Anomalous Price Behavior Following Earnings Surprises: Does Representativeness Cause Overreaction?*

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Abstract

Behavioral Finance aims to explain empirical anomalies by introducing investor psychology as a determinant of asset pricing. This study provides strong evidence that anomalous stock price behavior following earnings announcements is due to a representativeness bias. It investigates current and past earnings surprises and subsequent market reaction for listed US companies over the period 1983-1999.

The results suggest that investors overreact to past earnings surprises. As, on average, extreme past surprises are not confirmed by actual earnings figures, they are followed by stock market reactions of the opposite sign. Moreover, the longer the similar earnings surprise series, the higher the subsequent reversal.

1 Introduction

Over the last two decades, both theoretical and empirical work from the field of what is commonly called behavioral finance, has presented an important challenge to the traditional finance paradigm, which states that investors behave fully rationally. Although this appears to be very desirable, extensive theoretical and experimental evidence suggest systematic biases to rationality.

In fact, empirical research in finance has uncovered two families of pervasive regularities: short-term underreaction to news, such as earnings figures,

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showing that prices reflect new information only slowly and long-term overreaction, where stock prices exhibit negative autocorrelations. Recently, these empirical findings were integrated into theoretical models, in order to understand if potential cognitive biases drive prices away from their rational values. One approach explains market mispricing by positive feedback trading (Hong and Stein, 1999), overconfidence (Odean, 1998; Daniel, Hirshleifer, and Subrahmanyam, 1998) or anchoring and representativeness (taken into account simultaneously by Barberis, Shleifer, and Vishny (1998)).

This study provides deep insights into how overreaction occurs within the quarterly earnings announcement framework, by identifying representativeness as the most probable explanation of mispricing around these events. The paper is organized as follows: the remainder of this introduction provides an short review of Behavioral Finance literature that deals with the overreaction phenomenon and the representativeness bias. The data and research methodology is exposed in section 2. Section 3 presents the main results.

1.1 The overreaction phenomenon

Investors' overreaction to information seems to be the main conclusion of the seminal De Bondt and Thaler (1985)'s study. The authors rank all stocks traded on the NYSE by their past three year cumulative return. Subsequent abnormal performance turns out to be higher for prior "losers", that is, stocks having experienced the poorest past performance. Over the subsequent three years, the bottom decile portfolio yields an abnormal return 8% higher than that of the top decile portfolio: the prior winners. This stock return reversal suggests that part of an initial overweighing of negative (positive) stock information, driving prices below (over) their rational levels is subsequently corrected.

The overreaction phenomenon has been confirmed several times on the stock market (De Bondt and Thaler, 1987; Chopra, Lakonishok, and Ritter, 1992), but also for international stock market indices (Chui, Titman, and Wei, 2000; Bhojraj and Swaminathan, 2001), the gold market (Cutler, Poterba, and Summers, 1991) and the options market (Poteshman, 2001). Although this anomaly is now well established in empirical finance, the

question of what drives overreaction still remains unanswered. Many authors condition their studies on past performance (De Bondt and Thaler, 1985; Chopra, Lakonishok, and Ritter, 1992), current earnings (De Bondt and Thaler, 1987) and forecasted changes in earnings (De Bondt and Thaler, 1990) and invoke the "representativeness bias" as a potential explanation, without directly testing for it. At the time of this writing, only Poteshman (2001) lines up representativeness and overreaction by investigating the response of option market investors to changes in the instantaneous variance of the underlying asset.

1.2 The representativeness heuristic

Representativeness involves assessing *"[...] the probability of an uncertain event, or a sample, by the degree to which it is similar in its essential properties to the parents population [...]"*[1]. In other words, people rely too heavily on information gathered from small samples (the so-called "law of small numbers") and underestimate statements about unconditional probability - the bayesian prior probability. As a consequence, a series of similar information may be considered as a pattern, and extrapolated too far into the future.

The representativeness bias may lead people to overweight recent good or bad news when estimating future stock performance. For example, securities which have a long record of good news may end up overpriced and experience subsequent poor returns.

Most of the empirical studies, that deal with overreaction use past stock returns as a proxy for prior information. In the common portfolio-approach, stocks are ranked according to this past performance, then top and bottom decile past performers are simply compared to each other.

The focus of this study is on what's behind the mirror. As investors seem to overreact to some information, that, in turn, influences stock returns, it is crucial to the general acceptance of investor psychology as a determinant of asset prices to investigate *what* they overreact to. This work aims to provide evidence that overreaction is rather due to earnings infor-

[1] Tversky and Kahneman (1974).

mation than to stock performance, even if both phenomena are undoubtedly related. Its results hopefully reconcile the overreaction phenomenon and the representativeness bias.

2 Data and methodology

2.1 Data

Financial analysts' earnings forecasts and actual earnings were provided by the I/B/E/S summary file. Return data is obtained from the Center of Research in Security Prices (CRSP) for the period from January, 1st, 1983 until December, 31th, 1999.

For each quarterly earnings announcement made by any company over this period, the consensus earnings estimate from the month preceding the earnings announcement and the actual earnings per share (EPS) are collected. To allow for a time-line analysis, EPS estimates and their actual value for each of the 4 preceding quarters were also obtained. Moreover, for each earnings announcement, return data for the 60 trading days following the actual announcement date were extracted from CRSP.

Quarterly earnings, earnings announcement dates and estimates were not available for all companies in all quarters. Also, a few companies could not be found in CRSP and were deleted. The final sample consists of 79 289 earnings announcements for 4 081 companies.

2.2 Measuring earnings surprises and abnormal returns

For a given quarter q, standardized unexpected earnings (SUE_q) equal the difference between actual earnings (EPS_q) and the consensus estimate in the month preceding the actual announcement (EST_q), scaled by the standard deviation of the individual estimated (σ_{EST_q}):

$$SUE_q = \frac{EPS_q - EST_q}{\sigma_{EST_q}} \tag{1}$$

Daily abnormal returns are computed using a size-adjusted approach: for stock i at time t, the daily abnormal return is defined by the difference between the stock's daily raw return and the equally weighted daily return

for the size portfolio, the stock belongs to at the beginning of the year:[2]

$$AR_{i,t} = R_{i,t} - M_t \tag{2}$$

where $R_{i,t}$ is stock i's daily return at time t and M_t is the equally weighted daily return for the corresponding size portfolio.

Cumulative abnormal returns for stock i in an event window (p, q) is computed as follows:

$$CAR_i(p, q) = \sum_{t=p}^{q} AR_{i,t} \tag{3}$$

where p and q are the dates relative to the announcement date, denoted as 0.

2.3 Portfolio Construction

As many other studies, the tests presented hereafter rely on a sort ranking procedure. Each event (79 289 earnings announcements with valid data) is assigned to one of ten portfolios, according to its current standardized earnings surprise (SUE). Portfolio 1 is displaying the highest positive surprises and portfolio 10 the highest negative surprises.

For those studies which focus on the reaction to a series of similar past surprises, we repeat the portfolio formation procedure backwards. The events of each portfolio, obtained at the first step, are, in a second step, ranked according to the earnings surprise of the preceding quarter and assigned to one of three portfolios (respectively positive, null and negative surprises). This procedure is repeated up to 4 times, yielding, at most, one current earnings surprise and 4 past surprises.

This selection-rank methodology allows a progressive portfolio study, where consecutively formed portfolios only differ from their parent portfolio by the most ancient earnings surprise. This methodology allows to focus on the impact of the number of similar past earnings surprises on the market reaction to the most recent earnings announcement. Thereby it is possible to identify the marginal impact of an additional (past) similar information on the strength of representativeness.

[2]The size of a company is calculated at the beginning of each year, by multiplying the share price by the number of shares outstanding. Each stock is then assigned to one of ten size-portfolios.

2.4 Statistical significance of abnormal returns

Evidence regarding anomalies and/or financial market efficiency is always subject to criticism about the statistical significance of displayed results. The tests conducted within this study are not free of those statistical biases (no study actually is), but we aimed at limiting, as much as possible, their consequences. For most of the tests, a non parametric significance test, initiated by Foster, Olsen, and Shevlin (1984), employed by Ikenberry, Lakonishok, and Vermaelen (1995), Ikenberry, Rankine, and Stice (1996) Lee (1997) and reviewed by Lyon, Barber, and Tsai (1999) is used. It relies on statistical significance levels which are drawn from an empirical sample distribution.

Statistical significance is assessed by comparing the observed portfolio cumulated abnormal return (hereafter CAR) with the empirical distribution of CARs for a companion sample. The empirical distribution is generated as follows:

1. For each event in the portfolio, randomly select one event in the parent population.

2. Compute equal weighted CARs for the companion sample.

3. Repeat steps 1 and 2 2 500 times and rank the companion sample CARs from the lowest to the highest to obtain the empirical distribution.

This test has several appealing properties. It does not assume normality, it does not assume constant variance of security returns over time and it does not assume cross-sectional independence in the residuals. Moreover, as Lyon, Barber, and Tsai (1999) point out, unlike the conventional t-statistic, in which the null hypothesis is that the mean CAR is zero, the null hypothesis by approximating the empirical distribution is that the mean CAR equals the companion mean CAR.

3 Representativeness as a Source of Overreaction: Empirical Results

Most studies examine abnormal returns conditionally on past performance and report long-term reversals in abnormal stock performance. In such a framework, empirical evidence of long-term reversals of stock returns does not explain the phenomenon by a known psychological (cognitive) bias, be it representativeness or any other heuristic, at most, it could be considered consistent which such a bias.

3.1 Descriptive sample statistics and preliminary results

3.1.1 Sample wide statistics and normality

We first consider the behavior of stock prices immediately after earnings announcements, without conditioning on earnings surprises. Table 1 displays the sample wide average SUE (based on mean and median estimates of earnings per share) and cumulated abnormal returns for various event windows.

Table 1: Sample Wide Statistics for Standardized Unexpected Earnings and Cumulated Abnormal Returns

Measure	Mean	Standard deviation	Skewness	Kurtosis
SUE_c (mean estimate)	-0.0103	0.0762	-17.654	936.4
SUE_c (median estimate)	-0.0103	0.0762	-17.670	939.1
CAR event window (0;1)	0.0015	0.0675	0.331	18.499
CAR event window (0;3)	0.0011	0.0793	0.321	14.921
CAR event window (0;10)	0.0014	0.0890	1.824	82.901
CAR event window (0;30)	0.0077	0.1514	0.451	11.307
CAR event window (0;60)	0.0115	0.2107	0.307	7.375

The table above displays sample wide statistics for surprise indicators and abnormal returns for 79 289 quarterly earnings announcements. SUE_c denotes the current quarter standardized earnings surprise and CAR denotes the cumulated abnormal return for a specific event window.

On average, standardized unexpected earnings are negative (-0.0103), indicating analysts' optimism: their estimates globally overshot the actual

figures. Despite this fact, CARs appear to be slightly positive for all event windows up to 10 days after the earnings announcement. For larger windows (30 and 60 days), cumulated abnormal returns are respectively 0.77% and 1.15%. K-S statistics calculated for each variable (and not reported for simplicity) show that normality can be rejected for all variables at the 0.1 percent level.

3.1.2 Market reaction to current earnings surprises

It is well documented that investors essentially react to unexpected earnings. We followed the widely used portfolio-study approach, initiated by Ball and Brown (1968), and formed 10 portfolios based on the current earnings surprise, denoted SUE_c. Portfolio 1 contains the events with the highest positive earnings surprise, portfolio 10 the highest negative earnings surprises. The abnormal return of a given portfolio is the equal weighted average abnormal return of those events, which constitute the portfolio. We computed abnormal return statistics for several event windows, shown in table 2.

Our test statistics indicate that the stock price adjusts, on average, in the direction of the recent earnings surprise. For portfolios which exhibit negative surprises, that is, portfolios 6 to 10, CARs for all event windows are negative. These abnormal returns are significantly different from zero[3] and, with few exceptions, increasing in the average earnings surprise of the portfolio. For example, the bottom decile portfolio, which exhibits a negative SUE_c equal to -0.1310, yields a negative cumulated abnormal return of -1.66% for the day following the announcement date (event window A) and -1.41% over the first three trading days. Portfolio 9, displaying a smaller negative surprise (-0.0334) also experiences a smaller market reaction: on average $-1,28\%$ on the first trading day and -1.66% over the first three trading days. Conversely, positive surprise portfolios (portfolios 1 to 4) exhibit positive CARs, that increase with the average standardized earnings surprise of the portfolio.

These preliminary results confirm two well-known phenomena. First, the market reaction captured by the cumulated abnormal returns is not im-

[3]For these preliminary statistics, displayed significance levels were computed using conventional t-tests.

Table 2: Cumulated Abnormal Returns Following Earnings Surprises

Event Windows		A	B	C
Portfolio	SUE_c	(0;1)	(0;3)	(0;60)
1	0.0588	2.33%*****	2.25%*****	4.31%*****
2	0.0195	1.67%*****	1.52%*****	2.84%*****
3	0.0103	0.86%*****	0.74%*****	1.52%*****
4	0.0044	0.49%*****	0.33%*****	−0.14%
5	0.0000	0.04%	−0.19%*	0.08%
6	−0.0039	−0.06%	−0.17%	−0.62%***
7	−0.0098	−0.57%*****	−0.59%*****	−1.16%*****
8	−0.0174	−0.87%*****	−0.81%*****	−1.84%*****
9	−0.0334	−1.28%*****	−1.27%*****	−1.96%*****
10	−0.1310	−1.66%*****	−1.41%*****	−1.93%*****

The table shows cumulated abnormal returns (CAR) for different event windows, (the announcement data being day 0) for 10 portfolios, formed based on the recent standardized earnings surprise (SUE_c). Latter is defined as the difference between the earnings estimate from the month preceding the earnings announcement and the actual earnings per share value, scaled by the standard deviation of the estimate. The daily abnormal return a given stocks is defined as the daily raw return of that stock minus the equal weighted average return of the size portfolio, this stock belongs to at the beginning of the year.
The symbols *, **, ***, **** and ***** indicate that the measure is significantly different from zero at, respectively, the 10%, 5%, 1%, 0.5% and 0.1% level, assuming a two-tailed test.

mediate: CARs for event window D (0;60) are generally greater than those for short-term windows A (0;1) or B (0;3), denoting a progressive reaction to the earnings information. Second, the market reaction to earnings announcements seems to be too extreme on the first trading day, which is shown by the fact that for non-null surprises (portfolios 1 to 4 and 7 to 10), the abnormal return for day 1 exceeds (in absolute value) the cumulated abnormal return over the first three days, confirming the presence of "momentum" after earnings announcements.[4]

3.2 Evidence of representativeness behind overreaction to earnings surprises

While our preliminary results tend to confirm existing evidence of overreaction and underreaction for different time horizons, we focus specifically

[4] As our study does not address these issues, we did not compute any significance level, nor did we investigate further.

on representativeness. If such a bias affects investors and, consequently, financial markets, we would find evidence for two related phenomena. First, statistical results would indicate a market's overreaction to some disclosed information. Second, the overreaction will be increasing in the extent to which the series of similar information is long. The tests presented hereafter address the question wether representativeness is one of the causes of overreaction.

3.2.1 Market Reaction Conditionally on the Past Earnings Surprise

Investors that exhibit representativeness extrapolate their information too far into the future. As, on average, these extreme expectations are not confirmed by actual figures, there should be periodical corrections. Especially after high surprises, one could expect investors to overestimate future earnings surprises. On average, important surprises should be followed, at the date of subsequent earnings announcement, by a correction of the initial overreaction, that is, by CARs of the opposite sign.

We formed 10 portfolios based on the standardized earnings surprise preceding our event study period, SUE_{c-1}. Results are presented in table 3.

The results displayed in table 3 are consistent with the overreaction / representativeness hypothesis. It seems that investors rely to heavily on the information carried by the past earnings surprise. After an important positive surprise ($SUE_{c-1} = 0.0548$ for portfolio 1) they are deceived, on average, by the recent earnings figures. For this portfolio, cumulated abnormal returns computed over the period following the recent earnings announcement are negative, yielding -0.66% the first trading day and even -1.91% over the 60 first trading days after the announcement.

For non null-surprise portfolios, computed CARs are of the opposite sign to the past earnings surprise, and generally significantly different from the mean value of a randomly generated sample wide empirical distribution. Thus, a positive (negative) surprise, generating an immediate and extreme positive (negative) market reaction, is, on average, followed by a reversal, that is, negative (positive) abnormal returns at the time of the subsequent earnings announcement.

Table 3: Market Reaction Conditional on the Preceding Earnings Surprise

Portfolio	SUE_{c-1}	A (0;1)	B (0;3)	C (0;30)	D (0;60)
1	0.0548	$-0.66\%^{\diamond\diamond\diamond\diamond}$	$-0.92\%^{\diamond\diamond\diamond\diamond}$	$-1.21\%^{\diamond\diamond\diamond\diamond}$	$-1.91\%^{\diamond\diamond\diamond\diamond}$
2	0.0181	$-0.49\%^{\diamond\diamond\diamond\diamond}$	$-0.64\%^{\diamond\diamond\diamond\diamond}$	$-0.61\%^{\diamond\diamond\diamond\diamond}$	$-0.74\%^{\diamond\diamond\diamond\diamond}$
3	0.0102	$-0.06\%^{\diamond\diamond}$	$-0.24\%^{\diamond\diamond\diamond\diamond}$	$-0.23\%^{\diamond\diamond\diamond\diamond}$	$-0.44\%^{\diamond\diamond\diamond\diamond}$
4	0.0042	$-0.01\%^{\diamond}$	$-0.15\%^{\diamond\diamond}$	$-0.09\%^{\diamond\diamond\diamond\diamond}$	$-0.14\%^{\diamond\diamond\diamond\diamond}$
5	0.0000	0.12%	−0.01%	0.57%	$0.31\%^{\diamond\diamond\diamond}$
6	−0.0040	0.18%	0.11%	0.67%	$0.53\%^{\diamond\diamond}$
7	−0.0098	$0.46\%^{****}$	$0.54\%^{****}$	$1.27\%^{**}$	1.32%
8	−0.0171	0.10%	0.22%	0.59%	0.65%
9	−0.0319	$0.57\%^{****}$	$0.65\%^{****}$	$1.43\%^{****}$	1.32%
10	−0.1214	$0.66\%^{****}$	$0.78\%^{****}$	$1.35\%^{***}$	1.32%

The table shows cumulated abnormal returns for 10 portfolios formed according to the preceding quarter standardized earnings surprise (SUE_{c-1}) for different event windows. Each window A, B, C et D displays, in braces, the period (start date, end date) , the announcement day being denoted day 0.

The symbols *, **, ***, and **** indicate that the measure is significantly higher than, respectively, 90%, 95%, 99%, and 99, 5% of a sample-wide empirical distribution.
The symbols $^{\diamond}$, $^{\diamond\diamond}$,$^{\diamond\diamond\diamond}$, and $^{\diamond\diamond\diamond\diamond}$ indicate that the measure is significantly lower than, respectively, 90%, 95%, 99%, and 99, 5% of a sample wide empirical distribution.

3.2.2 Market reaction to null surprises

To ascertain wether these results are due to investors misperception of earnings surprises or a negative autocorrelation between consecutive SUEs, we restrained our tests to those events that display a recent null surprise. We rely on the rank-selection methodology used for table 2 and limit our sample to events contained in portfolio 5. For these earnings announcements, mean standardized unexpected earnings equals zero and cumulated abnormal returns are not significantly different from zero. If any subset of this sample exhibits significant CARs, then they might be related to previous information sets, such as past earnings surprises.

We report CARs for events of this subsample, sorted and ranked into 10 portfolios based on past earnings surprise SUE_{c-1}, in table 4. As all events display, on average, a recent null surprise, there should be no signif-

icant market reaction to this recent announcement. However, extreme past surprise portfolios exhibit a strong correction pattern: cumulated abnormal returns, globally negative for prior positive surprises. For example, top prior surprise decile ($SUE_{c-1} = 0.0412$) yields an abnormal return of -0.84% for the first trading day (event window A), -1.26% over the first three days (event window B) and even a -2.22% over the 60 trading days following the earnings announcement (event window D).

Table 4: Market Reaction Conditional on the Preceding Earnings Surprise for Recent Null Surprise Events

Portfolio	SUE_{c-1}	A (0;1)	B (0;3)	C (0;30)	D (0;60)
1	0.0412	$-0.84\%^{\diamond\diamond\diamond\diamond}$	$-1.26\%^{\diamond\diamond\diamond\diamond}$	$-2.07\%^{\diamond\diamond\diamond\diamond}$	$-2.22\%^{\diamond\diamond}$
2	0.0161	$-1.68\%^{\diamond\diamond\diamond\diamond}$	$-2.07\%^{\diamond\diamond\diamond\diamond}$	$-2.24\%^{\diamond\diamond\diamond\diamond}$	$-2.26\%^{\diamond\diamond}$
3	0.0100	0.20%	0.33%	-0.39%	-1.31%
4	0.0040	-0.23%	$-0.65\%^{\diamond}$	-1.04%	-0.61%
5	0.0000	0.03%	-0.09%	0.16%	-0.07%
6	0.0000	-0.04%	$-0.54\%^{\diamond\diamond}$	-0.70%	-0.95%
7	-0.0056	$0.63\%^{**}$	$0.38\%^{*}$	-0.39%	-1.35%
8	-0.0101	$0.62\%^{**}$	$0.58\%^{**}$	$1.98\%^{***}$	$2.37\%^{****}$
9	-0.0196	$0.67\%^{**}$	$0.70\%^{**}$	$2.55\%^{****}$	$3.46\%^{****}$
10	-0.0765	$0.72\%^{**}$	$0.49\%^{**}$	0.64%	-1.06%

The table displays cumulated abnormal returns (CAR) for 10 portfolios, that were formed based on past standardized unexpected earnings SUE_{c-1}. This portfolio constitution was restrained to events that exhibit a recent null surprise. CAR were computed for different event windows, denoted A, B, C, and D.

The symbols *, **, ***, and **** indicate that the measure is significantly higher than, respectively, 90%, 95%, 99%, and 99,5% of the empirical distribution generated from subsample portfolio 5.
The symbols $^{\diamond}$, $^{\diamond\diamond}$,$^{\diamond\diamond\diamond}$, and $^{\diamond\diamond\diamond\diamond}$ indicate that the measure is significantly lower than, respectively, 90%, 95%, 99%, and 99,5% of the empirical distribution generated from subsample portfolio 5.

We find a similar pattern for past negative surprises. With a notable exception for portfolio 10, important negative surprises are followed by positive CARs at the time of the subsequent earnings announcement, as document portfolios 8 and 9. For the latter, the past surprise SUE_{c-1} equals -0.0196. Despite a recent null surprise, cumulated abnormal returns subsequent to the recent announcement turn out to be significantly positive, for all event windows. While the first trading day abnormal return is "only" 0.67% (event window A), the event window D displays an impressive 3.46%. More gener-

ally, CARs for computed event windows decrease in past surprises.

For extreme prior surprises (portfolios 1, 2, 8, and 9), most of the cumulated abnormal returns displayed in table 4 are significantly different (at indicated significance levels) from those of the entire null surprise sample (portfolio 5 of a preceding sort ranking step). These results indicate that stocks with prior important surprises experience an important reversal when subsequent earnings are announced. Even if latter equal analysts' estimates, thus displaying a recent null-surprise, investors feel disappointed. Their extreme beliefs, due to an extrapolation of an important past surprise (and known as representativeness) are not confirmed by actual figures.

3.2.3 Progressive construction of representativeness

The results presented above indicate that an extreme earnings surprise is followed, at the time of the subsequent earnings announcement, by a market reaction in the opposite direction to the initial surprise. These findings suggest the presence of investors' overreaction to earnings surprises. If this overreaction is due to representativeness, then investors would not only extrapolate an earnings surprise into the future (and end up disappointed when the subsequent actual earnings figures are announced), but also misreact more heavily to a *series* of similar surprises. Hence, we expect the reversal to be more pronounced for event with long series of good or bad earnings surprises.

To capture the impact of a series of similar earnings surprises, we used the sequential sort-ranking procedure, described at point 2.3. As for the previous study, we used all null-surprise events (recent-surprise-portfolio 5) and ranked them according to the most recent past standardized unexpected earnings (SUE_{c-1}). We formed three equals sized portfolios (which could be understood as *positive*, *null*, and *negative* $c-1$ surprise portfolios). Each of those portfolios is divided again into three subportfolios, based on the earnings surprises, that lies two quarters behind (SUE_{c-2}). We repeat this procedure until we have 5 consecutive quarters (SUE_c until SUE_{c-4}). This procedure identifies events with a series of similar past earnings surprises, while keeping the most recent surprise SUE_c close to zero.

Results are reported in table 5. They are consistent with the repre-

Table 5: Market Reaction Conditional on Previous Earnings Surprises

Portfolio	SUE c	Sample Size	A (0;1)	B (0;3)	C (0;30)	D (0;60)
5,1,1,1,1	0.0026	18	$-3.07\%^{\diamond\diamond\diamond\diamond}$	$-1.76\%^{\diamond\diamond\diamond\diamond}$	$-4.73\%^{\diamond\diamond\diamond\diamond}$	$-11.18\%^{\diamond\diamond\diamond\diamond}$
5,1,1,1	0.0006	77	$-1.59\%^{\diamond\diamond\diamond\diamond}$	$-3.12\%^{\diamond\diamond\diamond\diamond}$	$-1.21\%^{\diamond\diamond\diamond\diamond}$	$-4.40\%^{\diamond\diamond\diamond\diamond}$
5,1,1	0.0005	271	$-0.75\%^{\diamond\diamond\diamond\diamond}$	$-1.64\%^{\diamond\diamond\diamond\diamond}$	$-2.19\%^{\diamond\diamond\diamond\diamond}$	$-3.48\%^{\diamond\diamond\diamond\diamond}$
5,1	0.0005	1103	$-0.83\%^{\diamond\diamond\diamond\diamond}$	$-1.25\%^{\diamond\diamond\diamond\diamond}$	$-1.77\%^{\diamond\diamond\diamond\diamond}$	$-1.80\%^{\diamond\diamond\diamond\diamond}$
5	−0.0001	4673	−0.02%	−0.23%	0.04%	−0.13%
5,3	−0.0006	1112	$0.53\%^{****}$	$0.41\%^{****}$	$1.24\%^{****}$	$0.70\%^{*}$
5,3,3	−0.0008	280	$0.57\%^{****}$	$0.73\%^{****}$	$1.32\%^{****}$	0.54%
5,3,3,3	−0.0008	80	$1.78\%^{****}$	$1.41\%^{****}$	$2.13\%^{****}$	−0.69%
5,3,3,3,3	−0.0021	21	$1.65\%^{****}$	$1.53\%^{****}$	$2.63\%^{****}$	$3.25\%^{****}$

The table shows that cumulated abnormal returns, computed for different event windows, are increasing in the length of a past earnings surprise series. All portfolios are formed sequentially starting from the current null surprise (portfolio 5), then forming, at each step, 3 portfolios based on the preceding standardized unexpected earnings.

Cumulated abnormal returns are computed for the first trading day after the announcement (event window A), the period covering the first three trading days (B), 30 trading days (C), and trading 60 days following the earnings announcement.

The symbols *, **, ***, and **** indicate that the measure is significantly higher than, respectively, 90%, 95%, 99%, and 99,5% of the empirical distribution generated from subsample portfolio 5.
The symbols $^{\diamond}$, $^{\diamond\diamond}$,$^{\diamond\diamond\diamond}$, and $^{\diamond\diamond\diamond\diamond}$ indicate that the measure is significantly lower than, respectively, 90%, 95%, 99%, and 99,5% of the empirical distribution generated from subsample portfolio 5.

sentativeness hypothesis. In addition to a correction period consecutively to recent earnings announcement, it appears that this correction is stronger for a long series of similar consecutive earnings surprises. For example, portfolio denoted $5,1,1,1,1$, having experienced a series of four positive past surprises and a current null surprise, displays a negative cumulated abnormal return of -3.07% for the first trading day, -4.73% over the first 30, and -11.18% over the first 60 trading days. This portfolio outperforms portfolio $5,1,1,1$, with only three consecutive positive past earnings surprises over nearly all event windows. Recall that those earnings announcements are actually *null surprises*, that is, the current earnings figures match, on average, analysts' estimates. Similar results are obtained for portfolios with prior negative surprises; thus displaying positive abnormal returns after the current null-surprise.

These results indicate that the longer the series of similar earnings sur-

prises (Standardized Unexpected Earnings in our study), the stronger the subsequent correction. This evidence is consistent with the idea that representativeness causes investors to overreact more heavily to a series of similar information. If these beliefs are not confirmed by actual earnings figures, the markets experiences a strong reversal. Latter is increasing in the length of the series of similar earnings surprises.

4 Conclusions

Psychological theory and experimental studies have establish that investors make mistakes in forming their beliefs. Behavioral Finance argues that taking into account cognitive biases such as overconfidence, anchoring, or representativeness could provide a better understanding of empirical anomalies, such as under- or overreaction.

Our study indicates that anomalous stock price behavior around earnings announcements, which is consistent with overreaction, could be based on representativeness. In fact, our tests provide strong evidence that important past earnings surprises are followed, at the time of the subsequent earnings announcement, by cumulated abnormal returns of the opposite sign to the initial reaction. These findings suggest that the stock market initially extrapolates the recent earnings surprise and hence overreacts to earnings surprises. As on average, these extreme expectations are not confirmed by subsequent earnings figures, investors feel deceived and the stocks experience a return reversal. Consistent with the representativeness hypothesis, series of similar surprises are more heavily extrapolated and lead to more important subsequent reversals.

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