A Tough Act to Follow:
Contrast Effects in Financial Markets*

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Abstract

We present evidence of sequential contrast effects in financial markets: investors mistakenly perceive information in contrast to what preceded it. We find that the stock price reaction to an earnings announcement is inversely related to the earnings surprise announced by large firms the previous day. A change in yesterday's earnings surprise from the lowest to the highest decile corresponds to a 61 basis point lower return response to today's earnings announcement. This effect is stronger among larger firms and cannot be explained by news conveyed through yesterday's announcements, strategic timing of announcements, or changes in risk and trading frictions.

PRELIMINARY AND INCOMPLETE: RESULTS SUBJECT TO CHANGE

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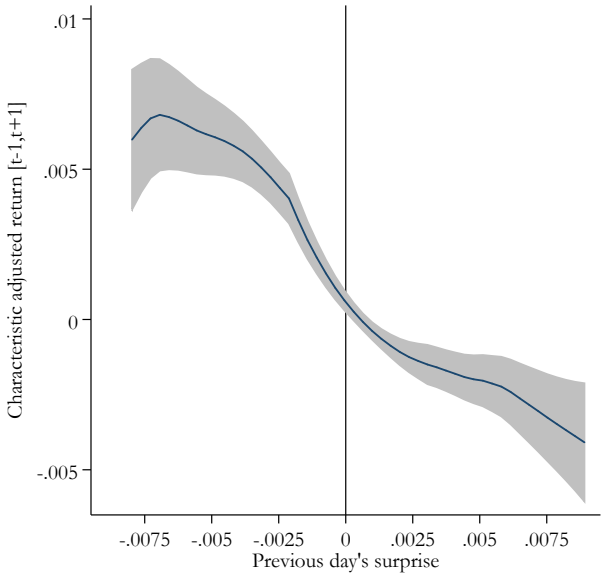
Figure 1



Average return of firms that announced earnings today vs. the average earnings surprise of large firms that announced earnings in the previous trading day (conditional on own earnings surprise).

> ***Socrates:*** *Could you tell me what the beautiful is?*
> ***Hippias:*** *For be assured Socrates, if I must speak the truth, a beautiful maiden is beautiful*
> ***Socrates:*** *The wisest of men, if compared with a god, will appear a monkey, both in wisdom and in beauty and in everything else. Shall we agree, Hippias, that the most beautiful maiden is ugly if compared with the gods?*
>
> -Plato

People often interpret information by contrasting it with what was recently observed. For example, Pepitone and DiNubile (1976) show that subjects judge crimes to be less severe following exposure to narratives of more egregious crimes. Kenrick and Gutierres (1980) show that male students rate female students to be less attractive after viewing videos of beautiful women. References to such contrast effects are also pervasive in our popular culture. For example, people often complain about having "a tough act to follow" when they are scheduled to perform following a great performance. Writers use literary foils to exaggerate a character's traits through juxtaposition with a contrasting character. Fashion designers use shoulder pads and peplum hips to create the illusion

of a comparatively smaller waist. In all of these cases, contrast effects bias our perception of information. People perceive signals as higher or lower than their true values depending on what else was recently observed.

While there is abundant anecdotal and laboratory evidence of contrast effects, field evidence is more limited. Perhaps most notably, Bhargava and Fisman (2014) find strong contrast effects in mate choice using a speed dating field experiment. In this paper, we test whether contrast effects operate in another important real world setting: financial markets. The financial setting is particularly interesting because it is not obvious whether contrast effects will matter for equilibrium prices and capital allocation in sophisticated markets. Full-time professionals making business decisions involving high stakes may be less prone to such a bias than individuals making dating decisions. In addition, prices in financial markets are determined through interactions among many investors. Thus, cognitive biases among a subset of investors may not affect market prices given the disciplining presence of arbitrage. And yet, if contrast effects influence prices in financial markets, it would represent an important form of mispricing and misallocation of capital. Contrast effects in financial markets would imply that prices react not only to the absolute content of news, but also to a bias induced by the relative content of news.

In this paper, we test whether contrast effects distort market reactions to firm earnings announcements. Quarterly earnings announcements typically represent the main recurring source of firm-specific news released by publicly-traded US firms. Prior to the earnings announcement, financial analysts and investors form expectations of what they believe earnings will be. Earnings surprises, i.e., the extent to which actual earnings exceed or fall short of those expectations, are associated with large equity price movements because they represent new information that shifts expectations of future firm performance.

We explore how the reaction to an earnings announcement made by a firm today depends on the level of the earnings surprises announced by other large firms in the previous day. The scheduling of when earnings are to be announced is usually set weeks before the announcement, so whether a given firm announces following positive or negative surprises by another firm is likely to

be uncorrelated with the firm's fundamentals. The theory of contrast effects predicts that, holding today's actual earnings announcement constant, the news will not seem as impressive if yesterday's earnings surprises were very positive. Conversely, today's earnings announcement will seem more impressive if yesterday's earnings surprises were very disappointing. Consistent with this prediction, we find a strong inverse relation between the earnings surprise on the previous day and the return response to the firm's earnings announcement today.

The downward sloping pattern in Figure 1 illustrates our main finding. The figure shows a local linear plot of characteristic adjusted returns surrounding a firm's earnings announcement relative to the average earnings surprise announced by large firms in the previous trading day. The figure demonstrates a strong negative relation: controlling for today's earnings news, the return reaction to today's earnings announcement is inversely related to yesterday's earnings surprise.

The effect is sizable. A change in yesterday's earnings surprise from the worst decile to the best decile corresponds to a 61 basis point lower return response to today's earnings announcement. While this return is not obtainable through a long-short portfolio on a single day (because the difference occurs across days), this magnitude is comparable to other well-known earnings anomalies such as the earnings announcement premium or post-earnings announcement drift. The earnings announcement premium is one of the more robust anomalies found in US equities markets and around the globe (Frazzini and Lamont, 2007; Barber et al., 2013), but contrast effects are strong enough that the predictable positive abnormal returns on an expected announcement date are negative if yesterday's salient earnings were especially good. Unlike most anomalies which are concentrated among small-cap stocks, we find that the negative returns relationship is actually substantially stronger when the firm announcing earnings today is larger or receives more analyst coverage.

Using regression analysis, we explore the basic relationship in Figure (1) in more detail and demonstrate that it is robust. We show that the negative relationship between short run returns around today's announcement and yesterday's earnings surprise holds regardless of whether we control for the level of today's earnings surprise. The relation also holds regardless of how we measure

yesterday's earnings surprise: the surprise relative to analyst forecasts over different windows of time or the direct returns reactions to the announcements of firms yesterday. We also measure the salient earnings surprise that occurred yesterday using a variety of different specifications including examining the largest firm to announce, equal-weighting firms above the 90th percentile of market cap, and value-weighting all of the firms that announced yesterday. Our results do not appear to be driven by specific modeling or measurement issues.

We present three additional pieces of evidence in support of the contrast effects hypothesis. First, consistent with mispricing caused by contrast effects, we find evidence of longer run reversals. Yesterday's surprises negatively affect returns from $t-1$ to $t+1$ but have a close-to-zero effect on returns from $t-1$ to $t+50$. Second, short run returns for firms announcing today are negatively related to earnings surprises released by other firms on $t-1$, but are not significantly related to lagged earnings surprises that occurred on $t-2$ and $t-3$ or future earnings surprises that will occur on $t+1$ and $t+2$. This is consistent with the transitory nature of contrast effects as found in laboratory and other non-financial settings, in which individuals react only to very recent observations. It also shows that our results are due to the precise ordering of earnings announcements rather than slower-moving time trends. Third, while our main analysis focuses on contrast effects across consecutive trading days, we find similar effects among earnings released sequentially within the same day. Most earnings announcements occur either slightly before the market opens or slightly after the market closes. We find that the earnings surprises of large firms that announce in the morning have a strong negative impact on the return response of firms that announce in the afternoon. Conversely, the returns of firms that announce in the morning are not impacted by afternoon announcements of large firms.

While our empirical findings are consistent with the theory of contrast effects, one may be concerned about potential alternative explanations. First, the previous day's earnings surprise may contain information relevant for firms that announce today. If so, firms that announced yesterday are "bellwethers" in that their announcements convey information about the earnings that other firms will announce in the future (Anilowski et al., 2007). For example, let's say firm ABC is

scheduled to announce its earnings on day t, and on day $t-1$ a bellwether firm announces a positive earnings surprise that conveys positive news for firm ABC. This announcement on day $t-1$ should increase investor's expectations for the earnings that ABC will announce on day t. This would result in positive returns on day $t-1$ for ABC and smaller returns for a given level of earnings on day t (as the surprise will be lower due to an increase in expectations on day $t-1$). According to a bellwether story, the earnings surprise of the bellwether firm should negatively predict ABC's return on t but positively predict ABC's return on day $t-1$, such that the cumulative characteristic adjusted return from $t-1$ to t should be uncorrelated with the bellwether's earnings surprise after controlling for ABC's actual earnings.

We present a number of tests to rule out the possibility that our results are caused by bellwether effects. First, and most importantly, our analysis focuses on the cumulative return response from $t-1$ to $t+1$ (a period that starts at the market close of day $t-2$). This cumulative return response includes the reaction to ABC's own announcement and to any relevant information contained in the bellwether's announcement released on $t-1$. A bellwether story predicts a zero relationship between the bellwether's earnings surprise and this cumulative return after controlling for ABC's actual earnings. Instead, we find a negative relationship, which is more consistent with a contrast effects hypothesis. We also directly test whether yesterday's announcements convey information about today's earnings, and find no relation after controlling for slower moving monthly time trends.

Another potential concern is that our results may be biased because firms strategically manipulate the timing or magnitude of their earnings announcements. Firms may advance or delay their earnings announcements relative to the date in previous years or manipulate the earnings announcement itself through adjustment of discretionary accruals (e.g., DellaVigna and Pollet, 2009 and So, 2015). However, these types of strategic manipulation will only bias our results if they alter firm earnings announcements as a function of the earnings surprises released by other firms on day $t-1$. Such short-run manipulation within a single trading day is very unlikely to occur. Firms typically publicly schedule when they will announce their earnings at least two weeks before they actually announce (Boulland and Dessaint, 2014). The earnings *surprises* of other firms are, by

definition, difficult to predict because they measure surprises relative to expectations. Therefore, it is unlikely that firms can strategically schedule to follow other firms with more or less positive surprises. Further, manipulation of the earnings number itself takes time and is unlikely to occur within a single day as a reaction to the earnings surprises made by other firms on day $t-1$. To directly test strategic timing, we separately examine earnings announcements that moved or stayed relative to the calendar date of the announcement for the same quarter in the previous year. We find similar results for the restricted sample of stayers.

One might also be concerned that our results could be driven by competition between firms. If one firm has a positive earnings surprise, that may be bad news for another firm that competes for the same customers or other resources. Under a competition story, we would expect a negative return for the second firm on $t-1$ (the day the first firm announces). Instead, we find a close-to-zero return. A competition story also implies that good earnings surprises by other firms is bad news for the firm in question regardless of the exact timing of when other firms release earnings news. We instead find that only earnings surprises by other firms on $t-1$ matter. Further lagged earnings surprises announced on $t-2$ and $t-3$ have no effect on the returns reaction for firms announcing on day t.

A final potential concern is that earnings surprises on day $t-1$ systematically impacts the risk or trading frictions associated with the announcement on day t, so the observed return difference is compensation for risk or trading frictions. Standard risk-based explanations involving fixed firm-specific loadings on known risk factors cannot explain the results because we use characteristic adjusted returns to account for such effects. To explain our results, a more negative earnings surprise yesterday must increase the daily betas on risk factors, so the higher return is compensation for the increase in day-specific risk. We estimate differences in daily betas for firms based on the previous day's earnings surprise and do not find any support for such a channel. We also show that return volatility does not vary substantially by the earnings surprise in $t-1$. Finally, we find that the earnings surprise in $t-1$ does not predict trading volume or other measures of liquidity for the firm announcing on day t. Therefore, the negative returns relationship cannot be explained by

compensation for low liquidity.

One of the main contributions of our paper is to further the understanding of how psychological biases found in the lab manifest in real-world market settings (e.g., Levitt and List, Chen, Moskowitz, and Shue, 2014). In general, once many agents interact in a professional setting, there are often too many confounding factors to cleanly identify a specific psychological channel. The earnings announcement setting is particularly suitable for the study of contrast effects because it contains prescheduled announcements of important sequential public signals combined with a clean measure of how markets interpret those signals. Our findings suggest that contrast biases persist outside the laboratory in a market setting where prices are determined by interactions among many investors including potentially deep-pocketed arbitrageurs.

Our findings also contribute to the literature on underreaction to earnings announcements, which has shown that investors underreact to earnings news (Ball and Brown, 1968; Bernard and Thomas1989; 1990), fail to fully incorporate the news from previous earnings announcements by the same firm (Bernard and Thomas (1990); Ball and Bartov 1996), and ignore predictable components of seasonal earnings information (Chang et al., 2014). Further, agents fail to unravel information in the timing of earnings announcements (DellaVigna and Pollet, 2009; So, 2015; Boulland and Dessaint, 2014). Relative to the existing research which explores underreaction to the firm's own earnings announcements, we show how prices are affected by the announcements of other firms that announced recently.

Overall, our evidence underscores how financial decisions are often distorted by comparisons to benchmarks that should be irrelevant to rational investors. Starting with the framework laid out by prospect theory (Kahneman and Tversky, 1979), research in behavioral finance has examined investor behavior based on how positions performed since they were purchased (Shefrin and Statman, 1985; Odean, 1998), how exciting certain stocks are relative to others in the market (Barber and Odean, 2008), and how a position compares versus the other holdings in an investor's portfolio (Hartzmark, 2015). Relative to this literature which focuses on the trading patterns of individual investors, we test how contrast effects in the perception of earnings news affect equilibrium market

prices for large cap stocks.

1 Data

1.1 Sources

The data on analyst forecasts come from the I/B/E/S detail history file which contains analyst by analyst estimates of what a specific firm's earnings will be upon announcement. We examine the quarterly forecasts of earnings per share and merge this to information on daily stock returns from CRSP and firm specific information from Compustat. Data on market excess return, the risk-free rate, SMB, HML and UMD portfolios as well as size cutoffs all come from the Ken French Data Library.

For most of our analysis, we examine daily returns that have been characteristic-adjusted, following the procedure in Daniel et al. (1997). Specifically, using the full CRSP daily returns sample from 1925 to 2013, we sort stocks into NYSE size quintiles, book value of equity divided by market value of equity (calculated as in Fama and French, 1992), and returns from $t-20$ to $t-252$ trading days (an analogue to a monthly momentum measure from months $m-2$ to $m-12$). We then match each stock's return to a portfolio of stocks that match each of these three quintiles. Our measure of characteristic-adjusted return is a stock's return on day t minus the return of the characteristic-matched portfolio on day t.

1.2 Measuring earnings surprise

A key variable in our analysis is the measure of the surprise for a given earnings announcement. Broadly defined, earnings surprise is the difference between the announced earnings and the expectations of investors prior to the announcement. To measure surprise we need an estimate of this expectation. We follow a commonly used method in the accounting and finance literature and measure expectations using analyst estimates prior to announcement. This measure is available for a long time-series and does not require us to take a stand on specific modeling assumptions (for

example assuming a random walk with drift as in Bernard, 1992). Analysts are professionals who are paid to forecast future earnings. While there is some debate about what their goal is and how unbiased they are, our tests only require that such a bias is not correlated with the surprises of other firms in the day before a firm announces earnings. Given that we only use forecasts made from day $t-2$ or earlier, such a bias is unlikely to exist.

Similar to DellaVigna and Pollet (2009) we take each analyst's most recent forecast, thereby limiting the sample to only one forecast per analyst, and then take the median of this number within a certain time window for each firm's earnings announcement. In our base specification, we take all analyst forecasts made between two and fifteen days prior to the announcement of earnings. We choose fifteen days to avoid stale information yet still retain a large sample of firms with analyst coverage. To show that these assumptions are not driving the results, we also present variations of this measure in Section 4 using longer windows from 30 and 45 days prior to announcement and using other measures or surprise such as the return reaction to the announcement. Our results are similar across each of these specifications.

To make the magnitude of the surprise comparable across firms, we scale the difference between the actual surprise and the median analyst forecast by the share price of the firm from three trading days prior to the announcement. Thus, our estimate of an earnings surprise for a firm i at time t (which we winsorize at the 1st and 99th percentile) can be written as:

$$surprise_{it} = \frac{\left(actual\ earnings_{it} - median\ estimate_{i,[t-15,t-2]}\right)}{price_{i,t-3}} \tag{1}$$

To examine the impact of contrast effects, we need a measure of the surprise occurring on the previous day taking into account that multiple firms may have announced earnings on the previous day. The ideal variable would focus on the earnings announcements that were salient as this is the appropriate benchmark against which investors examine the current day's announced earnings surprise. While we do not have an exact measure of this variable, we utilize a number of proxies and focus most of our analysis on large firms. A firm's market capitalization is related to how much

attention that firm receives. One measure we utilize is simply the surprise of the largest firm to announce on day $t-1$. A second measure, which we use as our baseline, is the value-weighted surprise among all large firms announcing on day $t-1$. We define large firms as those with market capitalization (measured three days before the large firm's announcement) above the NYSE 90th percentile of market capitalization in each month. If multiple large firms announced earnings on the previous trading day, we take the value-weighted average of these firms' surprise measures. We value-weight based on the market capitalization reported 3 days prior to the announcement. Thus our baseline measure of yesterday's average surprise is:

$$salient\ surprise_{t-1} = \frac{\sum_{i=1}^{N} (MktCap_{i,t-4} \times surprise_{i,t-1})}{\sum_{i=1}^{N} MktCap_{i,t-4}} \tag{2}$$

We winsorize this variable at the 1st and 99th percentile. In addition, in Section 4 we present alternative formulations where we value-weight over the universe of firms or take the equal-weighted average among all large firms.

1.3 Summary statistics

Table 1 describes the dataset used in our baseline specification. Our dataset begins in 1984 and ends in 2013. For our main analysis, we examine how the returns reaction for a firm that announces earnings on day t relates to the salient earnings surprise of other firms released on day $t-1$, controlling for the firm's own earnings surprise. Thus, to be included in the sample, a firm must have at least one analyst forecast in our dataset between days $t-2$ and $t-15$ prior to the announcement. In addition, we require a non-missing measure of salient surprise which means at least one firm above the 90th percentile of market-capitalization announced their earnings on day $t-1$ and at least one analyst forecasted earnings for this firm between time $t-16$ and $t-3$. After applying these filters and requiring the firm with an announcement at time t to have non-missing characteristic adjusted returns, we are left with 76,062 unique earnings announcements.

Examining the characteristic adjusted returns row, we see that days with an earnings announcement are associated with positive characteristic adjusted returns of 16 basis points, or raw returns of 17 basis points. This is the earnings announcement premium described in Beaver (1968), Frazzini and Lamont (2007) and Barber et al. (2013). Examining the row of earnings surprises announced at time t, we find a small negative surprise of -0.0003 when measured by the mean and a small positive surprise of 0.0002 when measured by the median. The market cap row shows the mean market capitalization in our sample is roughly $7 billion, while the 25th percentile of market cap is $440 million. Thus, we have a number of smaller firms and we value-weight a number of our specifications to focus on the most economically meaningful observations. We find a similar pattern when examining analyst coverage. For many firms we see only one analyst forecast and the median number of forecasts is 2, while the mean number of forecasts is nearly four. Thus, a small number of firms are covered quite heavily by many analysts. The final row describes the number of firms above the 90th percentile that announced on the previous trading day that are used to construct the $salient\ surprise_{t-1}$ variable. The median of this variable is 6 with a mean of 7.5, so in general multiple firms comprise the salient surprise measure.

2 Results

2.1 Baseline results

In our baseline specifications, we test how the price response to a given earnings surprise is impacted by the salient earnings surprise announced by large firms on the previous trading day. A major determinant of the price response to any earnings announcement will be the level of earnings surprise that the firm actually announces. The theory of contrast effects predicts that the return response to a given earnings announcement will be inversely related to yesterday's earnings surprise, conditional on the level of surprise today. Thus, in most of our specifications we include controls for the level of surprise for the firm's own earnings announcement. Our baseline specification thus allows for a direct impact of earnings surprise, contrast effects, and controls for time effects as follows:

$$Char.\ Adj.\ Return_{i,[t-1,t+1]} = \beta_0 + \beta_1\,(salient\ surprise_{t-1}) + surprise\ bin_j + \delta_{ym} \qquad (3)$$

The left hand side variable is the characteristic adjusted return from the three days of $t-1$ to $t+1$. This window is chosen to allow for the direct return response to the previous day's announcement (before today's announcement is released) to be included in our measure. In later sections, we discuss why including $t-1$ in our returns window helps to rule out bellwether effects. This returns measure is regressed on controls for a firm's surprise on announcement as well as the salient surprise from the previous day. In our baseline specification, we impose as little structure as possible on the price response to own earnings surprises by creating twenty bins based on the size of the earnings surprise. The regression includes dummy variables for each bin denoted $surprisebin_1$ to $surprisebin_{20}$. Each bin represents 5 percentiles of our sample of earnings surprises, so $surprisebin_1$ is equal to one if $surprise_{it}$ is less than the fifth percentile of the sample and $surprise\,bin_{20}$ is equal to one if $surprise_{it}$ is greater than the 95th percentile of our sample. Grouping the surprise level in this way and including them as dummy variables in our regressions means we non-parametrically allow each magnitude of surprise to be associated with a different level of average return response. δ_{ym} represents year-month fixed effects. We value-weight our regressions in most specifications to focus on the more economically meaningful firms and cluster the standard errors by date.

Salient surprise is our measure of yesterday's market-wide earnings announcement surprise and the coefficient β_1 is our main measure of contrast effects. The contrast effect hypothesis is that, all else equal, if yesterday's surprise was more positive, any given announcement will appear worse by comparison. If the last salient surprise was more negative, all else equal, today's announcement will appear better. This means that contrast effects predict a negative coefficient on β_1.

Table 2 shows the coefficients on yesterday's market-wide surprise (β_1) and strongly supports the hypothesis that there are significant contrast effects in the price response to earnings. As our first estimate of the salient earnings surprise from the previous day, we examine the earnings surprise of the largest firm to announce the previous day. To make sure this firm is salient, we

include only observations where the firm is above the 90th percentile of NYSE market capitalization. The coefficient is -0.433 and highly significant. The average earnings surprise in the lowest decile of earnings surprise is -0.41% and the average earnings surprise in the highest decile of earnings surprise is 0.44%. Thus a change in yesterday's salient surprise from the lowest to the highest decile is associated with a decrease in today's expected returns of 37 basis points after controlling for the actual level of surprise. The second column adds fixed effects for each month. The coefficient decreases slightly, to -0.329, suggesting that the effect is not driven by patterns in specific time periods of our sample.

Examining only the largest firm is a coarse measure of the salient earnings surprise from the previous day if there were multiple large firms that announced their earnings. As an example, if both Apple and Goldman Sachs announced earnings on the same day, it makes sense that both earnings would be salient events to a large number of investors and neither announcement should be wholly ignored. Columns 3 and 4 of Table 2 measure the market-wide earnings surprise using the equal-weighted mean of all firms that announced in the previous day and were above the 90th percentile of market capitalization. The coefficient is -0.927 without year-month fixed effects and -0.817 with them included, both highly statistically significant. Finally Columns 5 and 6 take the value-weighted mean of the earnings surprise of all firms that announced yesterday. This is implicitly assuming that the relative market cap of these firms is a good proxy for the relative salience of the announcements. Using this measure the coefficient is -0.731 without year-month fixed effects and -0.711 with them included. In later tables, we use this value-weighted surprise with year-month fixed effects as our baseline specification. This coefficient is the regression analog to the local linear plot on Figure 1 Panel A which we discussed in the introduction. Overall, we find strong support of contrast effects: the earnings surprise of large firms from the previous day negatively predicts the earnings of firms today after controlling for their actual level of earnings surprise.

We find that an increase in yesterday's salient earnings surprise from the average earnings surprise in the worst decile (-0.41%) to the average earnings surprise of the best decile (0.44%) is associated with lower returns of 61 basis points in our baseline specification ($\beta_1 = -0.711$). For

comparison, the earnings announcement premium under which the predicted return on announcement, without conditioning on earnings quality, is estimated to be slightly more than 20 basis points on the day of announcement or about 42 basis points when measured from $t-1$ to $t+1$ (Barber et al., 2013). When examining the impact of seasonality on return predictability, Chang et al. (2014) find that a shift from the lowest to the highest decile of seasonality is associated with characteristic adjusted returns of 17 basis points on the day of announcement and 35 basis points from $t-1$ to $t+1$. Thus the impact of contrast effects is of a similar magnitude to many of the well known predictable return patterns related to earnings announcements.

While the results from our base specification are consistent with the theory of contrast effects, a number of specific modeling and variable choices were made. Section 4 returns to these choices to demonstrate that the results are materially similar when reasonable alternative measures or empirical specifications are used.

2.2 Contrast effects without conditioning on today's surprise

So far, we have shown that the returns response to a given earnings announcement is inversely related to yesterday's salient earnings surprise, *conditional* on the level of surprise today. We conditioned on the firm's own earnings surprise because it's an obvious determinant of the firm's return reaction on announcement day. Figure 3 shows that, unsurprisingly, there is a strong positive relation between a firm's returns on announcement day and the firm's own earnings surprise.

However, controlling for the firm's own earnings surprise in our baseline regression primarily serves to increase the explanatory power of the regression and reduce noise in the estimation procedure. In general, the earnings surprise of the firm announcing on day t is not correlated with the earnings surprises of other firms released in the previous day, after controlling for slower moving time trends (see Section 3.1 for direct empirical evidence). This is because firms publicly schedule the date of their earnings announcement several weeks in advance. Earnings surprises of other firms are difficult to predict weeks ahead of time (a surprise is by definition an unexpected change relative to expectations), and therefore consecutively scheduled earning surprises are unlikely to be strongly

serially correlated.

In light of the fact that the firm's own earnings surprise is not strongly correlated with the salient surprise of other firms in day $t-1$, we should continue to find a negative relationship between the returns response to a given earnings announcement and yesterday's salient earnings surprise, *unconditional* on the level of surprise today. Omitting the firm's own earnings surprise as a control variable should lead to more noise in our regression fit, but should not systematically bias the coefficient on yesterday's salient surprise.

Table 4 Panel A presents results without controlling for the announced earnings surprise. We continue to find a robust negative coefficient on yesterday's announced surprise, although the R-squared declines as expected. Column 1 examines the impact without year-month fixed effects and finds a coefficient of -0.474 while Column 2 adds the fixed effects and finds a coefficient of -0.746. In fact the numbers in Columns 1 and 2 are not statistically different than the results where we controlled for the announced level of earnings surprise in Table 2 Columns 5 and 6. Figure 1 Panel B shows the graphical analogue of these tests using local linear regression. Similar to the pattern in Panel A, we see a robust negative relation between the earnings surprise at time $t-1$ and the characteristic adjusted return at time t.

One important implication of not conditioning on a firm's announced earnings surprise is that there is no longer a look-ahead bias when we examine the return response. We can predict day t and future returns using information only from day $t-1$. Thus it would be possible to trade based on the magnitude of the previous day's salient earnings surprise and earn predictably higher or lower returns on firms that release earnings the next day. To accurately measure returns responses without any look-ahead bias, we have to modify our regression specification slightly. First, we should exclude year-month fixed effects because they are estimated using future days within the same month. Second, we change our cumulative characteristic adjusted returns measure from $[t-1, t+1]$ to $[t, t+1]$ so it does not include returns on $t-1$. In the final two columns of Table 4, we examine the return from $t=0$ to $t+1$ and find a slightly smaller, although similar result in terms of size and significance.

There is one final concern to make sure that all information is known ex-ante. Up to this point, we have followed the convention in the finance literature and used close-to-close returns (so the day t return is measured from market close on day $t-1$ to market close on day t). Thus, in order for an investor to implement their strategy, they would need to know the previous firm's earnings surprise as of market close on day $t-1$. However, many firms announce earnings immediately after market close.

To make our regression more closely resemble a trading strategy without lookahead bias, we examine returns measured from market open to market open.[1] Table 4 Panel B presents the results and shows that our results are not driven by a look-ahead bias. In general the results are slightly stronger if we examine returns from open-to-open. The first two columns examine returns from $t-1$ to $t+1$, measured as open-to-open returns. The last two columns examine open-to-open returns and also limit the return period from $t=0$ to $t+1$. These return responses do not contain a look ahead bias as all earnings announcements on day $t-1$ will be public information by market open on day t. The coefficient in Column 3 is -0.679 without year-month fixed effects and -0.912 with year-month fixed effects, both highly significant. If anything the return results are larger when the returns examined are actually tradeable.

One of the more robust anomalies to be documented is the earnings announcement premium (Frazzini and Lamont, 2007; Barber et al., 2013). With no information other than the fact that earnings will be announced on a given day (typically known well in advance of the date), a strategy going long stocks with earnings announcements earns abnormal returns of about 22 basis points on

[1]To calculate the open-to-open return, we use three variables from CRSP for stock i at time t, the return from close-to-close ($ret_{close-to-close}$), the open price (P_{open}) and the close price (P_{close}). For each of these variables i and t subscripts are omitted for ease of exposition. To calculate the return we first calculate the intraday return:

$$ret_{intraday} = \frac{P_{close}}{P_{open}} - 1$$

We use this to calculate the overnight return:

$$ret_{overnight} = \frac{1 + ret_{close-to-close}}{1 + ret_{intraday}} - 1$$

Which we then utilize to calculate the return from open-to-open:

$$ret_{open-to-open} = (ret_{intraday} + 1)(ret_{overnight} + 1) - 1$$

the day of announcement and 42 basis points from $t-1$ to $t+1$. This strategy is based on earnings announcements around the world. The coefficient from Panel B Column 3 is also obtainable using only ex-ante information. Moving from the lowest decile to the highest decile of average earnings surprise is associated with returns that are 78 basis points lower. This means that the expected earnings announcement premium for a firm when yesterday's earnings surprise was in the highest decile of earnings surprise is actually negative. This means that, at least in extreme situations, contrast effects are strong enough to counteract the impact of the earnings announcement premium.

This finding is also shown in graphical form in Figure 4. The red line represents the cumulative returns of a simple tradeable strategy that buys firms announcing earnings today if the salient surprise in $t-1$ was negative. The blue line represents the cumulative returns of a tradeable strategy that buys firms announcing earnings today if the salient surprise in $t-1$ was positive. We find that the red line lies above the blue, indicating that it pays to buy firms announcing today if yesterday's announcement was very negative. The two lines begin to converge after day five, which is consistent with our later evidence of longer run reversals.

2.3 Placebo test using longer time lags

Previous tests of contrast effects in laboratory or non-financial settings have shown that it is a transient effect based on an observation that occurred directly prior to the current observation. For example, in the context of speed dating, Bhargava and Fisman (2014) finds that the appearance of the person whom you spoke with directly prior to the current person has a large impact on the current dating decision, but that this effect is limited to the prior subject only. Thus, if classic contrast effects account for the pattern that we observed in Table 2, the effect should be strongest for announcements that occurred at time $t-1$, and weaker for announcements at $t-2$ and $t-3$. Further, future announcements should have no effect on current returns responses. Thus, as a placebo test we add to our baseline specification the salient surprise as measured in days $t-3$, $t-2$, $t+1$ and $t+2$.

Table 5 offers such a placebo test. We see a strong negative relation between the previous day's

salient earnings surprise and the current day return response, but very little relation between returns and announcements at $t-3$, $t-2$, $t+1$ and $t+2$. In Column 1, we restrict the sample to only days where there are announcements by firms above the 90th percentile on trading days $t-3$, $t-2$, $t-1$, $t+1$ and $t+2$. We find that the coefficient on $t-1$ is more than four times larger than any of the other coefficients. Further the coefficient on $t-1$ is highly significant, while none of the other coefficients are statistically significant. Column 2 includes the full sample with dummy variables equal to one if a large firm did not announce earnings on a given lagged or future day. We find similar results. The coefficient at time $t-1$ is large and highly significant. The other coefficients are significantly smaller, vary in signs and only the coefficient at $t-2$ is marginally significant at the 10% level. Thus information transmission stories do not seem to account for the effect while the results support the hypothesis that contrast effects are responsible for the strong negative coefficient found on the salient earnings surprise at $t-1$.

Almost any empirical exercise involves the worry that there is a mechanical relation due to specification choice. In addition to providing a test for the transitory nature of contrast effects, Table 5 offers a placebo test for this concern. If the negative coefficient on surprise at time $t-1$ is mechanically due to our choice of specification, then the coefficients on $t-2$ or $t+1$ should be similarly biased. Given that we do not find such a relation (we find $t-2$ and $t+1$ actually have different signs and both are different from the coefficient on $t-1$), we feel confident that our empirical choices are not mechanically driving the result.

2.4 Same-Day Contrast Effects

All of the analysis so far has examined the data based on the date of announcement. The more recent portion of the data has additional information about the within-day timing of when each firm announced its earnings. Firms generally announce earnings either slightly before market open or slightly after market close. This ordering within a single day gives us another dimension along which we can analyze contrast effects. Specifically, we expect earnings surprises of large firms that announce in the morning to have a negative impact on the return response for firms that announce

later in the afternoon.

In theory, earnings surprises of large firms that announce in the afternoon could also have a negative impact on the (2-day) return response for firms that announce earlier in the morning. However, this reverse effect may be less strong because it would require investors revise their initial perceptions of morning earnings announcements in light of subsequent earnings announcements released in the afternoon.

To explore same-day contrast effects, we first categorize firms as announcing before market open (with an announce time earlier than 9:30 am) or after market close (an announce time after 4:00pm). We create a salient earnings surprise as described previously, but with two changes. First, for each day t we calculate two different salient surprises: the salient surprise of firms that announced before market open ($AM\ salient\ return\ surprise_t$) and the salient surprise of firms that announced after market closure ($PM\ salient\ return\ surprise_t$). Second, for our return measure we examine the return measured from close-to-close from t to $t+1$ as this window includes both the response to the AM or PM salient surprises as well as the response to the firm's own announcement.

We start by regressing the returns of firms that announce their earnings after market close on the surprise of firms that announced prior to market open that same day with the additional controls described in equation 3. If investors are contrasting the surprise from large firms in the morning with the surprise of firms that announce in the afternoon, we would expect to see a large inverse relation between these two variables. Table 6 shows that this is indeed the case. Regressing the returns of firms that announce in the afternoon on the salient surprise from morning announcers yields a coefficient in the first column of -1.12 after controlling for the announced earnings surprise. The number decreases slightly to -1.03 in the second column when estimated without controlling for the own firm earnings surprise. Both same-day measures are slightly larger than across-days measures estimated in earlier tables. Thus, if anything, the measured contrast effect is slightly larger when measured intra-day than when measured across days. We choose to focus on the difference across days for most of our analysis as this offers a larger sample to test for. There is not information of time of announcement prior to 1995 and many firms still lack such a time stamp after 1995.

Next, we explore whether afternoon salient earnings surprises has a negative impact on the return response for firms that announce earlier in the morning. Note, the return window (which extends to $t+1$), does not preclude such an effect as investors could revise their response to morning announcements due to new information released in the afternoon. If on the other hand investors only perceive information relative to what was viewed previously, and do not revise their options, then we should find no effect of afternoon salient surprises on return reactions to morning announcements.

Table 6 examines such a test in Columns 3 and 4. Column 3 and 4 show the coefficient from the regression of morning return on afternoon salient surprise, conditioning on the level of own firm earnings surprise in Column 3 and not conditioning on the firm's own surprise in Column 4. Both of the coefficients are relatively small and neither is statistically significant. Thus, within the same day investors exhibit behavior consistent with contrast effects, but only with respect with previously observed salient surprises.

2.5 Long run reversals

If contrast effects are a psychological bias that leads to mispricing, then the negative coefficient on salient earnings surprise in $t-1$ represents a deviation from the fundamental returns response to a firm's earnings news. This mispricing should reverse over time if prices eventually converge to fundamental value. Note that this stands in contrast to an information transmission story whereby the salient earnings surprise at $t-1$ permanently shifts the price of a firm that announces at time t. Table 7 examines the return patterns subsequent to the earnings announcement and finds evidence consistent with contrast effects causing mispricing that is reversed in the long run. All columns in the table estimate our baseline specifications, using different returns horizons as our dependent variable. The first column explores our baseline specification, using the characteristic adjusted return from $t-1$ to $t+1$ while Column 2 examines the return from $t+2$ to $t+25$. Over this period we see that the large negative coefficient in Column 1 is reversed slightly. As indicated by Column 3, which examines the return from $t-1$ to $t+25$, the overall contrast effect is still apparent but no longer statistically significant. Extending the window further, Column 4 shows that from $t+2$

to $t+50$, there is large and marginally significant positive return, representing a reversal from the original decline in prices from $t-1$ to $t+1$. If we include the initial announcement period as in Column 5, we find that yesterday's salient surprise has a close-to-zero impact on long run returns from $t-1$ to $t+50$. This suggests that contrast effects leads to mispricing that is fully reversed within the next couple of months after the earnings surprise was announced.

3 Potential alternative explanations

3.1 Information transmission from yesterday's earnings surprise and bellwether effects

While our empirical findings are consistent with the theory of contrast effects, one may be concerned about alternative channels through which yesterday's earnings surprises could affect the return response to earnings at time t. For example, the previous day's earnings surprise may contain information relevant for firms that announce today. If so, firms that announced yesterday are "bellwethers" in that their announcements convey information about the earnings that other firms will announce in the future (Anilowski et al., 2007). For example, let's say firm ABC is scheduled to announce its earnings on day t, and on day $t-1$ a bellwether firm announces a positive earnings surprise that conveys positive news for firm ABC. This announcement on day $t-1$ should increase investor's expectations for the earnings that ABC will announce on day t. This would result in positive returns on day $t-1$ for ABC and smaller returns for a given level of earnings on day t (as the surprise will be lower due to an increase in expectations on day $t-1$). According to a bellwether story, the earnings surprise of the bellwether firm should negatively predict ABC's return on t but positively predict ABC's return on day $t-1$, such that the cumulative characteristic adjusted return from $t-1$ to t should be uncorrelated with the bellwether's earnings surprise after controlling for ABC's actual earnings surprise.

We present a number of tests to rule out the possibility that our results are caused by bellwether effects. First, and most importantly, our analysis focuses on the cumulative return response from

$t-1$ to $t+1$ (a period that starts at the market close of day $t-2$). This cumulative return response includes the reaction to ABC's own announcement and to any relevant information contained in the bellwether's announcement released on $t-1$. A bellwether story predicts a zero relationship between the bellwether's earnings surprise and this cumulative return after controlling for ABC's actual earnings surprise. Instead, we find a negative relationship, which is more consistent with a contrast effects hypothesis.

By focusing on cumulative returns starting before the announcements in $t-1$ are made, we are able to identify contrast effects even if, hypothetically, bellwether effects strongly affect the data. In supplementary tests, we directly show that bellwether effects are likely to be quite weak. In Table 3, we test whether yesterday's announcements convey information about today's earnings. . Column 1 regresses the announced earnings surprise on day t on the salient surprise measure from day $t-1$. We find that there is a positive and significant relation, but Column 2 indicates that this is wholly driven by slower-moving time variation as it disappears after adding year-month fixed effects. Because we include year-month fixed effects in all our baseline specifications, we have already accounted for these slower-moving time variable. Overall, patterns in surprises are related to fluctuations in general economic conditions, not the day to day fluctuations in surprise. Columns 3 and 4 utilize bin measures of surprise (rather than the level measure used prior) and again finds no relation once time variation has been accounted for.

If information relevant to a firm's earning announcement at time t is contained in a different firm's announcement at time $t-1$, the market should react to this information when it is first released at time $t-1$. Columns 5 and 6 examine a regression of the returns of a firm the day before it announces its own earnings on the salient surprise that occurred at $t-1$. With and without year-month fixed effects, we find no significant relationship between salient earning surprises and the $t-1$ returns of firms that will announce the next day. This suggests that bellwether effects are unlikely to be large in our data and cannot account for the negative relation found between the time t earnings return reaction and the time $t-1$ salient surprise.

The fact that the salient earnings surprise in $t-1$ does not significantly affect the $t-1$ returns

of firms announcing the next day also helps to rule out a competition story. One might also be concerned that our results could be driven by competition between firms. If one firm has a positive earnings surprise, that may be bad news for another firm that competes for the same customers or other resources. Under a competition story, we would expect a negative return for the second firm on $t-1$ (the day the first firm announces). Instead, we find a close-to-zero return. A competition story also implies that good earnings surprises by other firms is bad news for the firm in question regardless of the exact timing of when other firms release earnings news. As shown earlier in Table 2, we find that only earnings surprises by other firms on $t-1$ matter. Further lagged earnings surprises announced on $t-2$ and $t-3$ have no effect on the returns reaction for firms announcing on day t.

3.2 Strategic timing of earnings announcements

Another potential concern is that firms may strategically manipulate the timing or magnitude of their earnings announcements. Firms may advance or delay their earnings announcements relative to the schedule used in the previous year or manipulate the earnings announcement itself (e.g., through adjustment of discretionary accruals). However, these types of strategic manipulation will only bias our results *if they alter firm earnings announcements as a function of the earnings surprises released by other firms on day* $t-1$. Such short-run manipulation within a single trading day in reaction to the earnings surprise news announced in the previous day is unlikely to occur. Firms typically publicly schedule when they will announce their earnings at least two weeks before they actually announce (Boulland and Dessaint, 2014). The earnings *surprises* of other firms are, by definition, difficult to predict because they measure surprises relative to expectations. Therefore, it is unlikely that firms can strategically schedule to follow other firms with more or less positive surprises. Further, manipulation of the earnings number itself takes time and is unlikely to occur within a single day as a reaction to the earnings surprises made by other firms on day $t-1$.

To directly test strategic timing, we separately examine earnings announcements that moved or stayed relative to the calendar date of the announcement for the same quarter in the previous

year. Firms typically report their earnings on roughly the same day every year (So, 2015). Thus, in order for strategic timing to explain our results, it must be the firms that change the date that they announce their earnings from their normal date. We follow So (2015) and examine the date a firm announces their earnings versus the date firms announced their same-quarter earnings on year ago. We categorize firms as having moved their earnings date forward or backwards if it differs from their previous same-quarter date by at least five days. We find roughly 80% of firms keep the date the same, roughly 10% move it forward by more than 5 days and roughly 10% move it backwards.

We examine these firms in Table 8 and find that strategic timing cannot account for our effect. Firms that did not greatly move their announcement date have a large negative coefficient of -0.769 that is statistically significant at the 1% level. Firms that moved their announcements forward or backwards have an insignificant coefficient of -0.384 with large standard errors. In column 2 we examine the advancers and delayers separately. Firms that kept their announcing date roughly the same show a large negative coefficient while the other groups both have insignificant coefficients. Under the strategic timing hypothesis, we should have found that firms that greatly shifted their earnings accounted for the effect, while those keeping a similar date became insignificant. Instead we observe the opposite pattern.

3.3 Risk and trading frictions

Another possible concern is that firms become more exposed to systematic risk factors based on the earnings surprise announced by firms the previous day. A number of standard risk-based explanations have already been controlled for because our analysis uses characteristic adjusted returns. Therefore, differences in stable loadings on standard risk factors cannot explain the result. In order to account for the result it must be that the previous day's salient earnings surprise shifts a firm's exposure to standard risk factors on its announcement day. More negative surprise yesterday leads to higher loadings on risk factors today, and then investors demand a higher risk premium. This could render our characteristic adjusted return measure insufficient as a risk control.

Table 9 tests for such a channel. We modify our base specification so the characteristic adjusted

return is regressed on four factors (mkt-rf, smb, hml, and momentum) along with interactions of those factors with yesterdays surprise. The emphasis of this test is on the interaction term. If a firm's covariation with market factors is systematically larger when there are more negative surprises on the previous day we would expect to see large negative coefficients for these interaction terms. Examining characteristic adjusted returns in Column 1 and raw returns in Column 2, we find no support for this hypothesis. Only one coefficient is marginally significant, but it is positive, and only one of the eight estimates is directionally negative. Thus fixed or systematically time-varying loadings on standard risk factors are unlikely to account for our results.

Another possible concern is that our findings are due to a illiquidity premium rather than a contrast effect. For a liquidity premium to explain our results, it must be that a more negative salient surprise yesterday predicts lower liquidity for firms announcing today, so that the the higher return is compensation for the low liquidity. In Table 10, we show that yesterday's salient surprise does not appear to be correlated with proxies for liquidity today. Column 1 regresses volume on the day of announcement on the average salient surprise at time $t-1$. In addition to our standard set of control variables, we also include firm fixed effects to account for the substantial heterogeneity in liquidity across different firms. The firm fixed effects means that we are identifying changes in within-firm announcement day liquidity as a function of variation in the salient earnings surprise released by other firms in the previous day. The coefficient on surprise does not display a strong pattern with volume. Column 2 examines runs a similar regression, but utilizing bid-ask spread as the proxy for liquidity or other trading frictions. Again, the regression does not indicate that trading costs are substantially different for firms based on the salient surprise announced at $t-1$. Finally we examine a longer-term measure of liquidity, the Amihud illiquidity measure (Amihud 2002) in Column 3 to make sure that we aren't capturing systematic differences in longer-term liquidity of firms that tend to follow more negative earning surprises in $t-1$. Again we find that the measure is not significantly different based on yesterday's announced surprise. The evidence does not support the hypothesis that our results are due to a illiquidity premium rather than a contrast effect.

4 Robustness

The initial analysis measured earnings surprises using analyst forecasts as our measure of market expectations. One concern is that analysts forecasts may not represent true market expectations (because they are stale or because analysts are biased or uninformed). If so, our surprise measure may not capture true market surprise. Thus we first utilize an alternative measure, the characteristic adjusted return that occurred on announcement from day $t-2$ to t for large firms that announced on day t-1. Thus, our returns based measure of salient surprise is:

$$salient\ return\ surprise_{t-1} = \frac{\sum_{i=1}^{N} MktCap_{i,t-4}\left(Char.\ Adj.\ Return_{i,[t-2,t]}\right)}{\sum_{i=1}^{N} MktCap_{i,t-4}} \tag{4}$$

Table 11 Column 1 utilizes this measure and finds a similar result. Utilizing our return based measure from large firms announcing in the previous day, we find a coefficient of -0.06 with a standard error of 0.024. The average return response in the lowest decile of salient return surprise is 7.6% and the average of the highest is 8.9%. Thus an increase from the lowest to the highest decile is on average associated with a decrease in returns of 96 basis points .

In Table 2, firms above the 90th percentile of market capitalization were used to calculate the salient earnings surprise released in $t-1$. To examine the robustness of these results to variations of this assumption, Columns 2 and 3 of Table 11 measure yesterday's value-weighted average surprise using all firm's above the 85th percentile of market capitalization and the 95th percentile of market capitalization. Both measures yield similar values to the measure using the 90th percentile of market capitalization, suggesting that the choice of 90th percentile is not materially important to our results. The next column includes all firms in the calculation, regardless of market capitalization. This causes the estimates to decrease slightly, but they still remain significant. In general, the earnings announcements of small firms will receive less attention and be noticed by fewer people. Thus the fact that the coefficient in column four of Table 11 is the smallest of these specifications suggests that including smaller firms adds noise to the estimate of what yesterday's salient earnings surprise

actually was.

Until this point, all measures of earnings surprise have been constructed utilizing analyst forecast from $t-15$ to $t-2$. The final two columns measure earnings surprise using analyst forecasts from $t-30$ to $t-2$ and from $t-45$ to $t-2$. Both columns utilize the baseline specification measuring yesterday's surprise using the value-weighted average of firms above the 90th percentile of market cap. Using errors that are slightly more stale, the coefficient changes to -0.529 relative to -0.711 using forecasts from the shorter time period of $t-15$. Including forecasts that are even more stale (stretching to $t-45$) causes the coefficient to change to -0.326. These results are consistent with more recent forecasts being better measures of the actual earnings surprise as measured by the strength of the contrast effect.

In our baseline estimates, we focus on large firms both in terms of the measure of yesterday's surprise and in terms of measuring coefficients (the regressions are value-weighted). We focus on earnings surprises released by large firms in $t-1$ because their earnings surprises are likely to be more salient to investors. In Table 12, we explore how the magnitude of the contrast effect varies with the size of the firm releasing earnings today. The first column breaks the coefficients down by size quintile of the firm releasing earnings on day t and shows that the smaller quintiles are generally negative but smaller and insignificant, while the largest (fifth) quintile is driving the results. The fifth quintile has a coefficient of -0.789 and is highly significant with a standard error of 0.226. These results show that our findings are not driven only by small firms as is the case with many other asset pricing anomalies. However, it is important to note that these results also don't necessarily prove that contrast effects are weak among investors of small firms. Rather, we could measure strong contrast effects for large firms announcing today because investors tend to contrast large firms releasing earnings today with other large firms that released earnings yesterday. Investors of smaller firms may tend to contrast small firm earnings with that of other similar small firms that released earnings yesterday. However, because many smaller firms release earnings on $t-1$, it is difficult for us, as econometricians, to identify which smaller firms are salient to investors for each small firm announcing earnings today.

The second column explores heterogeneity in terms of the number of analysts covering the firm the releases earnings today. In general, the more interest the market has in a given firm, the more analysts will cover that firms earnings announcement. We examine contrast effects separately for firms covered by one analyst, two analysts, and three or more analysts. We find a monotonic increase in contrast effects of -0.0169 for one analyst, -0.662 for firms with two analysts and -0.805 for firms with three or more analysts. The only statistically significant estimate is that for firms with three or more analysts. These results again show that our findings are not driven only by small firms with little analyst coverage as is the case with many other asset pricing anomalies. However, we again caution that these results do not imply that investors in firms with very little analyst coverage do not suffer from contrast effects. Rather, these investors may contrast these smaller, niche firms with a specific set of other similar small firms that we have difficulty identifying.[2]

5 Conclusion

We present evidence of sequential contrast effects in sophisticated financial markets: investors mistakenly perceive information in contrast to what preceded it. We examine stock price reactions to earnings announcements of publicly-traded US firms. The scheduling of when earnings are to be announced is usually set several weeks before the announcement, so whether a given firm announces following positive or negative surprises by other firms is likely to be uncorrelated with the firm's fundamentals.

We find that the reaction to an earnings announcement is inversely related to the level of earnings surprise announced by large firms in the previous day. A change in yesterday's earnings surprise from the lowest to the highest decile corresponds to a 61 basis point lower return response to today's earnings announcement. This effect is stronger among larger firms and firms with more analyst coverage. We also show that our results cannot be explained by news conveyed through

[2]We face the additional measurement challenge that earnings surprises of small firms that announced yesterday or today are measured with greater error. Larger firms and firms with more analyst coverage are more likely to allow us to accurately measure earnings surprise. This is similar to the result that adding in more stale forecasts decreases the magnitude of the measured effect.

yesterday's announcements, strategic timing of announcements, or changes in risk and trading frictions. Consistent with mispricing caused by contrast effects, we find suggestive evidence of longer run reversals.

To attain a clean measure of contrast effects, we chose a financial setting in which firms publicly commit to the date of a earnings news announcement several weeks ahead of time. However, our results imply that firms may strategically time the release of other types of news in order to take advantage of contrast effects bias in financial markets. For example, a firm with very bad news to release may try to release that news after another firm releases even worse news, so that its own news does not appear very negative in comparison. Such strategic manipulation of market biases may be a promising direction for future research.

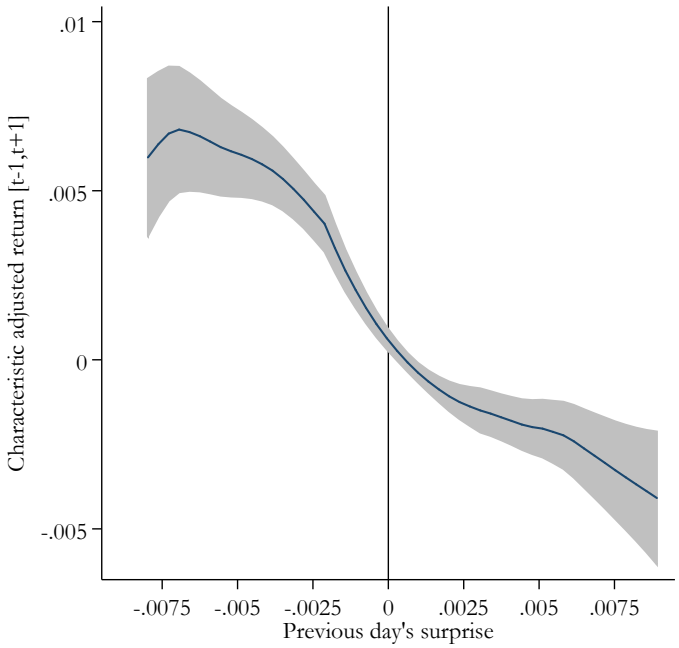
Overall, our results show that contrast effects, which has primarily been documented in laboratory settings, affects equilibrium prices and capital allocation in sophisticated markets. Contrast effects in financial markets implies that prices react to the relative content of news instead of only reacting to the absolute content of news.

Figure 2

Returns Reaction to Earnings Surprise $(t-1)$

This graph shows the value-weighted characteristic adjusted returns from $[t-1, t+1]$ of firms that announced earnings on date t against the value-weighted earnings surprises of large firms that announced earnings on date $t-1$, estimated using a value-weighted local linear regression with the optimal bandwidth. We define a "large" firm as a firm with market capitalization at $t-4$ exceeding the 90th percentile cutoff of the NYSE index in that month. Gray areas indicate 90 percent confidence intervals. Panel A reports returns residuals after controlling for 20 bins in terms of the firm's own earnings surprise. Panel B reports unconditional returns without controlling for the firm's own earnings surprise demeaned by the value weighted average return.

Panel A: Conditional on Own Earnings Surprise



Panel B: Unconditional

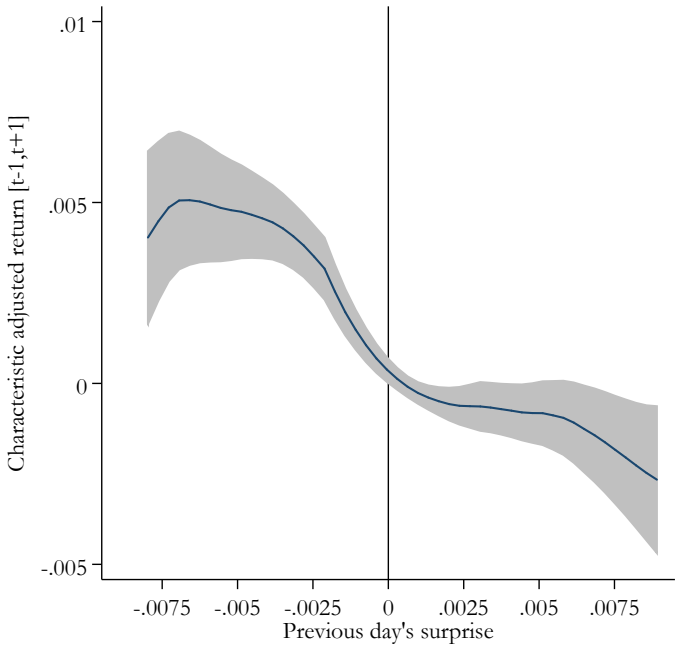


Figure 3
Returns Reaction to Own Earnings Surprise

This graph plots the value-weighted characteristic adjusted returns $[t-1, t+1]$ of firms that announced earnings on date t against the percentile ranks of the the firms own earnings surprise, estimated using a value-weighted local linear regression with the optimal bandwidth. Gray areas indicate 90 percent confidence intervals.

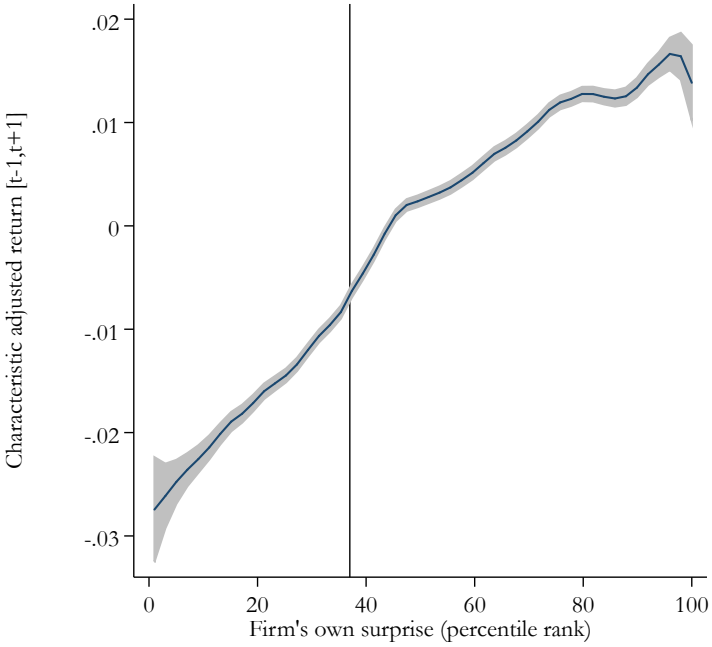


Figure 4
Cumulative Tradeable Returns

This graph plots the cumulative value-weighted characteristic adjusted returns starting at market open on day t of firms that announce on day t, conditional on whether the salient surprise is $t-1$ was positive or negative. The dotted lines indicate 90 percent confidence intervals.

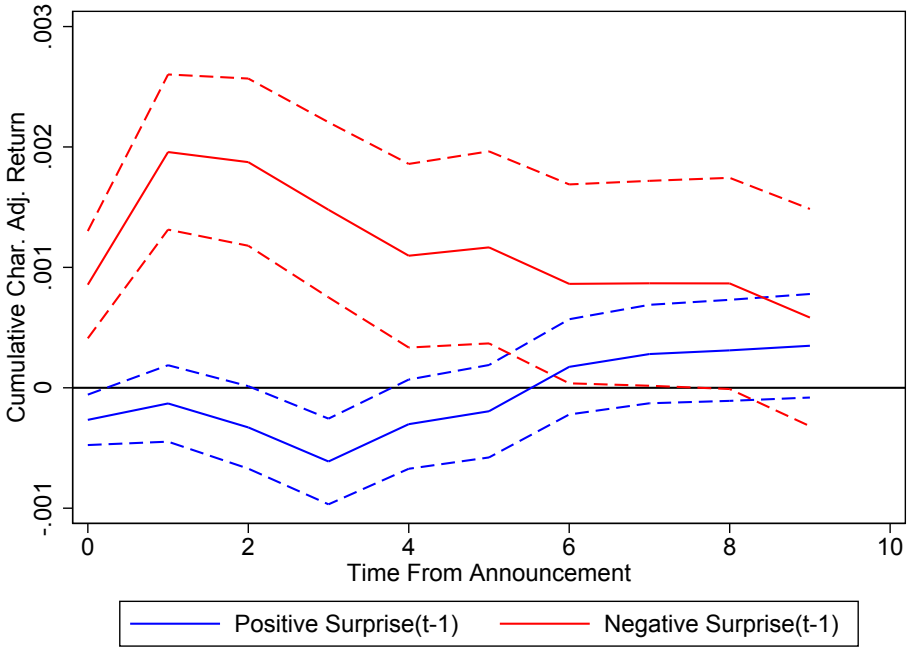


Table 1
Summary Statistics

This table presents summary statistics of the main variables used in our analysis using data from 1984 to 2013.

	N	Mean	SD	P25	P50
Surprise (t)	76062	-0.0003	0.0138	-0.0003	0.0002
Characteristic adjusted return	76062	0.0016	0.0671	-0.0297	0.0007
Return [t = -1, t= 1]	76062	0.0017	0.0503	-0.0181	0.0000
Volume	75899	3071148	15700000	132300	545000
Market cap (t = -3)	76062	7679468	24100000	440544	1490829
Number of analysts	76062	3.727	3.674	1	2
Surprise (t-1), value weighted	76062	0.0005	0.0017	0.0000	0.0004
Number of surprises (t-1), large firms	76062	7.546	5.782	3	6

Table 2
Baseline Results

This table explores the relationship between equity returns for firms that announce earnings today and the earnings surprises of firms that announced in the previous trading day. The characteristic adjusted return from $[t-1, t+1]$ for announcing firms is regressed on the earnings surprise from $t-1$ and additional controls. The table reports the coefficient on earnings surprise from $t-1$. Characteristic adjusted returns are the return of a firm minus the return of a portfolio matched on quintiles of market capitalization, book-to-market ratio and momentum. Surprises for the firms announcing today and in the previous trading day are measured as $(actual - forecast)/price_{t-3}$ where $forecast$ is the median analyst forecast among each analyst's most recent forecast that is released within 15 days of the announcement, excluding t and $t-1$. We define a "large" firm as a firm with market capitalization at $t-3$ exceeding the 90th percentile cutoff of the NYSE index in that month. Columns 1 and 2 use the earnings surprise of the largest firm (conditional on it being a large firm) announced in the previous trading day. Columns 3 and 4 use the equal weighted earnings surprise of all large firms that announced in the previous trading day. Columns 5 and 6 use the value-weighted earnings surprise of all large firms that announced in the previous trading day. All regressions include controls for 20 equally sized bins in terms of the earnings surprise of the firm that announced today. Columns 2, 4, and 6 also include controls for year-month fixed effects. Standard errors are clustered by date. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Characteristic adjusted return [t-1,t+1]					
	(1)	(2)	(3)	(4)	(5)	(6)
Surprise(t-1) of largest firm	-0.433***	-0.329**				
	(0.156)	(0.164)				
Surprise(t-1) large firms, EW mean			-0.927***	-0.817***		
			(0.236)	(0.247)		
Surprise(t-1) large firms, VW mean					-0.731***	-0.711***
					(0.204)	(0.209)
Own surprise(t) controls	Yes	Yes	Yes	Yes	Yes	Yes
Year-month FE	No	Yes	No	Yes	No	Yes
R^2	0.0583	0.0792	0.0589	0.0797	0.0587	0.0797
Observations	76062	76062	76062	76062	76062	76062

Table 3
Bellwether Effects

This table explores whether yesterday's earnings surprise conveys news about firms that will announce earnings today. In Columns 1 and 2, the dependent variable is the characteristic adjusted return for the firm that announced at time t on $t-1$. In Columns 3 and 4, the dependent variable is the earnings surprise of the firm that announces at time t. In Columns 5 and 6, the dependent variable is bin (1-20) for the earnings surprise of the firm that announces at time t. The dependent variable is regressed on the value-weighted earnings surprise of all large firms that announced in the previous trading day and additional controls. The table reports the coefficient on earnings surprise from $t-1$. Even-numbered columns include controls for year-month fixed effects. All variables are as defined in Table 2. Standard errors are clustered by date. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Surprise(t)		20 bins in surprise(t)		Char adj ret (t-1)	
	(1)	(2)	(3)	(4)	(5)	(6)
Surprise(t-1)	100.9***	-26.91	0.165**	0.0224	0.0917	0.00911
	(33.54)	(29.33)	(0.0662)	(0.0645)	(0.118)	(0.110)
Own surprise(t) controls	Yes	Yes	Yes	Yes	Yes	Yes
Year-month FE	No	Yes	No	Yes	No	Yes
R^2	0.00169	0.0562	0.00225	0.0325	0.000103	0.0234
Observations	76062	76062	76062	76062	76062	76062

Table 4
Unconditional Relationship (Not Controlling for Today's Surprise)

This table explores the relationship between equity returns for firms that announce earnings today and the earnings surprises of firms that announced in the previous trading day without controlling for the earnings surprise of the firm announcing today. This regressions are similar to those in Table 2, except that all regressions exclude these control variables. Panel A uses close-to-close returns and Panel B uses open-to-open returns in the two or three day windows around today's announcement. Odd-numbered columns exclude year-month fixed effects while even-numbered columns include year-month fixed effects. All variables are as defined in Table 2. Standard errors are clustered by date. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Close-to-Close Returns

	Char adj ret [t-1,t+1]		Char adj ret [t=0,t+1]	
	(1)	(2)	(3)	(4)
Surprise(t-1)	-0.474**	-0.746***	-0.594***	-0.776***
	(0.193)	(0.215)	(0.185)	(0.223)
Own surprise(t) controls	No	No	No	No
Year-month FE	No	Yes	No	Yes
R^2	0.000371	0.0226	0.000643	0.0220
Observations	76062	76062	76062	76062

Panel B: Open-to-Open Returns

	Char adj ret [t-1,t+1]		Char adj ret [t=0,t+1]	
	(1)	(2)	(3)	(4)
Surprise(t-1)	-0.516**	-0.807***	-0.679***	-0.912***
	(0.207)	(0.222)	(0.195)	(0.227)
Own surprise(t) controls	No	No	No	No
Year-month FE	No	Yes	No	Yes
R^2	0.000445	0.0216	0.000844	0.0224
Observations	61840	61840	61840	61840

Table 5
Placebo Test

This table shows that the relationship between equity returns for firms that announced earnings at date t and the earnings surprises of firms that announced in $t-3$, $t-2$, $t-1$, $t+1$, and $t+2$. In Column 1, observations are restricted to those of firms that announce on a date such that other large firms announced in $t-3$, $t-2$, $t-1$, $t+1$, and $t+2$. In Column 2, the sample is unrestricted. If a certain lag or lead of earnings surprise is missing that variable is set to 0 and a dummy variable is set equal to one for days of that lag that are missing. For example, if no large firm announced on $t-2$, $Surprise_{t-2}$ is set to zero and a dummy variable for whether $Surprise_{t-2}$ was missing is set to 1. All variables are as defined in Table 2. Standard errors are clustered by date. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Restricted Sample	Full Sample
	(1)	(2)
Surprise (t-3)	-0.249	-0.0526
	(0.200)	(0.169)
Surprise (t-2)	0.348	0.372*
	(0.280)	(0.202)
Surprise (t-1)	-1.649***	-0.705***
	(0.411)	(0.213)
Surprise (t+1)	-0.411	-0.000707
	(0.379)	(0.269)
Surprise (t+2)	-0.494	-0.132
	(0.313)	(0.281)
Own surprise(t) controls	Yes	Yes
Year-month FE	Yes	Yes
R^2	0.0890	0.0803
Observations	33133	76062

Table 6
Same-Day Contrast Effects

This table explores the relationship between returns for firms that announced earnings today and the earnings surprises of other large firms that announced in the same day. We classify an earnings announcement as an "AM" and "PM" announcement based on whether it was released before market open at 10am or after market close at 4pm, respectively (86% of earnings announcement are released within these two windows). Returns are cumulative close-to-close characteristic adjusted returns over [t,t+1]. Columns 1 and 2 regress the returns of firms that released PM earnings announcements on the value-weighted surprises of large firms that released AM earnings announcements. Columns 3 and 4 regress the returns of firms that released AM earnings announcements on the value-weighted surprises of large firms that released PM earnings announcements. Columns 1 and 3 control for own earnings surprise while Columns 2 and 4 omit these control variables. All columns include year-month fixed effects. All variables are as defined in Table 2. Standard errors are clustered by date. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Own PM announcement		Own AM announcement	
	(1)	(2)	(3)	(4)
AM surprise of others	-1.117*	-1.029*		
	(0.574)	(0.619)		
PM surprise of others			-0.359	-0.156
			(0.272)	(0.277)
Own surprise(t) controls	Yes	No	Yes	No
Year-month FE	Yes	Yes	Yes	Yes
R^2	0.146	0.0691	0.100	0.0444
Observations	19364	19364	17901	17901

Table 7
Long Run Return Windows

This table shows how the relationship between long run returns subsequent to announcement and the earnings surprises of firms that announced in the previous trading day. Panel A presents regressions controlling for the firm's own earnings surprise. Panel B presents unconditional regressions that exclude controls for the firm's own earnings surprise. Return windows are as labeled in column headers. All regressions include year-month fixed effects. All variables are as defined in Table 2. Standard errors are clustered by date. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Conditional on Own Surprise

	[t-1,t+1]	[t+2,t+25]	[t-1,t+25]	[t+2,t+50]	[t-1,t+50]
	(1)	(2)	(3)	(4)	(5)
Surprise(t-1)	-0.711***	0.105	-0.623	1.049*	0.344
	(0.209)	(0.384)	(0.396)	(0.604)	(0.609)
Own surprise(t) controls	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes
R^2	0.0797	0.0201	0.0396	0.0252	0.0341
Observations	76062	75886	75886	74795	74795

Panel B: Unconditional on Own Surprise

	[t-1,t+1]	[t+2,t+25]	[t-1,t+25]	[t+2,t+50]	[t-1,t+50]
	(1)	(2)	(3)	(4)	(5)
Surprise(t-1)	-0.746***	0.128	-0.637	1.086*	0.356
	(0.215)	(0.383)	(0.392)	(0.604)	(0.589)
Own surprise(t) controls	No	No	No	No	No
Year-month FE	Yes	Yes	Yes	Yes	Yes
R^2	0.0226	0.0183	0.0187	0.0232	0.0240
Observations	76062	75886	75886	74795	74795

Table 8
Strategic Timing of Earnings Announcements

This table tests whether the negative relationship between returns for firms that announce earnings today and the earnings surprises of firms that announced in the previous trading day is driven by potentially endogenous changes in the scheduling of earnings announcements. $\Delta date$ is the difference between the calendar day of the earnings announcement this year and the calendar day of the same-quarter earnings announcement last year. For example, if last year a firm is announcing earnings on March 15, 2004 and in the previous year they announced on March 12, 2003 for this observation $abs\,(\Delta date) = 3$. When $abs\,(\Delta date)$ is close to zero, the firm announcement this year is close to the same calendar date last year and suggests that firms remained on a regular schedule. All columns include year-month fixed effects and controls for announced surprise. All variables are as defined in Table 2. Standard errors are clustered by date. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Characteristic adjusted return [t-1,t+1]	
	(1)	(2)
Surprise(t-1) x abs(Δ date)<=5	-0.769***	
	(0.232)	
Surprise(t-1) x abs(Δ date)>5	-0.384	
	(0.506)	
Surprise(t-1) x Δ date<-5		0.998
		(0.788)
Surprise(t-1) x abs(Δ date)<=5		-0.776***
		(0.232)
Surprise(t-1) x Δ date>5		-0.847
		(0.679)
Own surprise(t) controls	Yes	Yes
Year-month FE	Yes	Yes
R^2	0.0802	0.0806
Observations	70272	70272

Table 9
Changes in Risk

This table tests whether the negative relationship between returns for firms that announce earnings today and the earnings surprises of firms that announced in the previous trading day is driven by changes in risk, as measured by the betas of market, SMB, HML and UMD. We regress the characteristic adjusted return (Column 1) or the raw return (Column 2) on the four factors, year-month fixed effects, surprise (t-1), and the interaction between surprise (t-1) and the four factors. For brevity, we only report coefficients for the interaction term which shoes how betas change depending on the surprise in (t-1). All variables are as defined in Table 2. Standard errors are clustered by date. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Char adj ret [t-1,t+1]	Raw ret [t-1,t+1]
	(1)	(2)
Mkt-rf x surprise (t-1)	1.639	0.958
	(8.017)	(9.658)
SMB x surprise (t-1)	-26.75	-34.68
	(19.83)	(26.25)
HML x surprise (t-1)	6.021	33.18
	(25.41)	(30.89)
UMD x surprise (t-1)	22.62	51.89***
	(14.78)	(17.53)
Own surprise(t) controls	Yes	Yes
Year-month FE	Yes	Yes
R^2	0.0808	0.216
Observations	76062	76062

Table 10
Changes in Liquidity

This table tests whether the negative relationship between returns for firms that announce earnings today and the earnings surprises of firms that announced the previous trading day is driven by changes in liquidity. Liquidity measures are regressed on surprise(t-1), own surprise controls, year-month fixed effects and firm fixed effects. Liquidity is measured as the log of daily dollar volume in Column 1, the log of the closing bid-ask spread in Column 2 and the log of the Amihud illiquidity measure in column 3. All variables are as defined in Table 2. Standard errors are clustered by date. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Log(volume)	Log(bid-ask)	Log(Amihud)
	(1)	(2)	(3)
Surprise(t-1)	3.953	0.988	-2.623
	(4.692)	(5.605)	(2.159)
Own surprise(t) controls	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
R^2	0.887	0.716	0.940
Observations	75910	68909	70367

Table 11
Alternative Measures of Surprise

This table shows that the negative relationship between equity returns for firms that announce earnings today and the earnings surprises of firms that announced in the previous trading day is robust to alternative measures and sample restrictions. All variables are as defined in Table 2, except for the following changes. Column 1 utilizes the value weighted average of the return response to an earnings announcement of firms above the 90the percentile of market capitalization in place of surprise (t-1). In Columns 2 and 3, the value-weighted surprise of firms that announced in the previous trading day is calculated conditional on those firms exceeding the 85th and 95th percentile cutoffs of the NYSE index in that month, respectively. Column 4 uses the value-weighted surprise of all firms that announced in the previous trading day, regardless of size. Columns 5 and 6 calculate surprise using the median of each analyst's most recent forecast released with the past 30 or 45 days, respectively. Because some earnings announcements do not have forecasts released within the past 15 days, the sample expands as we allow for more stale forecasts. Standard errors are clustered by date. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Forecasts: [t-15,t-2]				[t-30,t-2]	[t-45,t-2]
	(1)	(2)	(3)	(4)	(5)	(6)
Return(t-1), VW mean	-0.0552**					
	(0.0241)					
Surprise(t-1), >85th pctile		-0.753***				
		(0.197)				
Surprise(t-1), >95th pctile			-0.678***			
			(0.227)			
Surprise(t-1), all firms				-0.449***		
				(0.140)		
Surprise(t-1)					-0.529***	
					(0.195)	
Surprise(t-1)						-0.326*
						(0.187)
Own surprise(t) controls	Yes	Yes	Yes	Yes	Yes	Yes
Year-month FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.0791	0.0793	0.0767	0.0674	0.0706	0.0715
Observations	75044	79875	66609	76062	121617	150232

Table 12
Heterogeneity

This table shows how the relationship between returns for firms that announce earnings today and the earnings surprises of firms that announced in the previous trading day varies by firm size and analyst coverage. In Column 1, $Surprise_{t-1}$ is interacted with indicators for five quintiles of firm size in $t-3$ based upon quintile cutoffs in the NYSE index in that month. In Column 2, $Surprise_{t-1}$ is interacted with indicators for the number of analysts covering the firm announcing earnings today, (measured as the number of distinct analysts that released forecasts in the past 15 days). All direct effects of size quintiles or number of analysts indicators are included in the regression. All variables are as defined in Table 2. Standard errors are clustered by date. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Characteristic adjusted return [t-1,t+1]	
	(1)	(2)
Surprise(t-1) x size quintile 1	-0.295	
	(0.528)	
Surprise(t-1) x size quintile 2	-0.325	
	(0.459)	
Surprise(t-1) x size quintile 3	-0.267	
	(0.462)	
Surprise(t-1) x size quintile 4	0.103	
	(0.307)	
Surprise(t-1) x size quintile 5	-0.789***	
	(0.226)	
Surprise(t-1) x (num analysts = 1)		-0.0169
		(0.590)
Surprise(t-1) x (num analysts = 2)		-0.662
		(0.482)
Surprise(t-1) x (num analysts >= 3)		-0.805***
		(0.233)
Own surprise(t) controls	Yes	Yes
Year-month FE	Yes	Yes
R^2	0.0800	0.0800
Observations	76062	76062

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