prices greater than or equal to five dollars, that they have existed in the CRSP-Compustat merged file for at least five years, and that they have all 20 quarterly earnings announcements during these years.[16] We require that the firm makes four quarterly earnings announcements each year, and has an earnings announcement during the three-month period after the end of each fiscal quarter. We define a firm with such earnings announcement patterns as a "regular earnings announcement" firm.[17]

To compute some of the descriptive summary statistics, we obtain accounting information from the Compustat quarterly files and analyst forecast information from the I/B/E/S. We also use the Trade and Quote (TAQ) database provided by the (NYSE) to derive some of the spreads measures. Shane Corwin, Joel Hasbrouck, and Paul Schultz provided their transaction costs measures developed in Corwin and Schultz (2008), and Hasbrouck (2007).

3.2. Summary Statistics

3.2.1. Regular and Non-regular Earnings Announcers

At the beginning of each quarter, we classify a stock as either regular earnings announcers or non-regular announcers. A stock is a regular announcer if all of the following criteria are met: (1) the firm exists in CRSP-Compustat merged file for at least five years; and (2) the firm provides four timely earnings announcements in each of the previous five years. If a stock does not meet either of these two criteria, we classify it as a non-regular earnings announcer.[18] We compute the three-day earnings announcement period abnormal returns for the firms in each of these categories. Table 1 compares the time-series average of the three-day earnings announcement period abnormal

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[16] Our study includes industrial firms, banks, and utilities.

[17] For example, a regular earnings announcement firm with December as fiscal year end must report its first quarterly earnings during April to June; a regular earnings announcement firm with February as fiscal year end must report its first quarterly earnings during June to August. As we impose these criteria at the time of portfolio formation, the portfolio strategy can be implemented in real time, and this data filter does not introduce any look-ahead bias.

[18] In terms of coverage by the market capitalization (number of stocks) for all common shares traded on NYSE, AMEX and NASDAQ with end of prior quarter's price greater than or equal to five dollars, the time-series average of regular announcers account for 79.2 (43.6) percent, non-regular announcers account for 20.2 (33.1) percent, and the excluded stocks account for the rest 0.6 (23.3) percent.

returns for the regular earnings announcers and non-regular announcers. Except for the finance industry (Fama-French industry classification code = 29), the number of unique non-regular announcers is usually less than the number of unique regular announcers. For the finance industry, the average number of unique non-regular announcers is 1,503 stocks, and the number of unique regular announcers is 1,348 stocks.

The average three-day abnormal return is 12 basis points for all regular earnings announcers, and 14 basis points for all non-regular earnings announcers. These numbers are very similar to those reported in Cohen et al. (2007).[19] A comparison of the earnings announcement period return of regular announcers with that of non-regular announcers shows that the return difference, though small, is statistically significantly different from zero. The t-value is 3.20 (not tabulated) from a simple two-sample mean comparison test, and the p-value for the nonparametric sign rank test is 0.01. A closer look at the same difference by industry reveals that the difference is primarily driven by a small set of industries. The t-tests show that for six out of the 30 industries, the earnings announcement period returns of the regular announcers differ from those of the non-regular announcers at the ten percent significance level. The nonparametric sign rank tests indicate that in four out of the 30 industries, the earnings announcement period returns of the regular announcers differ from those of the non-regular announcers at the ten percent significance level.

3.2.2. Persistence of Being Early or Later Announcers

Table 2 provides evidence that the quarterly earnings announcement sequence is persistent. We summarize this persistence via transition matrices which describe the conditional distribution based on the relative sequence of the earnings announcements. Panel A reports the conditional distribution of next quarter's earnings announcements for all stocks across all industries making announcements during both quarter *Q-1* and quarter *Q*. We compute this conditional distribution as follows. At the end of each quarter *Q-1*, all announcers are first ranked into ten groups based on the sequence of their quarterly earnings announcement dates; group 1 comprises the earliest announcers and group 10 comprises the latest announcers. This procedure is repeated during quarter *Q* to compute the sequencing of earnings announcements during that quarter. Then, for each announcement-date-decile for quarter *Q-1*, we calculate the percentage of announcements in

[19] Table 2 of Cohen et al. (2007) documents the three-day earnings announcement period return at the actual announcement between 1980 and 2001 is 14 basis points for their sample of stocks.

each of the announcement-date-deciles for quarter *Q*. This calculation is repeated each quarter, and the time-series average is determined.

To take account of the possibility that some industries may announce earnings systematically earlier than other industries, we also compute the conditional distribution first across all stocks within an industry; then we calculate the cross-sectional average across all the industries. The latter results are reported in Panel B, Table 2.[20]

Table 2 shows that for early announcers as well as late announcers there is a considerable amount of persistence in the relative sequence of earnings announcements. For example, Panel A reports that for the earliest ten percent of announcers during quarter *Q-1*, 53 percent are also in the earliest ten percent of announcers in quarter *Q*. Similarly, for latest ten percent of announcers in quarter *Q-1*, more than 60 percent are also in the latest ten percent in quarter *Q*. Comparing Panel A and Panel B, we observe that some industries announce earnings systematically earlier than other industries, while some industries announce earnings systematically later than other industries. For example, Panel B reports that for the earliest ten percent of announcers in quarter *Q-1*, about 43 percent of the earliest announcers in quarter *Q-1* are also among the earliest ten percent of announcers in quarter *Q*. Similarly, Panel B reports that for the latest ten percent of announcers in quarter *Q-1*, that 53 percent of them are also in the latest ten percent of announcers in quarter *Q*. The difference between Panel A and Panel B arises because some industries announce the earnings systematically earlier or later than other industries.

3.2.3. Characteristics of Early and Late Announcers

Table 3 provides a number of stock-specific characteristics of early and late announcers where the classification of early and late announcers is similar to the method used in constructing Panel A of Table 2. The details of the calculation of the variables are provided in Appendix C. In general, late announcers are firms with smaller market capitalization, higher book-to-market ratio, lower past one-year returns, more negative quarterly earnings surprises (where the earnings forecasts are obtained from the seasonal random walk model and from consensus analysts' forecasts), higher accounting accruals, greater long-term earnings growth-rate forecasts, and higher forecast

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[20] We also consider an alternative way of classifying early and late announcers. Specifically, all earnings announcers are first sorted into ten equally-spaced time intervals based on the date of earnings announcement (rather than the relative sequence of the earnings announcements). Interval 1 is the earliest ten percent of the days of the quarter; and interval 10 the last ten percent of the days of the quarter. Using this alternative definition, we compute the results reported in Tables 2 and 3; this alternative definition generates very similar results to those that we report.

uncertainty. These differences are pervasive and pronounced, and not driven by the very early and the very late announcers. In fact, the differences between the earliest ten percent and the latest ten percent of the announcers, or the earliest 20 percent and the latest 20 percent of the announcers, as well as the earliest half and the second half of the announcers are all statistically significantly different from zero. The difference between the analyst forecast dispersions for the quarterly earnings forecasts is small and statistically insignificant.

Table 3 also provides some details on the transaction costs and liquidity measures associated with trading the early and late announcers. The first set of transaction cost measures are computed from the NYSE TAQ database. They include the proportional quoted spreads and the proportional effective spreads. The high frequency direct transaction cost measures derived from the tick-by-tick NYSE TAQ database did not start until 1993; we also consider the second set of indirect transaction costs estimates derived from the CRSP daily file, and the sampling period starting from the third quarter of 1976 and ending with the last quarter of 2005. They include the Amihud (2002) illiquidity measure, the Hasbrouck (2007) transaction costs estimates (γ_0 and γ_1), and the Corwin and Schultz (2007) high-low spreads measure.

The most salient feature of Table 3 is that the late announcers on average have much higher transaction costs than early announcers, and they are much less liquid. For example, in terms of direct transaction cost measures, the difference between the proportional effective spreads (PESPR) of the earliest ten percent of announcers and the latest ten percent of announcers is 60 basis points; the difference between the proportional quoted spreads (PQSPR) is 80 basis points. Using indirect transaction cost measures portrays essentially the same picture. The difference in the Amihud (2002) illiquidity measure is 0.76, the differences in the Hasbrouck (2007) transaction costs estimates (γ_0 and γ_1) are 2.30 and 0.88 respectively, and the difference in the high-low spreads is 50 basis points. All these differences are statistically significant at the one-percent level. Comparing the earliest 20 percent of announcers and latest 20 percent of announcers, or the first half and the second half of the announcers, has little or no effect on the conclusions.

3.2.4. Summary Statistics; Pair-wise Correlation Estimates

Table 4 describes the pair-wise correlations of long-run average abnormal returns by industry and across all industries, estimated from the average earnings announcement period returns in the past earnings announcement periods. The sample only includes regular earnings announcers. The correlations are, on average, positive. Across all industries, the average correlation is 0.015

(both sample mean and median), and 52 percent of the estimated correlations are positive. Out of the thirty Fama-French industry groups, only five of them have negative mean and median correlations. The standard deviation of the estimated correlations across industries is 0.273. This cross-sectional variation is not concentrated among a small number of industries; the industry standard deviations of the estimated correlation coefficients are similar, ranging from 0.250 to 0.281. On average, across all estimated pair-wise correlation coefficient estimates, 12 percent are statistically different from zero at the ten percent significance level or better. The proportion of statistically significant correlation coefficient estimates is similar across industries, ranging from eight percent for industry 2 (beer and liquor), to 15 percent for industry 20 (utilities).

The lack of precision in the estimates of correlation coefficients introduces noise into our analyses, biasing against the possibility of finding statistically significant results. To formally address the issue of measurement error, and to gauge the extent to which measurement error may influence our results, we conduct a simulation study. In this simulation, instead of estimating the pair-wise correlations, we randomly sample pair-wise correlations and we use them to compute the correlation implied returns and to form portfolios. Results from the simulation are summarized in Appendix B; the evidence supports the conclusion that noisy estimates and measurement error do not explain the main findings of our paper.

4. Results

4.1. Characteristics of Portfolios Sorted on Correlation Implied Returns

Table 5 reports the characteristics of the portfolios sorted on individual stock correlation implied returns based on the early announcers' returns. The portfolio of stocks with the lowest correlation implied returns is denoted as portfolio 1; the portfolio of stocks with the highest correlation implied returns is denoted as portfolio 5. The portfolio with the highest correlation implied returns has slightly larger market capitalization, lower book-to-market ratios, higher accounting accruals, higher long-term earnings growth rate forecasts, and lower dispersions of analysts' forecasts of quarterly earnings and of long-term growth rates. These differences, though statistically significant at the one percent level, are economically small.

Some of these characteristics are shown in the prior literature to be associated with stock returns. Fama and French (1992) show that smaller stocks, and stocks with higher book-to-market ratios, earn a higher return. In our sample, the portfolio of stocks with the highest correlation implied returns has higher market capitalization and lower book-to-market ratios. Evidence in the extant literature suggests that this portfolio is expected to earn a lower return than the portfolio of stocks with the lowest correlation implied returns. This includes: (1) evidence from Sloan (1996) suggests that the portfolio of stocks with the highest correlation implied returns is expected to earn a lower return than the portfolio of stocks with the lowest correlation implied returns - as the former portfolio has higher accruals; (2) La Porta (1996) illustrates that stocks with higher levels of long-term growth rate forecasts earn lower subsequent returns - thus the portfolio of stocks with the highest correlation implied returns is expected to earn lower return than the portfolio of stocks with the lowest correlation implied returns; and, (3) stocks with larger analyst forecast dispersions on average earn lower returns than stocks with smaller analyst forecast dispersions (see Karl, Malloy, and Scherbina, 2002). In summary, most of the characteristics of the portfolios formed on the basis of the correlation implied returns suggest that the portfolio of stocks with the highest correlation implied returns will earn a lower return than the portfolio of stocks with the lowest correlation implied returns. However, the differences in characteristics across these portfolios are small. Since there are differences among the stock characteristics, some of which may be related to returns, we use the Fama-French three factor model and the Fama-French and Carhart (1997) four-factor model to control for the effects of the differences in characteristics we observe in Table 5.

Table 5 also reports the average transaction costs estimated as the proportional quoted spreads and effective spreads, as well as the Amihud (2002) liquidity measure, the Hasbrouck (2007) transaction costs estimates (γ_0 and γ_1), and the Corwin and Schultz (2007) high-low spreads measure. Except for the Hasbrouck's measure (γ_0), there are no economically or statistically significant differences among these transaction costs and liquidity measures.

Table 6 identifies the Fama-French thirty-industry composition of portfolios 1 and 5. For portfolio 1, the largest fraction of stocks come from industry 18 (coal), and the smallest fraction come from industry 28 (finance and banking). For portfolio 5, the largest fraction of stocks come from industry 2 (beer and liquor), and the smallest fraction come from industry 29 (finance and banking). No single industry dominates either of these portfolios.

4.2. Evidence on Late Announcer Returns

Table 7 reports the performance of the portfolios formed on the basis of correlation implied returns. The first column in Panel A reports the excess returns from each quintile portfolio formed on the basis of stock-level correlation implied returns, as well as the return from the long/short portfolio. Portfolio 1, which has the lowest correlation implied returns, earns about 25 basis points per month, which is not statistically different from zero (t-statistic of 0.76). In contrast, portfolio 5, which has the highest correlation implied returns, earns about 130 basis points per month, which is highly significantly different from zero (t-statistic of 4.18). The return spreads from the long-short portfolio are about 105 basis points and highly significantly different from zero (t-statistic of 4.02).

The large and statistically significant excess returns from the long-short portfolio do not seem to be explained by the market risk, size, book-to-market and price momentum characteristics of the correlation implied return sorted portfolios. The estimates of the intercepts from the CAPM (column 2), the Fama-French three-factor model (column 3), and the Fama-French and Carhart four-factor model (column 4) are reliably different from zero. In every case, these intercepts indicate that the portfolio of stocks with the highest correlation implied returns has higher abnormal returns than the portfolio with the lowest correlation implied returns. For instance, the abnormal return on portfolio 5, varies between a 69 basis point per month under the CAPM and 83 basis point per month under the Fama-French and the Carhart four-factor models. In sharp contrast, the abnormal return on portfolio 1 ranges from a low of -36 basis points per month under the CAPM to a high of -24 basis points per month under the Fama-French and Carhart four-factor model. A strategy of purchasing the stocks with the highest correlation implied returns and selling short the stocks with the lowest correlation implied returns generates statistically significant abnormal returns between 106 basis points per month and 112 basis points per month.[21]

Panel B of Table 7 reports the regression coefficients from the Fama-French and Carhart four-factor model. For portfolios ranked on the basis of the correlation implied returns, the factor loadings on the market return factor are about one; a natural attribute of well-diversified portfolios. Portfolio 1 loads positively and significantly on the SMB factor (t-statistic of 2.40); but the loading is small (coefficient estimate of 0.18). Interestingly, the factor loading on the momentum factor is

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[21] Throughout the paper, when we compute the late announcers' correlation implied returns, we only consider the most recent early announcers. As a robustness check, we have extended the early earnings announcements backwards to include more early announcers as the basis for the correlation implied return computation; we have used intervals extending back as far as fifteen days from the portfolio formation date. The (un-tabulated) results are qualitatively similar, although the return differences between the long and the short portfolio are generally smaller. For example, when we include additional early announcers from previous five days, the long/short portfolio return is 73 basis points per month (t-statistic of 2.76); from previous ten days, the return is 66 basis points per month (t-statistic of 2.64); from previous fifteen days, the return is 81 basis points per month (t-statistic of 2.84).

small and negative. Portfolio 5 loads negatively on the HML factor (t-statistic of -2.32); but the loading is again small (coefficient estimate of -0.18). The factor loadings on the long-short portfolio are small and statistically insignificant, ranging from -0.024 for the market excess return factor to 0.041 for the momentum factor.

In order to shed more light on the time-series properties of the returns from the portfolios formed on the basis of the correlation implied returns, we plot the annual returns and the annual Sharp ratios of the long/short hedge portfolio in Figure 3. Similar to many market neutral strategies, the downside risk of the portfolio returns is relatively small, while there is a considerable amount of upside return potential.

4.3. Returns Prior to and at the Later Earnings Announcement Dates

Table 8 shows the decomposition of the correlation implied returns into two components. Panel A summarizes the returns accrued to the later announcers prior to their actual earnings announcement dates. Panel B summarizes the returns accrued to the late announcers during their actual earnings announcement dates. Both components contribute to the abnormal returns of the portfolio of stocks with the highest correlation implied returns.

As shown in Panel A, portfolio 5 earns a return in excess of risk free rate about 112 basis points per month (t-statistic of 3.54) prior to the earnings announcements of these late announcers, while portfolio 1 earns 33 basis points per month. The long-short portfolio earns 79 basis points per month (t-statistic of 3.15). Applying the CAPM, Fama-French three-factor model, and the Fama-French and Carhart model does not change the conclusion. Panel B shows that portfolio 5 continues to outperform portfolio 1 at the date of the later earnings announcement. For example, portfolio 5, on average, outperforms portfolio 1 at the date of earnings announcement by 2.73 percent per month before applying factor model adjustments (t-statistic of 2.74), and at least 2.85 percent per month after applying factor-model adjustments (t-statistic of 2.83).[22]

4.4. Late Announcer's Post Earnings Announcement Effect

In this section we ask the question: when is the earnings information from the early announcers completely incorporated into the prices of later announcers given the correlation channel we

[22] The returns reported in Table 8 are not attainable in real time because the actual dates of earnings announcements are unknown ex ante. Nevertheless, the point remains that both pre-earnings announcement period returns and the earnings announcement period returns contribute to the outperformance of the portfolio of stocks with the highest correlation implied returns.

identify? We analyze the returns to the correlation implied return strategy after the later earnings announcements. Panel A of Table 9, reports the returns over the five trading days after the earnings announcement (days *t+2* to *t+6*). Similarly, Panels B reports the returns over the next five days (*t+7* to *t+11*).

Panel A shows the returns to a long-short portfolio constructed by purchasing stocks with the highest correlation implied returns on day *t+2;* and, at the same time, short-selling stocks with the lowest correlation implied returns; and holding this position until day *t+6*. This portfolio earns about 72 basis points per month (t-statistic of 2.07). The hedge strategy implied by the intercepts from the CAPM and the Fama-French three-factor model are 77 and 84 basis points per month, and remain statistically significant (t-statistics of 2.21 and 2.34). Analogous to Panel A, Panel B shows the returns from the long-short portfolios constructed on day *t+7* and held until day *t+11*. The returns to these portfolios are neither statistically nor economically significant.[23] This evidence suggests that the earnings information of the early announcers, to the extent it is captured by the historical correlations, is incorporated into the prices very soon (within a week) after the later announcers' earnings announcements.

4.5. Correlation Implied Returns and Post-Earnings Announcement Drift

In this section we investigate the possible connection between the pre-earnings announcement drift, which we have demonstrated in this paper, and the well-known post-earnings announcement drift. We observe, in the previous section, that the earnings information from early announcers is incorporated in the prices of later announcers by the end of the first week after the later earnings announcements. This suggests that it is not likely that earnings information from early announcers' contributes to post-earnings announcement drift. If, however, there are common underlying factors driving both the under-reaction by the late announcers to the early announcers' earnings information, and a stock's under-reaction to its own earnings information, then these two types of return predictabilities may be related.

We use a double-sort procedure to explore the relation between pre-earnings announcement drift and post-earnings announcement drift. At end of each month, from October 1976 to May 2008, we sort all firms making earnings announcements within the month into five quintiles based on their earnings surprise [ES1 to ES5, where ES1 (ES5) is the portfolio of stocks with the lowest

[23] In unreported analysis, we also confirm that there is essentially no return spread from the long-short portfolio going forward by additional two or three months. Neither do we observe any patterns of return reversals.

(highest) earnings surprise]. The earnings surprise of each firm is defined as the abnormal return on the earnings announcement day. We independently assign firms/observations to five quintiles based on the ranking of their implied returns [IR1 to IR5, where IR1 (IR5) is the portfolio of stocks with the lowest (highest) implied return]. This implied return ranking is determined at the last portfolio formulation date prior to the earnings announcement date. This double sort procedure generates 25 portfolios.

Table 10 summarizes the average monthly returns for these 25 portfolios for holding periods of one month (Panel A), three months (Panel B), and six months (Panel C). For the holding periods of three and six months, we, following Jegadeesh and Titman (1993), adopt an independently managed portfolio approach and calculate the portfolio monthly returns by averaging the returns to all outstanding portfolios formed during the previous three or six months. For comparison purposes, we also report the returns to portfolios formed on the basis of earnings surprise alone. We observe a post-earnings announcement drift effect in our sample. The average monthly return to the portfolios formed on the basis of earnings surprise alone is 61 basis points for the holding horizon of one month (t-statistic of 2.85); 47 basis points for the holding period of three months (t-statistic of 3.27); and 29.7 basis points for the holding period of six months (t-statistic of 3.23). The Fama-French and Carhart four-factor model adjusted returns are slightly lower. The monthly factor model adjusted return is 52.4 basis points for the holding horizon of one month (t-statistic of 2.32); 35.5 basis points for the holding horizon of three months (t-statistic of 2.45); and 21.5 basis points for the holding horizon of six months (t-statistic of 2.29).

The post-earnings announcement drift effect seems to concentrate among the most extreme implied return portfolios. Consider, for example, the holding period of one month. The left-most columns of Panel A show that the post-earnings announcement drift effect for the portfolio of stocks with the lowest implied returns is 116 basis points per month (t-statistic of 2.49) and 78 basis points per month for the portfolio of stocks with the lowest implied returns (t-statistic of 2.13). In contrast, the post-earnings announcement drift effect is much weaker; it is statistically insignificant for the less extreme implied return portfolios ranging from 12 basis points (t-statistic of 0.30) to 39 basis points (t-statistic of 1.22). These observations regarding the post-earnings announcement drift effect are robust to the Fama-French and Carhart four-factor model adjustment.

These results suggest that the two earnings-based return predictability phenomena are related. A possible link is transactions costs. The results we reported earlier suggest transactions costs as an explanation for pre-earnings announcement drift. Work by others (for example, Ng, Rusticus, and Verdi, 2008) suggests transactions costs as an explanation for post-earnings announcement drift.[24]

4.6. Decomposing the Predictive Power of Correlated Returns

Table 11 provides direct evidence that most of the predictive power of the correlation implied returns comes from the covariance component rather than the long-term average abnormal return (LT-AAR) component. Panel A summarizes the return from the portfolio sorted on the basis of the long-term average abnormal return component of equation (3); Panel B describes the return from the portfolio sorted on the basis of the covariance component of equation (3).

The long-short portfolio constructed by sorting on the long-term average abnormal return component generates about 47 basis points per month; this is not statistically significantly different from zero (t-statistic of 1.65). The estimate of the intercept from the CAPM is similar to the raw return of the long-short portfolio, and remains statistically insignificant. The estimates of the intercepts from the Fama-French three-factor model, and Fama-French and Carhart four-factor model are larger, and are statistically significantly different from zero. The long-short portfolio constructed by sorting on the covariance component generates a statistically significant 66 basis points per month (t-statistic of 2.46). The intercept terms from the CAPM, the Fama-French three-factor model, and Fama-French and Carhart four-factor model range from 59 basis points per month to 74 basis points per month and remain statistically significant.

4.7. Difference in Under-reaction to Good vs. Bad news

In this section, we address the question of whether the under-reaction that we observe for the entire sample of observations differs according to whether the news is good or bad. Our method focuses on whether the news in the early announcements is good or bad for the later announcers; earlier good news for an early announcer may imply good, neutral or bad news for a later announcer.

We first calculate the "implied news" for late announcers then use the “implied news” to sort into “good news” and “bad news” portfolios. To illustrate, suppose stocks A and B are early announcers, and E is a late announcer. We define the implied news as:

$$Implied\ News = \frac{R_A \times corr(R_A, R_E) + R_B \times corr(R_B, R_E)}{|corr(R_A, R_E)| + |corr(R_B, R_E)|}$$

[24] We will return to this point.

where R_A , R_B , and R_E are the abnormal returns for stocks A, B, and E over their three-day earnings announcement window, $corr(R_A, R_E)$ is the correlation between the returns of stocks A and E estimated using data from the previous five years (skipping the immediately preceding year), and $corr(R_B, R_E)$ is the correlation between the returns of stocks B and E estimated using data from the previous five years (skipping the immediately preceding year). This definition of implied news permits us to take account of both the sign of the correlation and the early announcers' return; for instance, an early announcer's positive earnings announcement day abnormal return and a negative correlation with the return of a late announcer implies a bad news signal for late announcer.

As in the previous analyses, during the three-month period subsequent to the earnings announcements, we implement the correlation implied return strategies. On each earnings announcement date of early announcers, we first classify the late announcers into "good news" and "bad news" groups depending on the direction of implied returns. Within each of these two portfolios, we then compute the implied returns for all late announcers and rank them into tercile portfolios. Tercile 1 (3) contains the stocks with the lowest (highest) correlation implied returns, and the long/short hedge portfolio (3-1) is constructed by buying the stocks in Q3 and short-selling the stocks in Q1. To obtain the portfolio monthly returns, we compound the value-weighted daily portfolio returns. In the event of no earnings announcement at the beginning of the first month of the calendar quarter, or less than five stocks in either Q1 or Q3, we invest into T-bills using the daily risk-free rate.

The results of these analyses of good and bad earnings news portfolios are included as Table 12. It is evident that the return to a strategy of investing in the highest implied return portfolio and going short the low implied return portfolio shows a considerable and significant return for the bad news strategy (between 67 and 82 basis points depending on the model of abnormal returns); but there is only a minimal return to such an investment for the good news portfolio (between 12 and 19 basis points depending on the model of abnormal returns).

5. Slow Information Diffusion, Transaction Costs, and Returns

The observation that the returns of early earnings announcers may be used to predict the returns of late earnings announcers is consistent with the notion of slow information diffusion notion (Hong and Stein, 1998). We suggest that transaction costs may be a reason for the slow information diffusion. These transaction costs limit the arbitragers' ability to exploit the seemingly profitable return predictability. We provide some evidence consistent with this view. First, the most salient feature of Table 3 is that late announcers have much larger transaction costs than the early announcers. In fact, there is an almost monotone relation between the relative sequencing of the quarterly earnings announcements and the magnitude of the transaction costs. For example, the proportional effective spreads - which take into account potential price improvements - average 80 basis points for the earliest 30 percent of announcers. In sharp contrast, the proportional effective spreads average 140 basis points for the last 30 percent of announcers. Spread measures may not fully take into account the price impact costs. The Amihud (2002) illiquidity measure - or price impact - almost doubles, however, between the earliest 30 percent of announcers and the latest 30 percent of announcers.

To see the effect of transaction costs on the speed of information diffusion, we compare the correlation implied return strategy's payoff from firms with different relative sequences of earnings announcements. Consistent with the trend of increasing transaction costs, the return to the long-short strategy increases as the lateness of the late announcers increases. The long-short portfolio comprising the earliest 30 percent of announcers earns about 44 basis points per month (t-statistic of 1.50); the long-short portfolio comprising the middle 40 percent of announcers earns about 94 basis points per month (t-statistic of 2.46); and the long-short portfolio comprising the last 30 percent of announcers earns 177 basis points per month (t-statistic of 2.88).[25]

In addition, Table 9 shows that the return predictability largely ceases to exist after the quarterly earnings announcements of the late announcers. This is consistent with the view that value relevant earnings news from early announcers is only incorporated into the prices of late announcers when the gains from trading on the cumulative effects of the news outweigh the associated transaction costs (Constantinides, 1986). This observation lends further support to our interpretation that transaction costs may be directly related to the slow information diffusion.

Table 10 shows an interesting commonality between the correlation implied return portfolio and the post-earnings announcement drift effect. The post-earnings announcement drift effect seems to be evident only in the most extreme implied return portfolios. This is consistent with the view that transaction costs are the main underlying factor driving these two different return

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[25] These results are not tabulated.

predictabilities. Recall the liquidity and transaction costs attributes from Table 5. Though the extreme implied return portfolios (that is, portfolios 1 and 5) are similar in terms of liquidity and transaction costs attributes, these extreme implied return portfolios are much less liquid and have much higher transaction costs than those of the less extreme portfolios (that is, portfolios 2, 3 and 4). For example, the difference in the Amihud (2002) illiquidity measure between extreme and less extreme portfolios is 0.4. Similarly, the difference in the proportional quoted spreads (PQSPR) between extreme and less extreme portfolios is 0.005. In addition, the difference in the proportional effective spreads (PESPR) between extreme and less extreme portfolios is 0.004. In all cases, these differences are statistically significant at, at least, the one percent level. If illiquidity and transaction costs are responsible for the slow diffusion of early announcers' earnings announcement information into stock prices of the late announcers, the same illiquidity and transaction costs also constrain the diffusion of a firm's own earnings information into stock prices. The latter observation is consistent with the evidence in Ng, Rusticus and Verdi (2008), who show that informed trades are kept at bay due to large transaction costs.

Second, direct transaction costs may, to a large extent, eliminate the possibility of making arbitrage profits by taking advantage of the apparent return predictability, including the correlation implied return strategy we consider here.[26] The correlation implied return strategy we discuss in this paper involves substantial portfolio turnover. The portfolio turnover comes from two major sources. The first source is the exclusion of late announcers when they make their (subsequent) earnings announcements. The second source is the rebalancing due to the change of relative ranking of late announcers (who have yet to make announcements) due to arrival of new earnings news. In fact, the average monthly portfolio turnover rates for the highest and lowest correlation implied return portfolios is 112 percent. The average proportional effective spread, which captures the average transaction costs, for these two portfolios is approximately 160 basis points. Therefore, the direct transaction costs amount to 179 basis points per month, which easily overwhelms the profits from both the long-side and short-side of the portfolio. Though it may be possible for some skillful arbitragers, who can efficiently control transaction costs, or market-makers for these stocks,

[26] We do not consider brokerage commissions, price impact costs, short-selling costs, and borrowing costs. We only focus on the relatively transparent direct bid-ask spreads transaction costs. All other costs clearly matter for the actual implementation of the strategy. Since we only focus on the bid-ask spreads, one may view our calculation as an upper bound for payoffs from implementing the correlation implied return strategy.

or investors who already hold the stocks to take advantage of the return predictability, it would be difficult for outside investors to systematically make profits from the apparent return predictability.

6. Conclusions

We investigate the extent to which the market efficiently processes the information in the correlations of the returns associated with earnings news among firms in the same industry. We find that the market on average under-reacts to these correlations; this generates statistically significant return predictability for later earnings announcers. We show that buying a portfolio of stocks with the highest correlation implied returns, and selling a portfolio of stocks with the lowest correlation implied returns, yields significant spreads. The returns from the strategy are largely unaffected in either magnitude or significance by controlling for the risk factors in the Fama-French three-factor or Fama-French-Carhart four-factor model. We set a minimum liquidity threshold by not allowing trading in stocks with a closing price at the end of the previous month less than $5; and we use value-weighted returns throughout the paper, thus ensuring that portfolio returns are not driven by illiquid stocks and the market microstructure effects. Our simulation study provides a benchmark case of the return predictability from the correlations of earnings news and validates the main empirical results of the paper.

We attribute the slow information diffusion of quarterly earnings news from the early announcers into the prices of the late announcers to transaction costs. First, we show that transaction costs increase monotonically from early announcers to the late announcers in the industry, which is consistent with the intra-quarter patterns of return predictability. On average, the profits from the correlation implied return strategy are lower at the beginning of the quarter, but higher at the end of the quarter. Second, we find that the return predictability ceases to exist after quarterly earnings announcements of the late announcers; this lends additional support to our conjecture that transaction costs are responsible for the slow information diffusion. Value relevant earnings news from early announcers appears to be incorporated into the prices of late announcers when the gains from trading on the cumulative effects of the news outweigh the associated transaction costs (Constantinides, 1986).

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Table 1: Summary statistics re three-day earnings announcement period returns

This table reports the first quartile, mean, median, the third quartile, and the standard deviation of the earnings announcement period returns for stocks with regular earnings announcements in the past five years (Panel A), and stocks with at least one non-regular earnings announcement in the past five years (Panel B). All summary statistics are expressed in percent, except for the column 'N', which is the number of unique stocks satisfying the data requirements. Panel C reports the p-values from the simple two-sample *t*-tests (denoted as p-value$_1$) and from the nonparametric sign rank tests (denoted as p-value$_2$) to test the equality of average earnings announcement period returns. We report these summary statistics for each of the Fama-French 30-industries and across all industries.

On each firm's quarterly earnings announcement date during 1976/09 to 2008/03, we calculate the three-day (days -1, 0, and +1) earnings announcement window average abnormal returns. We select different firm samples according to the following data requirements. Panel A requires: (1) the firm exists in the CRSP-Compustat merged files for at least five years; (2) the firm has share price not less than $5 at the end of the month prior to the month when the earnings are reported; and (3) the firm makes four timely earnings announcements in each of the previous five years. Panel B imposes conditions (1) and (2) as in panel A, and permits the firm to have less than 20 quarterly earnings announcements or delayed earnings announcements in the previous five years.

The Fama-French 30-Industry classification includes the following. 1: Food; 2: Beer; 3: Smoke; 4: Games; 5: Books; 6: Household; 7: Clothes; 8: Health; 9: Chemicals; 10: Textiles; 11: Construction; 12: Steel; 13: Fabricated products; 14: Electrical equipment; 15: Autos; 16: Carry; 17: Mines; 18: Coal; 19: Oil; 20: Utilities; 21: Telecom; 22: Service; 23: Business equipment; 24: Paper; 25: Transportation; 26: Wholesale; 27: Retail; 28: Meals; 29: Finance; 30: Other.

	Panel A: Stocks with regular EAs						Panel B: Stocks with at least one non-regular EAs						Panel C: p-values	
Industry	Q1	Median	Mean	Q3	Std	N	Q1	Median	Mean	Q3	Std	N	p-value$_1$	p-value$_2$
1	-0.82	0.01	0.04	0.82	1.81	180	-0.81	0.02	0.14	0.89	1.93	122	0.07	0.05
2	-0.93	0.02	-0.03	0.84	1.92	29	-0.76	0.08	0.13	1.34	2.06	15	0.39	0.27
3	-0.46	0.12	0.13	0.66	1.08	12	-0.66	0.05	-0.01	0.73	1.72	6	0.11	0.04
4	-1.04	0.01	0.10	1.19	2.42	159	-1.13	0.00	0.06	1.13	2.70	149	0.07	0.41
5	-0.70	0.04	0.11	0.86	1.71	108	-0.80	0.01	0.01	0.81	1.95	85	0.19	0.35
6	-0.79	0.06	0.08	0.94	1.99	161	-0.88	0.01	0.12	1.04	2.27	127	0.92	0.93
7	-0.96	0.07	0.11	1.12	2.31	104	-0.96	0.11	0.27	1.33	2.60	92	0.17	0.10
8	-1.12	0.08	0.11	1.28	2.72	606	-1.35	-0.05	0.09	1.34	3.04	501	0.52	0.74
9	-0.72	0.06	0.11	0.92	1.77	149	-0.95	-0.03	0.09	0.99	2.28	91	0.25	0.04
10	-0.84	0.03	0.15	1.06	2.18	76	-0.79	0.16	0.39	1.44	2.49	54	0.30	0.15
11	-0.87	0.04	0.14	1.04	2.03	347	-0.95	0.03	0.19	1.09	2.50	261	0.48	0.62
12	-1.02	-0.02	0.04	0.94	2.00	140	-0.99	-0.03	0.10	0.97	2.30	76	0.99	0.67
13	-0.94	0.01	0.14	1.06	2.29	326	-0.99	0.04	0.19	1.16	2.51	230	0.02	0.28
14	-1.08	0.07	0.17	1.32	2.78	203	-1.16	-0.04	0.18	1.30	2.85	160	0.26	0.35
15	-0.86	0.01	0.06	0.96	1.91	121	-1.01	0.09	0.17	1.25	2.50	72	0.49	0.35
16	-0.82	0.06	0.06	0.89	1.76	57	-0.97	-0.07	0.25	0.88	3.68	38	0.23	0.28
17	-0.96	-0.08	0.00	0.83	1.82	57	-1.05	-0.14	0.09	0.99	2.30	52	0.73	0.83
18	-0.96	0.00	-0.03	0.86	1.64	15	-1.36	-0.30	-0.33	0.60	1.78	10	0.40	0.43
19	-0.82	-0.03	0.04	0.84	1.71	256	-0.97	-0.01	0.14	1.08	2.26	255	0.51	0.24
20	-0.48	0.01	0.02	0.54	1.11	221	-0.51	0.01	0.04	0.53	1.05	225	0.06	0.13
21	-0.75	0.03	0.05	0.88	1.96	178	-0.91	0.06	0.18	1.11	2.37	137	0.32	0.73
22	-1.14	0.12	0.23	1.57	2.99	813	-1.07	0.04	0.17	1.30	2.88	581	0.53	0.67
23	-1.25	0.07	0.17	1.53	2.99	799	-1.26	-0.02	0.15	1.31	3.32	601	0.29	0.73
24	-0.78	0.05	0.04	0.82	1.73	134	-0.94	-0.02	0.10	0.93	2.05	83	0.36	0.75
25	-0.93	0.05	0.10	1.10	2.03	177	-1.01	-0.03	0.15	1.11	2.37	130	0.08	0.54
26	-0.94	0.08	0.20	1.26	2.55	325	-1.07	-0.03	0.17	1.18	3.11	282	0.64	0.42
27	-0.91	0.10	0.19	1.22	2.29	463	-0.97	0.05	0.22	1.19	2.33	349	0.08	0.17
28	-0.91	0.04	0.11	1.15	2.01	160	-0.96	0.03	0.15	1.02	2.21	141	0.14	0.29
29	-0.65	0.03	0.08	0.79	1.60	1348	-0.67	0.06	0.12	0.84	1.63	1503	0.75	0.69
30	-0.88	0.12	0.21	1.19	2.32	162	-0.93	0.01	0.29	1.24	2.72	146	0.44	0.36
All	-0.85	0.04	0.12	1.01	2.21	7134	-0.88	0.02	0.14	1.02	2.40	6093	0.00	0.01

Table 2: The persistence of earnings announcement sequences

This table reports the persistence of earnings announcement sequences by transition matrices. The sample firms are those in the correlation implied return portfolio strategy. Panel A reports the conditional distribution of next quarter's earnings announcement dates for all stocks making announcements in both the prior quarter (*Q-1*) and the current quarter (*Q*). To calculate the conditional probability, at the end of each quarter (*Q-1*), all earnings announcers are ranked into ten groups based on the sequence of their announcements; interval 1 is the earliest 10 percent of the announcers; and interval 10 is the last 10 percent of the announcers. We similarly rank the announcers into ten groups based on their sequence of earnings announcements at the end of the current quarter (*Q*). The distribution of the relative sequence of last quarter's earnings announcers with respect to current quarter is computed. This calculation is repeated each quarter, and the time-series average is reported. Panel B first computes the time-series average conditional distribution of next quarter's earnings announcement for each industry, and then reports the cross-sectional means by averaging across industries. In Panel B, if the average number of stocks within an industry is less than 20, the industry is excluded from the calculation. The rows and columns represent quarter *Q-1* and quarter Q's time-intervals respectively.

	Sequence of Next Quarter's Earnings Announcements									
	1 (Early)	2	3	4	5	6	7	8	9	10 (Late)
Panel A: Conditional distribution of next quarter's earnings announcements, average by all stocks										
1 (Early)	0.530	0.192	0.095	0.056	0.035	0.028	0.025	0.022	0.014	0.003
2	0.182	0.305	0.169	0.126	0.078	0.047	0.041	0.028	0.021	0.004
3	0.081	0.160	0.272	0.150	0.118	0.094	0.059	0.036	0.026	0.006
4	0.038	0.098	0.155	0.272	0.131	0.115	0.102	0.049	0.031	0.008
5	0.027	0.061	0.103	0.160	0.247	0.151	0.125	0.076	0.038	0.012
6	0.023	0.041	0.088	0.106	0.165	0.249	0.146	0.108	0.058	0.017
7	0.021	0.033	0.051	0.086	0.106	0.157	0.274	0.143	0.101	0.028
8	0.019	0.027	0.037	0.045	0.072	0.100	0.173	0.295	0.163	0.068
9	0.012	0.019	0.026	0.032	0.040	0.052	0.096	0.164	0.358	0.200
10 (Late)	0.003	0.004	0.007	0.009	0.015	0.021	0.037	0.080	0.223	0.601
Panel B: Conditional distribution of next quarter's earnings announcements, average by industry										
1 (Early)	0.439	0.192	0.102	0.076	0.058	0.037	0.035	0.030	0.020	0.012
2	0.149	0.276	0.165	0.120	0.099	0.060	0.053	0.037	0.028	0.012
3	0.076	0.166	0.223	0.162	0.120	0.092	0.076	0.045	0.029	0.012
4	0.048	0.104	0.161	0.211	0.161	0.110	0.092	0.064	0.030	0.020
5	0.035	0.074	0.101	0.169	0.212	0.145	0.117	0.081	0.046	0.020
6	0.027	0.056	0.077	0.113	0.172	0.189	0.154	0.111	0.066	0.035
7	0.024	0.045	0.058	0.080	0.117	0.152	0.207	0.161	0.103	0.053
8	0.023	0.033	0.041	0.057	0.078	0.098	0.165	0.233	0.174	0.097
9	0.013	0.026	0.027	0.031	0.044	0.057	0.097	0.186	0.287	0.231
10 (Late)	0.006	0.010	0.012	0.014	0.021	0.030	0.054	0.099	0.205	0.550

Table 3: Means of firm characteristics in each group of quarterly earnings announcers sorted by the sequence of announcements

In each three-month earnings announcement period from 1976Q3 to 2008Q2, we rank all announcers into ten groups based on their relative sequence of earnings announcements. Group 1 (10) consists of the early (late) announcers. Within each group, we first obtain each firm's market equity ME (in millions), market equity decile ranking (ME rank) by NYSE decile breakpoints, share price (Price), book-to-market equity (B/M), book-to-market equity decile ranking B/M rank by NYSE decile breakpoints, return momentum, earnings surprise (ES) determined via the seasonal random walk (SRW) model, accruals, one-quarter ahead EPS forecast error (FE), long-term growth rate forecast (FLTG), one-quarter ahead EPS forecast dispersion (σ(FEPS)), long-term growth rate forecast dispersion (σFLTG)), Amihud (2002) illiquidity measure (Ahimud), Hasbrouck (2007) spreads measure (γ_0 and γ_1), Corwin and Schultz (2007) spreads measure (High-Low), proportional quoted spreads (PQSPR) and proportional effective spreads (PESPR) by the end of the previous quarter. Then we take averages across all firms within each group. In the top panel, we report the time-series averages of these group characteristics; and in the bottom panel, we report the time-series averages and *t*-value of the difference of characteristics across different groups. '10-1' is the group 10 minus group 1, '(8,9,10)-(1,2,3)' is the average of the last three groups minus that of the first three groups. '(6 to 10)-(1 to 5)' is the average of the last five groups minus that of the first five groups.

	ME	ME Rank	Price	B/M	B/M Rank	Return Momentum	SRW ES	Accruals	FE (Median)	FLTG (Median)	σ(FEPS)	σ(FLTG)
1 (early)	5,363	5.892	33.683	0.777	4.971	0.144	0.001	-0.036	-0.019	0.135	0.031	0.032
2	4,097	5.784	31.690	0.794	5.075	0.135	0.002	-0.036	-0.020	0.134	0.035	0.033
3	3,611	5.686	30.713	0.814	5.166	0.129	0.001	-0.036	-0.020	0.134	0.040	0.035
4	3,359	5.483	30.012	0.839	5.297	0.120	0.002	-0.036	-0.032	0.132	0.052	0.035
5	2,854	5.293	28.987	0.859	5.381	0.116	0.001	-0.035	-0.021	0.133	0.052	0.037
6	2,345	5.089	27.707	0.883	5.545	0.109	0.000	-0.036	-0.056	0.132	0.057	0.038
7	1,900	4.583	36.822	0.914	5.694	0.108	-0.001	-0.034	-0.069	0.136	0.046	0.039
8	1,576	4.062	51.802	0.923	5.712	0.106	-0.002	-0.032	-0.058	0.148	0.051	0.041
9	1,711	3.862	64.762	0.883	5.423	0.113	-0.002	-0.028	-0.090	0.159	0.062	0.038
10 (late)	1,304	3.829	28.824	0.845	5.295	0.113	-0.001	-0.027	-0.039	0.156	0.033	0.036
10-1	-4,059	-2.063	-4.859	0.068	0.324	-0.031	-0.003	0.008	-0.020	0.021	0.002	0.004
t-value	[-12.70	[-38.11]	[-1.13]	[4.93]	[4.58]	[-4.80]	[-4.14]	[8.12]	[-1.73]	[21.83]	[0.83]	[7.53]
(8,9,10)-(1,2,3)	-2,827	-1.869	16.434	0.089	0.406	-0.025	-0.003	0.007	-0.043	0.020	0.013	0.005
t-value	[-14.82	[-54.11]	[3.61]	[9.62]	[8.64]	[-5.25]	[-6.92]	[10.47]	[-4.17]	[25.99]	[1.67]	[12.43]
(6 to 10)-(1 to 5)	-2,086	-1.343	10.973	0.073	0.356	-0.019	-0.003	0.004	-0.041	0.013	0.008	0.004
t-value	[-14.48	[-50.51]	[3.72]	[11.13]	[10.38]	[-5.33]	[-6.69]	[9.13]	[-4.25]	[17.03]	[1.75]	[13.08]

Table 3, continued.

	Amihud Illiquidity	γ_0 (LCF, x 10^3)	γ_1 (LCF, x 10^3)	High-Low Spreads	PQSPR	PESPR
1 (early)	0.394	4.640	5.437	0.014	0.011	0.008
2	0.366	4.598	5.702	0.014	0.010	0.008
3	0.410	4.645	5.857	0.014	0.011	0.008
4	0.421	4.720	5.873	0.014	0.011	0.008
5	0.504	4.984	6.013	0.015	0.012	0.009
6	0.557	5.095	6.019	0.015	0.012	0.009
7	0.754	5.723	6.107	0.017	0.015	0.011
8	1.039	6.441	6.125	0.018	0.017	0.013
9	1.158	7.020	6.335	0.019	0.019	0.015
10 (late)	1.151	6.945	6.315	0.019	0.019	0.014
10-1	0.757	2.305	0.878	0.005	0.008	0.006
t-value	[15.88]	[19.68]	[11.53]	[15.50]	[9.23]	[9.54]
(8,9,10)-(1,2,3)	0.726	2.174	0.593	0.005	0.008	0.006
t-value	[19.61]	[24.91]	[9.42]	[20.27]	[11.19]	[11.87]
(6 to 10)-(1 to 5)	0.512	1.529	0.405	0.003	0.005	0.004
t-value	[18.54]	[24.83]	[8.39]	[20.71]	[11.22	[11.89]

Table 4: Summary statistics of pair-wise correlations

This table reports the summary statistics of the pair-wise correlations estimated from the average abnormal returns in the past earnings-announcement periods. During the ending month of each calendar quarter from 1976Q3 to 2008Q1, only the common shares that have traded in NYSE/AMEX/NASDAQ, with stock prices not less than five dollars, have existed in CRSP-Compustat merged files for at least five years, and have regular earnings announcements in each of past 20 quarters are retained. Within each Fama-French industry, we calculate the long-term average abnormal return pairwise correlations We report the lower quartile, mean, standard deviation, median, upper quartile, the number of stocks, and the number of pairs. In addition, among all pair-wise correlations we calculate the percentage of positive/negative correlations and the percentage of significant correlations. We report the time-series average of these statistics over 127 months. The last row 'All' reports the summary statistics of all firms across all industries.

Industry	Q1	Mean	Std	Median	Q3	Pos. Cor.	Neg. Cor.	Sig. Cor.	No. Stock	No. Pairs
1	-0.182	0.010	0.272	0.013	0.202	0.52	0.48	0.12	44	953
2	-0.170	-0.001	0.250	-0.003	0.168	0.49	0.51	0.08	8	27
3	-0.180	-0.028	0.271	-0.041	0.127	0.46	0.54	0.14	5	10
4	-0.185	0.003	0.268	0.003	0.192	0.50	0.50	0.11	25	349
5	-0.181	0.008	0.275	0.011	0.199	0.51	0.49	0.12	33	523
6	-0.181	0.007	0.269	0.006	0.194	0.51	0.49	0.12	44	992
7	-0.176	0.013	0.267	0.011	0.201	0.51	0.49	0.12	25	319
8	-0.181	0.005	0.267	0.005	0.191	0.51	0.49	0.11	98	6,926
9	-0.176	0.011	0.270	0.011	0.200	0.52	0.48	0.12	43	924
10	-0.188	0.011	0.278	0.018	0.214	0.52	0.48	0.14	16	157
11	-0.184	0.004	0.267	0.004	0.191	0.51	0.49	0.11	84	3,605
12	-0.173	0.013	0.266	0.012	0.199	0.52	0.48	0.11	37	710
13	-0.179	0.010	0.270	0.009	0.199	0.51	0.49	0.12	79	3,148
14	-0.189	-0.003	0.265	-0.004	0.183	0.49	0.51	0.11	33	637
15	-0.165	0.024	0.270	0.026	0.214	0.53	0.47	0.12	35	602
16	-0.171	0.017	0.265	0.014	0.202	0.52	0.48	0.11	16	121
17	-0.203	-0.006	0.263	-0.009	0.177	0.49	0.51	0.11	13	90
18	-0.125	0.024	0.253	0.010	0.164	0.54	0.46	0.12	4	5
19	-0.161	0.031	0.273	0.032	0.224	0.54	0.46	0.13	59	1,796
20	-0.134	0.063	0.281	0.066	0.266	0.59	0.41	0.15	101	5,497
21	-0.170	0.021	0.278	0.025	0.214	0.54	0.46	0.13	26	374
22	-0.185	0.004	0.269	0.004	0.193	0.51	0.49	0.12	119	10,526
23	-0.179	0.008	0.267	0.008	0.194	0.51	0.49	0.11	157	14,085
24	-0.187	0.005	0.274	0.007	0.198	0.51	0.49	0.12	43	895
25	-0.179	0.008	0.266	0.008	0.194	0.51	0.49	0.11	44	983
26	-0.188	-0.001	0.267	-0.001	0.186	0.50	0.50	0.11	59	1,992
27	-0.172	0.014	0.267	0.015	0.201	0.52	0.48	0.11	89	4,140
28	-0.188	0.005	0.271	0.007	0.194	0.51	0.49	0.12	32	575
29	-0.176	0.017	0.275	0.017	0.211	0.52	0.48	0.13	245	43,165
30	-0.175	0.010	0.267	0.009	0.196	0.51	0.49	0.11	29	445
All	-0.176	0.015	0.273	0.015	0.207	0.52	0.48	0.12	1,642	104,572

Table 5: Summary statistics of portfolio characteristics

On each earnings announcement date over the three-month period during which we implement our correlation implied return strategy, we first obtain each firm's size decile ranking (Size Rank), book-to-market equity decile ranking (B/M Rank) both using the NYSE decile breakpoints, accounting accruals (Accruals) computed using the most recent fiscal year end data, one-quarter ahead earnings per share forecast dispersion (σ(EPS)), long-term growth rate forecast (LTG), and the long-term growth rate forecast dispersion (σ(LTG)). All of these measures are computed as of the end of previous month. We also include several liquidity and transaction cost measures, including the Amihud (2002) illiquidity measure (*Amihud Illiquidity*), Hasbrouck (2007) liquidity measures (γ_0 and γ_1, multiplied by 10^3 respectively), Corwin and Schultz (2007) High-Low spreads (Hi-Low Spreads), proportional effective spreads (PESPR) and proportional quoted spreads (PQSPR) derived from NYSE TAQ database. The Amihud (2002) illiquidity measure, Hasbrouck (2007) liquidity measures are the annual measure computed as of the end of the previous year. The Corwin and Schultz (2007) High-Low spreads, effective and quoted spreads from TAQ are the monthly measure computed as of the end of the previous month. Then we take the average across the firms in each portfolio to obtain these reported portfolio characteristics. At the end of each month in the period of trading the correlation implied return portfolios, we average over all earnings announcement dates in that month to obtain the monthly portfolio characteristics (381 months during 1976/10 to 2008/06). Quintile 1 (5) contains the stocks with the lowest (highest) implied returns. We report the time-series average of the portfolio characteristics and t-values of the differences of characteristics between quintile 5 and 1.

	Size Rank	B/M Rank	Accruals	σ(EPS)	LTG	σ(LTG)	Amihud Illiquidity	γ_0 (LCF, x 10^3)	γ_1 (LCF, x 10^3)	Hi-Low Spreads	PQSPR	PESPR
1 (low)	3.6	5.6	-0.033	0.0080	0.1565	0.0400	1.178	7.240	6.712	0.020	0.020	0.016
2	4.2	5.6	-0.032	0.0049	0.1422	0.0349	0.913	6.208	5.956	0.018	0.018	0.013
3	4.5	5.5	-0.029	0.0029	0.1399	0.0328	0.797	5.753	5.713	0.017	0.016	0.012
4	4.3	5.3	-0.025	0.0029	0.1505	0.0346	0.893	6.108	6.003	0.018	0.017	0.013
5 (high)	3.7	5.2	-0.021	0.0040	0.1642	0.0380	1.215	7.126	6.656	0.020	0.021	0.016
5-1	0.1	-0.4	0.013	-0.0041	0.0079	-0.0020	0.037	-0.114	-0.056	0.000	0.000	0.000
t-value	[6.28]	[-18.14]	[21.67]	[-2.44]	[11.14]	[-4.46]	[1.49]	[-2.44]	[-1.57]	[0.42]	[0.42]	[0.33]

Table 6: Industry distribution of the lowest/highest implied return portfolios

This table reports the industry composition of the lowest correlation implied return portfolio (Q1) and of the highest correlation implied return portfolio (Q5). On each earnings announcement date over a three-month period in which we form the correlated implied return portfolios, we count the number of stocks from each industry. By the end of period of the portfolio strategy, within the top/bottom quintile we calculate the average number of stocks from each industry in the past three months. Then we compute the percentage of the average number of stocks in the quintile to the total number of stocks within each industry. This calculation is repeated for each portfolio strategy period (127 periods during 1976/10 to 2008/06). We obtain the time-series average of these frequencies (in percent) and rescale them across all industries to report the industry composition in the table.

Industry Code	Industry Name	Q1	Q5
1	Food Products	3.0	2.9
2	Beer & Liquor	5.0	5.5
3	Tobacco Products	4.7	3.6
4	Recreation	3.7	4.2
5	Printing and Publishing	2.9	3.0
6	Consumer Goods	2.8	2.8
7	Apparel	3.9	4.2
8	Healthcare, Medical Equipment, Pharma. Products	2.7	2.7
9	Chemicals	2.4	2.4
10	Textiles	4.8	4.8
11	Construction and Construction Materials	2.4	2.6
12	Steel Works Etc	3.2	2.9
13	Fabricated Products and Machinery	2.6	2.7
14	Electrical Equipment	3.3	3.3
15	Automobiles and Trucks	2.9	3.0
16	Aircraft, ships, and railroad equipment	3.9	4.0
17	Precious Metals, Metallic, and Industrial Metal Mining	4.5	4.5
18	Bituminous coal	6.4	4.2
19	Petroleum and Natural Gas	2.6	2.4
20	Utilities	2.3	2.0
21	Communication	3.5	3.8
22	Personal and Business Services	2.9	3.0
23	Business Equipment	2.8	2.9
24	Paper - Business Supplies and Shipping Containers	2.5	2.6
25	Transportation	3.0	2.9
26	Wholesale	3.2	3.5
27	Retail	3.4	4.0
28	Restaurants, Hotels, Motels	3.5	4.0
29	Banking, Insurance, Real Estate, Trading	1.8	1.9
30	Everything Else	3.5	3.7

Table 7: Monthly portfolio returns and alphas of the earnings announcement return correlation strategies

At the end of each quarter during 1976Q3 to 2008Q1, we select all firms meeting the following criteria: (1) common shares are traded in NYSE/AMEX/NASDAQ with stock price not less than five dollars; (2) existed on the CRSP-Compustat merged files for at least five years; and (3) regular quarterly earnings announcements in past five years. Within each of the Fama-French 30 industries, we calculate the sample means and pair-wise sample covariances of long-term average abnormal returns based on the firm's earnings announcement period average abnormal returns over past 20 quarters (skipping the most recent four quarters). During the subsequent three-month earnings announcement period, we implement the correlation implied return strategies. On each earnings announcement date of the early announcers, we compute the implied returns for all late announcers and rank them into quintile portfolios. Quintile 1 (5) contains the stocks with the lowest (highest) correlation implied returns, and the long/short hedge portfolio (5-1) is constructed by buying the stocks in portfolio 5 and short-selling the stocks in portfolio 1. To obtain the portfolio monthly returns, we compound the value-weighted daily portfolio returns. In the event of no earnings announcement at the beginning of the first month of the calendar quarter, or less than five stocks in either protfolio1 or portfolio 5, we invest into T-bills using daily risk-free rate. Panel A reports the mean excess monthly returns and alphas (in percent), and panel B reports Fama-French four-factor model loadings and regression R-squares. The average number of stocks in each quintile portfolio is 99.

	Panel A: Intercepts				Panel B: Loadings and R^2				
	Excess Return	CAPM alpha	FF3 alpha	FF4 alpha	MKTRF	SMB	HML	UMD	R^2
1	0.253	-0.364	-0.341	-0.241	1.052	0.180	-0.106	-0.099	0.574
	[0.76]	[-1.64]	[-1.50]	[-1.04]	[18.17]	[2.40]	[-1.20]	[-1.86]	
2	0.750	0.229	0.200	0.125	0.902	0.244	-0.003	0.074	0.616
	[2.74]	[1.30]	[1.13]	[0.69]	[19.94]	[4.16]	[-0.05]	[1.79]	
3	0.697	0.182	0.182	0.199	0.921	0.043	-0.014	-0.017	0.603
	[2.61]	[1.07]	[1.03]	[1.10]	[20.47]	[0.73]	[-0.20]	[-0.42]	
4	0.571	0.051	0.031	0.131	0.928	0.078	-0.002	-0.098	0.598
	[2.09]	[0.29]	[0.17]	[0.71]	[20.09]	[1.30]	[-0.03]	[-2.33]	
5	1.302	0.691	0.770	0.829	1.028	0.104	-0.179	-0.057	0.635
	[4.18]	[3.58]	[3.92]	[4.10]	[20.44]	[1.59]	[-2.32]	[-1.24]	
5-1	1.048	1.055	1.112	1.069	-0.024	-0.076	-0.072	0.041	0.004
	[4.02]	[4.01]	[4.09]	[3.83]	[-0.34]	[-0.85]	[-0.68]	[0.65]	

Table 8: Return decomposition of the portfolios sorted on the correlation implied return.

Panel A reports the portfolio holding period returns excluding the later announcers' earnings announcement day returns. Panel B reports the portfolio holding period returns only considering the late announcers' earnings announcement day returns. On the earnings announcement date during a three-month period of implementing the correlation implied return portfolio strategy, we calculate the value-weighted daily returns of each quintile portfolio over its holding period; we then compound the daily returns over a month to obtain the portfolio monthly return. Quintile 1 (5) contains the stocks with the lowest (highest) implied returns for the late announcers. In panel A, we calculate the portfolio holding period daily returns excluding the earnings announcement day returns of the late announcers. In panel B, we calculate the portfolio holding period daily returns including only using the earnings announcement day returns for the late announcers. After compounding the daily returns into monthly returns for each quintile portfolio, we report the mean excess monthly returns and alphas from the CAPM and Fama-French factor models (in percent).

	Panel A: Excluding EA Firms				Panel B: Only EA Firms			
	Excess Return	CAPM alpha	FF3 alpha	FF4 alpha	Excess Return	CAPM alpha	FF3 alpha	FF4 alpha
1	0.329	-0.278	-0.241	-0.179	0.547	0.039	-0.106	0.118
	[1.01]	[-1.26]	[-1.07]	[-0.78]	[0.77]	[0.06]	-0.15]	[0.16]
2	0.711	0.196	0.158	0.109	1.808	1.379	0.983	0.826
	[2.66]	[1.16]	[0.93]	[0.62]	[2.76]	[2.16]	1.51]	[1.23]
3	0.641	0.126	0.114	0.147	1.536	1.070	0.895	1.024
	[2.46]	[0.79]	[0.69]	[0.87]	[2.71]	[1.98]	1.62]	[1.81]
4	0.514	-0.014	-0.045	0.048	1.599	1.139	1.048	0.872
	[1.87]	[-0.08]	[-0.25]	[0.26]	[2.34]	[1.71]	1.55]	[1.25]
5	1.120	0.492	0.566	0.660	3.280	2.884	3.063	2.995
	[3.54]	[2.56]	[2.88]	[3.27]	[4.10]	[3.65]	3.83]	[3.64]
5-1	0.790	0.769	0.807	0.839	2.733	2.846	3.169	2.877
	[3.15]	[3.04]	[3.09]	[3.12]	[2.74]	[2.83]	[3.07]	[2.71]

Table 9: Late announcers' post-earning announcement returns

On each earnings announcement date over a three-month period, we form the quintile portfolios based on the correlation implied returns for the late announcers. Quintile 1 (5) contains the stocks with the lowest (highest) implied returns for the late announcers. We calculate the post-earnings announcement daily returns of each late announcer for the first week (panel A) and the second week (panel B) after the earnings announcement date. The first day after earnings announcement is skipped. For each quintile portfolio on with late announcers' post-earnings returns, we calculate the value-weighted daily returns, if returns are not available we use daily returns to T-Bills. Then we compound daily returns to compute the monthly return. This table reports the mean excess monthly returns and alphas from the CAPM, the Fama-French three-factor model, and the Fama-French and Carhart four-factor model. The returns are reported in percentages, and the time-series *t*-statistics are reported below the portfolio returns.

	Panel A: Post EA [t+2, t+6]				Panel B: Post EA [t+7, t+11]			
	Excess Return	CAPM alpha	FF3 alpha	FF4 alpha	Excess Return	CAPM alpha	FF3 alpha	FF4 alpha
1	0.508	-0.002	-0.181	-0.051	0.624	0.212	0.125	0.182
	[1.46]	[-0.01]	[-0.62]	[-0.17]	[2.01]	[0.80]	[0.46]	[0.65]
2	1.010	0.632	0.523	0.544	0.713	0.361	0.258	0.338
	[3.35]	[2.41]	[1.94]	[1.96]	[2.59]	[1.52]	[1.05]	[1.35]
3	0.911	0.473	0.270	0.370	0.670	0.268	0.228	0.312
	[3.03]	[1.92]	[1.09]	[1.45]	[2.39]	[1.16]	[0.96]	[1.28]
4	0.924	0.448	0.392	0.449	0.698	0.269	0.201	0.275
	[2.93]	[1.78]	[1.51]	[1.68]	[2.50]	[1.22]	[0.88]	[1.18]
5	1.224	0.768	0.662	0.659	0.567	0.161	0.114	0.315
	[3.53]	[2.58]	[2.16]	[2.09]	[1.94]	[0.66]	[0.45]	[1.23]
5-1	0.716	0.771	0.842	0.710	-0.056	-0.051	-0.010	0.133
	[2.07]	[2.21]	[2.34]	[1.92]	[-0.18]	[-0.17]	[-0.03]	[0.41]

Table 10: Monthly returns of Earning Surprise (ES) and Implied Return (IR) independently sorted portfolios

Table 11 reports the monthly returns in percentage from the earnings surprise (ES) and implied return (IR) independently sorted portfolio returns. ES1 (ES5) contains the stocks with the most negative (positive) earnings surprise. IR1 (IR5) contains the stocks with the lowest (highest) correlation implied returns. ES5-1 is a zero-cost long-short hedge portfolio constructed by buying the stocks in quintile ES5 and short-selling the stocks in quintile ES1. Stocks are held for one month (Panel A), three months (Panel B), and six months (Panel C). All the portfolio returns are value-weighted. The table reports the mean excess monthly returns (left side of each panel) and alphas estimated in Fama-French-Carhart four-factor model (right side of each panel). For comparison purposes, we also report the monthly returns from the portfolios ("All Stocks") sorted on earnings surprise only. The time-series average number of stocks in each earnings surprise (ES) and implied return (IR) independently sorted portfolio ranges from 20 to 25, and the time-series average number of stocks from the portfolios sorted only on earnings surprise ranges from 103 to 104.

Panel A: Monthly returns of earnings surprises and implied return independently sorted portfolios with the holding horizon of one month

	Value Weighted Raw Returns						Fama-French and Carhart Model Adjusted Returns					
	1 (low IR)	2	3	4	5 (high IR)	All Stocks	1 (low IR)	2	3	4	5 (high IR)	All Stocks
1 (Low ES)	0.147	0.062	0.573	0.088	0.286	0.227	-0.418	-0.462	0.082	-0.344	-0.345	-0.298
2	0.578	0.405	0.498	0.657	0.485	0.456	0.012	-0.292	-0.081	0.241	-0.172	0.016
3	1.025	0.621	0.616	0.812	0.379	0.562	0.286	-0.016	0.063	0.202	-0.390	-0.009
4	0.769	0.916	0.629	0.170	0.370	0.560	-0.093	0.201	-0.061	-0.418	-0.126	-0.048
5 (High ES)	1.255	0.434	0.723	0.477	1.065	0.837	0.874	-0.465	-0.060	-0.241	0.452	0.226
5-1 (High – Low)	1.161	0.371	0.117	0.389	0.779	0.610	1.375	-0.003	-0.167	0.103	0.797	0.524
t-statistics	[2.49]	[1.03]	[0.30]	[1.22]	[2.13]	[2.85]	[2.77]	[-0.01]	[-0.40]	[0.30]	[2.04]	[2.32]

Panel B: Monthly returns of earnings surprises and implied return independently sorted portfolios with the holding horizon of three months

	Value Weighted Raw Returns						Fama-French and Carhart Model Adjusted Returns					
	1 (low IR)	2	3	4	5 (high IR)	All Stocks	1 (low IR)	2	3	4	5 (high IR)	All Stocks
1 (Low ES)	0.178	0.424	0.950	0.453	0.434	0.510	-0.368	-0.059	0.518	-0.047	-0.198	-0.020
2	0.638	0.707	0.656	0.758	0.776	0.547	0.176	0.083	0.185	0.310	0.203	0.167
3	0.844	0.680	0.613	0.751	0.520	0.602	0.102	0.072	0.020	0.207	-0.088	0.094
4	0.748	0.708	0.747	0.688	0.503	0.655	-0.013	0.107	0.144	0.169	-0.054	0.090
5 (High ES)	0.808	0.759	0.824	1.002	1.202	0.980	0.292	0.011	0.143	0.267	0.526	0.335
5-1 (High – Low)	0.631	0.334	-0.125	0.549	0.768	0.470	0.660	0.069	-0.374	0.314	0.723	0.355
t-statistics	[2.44]	[1.58]	[-0.55]	[2.43]	[3.60]	[3.27]	[2.40]	[0.31]	[-1.59]	[1.33]	[3.28]	[2.45]

Panel C: Monthly returns of earnings surprises and implied return independently sorted portfolios with the holding horizon of six months

	Value Weighted Raw Returns						Fama-French and Carhart Model Adjusted Returns					
	1 (low IR)	2	3	4	5 (high IR)	All Stocks	1 (low IR)	2	3	4	5 (high IR)	All Stocks
1 (Low ES)	0.526	0.456	0.687	0.458	0.514	0.447	-0.029	-0.063	0.191	-0.098	-0.118	-0.086
2	0.606	0.677	0.574	0.570	0.805	0.474	0.077	0.094	0.071	0.100	0.211	0.079
3	0.833	0.637	0.651	0.725	0.724	0.635	0.236	0.025	0.118	0.189	0.092	0.134
4	0.642	0.760	0.674	0.682	0.764	0.664	-0.036	0.199	0.057	0.155	0.332	0.166
5 (High ES)	0.692	0.844	0.793	0.763	0.809	0.744	0.073	0.144	0.123	0.085	0.135	0.129
5-1 (High – Low)	0.166	0.388	0.106	0.305	0.294	0.297	0.102	0.208	-0.068	0.183	0.253	0.215
t-statistics	[0.85]	[2.50]	[0.67]	[1.88]	[1.90]	[3.23]	[0.49]	[1.27]	[-0.41]	[1.06]	[1.57]	[2.29]

Table 11: Mean excess monthly returns and alphas for the portfolio strategy based on the individual component of the correlation implied return

Panel A reports the mean excess return and the intercepts from time-series regressions of the monthly returns of the portfolios sorted on the mean of long-term average abnormal returns (LT-AAR) -- i.e., the second component of the correlation implied return equation -- over the past 20 quarters, skipping the most recent four quarters. Panel B reports the mean excess return and the intercepts from time-series regressions of the monthly returns of the portfolios sorted on the covariance term -- i.e., the first component of the correlation implied return equation over the past 20 quarters, skipping the most recent four quarters. *t*-statistics are in parenthesis. The average number of stocks in each quintile is 99.

	Panel A: LT-AAR Mean Component				Panel B: Covariance Component			
	Excess Return	CAPM alpha	FF3 alpha	FF4 alpha	Excess. Return	CAPM alpha	FF3 Alpha	FF4 Alpha
1	0.466	-0.183	-0.307	-0.230	0.404	-0.193	-0.120	-0.117
	[1.32]	[-0.77]	[-1.30]	[-0.95]	[1.25]	[-0.88]	[-0.55]	[-0.52]
2	0.516	0.020	0.003	0.010	0.560	0.001	0.008	0.028
	[1.93]	[0.11]	[0.01]	[0.05]	[1.96]	[0.00]	[0.05]	[0.15]
3	0.856	0.377	0.349	0.369	0.834	0.356	0.309	0.367
	[3.41]	[2.33]	[2.09]	[2.15]	[3.12]	[1.90]	[1.61	[1.86]
4	0.714	0.178	0.150	0.176	0.495	-0.040	-0.023	-0.083
	[2.61]	[1.06]	[0.87	[0.99]	[1.70]	[-0.20]	[-0.11	[-0.40]
5	0.931	0.263	0.471	0.474	1.065	0.479	0.468	0.623
	[2.74]	[1.25]	2.29]	[2.24]	[3.49	[2.46]	[2.37]	[3.10]
5-1	0.465	0.446	0.778	0.704	0.661	0.672	0.589	0.740
	[1.65]	[1.57]	[2.74]	[2.41]	[2.46]	[2.48]	[2.11]	[2.59]

Table 12: Monthly portfolio returns and alphas of the earnings announcement return correlation strategies conditional on early announcers' announcement information content: "Good vs. "Bad" news partitions

At the end of each quarter during 1976Q3 to 2008Q1, we select all firms meeting the following criteria: (1) common shares traded in NYSE/AMEX/NASDAQ with stock price not less than five dollars; (2) existed on the CRSP-Compustat merged files for at least five years; and (3) has regular quarterly earnings announcements in past five years. Within each of Fama-French 30 industries, we calculate the sample means and pair-wise sample covariances of long-term average abnormal returns (LT-AAR) based on the firms' earnings announcement period average abnormal returns over past 20 quarters (skipping the most recent 4 quarters). During the subsequent three-month earnings announcement period, we implement the correlation implied return strategies. On each early earnings announcement date, we first classify the late announcers into "good news" and "bad news" groups depending on the direction of implied returns. Within each of these two portfolios, we then compute the implied returns for all late announcers and rank them into tercile portfolios. Tercile 1 (3) contains the stocks with the lowest (highest) correlation implied returns, and the long/short hedge portfolio (3-1) is constructed by buying the stocks in tercile3 and short-selling the stocks in tercile 1. To obtain the portfolio monthly returns, we compound the value-weighted daily portfolio returns. In the event of no earnings announcement at the beginning of the first month of the calendar quarter, or less than five stocks in either tercile 1 or tercile 3, we invest in T-bills at the daily risk-free rate. The left columns report the mean excess monthly returns and alphas (in percent), and the right columns report Fama-French and Carhart four-factor model loadings and regression R-squares. The average number of stocks in tercile 1 is 75, in tercile 2, 101 and in tercile 3, 75.

Panel A: monthly portfolio returns and alphas, conditional **"good news"** early announcers

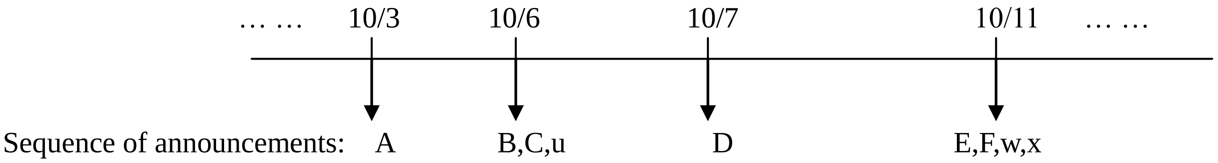
	Excess Returns and Intercepts				Factor Loadings and R^2				
	Excess Return	CAPM alpha	FF3 alpha	FF4 alpha	MKTRF	SMB	HML	UMD	R^2
1	0.800	0.216	0.255	0.286	0.988	0.170	-0.122	-0.031	0.508
	2.39	0.90	1.05	1.14	15.79	2.10	-1.28	-0.53	
2	0.418	-0.089	-0.119	-0.047	0.929	0.014	0.036	-0.071	0.607
	1.59	-0.53	-0.69	-0.26	21.04	0.24	0.54	-1.75	
3	0.921	0.366	0.419	0.471	0.950	0.084	-0.126	-0.051	0.565
	3.07	1.82	2.03	2.22	17.99	1.23	-1.57	-1.06	
3-1	0.122	0.150	0.164	0.185	-0.038	-0.086	-0.004	-0.021	0.004
	0.43	0.53	0.56	0.62	-0.51	-0.89	-0.04	-0.31	

Panel B: monthly portfolio returns and alphas, conditional **"bad news"** early announcers

	Excess Returns and Intercepts				Factor Loadings and R^2				
	Excess Return	CAPM alpha	FF3 alpha	FF4 alpha	MKTRF	SMB	HML	UMD	R^2
1	0.328	-0.260	-0.297	-0.227	1.007	0.295	-0.026	-0.069	0.531
	0.99	-1.11	-1.25	-0.93	16.59	3.75	-0.28	-1.25	
2	0.508	0.020	0.028	-0.074	0.871	0.053	-0.011	0.100	0.633
	2.04	0.13	0.17	-0.46	21.61	1.02	-0.18	2.71	
3	1.075	0.484	0.518	0.439	1.019	0.138	-0.085	0.077	0.606
	3.48	2.43	2.55	2.11	19.63	2.05	-1.07	1.62	
3-1	0.747	0.744	0.815	0.666	0.013	-0.157	-0.059	0.146	0.018
	2.68	2.65	2.82	2.25	0.17	-1.64	-0.52	2.17	

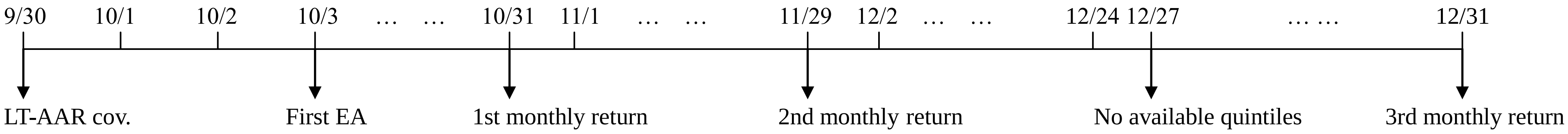
Figure 1: Diagram of correlation implied return portfolio strategy

Industry 1 contains firms “A”, “B”, “C”, “D”, “E” and “F”, and industry 2 contains firms “u”, “w”, “x”, “y”, and “z”. All of these 11 firms make earnings announcements in October. The first announcement starts on October 3rd. For simplicity, we only illustrate the procedures up to the EA date on October 11th, and require at least 5 stocks available to form quintiles at each time.



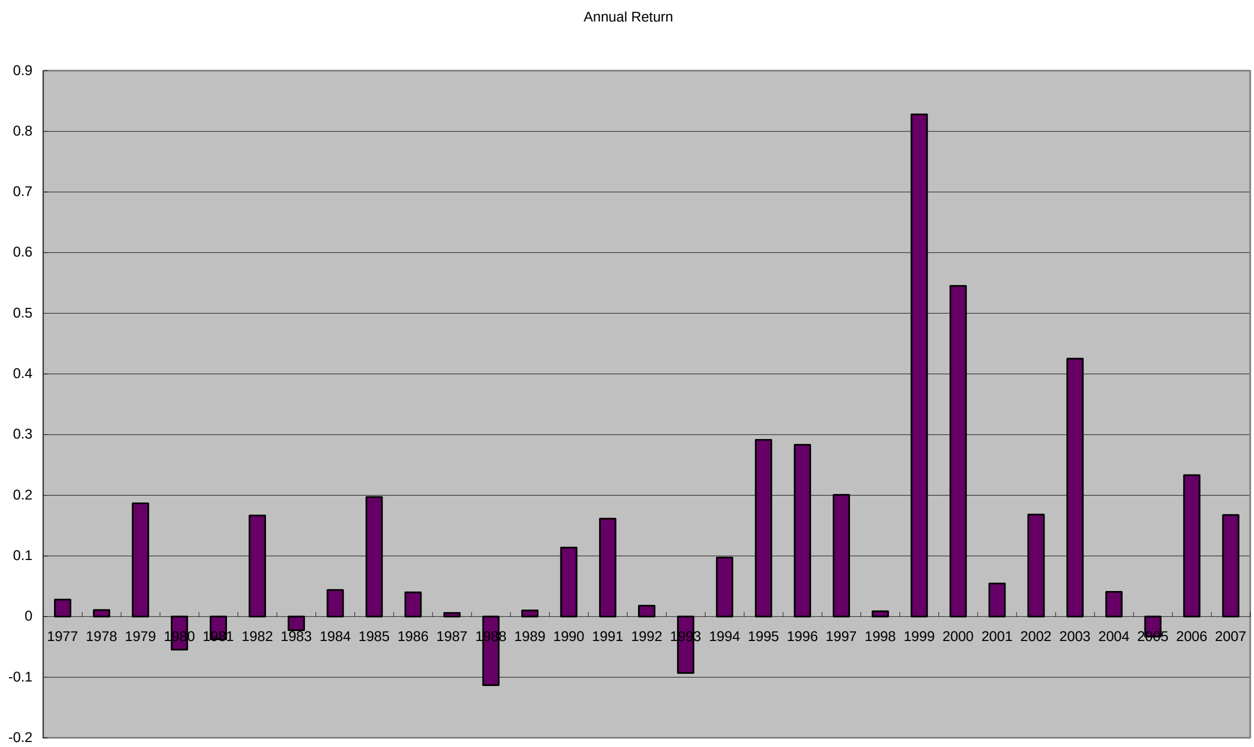
EA date	Early announcer(s)	Pairs with late announcers	Firms entered into portfolios	Procedure description
10/3	A (industry 1)	(A,B), (A,C), (A,D), (A,E), (A,F)	B, C, D, E, F (industry 1)	Calculate the correlation implied returns within industry 1 and form quintiles
10/6	B,C (industry 1)	(B,D), (B,E), (B,F), (C,D), (C,E), (C,F)	D, E, F (industry 1)	A is dropped and its covariances with D,E, and F are not used to calculate implied returns
	u (industry 2)	(u,w), (u,x), (u,y), (u,z)	w, x, y, z (industry 2)	Calculate the correlation implied returns within industry 2
				Form quintiles over all late announcers across both industry 1 and 2
10/7	D (industry 1)	(D,E), (D,F)	E, F (industry 1)	B and C are dropped, and their covariances with E and F are not used
			w, x, y, z (industry 2)	Industry 2 has no firm announcing earnings, and use the implied returns from the last EA date
				Form quintiles over all late announcers across both industry 1 and 2
10/11	E,F (industry 1)		Not enough number of stocks	All firms from industry 1 report the earnings
	w,x (industry 2)	(w,y), (w,z), (x,y), (x,z)		Calculate the implied returns within industry 2 Retain these implied returns, and hold T-bills

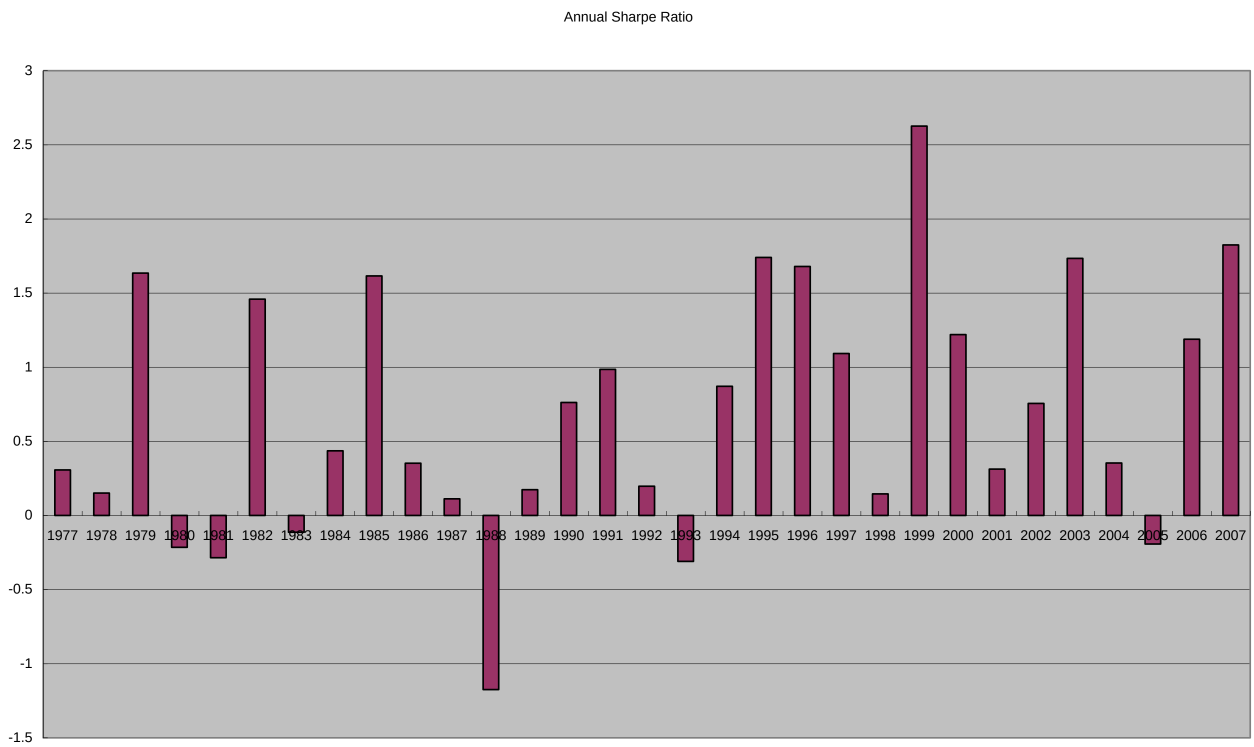
Figure 2: Diagram of calculating portfolio monthly returns using the fourth quarter of the calendar year as an example



At the ending month of 3rd quarter (9/30), we calculate the long-term average abnormal return (LT-AAR) covariances among all firms within each industry based on their past 20 quarterly earnings announcements (EAs) (skipping the most recent four announcements). The trading strategy begins at 10/1. On 10/1 we invest T-bills until the first ea date at 10/3. We form the quintiles on this date, hold the portfolios to the next EA date, and re-form the quintiles accordingly, all of which are described in the procedures in Figure 1. At the end of October (10/31), we calculate the portfolio monthly return by hypothetically closing our position and compounding the daily returns within that month. If this date also happens to be an EA date, we re-form the portfolios and start to calculate the daily returns into November. Otherwise, we reopen our position at 11/1 using the portfolio weights formed at the last EA date in October, and continue to hold the portfolios into November. At the end of November (11/29), we use the same method to calculate portfolio return in the second month. On the EA date 12/27, since we have not enough number of stocks to form quintiles, we close our position and invest all proceeds into T-bills until the end of December. The trading strategy ends at 12/31 and we calculate the portfolio return in the third month. During the three-month trading strategy period, if on a particular EA date we don't have the enough stocks to form portfolios, we hold the T-bills until the date at which we can reformulate the quintiles to invest.

Figure 3: Annual return and Sharpe ratio of long-short hedge portfolios. The years of 1976 and 2008 are excluded since we only have 3-6 months of portfolio returns.





Appendix A: Return Predictability of Earnings Announcement Period Returns

In this Appendix, we consider the monthly returns of several long/short hedge portfolios formed on the basis of the average quarterly earnings announcement period average abnormal returns. In Panel A of the Table, the long side consists of stocks with the highest most recent quarter earnings announcement period abnormal returns, and the short side consists of stocks with the lowest most recent quarter earnings announcement period abnormal returns. Panel B is similar to Panel A; instead of sorting stocks based on the most recent quarter's average earnings announcement period abnormal returns, we sort stocks based on the average of the most recent four quarters' earnings announcement period returns. Finally, Panel C considers the most recent twenty quarter's earnings announcement period returns, excluding the most recent four quarters.

Panels A and B show that short-term average abnormal returns during the three days surrounding the earnings announcement may be used to form portfolios with economically and statistically significant returns; especially for the equally-weighted portfolios. The monthly returns of the long/short portfolio formed on the basis of the most recent quarter's earnings announcement period return range from 25 basis points per month (value-weighted, t-statistic of 1.75) to 71 basis points (equally-weighted, t-statistic of 8.95). The monthly returns of the long/short portfolio formed on the basis of the most recent four quarter's earnings announcement period return ranges from 38 basis points per month (value-weighted, t-statistic of 2.71) to 67 basis points (equally-weighted, t-statistic of 7.61).

In contrast, Panel C shows that the portfolios based on the long-term average abnormal earnings announcement period returns have no economically and statistically significant return predictability for either the equally-weighted or value-weighted portfolios. The monthly returns of the long/short portfolios range from 4 basis points per month (value-weighted, t-statistic of 0.29) to 13 basis points (equally-weighted, t-statistic of 1.57). It follows that, if there is any predictability of returns, this predictability relies on the first component of equation (3).

The pair-wise abnormal return covariances are estimated using the first 16 of the 20 quarterly earnings announcement period returns in the past five years (including the current quarter T). We exclude the returns of the recent four quarters because in order to remove the effect of the return predictability shown in this Appendix. That is:

$$\hat{C}_{i,j} = \frac{1}{16}\sum_{q=T-19}^{T-4}\left(R_{iq} - \overline{R}_i\right)\left(R_{jq} - \overline{R}_j\right) \quad (8)$$

where $\overline{R}_i = \frac{1}{16}\sum_{q=T-19}^{q=T-4} R_{iq}$.[27]

Table A1: Return predictability from most recent earnings announcement period return, short-term average abnormal returns (ST-AAR), and long-term average abnormal return (LT-AAR)

At the end of each month t from September 1976 to March 2008, all CRSP common stocks with price no less than five dollars are sorted into quintiles based on their average abnormal returns (AAR) over three-day earning announcement event-window. At the end of each month, we sort the stocks into quintiles based on the earnings announcement period abnormal returns. Panel A ranks all stocks with earnings announcements during past one quarter, Panel B ranks all stocks making earnings announcements during past four quarters, and Panel C ranks all stocks making earnings announcement during the past twenty quarters but skipping the most recent four quarters. The table reports both equally-weighted and value-weighted mean monthly returns in excess of the risk free rate (in percent), in addition to the alphas from the CAPM, and from the Fama-French factor models (in percent). t-statistics are reported in parentheses. The last column reports the average number of stocks in each portfolio. "5-1" represents the long/short hedge portfolio, which is constructed by going long in stocks in quintile 5 and by going short in stocks in quintile 1.

Panel A: Pre-earnings announcement drift based on the most recent quarterly earnings announcements. All firms with either December or non-December fiscal year end month are considered, requiring five-year existence in the CRSP-Compustat merged files and regular earnings announcements in the past 20 quarters.

	Equally Weighted Portfolio				Value Weighted Portfolio				
	Excess Return	CAPM alpha	FF3 alpha	FF4 alpha	Excess Return	CAPM alpha	FF3 alpha	FF4 alpha	N
1	0.476	-0.144	-0.398	-0.212	0.472	-0.146	-0.171	-0.040	104
	[1.70]	[-1.13]	[-4.82]	[-2.86]	[1.74]	[-1.37]	[-1.58]	[-0.37]	
2	0.837	0.323	0.019	0.089	0.588	0.033	0.003	0.035	104
	[3.59]	[2.98]	[0.27]	[1.22]	[2.42]	[0.35]	[0.03]	[0.35]	
3	0.798	0.301	0.018	0.082	0.519	-0.003	-0.052	-0.051	104
	[3.57]	[2.99]	[0.24]	[1.08]	[2.30]	[-0.03]	[-0.69]	[-0.65]	
4	0.948	0.422	0.142	0.179	0.599	0.074	0.041	0.013	104
	[4.02]	[4.06]	[2.03]	[2.50]	[2.66]	[0.95]	[0.51]	[0.16]	
5	1.188	0.562	0.329	0.388	0.716	0.088	0.095	0.096	105
	[4.22]	[4.48]	[4.37]	[5.08]	[2.62]	[0.84]	[0.91]	[0.89]	
5-1	0.712	0.707	0.728	0.600	0.245	0.234	0.267	0.136	
	[8.95]	[8.80]	[8.82]	[7.50]	[1.75]	[1.65]	[1.83]	[0.92]	

[27] Statistically, Fisher's z-transformation approaches normality rapidly as the sample size increases for any values of correlation coefficient, even for the sample size as small as 10 (Fisher, 1970, pp. 200-201). Under the null hypothesis that the correlation is equal to zero, the test based on the t-distribution is slightly more powerful than that on Fisher's approximate inference (Anderson, 1984). As a result, our sample covariance estimates based on 16 quarterly observations are reasonably precise.

Panel B: Pre-earnings announcement drift based on the mean of short-term average abnormal returns over the most recent four quarterly earnings announcements. All firms with either December or non-December as fiscal year end month are considered, requiring five-year existence in CRSP-Compustat merged files and regular earnings in past 20 quarters.

	Equally Weighted Portfolio				Value Weighted Portfolio				
	Excess Return	CAPM alpha	FF3 alpha	FF4 alpha	Excess Return	CAPM alpha	FF3 alpha	FF4 Alpha	N
1	0.566	-0.038	-0.311	-0.098	0.510	-0.090	-0.157	0.047	104
	[2.05]	[-0.29]	[-3.68]	[-1.35]	[1.92]	[-0.81]	[-1.38]	[0.43]	
2	0.737	0.227	-0.075	0.023	0.461	-0.058	-0.170	-0.097	104
	[3.20]	[2.15]	[-1.04]	[0.32]	[2.02]	[-0.64]	[-1.93]	[-1.09]	
3	0.788	0.285	0.002	0.071	0.494	-0.038	-0.051	-0.046	104
	[3.51]	[2.93]	[0.03]	[1.01]	[2.18]	[-0.50]	[-0.67]	[-0.60]	
4	0.919	0.384	0.115	0.116	0.668	0.113	0.135	0.064	104
	[3.84]	[3.67]	[1.58]	[1.54]	[2.81]	[1.38]	[1.60]	[0.74]	
5	1.240	0.608	0.381	0.418	0.890	0.238	0.250	0.203	105
	[4.36]	[4.73]	[4.93]	[5.28]	[3.18]	[2.43]	[2.56]	[2.03]	
5-1	0.674	0.646	0.691	0.516	0.379	0.329	0.406	0.156	
	[7.61]	[7.29]	[7.63]	[6.10]	[2.71]	[2.35]	[2.86]	[1.15]	

Panel C: Pre-earnings announcement drift based on the mean of long-term average abnormal returns over past 20 quarterly earnings announcements (skipping the most recent four quarters). All firms with either December or non-December as fiscal year end month are considered, requiring five-year existence in CRSP-Compustat merged files and regular earnings in past 20 quarters.

	Equally Weighted Portfolio				Value Weighted Portfolio				
	Excess Return	CAPM alpha	FF3 alpha	FF4 alpha	Excess Return	CAPM alpha	FF3 alpha	FF4 Alpha	N
1	0.837	0.250	-0.024	0.066	0.685	0.102	-0.021	-0.001	104
	[3.12]	[1.95]	[-0.33]	[0.90]	[2.69]	[1.03]	[-0.22]	[-0.01]	
2	0.794	0.281	-0.002	0.051	0.559	0.057	0.014	0.022	104
	[3.45]	[2.77]	[-0.03]	[0.68]	[2.51]	[0.61]	[0.16]	[0.24]	
3	0.831	0.319	0.013	0.093	0.686	0.159	0.096	0.095	104
	[3.59]	[3.02]	[0.18]	[1.27]	[3.02]	[1.94]	[1.15]	[1.10]	
4	0.830	0.286	-0.010	0.050	0.483	-0.084	-0.085	-0.061	104
	[3.40]	[2.66]	[-0.13]	[0.68]	[1.99]	[-1.03]	[-1.01]	[-0.70]	
5	0.963	0.335	0.139	0.272	0.724	0.050	0.177	0.211	105
	[3.42]	[2.70]	[1.71]	[3.47]	[2.50]	[0.50]	[1.90]	[2.21]	
5-1	0.126	0.085	0.163	0.206	0.039	-0.052	0.198	0.212	
	[1.57]	[1.07]	[2.03]	[2.51]	[0.29]	[-0.39]	[1.57]	[1.64]	

Appendix B: Robustness Check - Simulation Evidence on Correlation Implied Returns

As we reported in Table 1 in the main text, on average there are about 8 to 15 percent of sample correlations which are statistically significantly different from zero at the ten percent significance level or higher within each of the Fama-French industry groups. Thus, we may be concerned about the possibility that the relatively large spread of the long-short hedge portfolio is spurious. We show via a simulation that, although these correlation estimates are noisy, they are not completely random noise.

Our simulation focuses on the pair-wise correlations of the average earnings announcement period returns. If the pair-wise correlations we estimate in equation (2) are simply random noise, then the estimated long-short hedged portfolio returns should not be statistically different from those of a similar portfolio where the pair-wise correlations are random numbers. To examine this possibility, we randomly generate pair-wise correlations, calculate the implied returns for late announcers, form the correlation implied return sorted portfolios, and examine the portfolio returns. The simulation procedure involves the following four steps.

1. At the ending month of each quarter from the third quarter of 1976 to the first quarter of 2008, we draw a random number r_{ij} following the uniform distribution over [-1, 1] for each pair of stocks (i, j) satisfying our data requirements outlined before. We also calculate the t-statistics under the null hypothesis of the correlation equal to zero based on this pseudo-sample correlation and the sample size, $t = r_{ij} \dfrac{\sqrt{n-2}}{\sqrt{1-r_{ij}^{2}}}$, where t is the t-statistics under the null hypothesis that the correlation is zero, and n is the sample size used in calculating the pair-wise correlations.
2. On each earnings announcement date during the three-month announcing period, we calculate the implied returns for late announcers using the same components of equation (3) except for the pair-wise covariance C_{ij}. We replace the estimated sample covariance with the pseudo-covariance from the simulation $C_{ij}^{P} = \hat{r}_{ij} \times \sigma_i \times \sigma_j$, where $\hat{r}_{ij}$ is a random number drawn from step 1, σ_i^{2} is the estimated of variance of firm i's LT-AAR obtained from the real data. Whenever there are multiple firms making earnings announcements on the same day, we use the pseudo-covariances and the pseudo t-statistics in place of their respective counterparts in equation (5).
3. We form the correlation implied return portfolios on each subsequent earnings announcement date, and we aggregate and compute the portfolio's monthly returns. Thus, we obtain a time-series of portfolio returns based on these pseudo pair-wise correlations. This completes one complete run

and we calculate the average monthly returns for long-short hedge portfolio in this simulation.

4. We repeat this simulation 1,000 times, and report the p-value in terms of the percentage of times the long-short hedge portfolio from the real data beats that from the simulated data.[28]

Figure A1 presents the return characteristics of the lowest correlation implied return portfolio (Panel A); the highest correlation implied return portfolio (Panel B); and the long-short portfolios (Panel C) in which all the correlation coefficients are simulated random numbers. In Panels A to C, the solid line is the fitted normal density plot; the dashed line is the fitted Epanechnikov kernel density plot; and the bar chart is the histogram of the simulated long-short portfolio returns. Panel D provides some detailed summary statistics on the return characteristics (0.5-percentile, 1-percentile, first quartile, mean, median, third quartile, 99-percentile, and 99.5-percentile). While the return distributions of the lowest and the highest correlation implied return portfolios noticeably deviate from normal densities, the long-short portfolio returns seem to fit the normal distribution quite well.

Table A2 reports the performance of the simulated correlation implied returns sorted portfolios in which the correlations were randomly drawn from a uniform distribution over [-1, 1]. Panel A and Panel B report the mean and median portfolio returns and t-statistics respectively across all the simulations. Means and medians of each of the portfolio's returns and t-statistics are similar, which illustrates that we achieve stable simulation outcomes. There are several noteworthy observations. First, the excess returns across all portfolios are similar. For example, Panel A shows that the portfolio returns range from 59 basis points per month (portfolio 3) to 89 basis points per month (portfolio 5). Panel B shows that the portfolio returns range from 58 basis points per month (portfolio 3) to 90 basis points per month (portfolio 5). The long-short portfolio constructed by purchasing portfolio 5 and short selling portfolio 1 generates average spreads of 10 basis points per month and median spreads of 12 basis points per month. However, the long-short spreads are not statistically different from zero (t-statistic of 0.40). Second, none of the returns for portfolios 1 to 5 is statistically significantly different from zero at the five percent level after we apply the CAPM, the Fama-French three-factor model, and Fama-French and Carhart four-factor model as the benchmark risk adjustment models. This is what we expect. By the design of the simulation, we randomly draw correlations from a uniform distribution and these correlations are expected to contain no useful information. In addition, we have argued earlier that the long-run average abnormal returns (LT-AAR) contain no reliable information for determining the current quarter's earnings announcement period returns. Therefore,

[28] We choose 1,000 times to achieve a balance between the sampling properties of the simulation results and computational time. It takes about 30 minutes for a single run of the simulation.

essentially, our simulation-based procedure selects stocks randomly from the CRSP universe, which should not earn excess returns. Third, we also compute the empirical distribution of the long-short portfolio returns from the random correlation coefficient. The 99.5^{th} percentile return is about 80 basis points per month, and the return of 105 basis points per month from our sample is clearly beyond the 99.5^{th} percentile. Indeed, this implies a pseudo p-value of less than one percent, which rejects the null hypothesis that our results are sampled from the random correlation implied portfolios. In summary, the simulation provides empirical evidence that the correlations estimated from past earnings announcement period returns contain useful information, and the return predictability induced by the correlation implied returns is unlikely to be a chance result.

Table A2: Monthly portfolio returns and alphas of the earnings announcement return correlation implied strategies based on the simulated random correlation coefficients

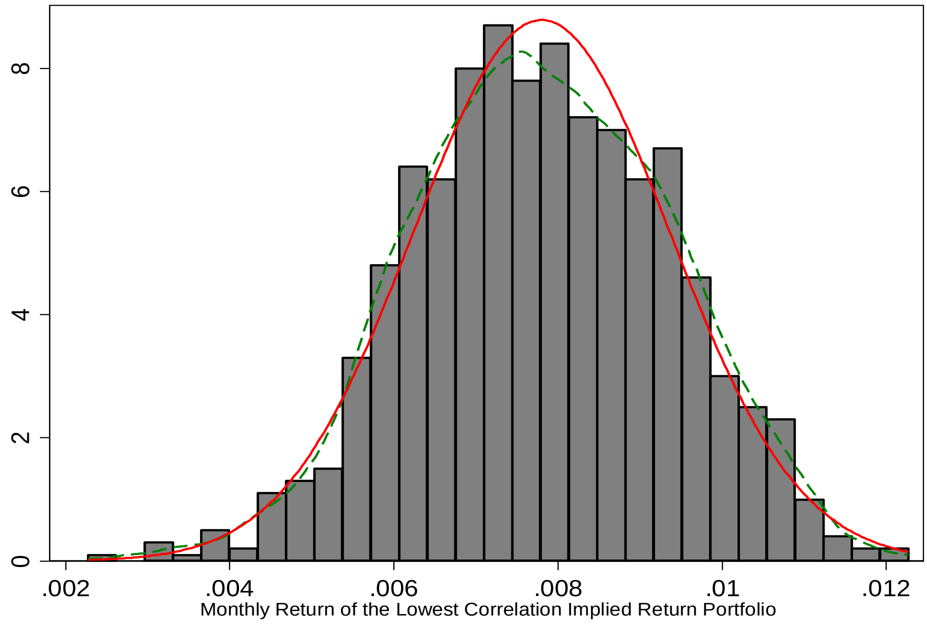
Panel A reports the mean excess monthly (in percent, first column) returns and alphas (in percent, second to fourth columns), and panel B reports the median excess monthly returns and alphas for the correlation implied portfolio strategy within the Fama-French 30-industry classification based on the mean and simulated random covariance of long-term average abnormal returns (LT-AAR) over past 20 quarters (skipping the most recent four quarters). All firms with either December or non-December as fiscal year end-month are considered, requiring five-year existence in CRSP-Compustat merged files and regular earnings announcements in the past 20 quarters. "5-1" represents a long/short hedge portfolio, which is constructed by going long in stocks in quintile 5 (the highest implied returns for the late announcers) and short in stocks in quintile 1 (the lowest implied returns for the late announcers). *t*-statistics are the average *t*-statistics from the simulations. The average number of stocks in each quintile portfolio is 99 in each simulation.

	Panel A: Portfolio returns (mean)				Panel B: Portfolio returns (median)			
	Excess Return	CAPM alpha	FF3 alpha	FF4 alpha	Excess Return	CAPM alpha	FF3 alpha	FF4 alpha
1	0.780	0.173	0.152	0.181	0.776	0.167	0.148	0.175
	[2.39]	[0.79]	[0.69]	[0.80]	[2.37]	[0.76]	[0.69]	[0.75]
2	0.566	0.044	-0.014	0.012	0.566	0.044	-0.014	0.013
	[2.01]	[0.23]	[-0.08]	[0.05]	[2.01]	[0.23]	[-0.07]	[0.06]
3	0.636	0.145	0.116	0.148	0.635	0.142	0.115	0.146
	[2.45]	[0.85]	[0.66]	[0.82]	[2.46]	[0.85]	[0.67]	[0.82]
4	0.703	0.166	0.177	0.209	0.700	0.165	0.178	0.384
	[2.50]	[0.91]	[0.95]	[1.09]	[2.51]	[0.93]	[0.96]	[1.80]
5	0.900	0.292	0.365	0.388	0.893	0.285	0.361	0.384
	[2.81]	[1.41]	[1.76]	[1.82]	[2.79]	[1.37]	[1.75]	[1.80]
5-1	0.120	0.119	0.213	0.207	0.120	0.120	0.220	0.212
	[0.46]	[0.45]	[0.79]	[0.75]	[0.46]	[0.45]	[0.80]	[0.76]

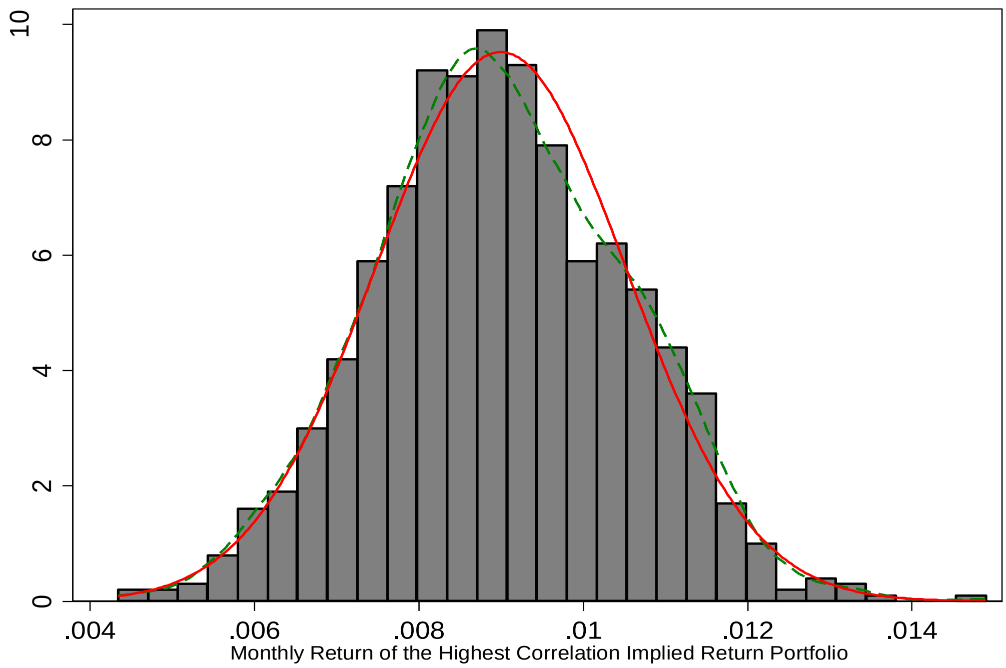
Figure A1: Distributional characteristics of the simulated correlation implied returns.

This figure illustrates the characteristics of the lowest (Panel A), the highest (Panel B) and the long-short portfolios (Panel C) constructed based on the simulated correlation implied returns as described in the text. The solid line is the fitted normal density plot, the dashed line is the fitted Epanechnikov kernel density plot, and the bar chart is the histogram of the simulated long-short portfolio returns. Panel D provides return distribution's summary statistics (0.5-percentile, 1-percentile, first quartile, mean, median, third quartile, 99-percentile, and 99.5-percentile).

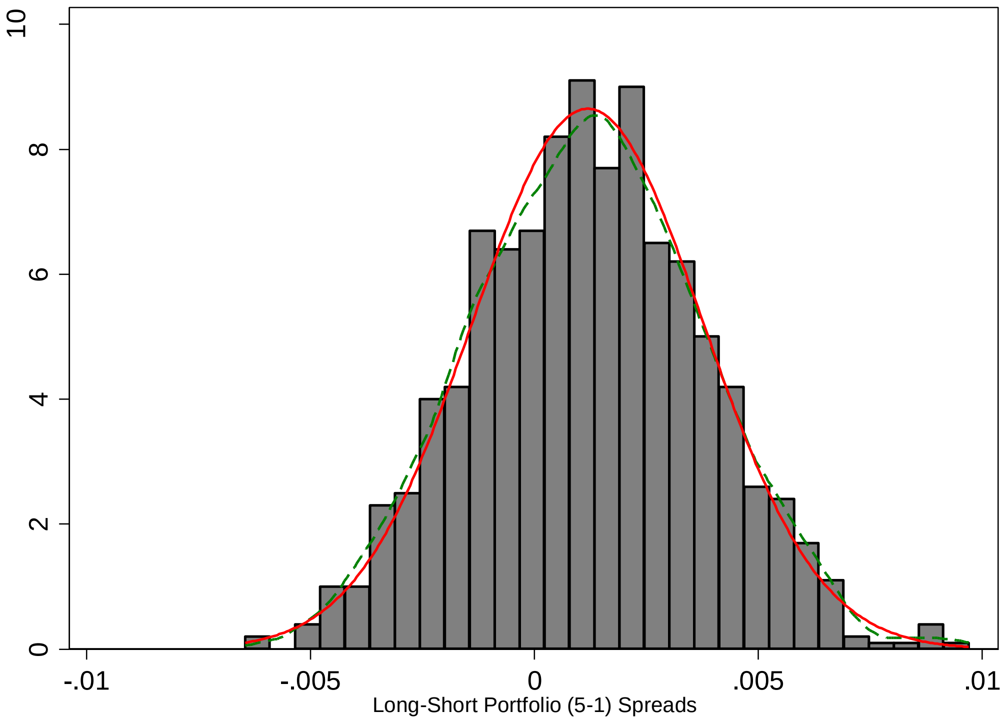
Panel A: Distributional characteristics of the returns from the simulated lowest correlation implied return portfolios



Panel B: Distributional characteristics of the returns from the simulated highest correlation implied return portfolios



Panel C: Distributional characteristics of the returns from the simulated long-short portfolios



Panel D: Portfolio Return Distributional Characteristics

	P0.5	P1	Q1	Mean	Std	Median	Q3	P99	P99.5
1	0.351	0.411	0.670	0.780	0.157	0.776	0.895	1.120	1.144
2	0.196	0.227	0.478	0.566	0.137	0.566	0.664	0.872	0.911
3	0.311	0.335	0.554	0.636	0.124	0.635	0.718	0.917	0.961
4	0.349	0.392	0.608	0.703	0.132	0.700	0.794	0.999	1.026
5	0.523	0.565	0.797	0.900	0.152	0.893	1.009	1.242	1.301
5-1	-0.505	-0.442	-0.065	0.120	0.257	0.120	0.293	0.682	0.851

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Appendix C: Definition and Construction of Variables

In this appendix, we provide details on the construction of various variables used in this paper.

"ME": The market equity is the closing price times shares outstanding, measured as of the end of the month prior to the earnings announcement date.

"ME Rank": The market equity of the firm, measured at the end of the month prior to the earnings announcement date, is ranked into deciles based on the NYSE market capitalization decile breakpoints, where 1 is the smallest market capitalization decile and 10 is the largest market capitalization decile.

"Return Momentum": At the beginning of month t, we cumulate the past monthly returns over the period from t-12 to t-2, skipping the return in the last month *t-1* to avoid bid-ask bounce induced market microstructure noise, where *t* is the month of earnings announcement.

"B/M": we calculate the annual book-to-market equity following the definition in Fama and French (1992, 1993). The stockholder's equity (SEQ), common equity (CEQ), preferred stocks (PSTK), total assets (AT), total liabilities (LT), preferred stock redemption value (PSTKRV), preferred stock liquidating value (PSTKL), deferred taxes and investment tax credit (TXDITC), and post retirement benefit asset (PRBA) are extracted from COMPUSTAT XPF annually files. To get stockholder's equity, we use SEQ if it is not missing. If it is missing, then we use CEQ plus PSTK if both are available. Otherwise, we use AT minus LT if both are present. If none of these yields a valid stockholder's equity value, we treat the observation as missing. To determine preferred stock value, we use PSTKRV, PSTKL, or PSTK, in that order, according to data availability. If none of these yields a valid preferred stock value, then, again treat the observation as missing. To determine book equity, we subtract preferred stock value from stockholder's equity, add back TXDITC if available, and subtract PRBA if available. To ensure the availability of accounting data to the market, we require a six-month lag between the time of using these variables and the last fiscal year end date. The banks and industrial firms with negative book equity are excluded when we report the portfolio characteristics. Finally, to obtain the book-to-market equity, we use the price and shares outstanding at the end of month of firm's fiscal year ending date.

"B/M Rank": The book-to-market equity ratio of a firm, measured at the end of month of firm's fiscal year ending date, is ranked into deciles based on the NYSE book-to-market equity ratio decile breakpoints, where 1 is the smallest book-to-market equity ratio decile and 10 is the largest book-to-market equity ratio decile.

"Accruals": annual accruals are based on Sloan's (1996) calculation. The current assets (ACT), cash and short-term investments (CHE), current liabilities (LCT), short-term debt (DLC), taxes payable (TXP), depreciation and amortization (DP), and total assets (AT) are extracted from COMPUSTAT XPF annually files. The annual accruals over the fiscal year T is the change of (ACT-CHE) minus the change of (LCT-DLC-TXP) minus the change of DP from the last fiscal year T-1. To make these variables comparable across the different size of firms, we scale each item by the average of total assets $(AT_T+AT_{T-1})/2$.

"Seasonal Random Walk Model Earnings Surprise (SRW ES)": we calculate the earnings surprise based on seasonal random walk model (SRW) following the definition by Chan et al. (1996). The earnings per share (EPSPXQ) and cumulative adjustment factor (AJEXQ) are extracted from COMPUSTAT XPF quarterly files. The variable e_{iq}, the adjusted EPS for firm i during quarter q, is EPSPXQ divided by AJEXQ. To get the standardized unexpected earnings (SUE) in quarter q, we first subtract e_{iq-4} from e_{iq}, and then scale by σ_{iq}, and σ_{iq} is the standard deviation of unexpected earnings, e_{iq} - e_{iq-4}, over the preceding eight quarters.

"I/B/E/S Analyst Consensus Forecast Earnings Surprise (FE)": we calculate the earnings surprise as the difference between the I/B/E/S analyst earnings per share (EPS) consensus forecasts made at the end of the month prior to the month of earnings reports, and the actual I/B/E/S reported actual earnings per share (EPS), then deflated by the stock price at the beginning of the quarter. All measures are adjusted for stock splits.

"I/B/E/S Analyst Consensus Long-term Earnings Growth Rate Forecast (FLTG)": the I/B/E/S analyst earnings per share (EPS) long-term growth rate consensus forecasts made at the end of the month prior to the month of earnings reports.

"Amihud Illiquidity Measure": defined as $\frac{1}{N}\sum_{t=1}^{N}\frac{|R_d|}{VOLD_d}$, where N is the number of trading days with available volume data during the year prior to earnings announcement, $|R_d|$ is the absolute value of the daily stock return on day *d*, $VOLD_d$ is the dollar trading volume on day *d*.

"Proportional Quoted Spreads (PQSPR)": $PQSPR_t = (Ask_t - Bid_t)/Midpoint_t$, and $Midpoint_t = (Ask_t + Bid_t)/2$, where Ask_t equals the inside ask at time *t*, Bid_t equals the inside bid at time *t*. For each stock, the average proportional quoted spread for the day is defined as the weighted average spreads during the day, where the weight is the number of seconds it is in display. The monthly proportional quoted spread for each stock is defined as the average of daily proportional quoted spread for that stock during the month.

"Proportional Effective Spreads (PESPR)": $PESPR_t = 2 \times |P_t - Midpoint_t|/Midpoint_t$, and $Midpoint_t = (Ask_t + Bid_t)/2$, where P_t is the trade price at time *t*, Ask_t equals the inside ask at time *t*, Bid_t equals the inside bid at time *t*. For each stock, the average proportional effective spread for the day is defined as the trade-weighted average spreads during the day. The monthly proportional effective spread for each stock is defined as the average of daily proportional effective spread for that stock during the month.

"Hasbrouck (2007) Gibbs Measure Spreads (γ_0 and γ_1)": the spread measures derived from the CRSP daily stock file using Bayesian method. Hasbrouck (2007) provide details on the construction of the spreads.

"Corwin and Schulz (2007) High-Low Spreads": the spread measure derived from the CRSP daily stock files. Corwin and Schulz (2007) provide details on the construction of the spreads.