International Review of Financial Analysis 52 (2017) 160–171

Contents lists available at ScienceDirect

International Review of Financial Analysis

Under-or-overreaction: Market responses to announcements of earnings surprises☆

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ARTICLE INFO

Article history:
Received 19 July 2016
Received in revised form 25 May 2017
Accepted 7 July 2017
Available online 8 July 2017

JEL classification:
G14

Keywords:
Earnings surprise
Initial SUE
Confirming SUE signals
Disconfirming SUE evidence
Overreaction
Price reversals

ABSTRACT

We test whether the well-documented market reaction to the announcements of earnings surprises is a manifestation of an investor underreaction or overreaction to extremely good or bad earnings news. Using the market reaction in the three-day period surrounding the announcements of extreme earnings surprises (i.e., SUE) in quarter Q_t as a reference point, we show that firms reporting a high (low) SUE in subsequent quarter Q_{t+1} that confirms their initial quarter Q_t SUE ranking in the same highest or lowest SUE quintiles generate an incremental price run that moves in the same direction as that of the initial SUE. However, the price impact of the confirming SUE signal is weaker than that of its initial SUE. Our findings are robust to the Fama-French three-factor daily regression extended by the momentum factor and a number of other robustness tests. Our result is not consistent with the prevalent view that investors underreact to earnings news. To the contrary, the evidence suggests an initial investor overreaction to extreme SUE signals.

1. Introduction

The objective of this study is to empirically test whether extreme earnings announcement price reactions are a manifestation of a market underreaction to extreme earnings surprises, as it is widely interpreted (e.g., Bernard & Thomas, 1989) or caused by an investor overreaction as suggested by some recent studies (e.g., Bai & Qin, 2015; Huang, Nekrasov, & Teoh, 2013; Milian, 2015). We provide evidence that suggests an investor overreaction to extreme earnings announcements.

Earnings momentum, i.e., the return continuation in the same direction of a recent earnings surprise, has been the subject of many empirical studies since Ball and Brown's (1968) influential research. This phenomenon is commonly interpreted as a failure of market prices to fully reflect in a timely manner the implications of a firm's current earnings innovation for its future earnings prospects. Much of the early literature concludes that it takes a period ranging from 6 to 12 months for earnings information to be fully reflected in stock prices (e.g., Abarbanell & Bushee, 1998; Bernard & Thomas, 1989). Because of this prior research, this market anomaly is dubbed by Fama (1998, p. 286) as "the granddaddy of underreaction events." Underreaction to earnings announcements has been attributed to behavioral biases (e.g., Barberis, Shleifer, & Vishny, 1998; Daniel, Hirshleifer, & Subrahmanyam, 1998), the disposition effect (e.g., Frazzini, 2006), the bounded rationality of and interaction between heterogeneous investor types (e.g., Hong & Stein, 1999), risk (e.g., Fama, 1998), and liquidity (e.g., Chordia, Goyal, Sadka, & Shivakumar, 2009).

However, Tversky and Kahneman (1974) report that individuals are inclined to ignore the laws of probability when assessing the degree by which an object or event reflects the salient features of a specific class or process. They attribute this human tendency to the representativeness heuristic, a mental shortcut that people rely on when they are faced with complex problems. In this process, people overweight the salient characteristics of the parent population to which the object belongs and ignore the laws of probability and statistics.

Barberis et al. (1998) suggest that the representativeness heuristic leads to market overreaction. Ertan, Karolyi, Kelly, and Stoumbos (2015) show that past earnings announcement returns are a determining factor of individuals' investing decisions in the period leading up to the next earnings announcement. Milian (2015) studies the earnings

☆ We thank George Iatridis (the associate editor for accounting) for his helpful comments. We are grateful to the two referees for their helpful comments and insights. As well, we highly appreciate comments from participants at the American Accounting Association, 2014 Annual Conference and the 2013 Annua2212l Meeting of the Academy of Behavioral Finance and Economics. Abdulaziz Alwathnani thanks Mashal Alassaf and Nick Somos for their outstanding research assistance. This paper is funded through a start-up research fund at York University while Alwathnani was a tenured Associate Professor at York. As well, the paper is funded through a research grant from Alfaisal University, Riyadh, Saudi Arabia.

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http://dx.doi.org/10.1016/j.irfa.2017.07.006
1057-5219/

announcement returns for easy-to-arbitrage firms. He finds a significant, negative association between firms' abnormal returns during the two-day window around the announcement of current quarterly earnings and their prior earnings announcement news.[1] On average, his evidence shows that firms in the top decile of prior earnings surprise news significantly underperform their bottom decile earnings surprise counterparts over the next two-day earnings announcement period. He interprets his findings as evidence of a market overreaction to the announcements of extreme earnings surprises by a sample of firms with traded stock options.

Because overreaction is often argued to evolve after an initial period of underreaction, it is difficult to distinguish between overreaction and underreaction. When does the positive autocorrelation of short-term performance due to underreaction become an overreaction that ultimately leads to a longer-term reversal? In the Barberis et al. (1998) model, conservatism creates underreaction, but eventually, representativeness leads to overreaction. Daniel et al. (1998) propose that biased self-attribution and overconfidence together can create either underreaction or overreaction, depending on the nature of private and public signals. The Hong and Stein (1999) model relies on the interaction between two sets of boundedly rational traders, and is less behavioral. In their model, private information initially diffuses slowly among news watchers, creating underreaction; when momentum traders try to arbitrage the underreaction, it leads to overreaction. De Bondt (1995, p. 11) considers that empirical results can be consistent both with overreaction and underreaction: "Logically, can both be true? The answer is a definite yes".

To test whether the market reaction to earnings surprise announcements (e.g., Bernard & Thomas, 1989, 1990) is the manifestation of a market overreaction or an underreaction, we use a two-step model, as shown in Fig. 1. First, using quarterly earnings data from the first quarter of 1977 to the fourth quarter of 2012, we identify firms with unexpected earnings surprises (SUE) at the end of quarter Q_t (the ranking quarter) that place them in the top or bottom quintiles.

Second, at the end of the following quarter (quarter Q_{t+1}), we divide each of our initial high and low SUE firms into two groups: confirming and disconfirming firms based on their SUE performance in quarter Q_{t+1}. The confirming SUE group includes firms that report SUE performance that allows them to maintain their ranking positions in the same extreme SUE quintile, while the disconfirming SUE group refers to the initial extreme SUE firms that fail to keep their initial extreme high or low ranking (see Fig. 2).

In an efficient market, share prices for extreme SUE quintile announcements are expected to fully incorporate the initial SUE news in a timely fashion provided that the initial SUE is a permanent earnings change (see Fig. 3a). However, if the market is not efficient, investors may overreact or underreact to the initial extreme SUE performance conditional on their perception about the quality of reporting firms. If investors doubt the earnings quality of the reporting firm, they are likely to *underreact* to the announcement of the initial SUE signal. However, if the firm reports a confirming SUE news in quarter Q_{t+1}, the confirming signal is likely to alleviate investors' doubt about the quality of the firm, resulting in a stronger market reaction relative to the price reaction to the initial SUE announcement. On the other hand, the market reaction to the disconfirming SUE performance will be weaker than the market reaction to the initial earnings announcement because investors expected the initial SUE to be reversed (see Fig. 3b).

However, if investors *overreact* to the initial earnings surprise (initial SUE), the market price reaction to the subsequent earnings announcement in quarter Q_{t+1} that confirms the initial earnings surprise will move in the same direction as that of the initial SUE, but it will be weaker than the market reaction to the initial announcement (see Fig. 3c). On the other hand, reactions to subsequent earnings announcements that disconfirm the initial earnings surprise will generate price reversals that move in the opposite direction of the reaction to the initial SUE.

Using the market reaction to the initial SUE in quarter Q_t as a reference point, we show that firms reporting a SUE in Q_{t+1} that confirms

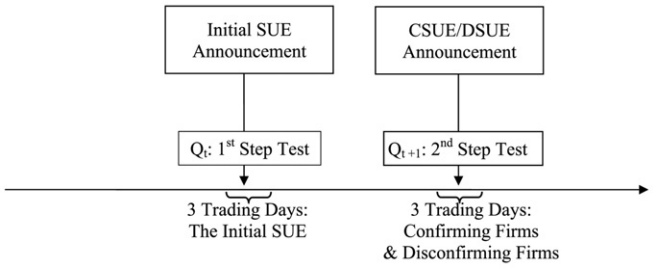

Fig. 1. This figure shows the time line for the sample periods and the two-step tests: the initial earnings surprise (SUE) and the subsequent confirming/disconfirming SUE (CSUE/DSUE). In the first step, firms are sorted by their quarter Q_t SUE into quintiles. Following the earnings momentum literature, SUE is calculated as the seasonally differenced quarterly earnings divided by the standard deviation of the same measure for the last eight quarters. Firms in the top (bottom) SUE quintile are classified as high (low) SUE. The return performance of firms included in this group is measured over a three-day period around the announcement date of quarter Q_t earnings. In the second step of the test, the initial extreme SUE firms are decomposed into two groups: confirming and disconfirming SUE groups. The confirming SUE category includes firms that report earnings for quarter Q_{t+1} that keeps them in the same highest or lowest SUE quintiles as the initial SUE from quarter Q_t, while the disconfirming group contains firms that fail to maintain their ranks in the top or bottom SUE quintiles. The return performance of these firms is measured as the average daily return over a three-day window around the announcement date of the confirming/disconfirming SUE.

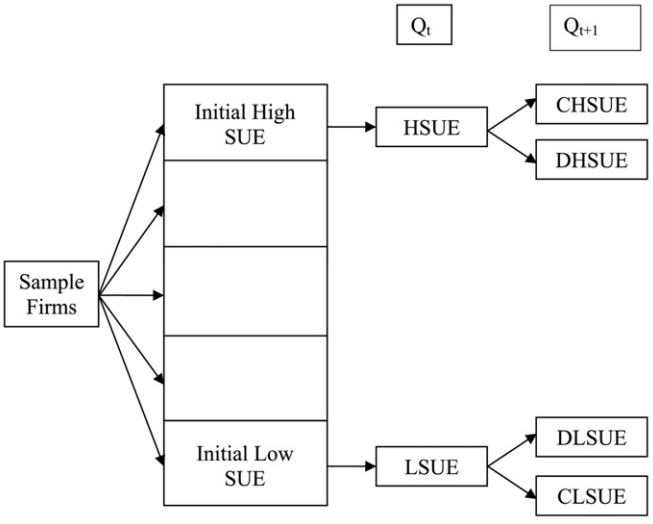

Fig. 2. The method used to implement our two-step tests and measure the return performance of the three-day earnings announcement period. (1) Based on quarter Q_t earnings (SUEs), firms are placed into the HSUE (highest quintile) or LSUE (lowest quintile) portfolios, or neither. (2) CHSUE (CLSUE) is the confirming high (low) SUE portfolio while DHSUE (DLSUE) refers to disconfirming high (low) SUE firms, in quarter Q_{t+1}. We use the initial market reaction to earnings announcements of firms in the initial high (low) SUE group as a reference point to test whether the market underreacts or overreacts to the announcement of good (bad) earnings surprises. If the market underreacts to the initial high (low) SUE, the price impact of the confirming high (low) SUE should be stronger than that of the initial SUE. Alternatively, if the market overreacts to the initial SUE, the market reaction to the confirming SUE should be weaker than that of the initial SUE. (3) As well, if the market underreacts to the initial SUE, the disconfirming SUE should have a muted impact on the performance of the disconfirming SUE firms because investors expected the initial SUE to reverse. However, if the market response to the initial SUE is an overreaction, the disconfirming SUE news should lead to a strong negative price impact.

[1] Milian (2015) tries a number of earnings announcement windows, such as (−60, −1; −60, +1; −5, −1; and 0, +1), but the focus of his paper and interpretation of his main finding is based on the two-day horizon.

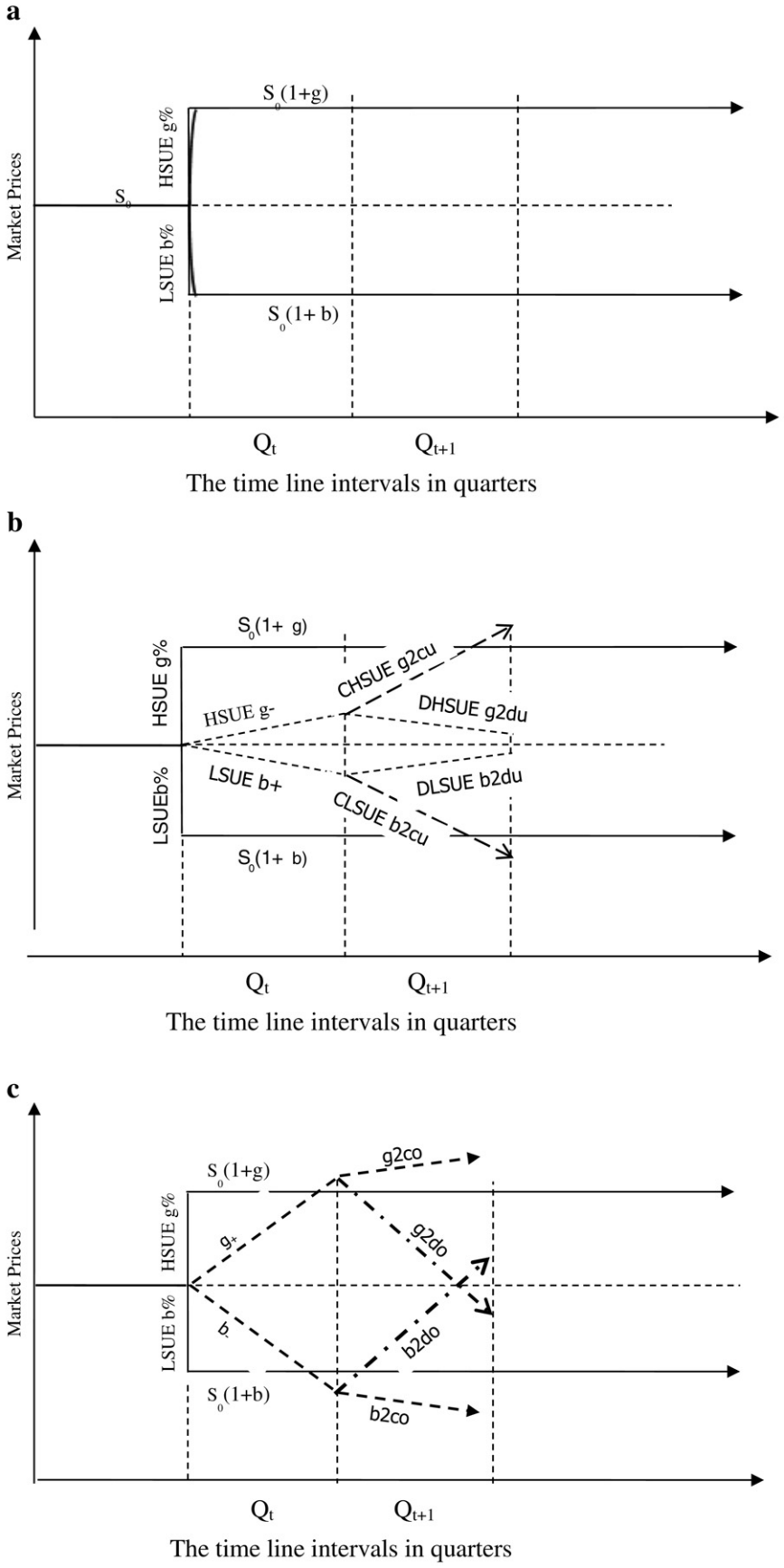

Fig. 3. a: Efficient market. HSUE: high SUE; LSUE: low SUE; CHSUE: confirming high SUE; CLSUE: confirming low SUE; DHSUE: disconfirming high SUE; DLSUE: disconfirming low SUE. b: Market underreaction: HSUE: high SUE; LSUE: low SUE; CHSUE: confirming high SUE; CLSUE: confirming low SUE; DHSUE: disconfirming high SUE; DLSUE: disconfirming low SUE. c: Market overreaction: HSUE: high SUE; LSUE: low SUE; CHSUE: confirming high SUE; CLSUE: confirming low SUE; DHSUE: disconfirming high SUE; DLSUE: disconfirming low SUE.

their ranking positions in the highest or lowest SUE quintiles generate an incremental price run that moves in the same direction of the initial SUE. However, the price impact of the confirming SUE signal is not as strong as that of the initial SUE. For example, as shown in the second row from the bottom of Table 3, the initial high SUE firms outperform their confirming high SUE events by an average abnormal daily return of 0.14% (t = 3.03) over the three trading days surrounding the announcement of the confirming SUE news. The initial low SUE firms tell a similar story, but in a different direction. Firms in the bottom initial SUE quintile underperform their confirming low SUE counterparts by an average abnormal daily return of −0.19% (t = −4.25) for the same three trading days. Our empirical results are robust to the three-factor Fama-French regression (Market – RF, size and book) extended by the momentum factor, as well as a number of robustness tests including an alternative measure of an earnings surprise (SUE) as the difference between actual quarterly earnings and analysts' earnings forecasts (from IBES) for the same quarter divided by the stock price at the end of the quarter.[2]

Our study contributes to the existing literature in three ways. First, we find that salient financial measures (surprisingly good or bad earnings) are likely to be heavily weighted in investor expectations. Our evidence shows that the announcement of extreme earnings surprises appear to lead to an investor overreaction during the three days surrounding the announcement.[3] This is consistent with other recent research (e.g., Bai & Qin, 2015; Huang et al., 2013; Milian, 2015). Investors appear to be inclined to overestimate the likelihood that salient and extreme earnings measures will persist longer into the future than they actually do, resulting in a market overreaction.

Second, our study extends the findings of recent theoretical and empirical studies that provide evidence suggesting a link between the market under- and overreaction anomalies. These studies indicate that underreaction can ultimately become overreaction. For example, Lee and Swaminathan (2000) find that the bulk of momentum returns reverse over the long horizon, i.e., years 2 through 5, and argue that a large part of the momentum profit should be characterized as a market overreaction.

Finally, we introduce an intuitive research design, which focuses on the price impact of firms reporting an extreme earnings surprise, during the three-day period surrounding the earnings announcement. The design provides a clear and sharp test of whether salient earnings news leads investors to form biased expectations about the future earnings performance of these firms. The three-day horizon of our test surrounding the earnings performance announcement allows us to isolate the immediate market reaction of extreme earnings news and provides reliable evidence on its impact on stock market prices of reporting firms. Fama (1991, p. 1602) states that short–horizon tests provide the "cleanest evidence we have on efficiency." Kothari and Warner (2007, p. 8) argue that short–horizon methods are trouble–free. They go on to contend that "as a result, we have more confidence and put more weight on the results of short–horizon tests than long–horizon tests."

The balance of the paper is structured as follows. Section 2 reviews the most relevant of the post-earnings-announcement drift literature and Section 3 presents and discusses our research design and two-step model. Data sources and descriptive statistics of our sample are presented in Section 4. In Section 5, we present and discuss the results of our empirical tests followed by the findings of our robustness tests. Section 6 provides concluding remarks of our findings and a brief description of the contributions of this paper.

[2] IBES analyst forecast data covers a shorter period than our sample: from the first quarter of 1984 to the fourth quarter of 2012.

[3] Our research design focuses only on the market reaction surrounding the earnings surprise announcement. In other words, we are not interested in the positive return drift following the announcement of earnings news.

2. Related literature review

The price impact (i.e., market reaction to) of the announcement of good or bad earnings news is one of the most prominent market anomalies that has withstood a variety of model misspecification, methodological and risk-exposure tests (e.g., Foster, Olsen, & Shevlin, 1984; Bernard & Thomas, 1989, 1990; Ball, 1992; Ball, Kothari, & Watts, 1993; Hong, Lim, & Stein, 2000; Aboody, Lehavy, & Trueman, 2010). The findings of the earnings announcement literature are widely interpreted as indicating a market underreaction to earnings news resulting from investors' inability to recognize the ways in which a firm's current earnings innovation might forecast its future earnings prospects (e.g., Bernard & Thomas, 1990; Bernard, Thomas, & Abarbanell, 1993; Hirshleifer, Lim, & Teoh, 2009; Hong et al., 2000).

Several factors have been proposed to create an underreaction. The conservatism bias of Edwards (1968) causes investors to slowly update their beliefs even when confronted with new and relevant information (Barberis et al., 1998). Limited investor attention has been cited as a plausible explanation for investor underreaction to the announcement of extreme earnings news (e.g., Peng, 2005; Hirshleifer & Teoh, 2003; Peng & Xiong, 2006; Hirshleifer et al., 2009; Hirshleifer, Lim, & Teoh 2011; Hirshleifer, Teoh, & Yu 2011; DellaVigna & Pollet, 2009). The central claim of this research stream is that, due to attention constraints, investors use only a limited subset of public data that draws their attention to a given firm while information that fails to attract their attention is neglected. Because attention is a scarce cognitive resource (Kahneman, 1973), it is allocated selectively. When investors' attention is divided among multiple information sources, most of which are distracting or irrelevant, significant corporate events such as earnings announcements are to some degree disregarded. Consequently, the impact of reported value-relevant information is only gradually impounded into market prices, creating a price continuation over the 6–12-month period following the disclosure of unexpectedly good or bad earnings news. Thus limited attention creates underreaction.

In contrast to the different underreaction hypotheses regarding earnings announcements, other studies draw on evidence from the cognitive psychology literature to suggest possible overreaction. These studies conclude that there is a robust and widespread effect of widely available, easily comparable and processed, highly salient and attention-grabbing information on individuals' attention and judgment (e.g., Andreassen, 1990; Fiske & Taylor, 1991; Griffin & Tversky, 1992; Song & Schwarz, 2008; Taylor & Thompson, 1982; Tversky & Kahneman, 1973). The availability heuristic of Tversky and Kahneman (1973) refers to the experimental evidence suggesting that individuals are inclined to form a judgment based on readily available information.

In the social science literature, salience is defined as the importance, prominence and accessibility of available knowledge. An information signal is considered to be salient when it is important or it has a greater impact on individuals' perceptions relative to that of other available information (Guido, 2001). The psychology literature focuses on how information saliency affects cognitive behaviors. According to Taylor and Thompson (1982, p. 175), salience is defined as "the phenomenon that when one's attention is differentially directed to one portion of the environment rather than to others, the information contained in that portion will receive disproportionate weighting in subsequent judgments." In an experimental setting, Griffin and Tversky (1992) show that individuals are inclined to overreact to salient and extreme evidence (e.g., good or bad news) and underreact to its credibility (e.g., the statistical reliability of news).

Palomino, Renneboog, and Chang (2009) suggest that market price reactions to new information depend on the relative salience of the information signal (e.g., media coverage). Andreassen (1990) finds that when subjects are given new information and asked to predict stock prices, their forecasts are a function of the relative salience of the

information. Chan, Frankel, and Kothari (2004) argue that financial measures (e.g., earnings) are both salient and readily available to a large number of market participants. Empirical findings (e.g., Barber & Odean, 2008) show that investors tend to buy stocks that attract their attention, such as stocks with high turnover, strong price returns or media coverage. Huang et al. (2013) find that salient headlines concerning press releases about a firm's earnings are associated with a strong price reaction that subsequently reverses following the disclosure of quarterly earnings. They interpret their findings as evidence of a market overreaction to salient news.

Given the fixation on quarterly earnings reports by the media, the financial press and investors, firms reporting surprising earnings news are likely to be good candidates for salience because their surprising financial performance will attract investors' attention and interest. If investors assign more weight to this extreme financial performance when projecting the future financial prospects of these firms, shares of these firms will generate a strong market response that might lead to an overreaction.

If investors believe that current extreme earnings performance is likely to be repeated in the future, they may overreact, driving market prices away from their fundamentals. Barberis et al. (1998) attribute this to the representativeness heuristic of Tversky and Kahneman (1974). If investors use the representativeness heuristic, they are likely to overweight the current earnings surprises of firms when predicting their future prospects while ignoring the laws of probability and statistics in the process. Hence we might expect earnings surprises, as salient financial measures, to trigger a market overreaction. According to the model of Daniel et al. (1998), which is based on investors' overconfidence and self-attribution, an extreme earnings surprise should trigger market overreaction.

Milian (2015) provides evidence that what was formerly an underreaction to earnings surprises may have more recently become an overreaction for stocks with highly traded listed options. Bai and Qin (2015) provide evidence of return reversals following earnings announcements of firms reporting negative earnings. They suggest that their finding may indicate a possible market overreaction to the negative earnings on the announcement day.

It is important to note that it is possible that markets randomly overreact and underreact to earnings announcements. If the market overreactions and underreactions to exceptionally high or low earnings performance are balanced, markets are actually efficient in the aggregate (Fama, 1998).

3. Research design and model

In this section, we describe and discuss our research design and the proposed two-step model that tests whether the market price reaction to firms' earnings announcements is an investor underreaction as it is commonly characterized in the earnings announcement literature (e.g., Bernard & Thomas, 1989) or a market overreaction as suggested by some recent studies (e.g., Bai & Qin, 2015; Huang et al., 2013; Milian, 2015). Our model is an intuitive, yet novel research design that provides a clear and sharp test to capture both investor reactions to the initial SUE announcement and to the subsequent confirming or disconfirming SUE event. This feature of our research design allows us to determine whether the market reaction to the initial SUE is a manifestation of an investor overreaction to extremely good (bad) earnings news, or an investor underreaction, as it is commonly believed.

Our study is not interested in the behavior or the magnitude of the post-earnings announcement price drift. Rather, it focuses only on the market reaction to the announcement of extreme earnings signals. The focus on a three-day period surrounding the earnings announcement event tests whether the release of unexpectedly high (low) earnings performance leads investors to form biased expectations about the future earnings prospects of the reporting firms.

Kothari and Warner (2007) argue that event studies serve as an important test of market efficiency. They continue to argue that although "long–horizon methods have improved, serious limitations of long–horizon methods have been brought to light and still remain." Inferences from long–horizon tests "require extreme caution" even in studies that use the best known techniques (Kothari & Warner, 1997, p. 301). In contrast, short–horizon methods provide reliable and trouble–free tests (Kothari & Warner, 2007).

Fama (1991, p. 1602) argues that short–horizon methods provide the "cleanest evidence" we have on market efficiency, but the interpretation of the findings of long-horizon studies is problematic. According to Kothari and Warner (2007), unlike long-horizon returns, daily and intraday stock returns are more informative of the impact of corporate announcements on market prices and provide more precise measures of abnormal returns.

To test whether reactions to extreme unexpected earnings are the manifestation of market overreaction or an underreaction, we employ a two-step test, as shown in Fig. 1. First, using quarterly earnings data from the first quarter of 1977 to the fourth quarter of 2012, we identify firms with unexpected earnings surprises (SUEs) in quarter Q_t (the ranking quarter) that place them in the top or bottom quintiles.[4]

Second, at the end of the following quarter (quarter Q_{t+1}), we divide our initial extreme SUE firms into two groups, confirming and disconfirming firms, based on their SUE in quarter Q_{t+1}. The confirming SUE group includes firms that achieve unexpected SUEs that allow them to maintain their ranking positions in the same top or bottom SUE quintiles. The disconfirming SUE group consists of firms that fail to maintain their ranking status in the highest or lowest SUE quintiles (see Fig. 2).

If markets underreact to earnings news as generally suggested by the existing earnings momentum literature, the market will react to the initial extreme SUE with caution because investors believe that the initial SUE evidence is likely to be reversed. Then, firms reporting a subsequent SUE that confirms their initial SUE rankings will experience a stronger price response (in the same direction as the first response) than that associated with their initial SUE, because their earnings performance contradicts reversal expectations. With underreaction, firms that report a 2nd SUE that disconfirms the initial ranking will exhibit a muted response.

On the other hand, if earnings news triggers a market overreaction, firms with surprisingly good or poor earnings will generate a strong price reaction to the initial SUE reports. Subsequently, confirming SUE firms (firms reporting earnings performance that allow them to maintain their initial SUE positions) are likely to generate an additional market reaction that will be smaller in magnitude relative to the reaction to their initial SUE. The price impact of the confirming SUE news will be in the same direction of the initial SUE, but not be as strong as that of the initial SUE because investors expected the earnings performance of these firms to continue on the same trajectory. However, overreacting firms reporting disconfirming SUE news (firms that fail to maintain their initial SUE rankings) will experience a price reversal. This adverse market reaction is a natural response because disconfirming SUE news is contrary to investor expectations.

In our two-step model, the market receives two consecutive SUE signals for Q_t and Q_{t+1}, respectively. The announcement of the second SUE news in quarter Q_{t+1} may confirm or disconfirm the initial SUE earnings performance, the Q_t signal. In an efficient market, a firm's stock price will fully reflect the impact of the initial SUE signal in a timely manner. As shown in Fig. 3a, the firm's initial share price of S_0 will

[4] In an unreported test, we replicate our ranking using deciles instead of quintiles and our key findings remain the same although confirming SUE deciles have fewer firms relative to those in their quintile counterparts.

increase by g% if the firm reports earnings performance that places it in the top SUE quintile. Analogously, the firm's stock price will decrease by b% if the firm's initial SUE places it in the bottom SUE quintile. However, if the market is not efficient, investors may overreact or underreact to the extreme earnings performance conditional on their perception about the quality of reporting firms.

In our model, if investors underreact to the initial extreme earnings news in quarter Q_t, their conservative response is likely to be due to their concerns about the quality of reporting firms. As shown in Fig. 3b, in a market underreaction, investors are expected to respond cautiously to the initial earning change because they believe the initial SUE is transitory and it will revert in the future. As a result, the stock prices of firms with initial high SUEs that place them in the top SUE quintile will increase by g_-% in quarter Q_t, where $g_- < g$ (the unobservable efficient market return). Analogously, market prices of firms reporting initial low SUEs that put them in the bottom SUE quintiles will decline by b_+% in quarter Q_t as shown in Fig. 3b, where $b_+ > b_-$ (the unobservable efficient market return).

In our two period model, confirming SUE news in quarter Q_{t+1} by underreacting firms will resolve investors' uncertainty about the quality of these firms, resulting in a stronger market reaction than that of the initial Q_t earnings announcement. Accordingly, if the initial top (bottom) SUE ranking firms receive confirming SUE signals in quarter Q_{t+1} that allow them to keep their positions in the top (bottom) SUE quintile, their market prices will increase (decrease) by g_{2cu} (b_{2cu}), where $g_{2cu} > g_-$ and $b_{2cu} < b_+$. Further, the magnitude of the market reaction to the confirming SUE evidence should be greater than that of the initial SUE news, that is, $|g_{2cu}| > |g_-|$ and $|b_{2cu}| > |b_+|$. However, disconfirming evidence is likely to lead to a relatively muted response because investors expected the price reaction to the initial earnings announcement to be reversed. In this case, if the initial highest (lowest) SUE ranking firms receive disconfirming SUE news in quarter Q_{t+1}, their stock prices will slightly decrease (increase) by g_{2du} (b_{2du}), where $g_{2du} < g_-$ and $b_{2du} > b_+$.

In the case of a market overreaction (see Fig. 3c), however, investors are overconfident in their ability to interpret the initial SUE signal and its implications for the next period SUE. Firms in the top SUE quintile are likely to be classified as high quality firms while firms in the bottom SUE quintile are deemed low quality. As a result, the market prices of these firms will initially be driven away from their fundamentals as shown in Fig. 3c. The stock prices of firms reporting large positive SUEs that place them in the top SUE quintile in quarter Q_t will increase by g_+, where $g_+ > g$ (the unobservable efficient market return for high SUE firms). Similarly, the share prices of firms with large negative SUEs that place them in the bottom SUE quintile in quarter Q_t will decrease by b_- where $b_- < b$ (the unobservable efficient market return for low SUE firms).

In the second step of our model, high (low) initial SUE firms will receive another SUE signal in quarter Q_{t+1} that will either confirm or disconfirm investor expectations about the quality of these firms. Confirming SUEs, extreme earnings performance that allows these firms to maintain their ranking in the top or bottom SUE quintile for the two consecutive quarters, are likely to increase investor confidence in their initial classifications due to self-attribution bias (Daniel et al., 1998). This should lead to a market reaction that is consistent with the sign of the market response to the initial SUEs, but smaller in magnitude relative to that of the initial SUEs because it meets investor expectations. However, disconfirming SUE evidence will result in a price reversal because it contradicts investor expectations.

Accordingly, if overreacting firms in the highest (lowest) initial SUE quintile receive confirming SUE news in quarter Q_{t+1} that allows them to maintain their positions in the top (bottom) SUE quintile, their market prices will increase (decrease) by g_{2co} (b_{2co}), where $g_{2co} < g_+$ and $b_{2co} > b_-$. Further, the magnitude of the market reaction to the confirming SUE evidence should be less than that of the initial SUE news, that is, $|g_{2co}| < |g_+|$ and $|b_{2co}| < |b_-|$. However, if firms in the initial top (bottom) SUE quintile receive disconfirming SUE signals in quarter Q_{t+1}, their stock prices will decrease (increase) by g_{2do} (b_{2do}), where $g_{2do} < g_+$ and $b_{2do} > b_-$.

4. Data and descriptive statistics

4.1. Sample and variables

We obtain quarterly earnings and quarterly earnings announcement dates from the Compustat quarterly database for the 1975–2012 period.[5] For a firm to be included in our sample, it must have quarterly earnings data for at least 10 consecutive prior quarters, and daily stock returns from the Center for Research in Securities Prices (CRSP) daily return file for a three-day earnings announcement period (i.e., day $t-1$ to $t+1$, where day t is the earnings announcement day).[6]

Following the post-earnings-announcement literature (e.g., Bernard & Thomas, 1989, 1990), we calculate quarterly earnings surprises as the seasonally differenced quarterly earnings before extraordinary items divided by the standard deviation of the same measure for the last eight quarters.[7] More specifically, SUE for firm j in quarter t is defined as

$$SUE_{j,t} = \frac{E_{j,q} - E_{j,q-4}}{\sigma_{j,t}} \quad (1)$$

where Ej,q is the most recently quarterly earnings announced for firm j, Ej,q − 4 is the earnings for firm j from four quarters ago, and σj,t the standard deviation of (Ej,q − Ej,q − 4) over the preceding eight quarters.

4.2. Descriptive statistics

Table 1 provides summary statistics of firms with the required data and firms in the three portfolio groups: the initial SUE, confirming and disconfirming SUE firms. In Panel A, we report the time-series average count of firms included in our sample over six subsample intervals of six years each, as well as their market betas (Beta), book/market ratios (B/M) and market capitalizations (size). Generally, average B/M ratios at quarter end decline over time while average firm size increases from $657 million for the 1977–1982 period to $5185 million for the 2007–2012 intervals. The average firm – quarter count increases monotonically over the sample period. This is consistent with prior studies.

Panel B of Table 1 presents the time-series average of the proportion of firms that are included in the three group portfolios considered in this study, i.e., the initial SUE, confirming and disconfirming SUE firms. By design, the initial top (bottom) SUE quintile includes 20% of the total sample firms. As indicated in Panel B, the percentages of firms in the confirming and disconfirming SUE groups for both the initial high and low SUE stocks are roughly the same, although the low SUE firms tend to have slightly more confirming firms relative to their high SUE counterparts. As shown in Panel B, the confirming high SUE group includes 9% percent of the total sample which is roughly about 45% of the initial high SUE stocks; the confirming low SUE category contains 9.8% of the total sample firms, which is approximately equal to 50% of the initial low SUE firms.[8]

[5] Real estate investment trusts (REITs), closed end funds, American Depository Receipts (ADRs) and foreign companies are excluded. As well, firms with earnings announcements that are issued more than 90 days after quarter end are eliminated. Our analysis is not sensitive to including these firms.

[6] Results reported in this study are based on equally weighted daily returns. In a robustness test, we repeat our analysis using value-weighted daily returns and our key findings remain unchanged.

[7] SUE is winsorized to the 99% and 1% levels to mitigate the influence of outliers.

[8] Although we are not interested in the consistency of SUE performance beyond the second consecutive quarter, that is, Q_{t+1}, when we extend our SUE ranking to the third consecutive quarter, e.g., Q_{t+2}, the number of confirming firms for both the high and low SUE groups falls to below 22% of the initial SUE stocks, which is roughly equal to less than 4.4% of the total sample firm.

Table 1
Summary Statistics.

Panel A: firms with required data				
Average firm – quarters for six – Year intervals	Sample characteristics			
	Firms	Beta	B/M	Size
1977–1982	1085	1.10	1.03	657
1983–1988	1331	1.06	0.85	1145
1989–1994	1945	1.04	0.78	1508
1995–2000	3368	1.03	0.57	2370
2001–2006	3476	1.01	0.60	3825
2007–2012	3414	1.06	0.65	5185

Panel B: SUE portfolios as percentage of the total sample firms

High and low SUE	SUE Portfolios		
	Initial SUE	Confirming SUE	Disconfirming SUE
HSUE	20%	9%	11%
LSUE	20%	9.8%	10.2%

Panel C: overall sample firm characteristics

Earnings signals	Statistics	Sample firms		
		HSUE	LSUE	All firms
Initial SUE	Beta	1.12	1.15	1.05
	B/M	0.65	0.76	0.73
	Size	2847	1236	2531
Confirming SUE	Beta	1.10	1.16	1.04
	B/M	0.58	0.82	0.72
	Size	3326	1148	2492
Disconfirming SUE	Beta	1.10	1.15	1.05
	B/M	0.70	0.74	0.73
	Size	2776	1592	2586

This table presents a statistics summary of sample firms – quarters and the three portfolio groups considered in this study – the initial SUE, confirming and disconfirming SUE firms. At the end of each quarter from the first quarter of 1977 to the fourth quarter of 2012, all firms with required data are sorted by their standardized unexpected earnings (SUE), which is calculated as the seasonally differenced quarterly earnings divided by the estimated standard deviation of the same measure for the last eight quarters, into quintiles. Firms in the highest (lowest) SUE quintile are defined as initial high (low) SUE firms. For simplicity, we refer to these groups as the HSUE and LSUE portfolios. At the end of the first quarter (i.e., quarter Q_{t+1}) following the initial SUE ranking quarter (quarter Q_t), we divide our initial SUE firms into two groups: confirming and disconfirming SUE firms. The first group includes firms reporting SUE for quarter Q_{t+1} that allows them to maintain their position in the top (bottom) SUE quintile for the second consecutive quarter, while the second group consists of firms that fail to keep (move out of) their initial SUE rankings.
Variable definitions:
Beta = A firm's market beta. It is calculated using daily returns for the last 90 days, with a minimum of 60 days by the end of the fiscal quarter before the earnings announcement.
B/M = the book-to-market value ratios at the end of the fiscal quarter before the earnings announcement.
Size = market value of equity capital (in $million) at the end of the fiscal quarter prior to the earnings announcement.

In Panel C, we report the time-series averages of Beta, B/M and Size for firms in the initial highest (HSUE) and lowest (LSUE) quintiles, confirming and disconfirming SUE firms, as well as those for the overall sample firms. The summary statistics that are shown in Panel C indicate that firms in the top (bottom) SUE group have slightly lower (higher) B/M ratios than the average sample firms. The highest SUE quintile firms tend to be slightly larger in terms of market capitalization relative to the average sample firm, while firms in the bottom SUE quintile are smaller than the average sample firm.

5. Empirical test results

In this section, we describe the results of our empirical tests. We report both the results of the raw (unadjusted) return performance of our portfolio tests over the three-day earnings announcement period as well as the risk adjusted abnormal returns from the three-factor Fama-French regression (Market – RF, size and book) extended by the momentum factor (UMD). We conclude this section by discussing the results of various robustness tests.

Table 2
Average daily returns for SUE portfolios.

Holding periods	Earnings signals	Portfolios	
		HSUE	LSUE
3 day returns - quarter Q_t	Initial SUE (ISUE)	0.65	−0.14
		18.97	**−4.54**
3 day returns - quarter Q_{t+1}	Confirming SUE (CSUE)	0.50	0.01
		13.34	**0.34**
	Disconfirming SUE (DSUE)	−0.16	0.30
		−4.60	**7.10**
	ISUE – CSUE	0.15	−0.15
		3.14	**−3.31**
	ISUE – DSUE	0.81	−0.44
		16.26	**−8.3**

This table reports the average daily returns for a three-day period (i.e., day t − 1 to t + 1, where day t is the earnings announcement day) surrounding the earnings announcement for three groups of portfolios – the initial SUE, confirming and disconfirming SUE firms. At the end of each quarter from the first quarter of 1976 to the fourth quarter of 2012, all firms with required data are sorted by their standardized unexpected earnings (SUE), which is calculated as the seasonally differenced quarterly earnings divided by the estimated standard deviation of the same measure for the last eight quarters, into quintiles. Firms in the highest (lowest) SUE quintile are defined as initial high (low) SUE firms. For simplicity, we refer to these groups as the HSUE, LSUE portfolios. The return for the initial SUE portfolios is measured as the average daily return over the three-day period around the earnings announcement date for quarter Q_t. At the end of the first quarter (i.e., quarter Q_{t+1}) following the initial SUE ranking quarter, we divide our initial SUE firms into two groups: confirming and disconfirming SUE firms. The first group includes firms reporting SUE for quarter Q_{t+1} that allow them to maintain their position in the top (bottom) SUE quintile for the second consecutive quarter. These firms are referred to as confirming SUE firms (CSUE). The second group consists of firms that fail to keep (successfully move out of) their initial SUE rankings. These firms are defined as disconfirming SUE firms (DSUE). ISUE – CSUE refers to the return differential between initial SUE firms and the confirming SUE firms for both the initial high SUE firms and the initial low Sue firms. The returns for high SUE stocks are reported in the second column from the right while the returns for low SUE stocks are shown in the last column. All returns are measured as the average daily return over the three-day period around the earnings announcement for quarters Q_t and Q_{t+1} for initial SUE and CSUE and DSUE firms, respectively. The Newey-West *t*-statistics are reported in **bold** below portfolio returns.

5.1. Portfolio return performance

In Table 2, we present the average daily raw returns over a three-day period, that is, day t − 1 to t + 1, where day t is the earnings announcement day, for the three portfolio groups: the initial SUE firms, confirming SUE firms, and disconfirming SUE firms.

We refer to firms that rank in the top SUE quintile in the initial earnings announcement as the initial high SUE (HSUE) portfolio while firms with initial SUEs that place them in the bottom SUE quintile as the initial low SUE (LSUE) portfolio. At the first quarterly earnings announcement (i.e., quarter Q_{t+1}) following the initial SUE ranking quarter (Q_t) we divide our initial SUE firms into two groups: confirming and disconfirming SUE firms. Firms that achieve a SUE in quarter, Q_{t+1} that allows them to maintain their position in the same extreme SUE quintile for the second consecutive quarter are defined as confirming SUE (CSUE) firms. On the other hand, firms that fail to keep their initial top or bottom SUE rankings are classified as disconfirming SUE (DSUE) firms.

For the results presented in Table 2, we use the market reaction to the initial extreme SUE signal in quarter Q_t as a reference point against which we test how the market responds to the subsequent confirming or disconfirming SUE news in quarter Q_{t+1}. ISUE – CSUE refers to the return differential between initial SUE firms (both HSUE and LSUE firms) and the confirming CSUE firms. The test statistic is the result of a simple paired *t*-test. The returns for high SUE stocks are reported in the second column from the right of Table 2 while the returns for low SUE stocks are shown in the last column.

The results of the initial SUE portfolios are provided in the first row of Table 2. These results indicate that firms in the highest and lowest SUE quintiles have a strong market reaction to the earnings announcement (their initial SUE). The average daily return over the three-day period surrounding the earnings announcement for quarter Q_t is −0.14% (t = −4.54) a day for the initial low SUE stocks vs. 0.65% (t = 18.97) per day for the initial high SUE firms.

The return performance of the confirming and disconfirming SUE portfolios is shown in the second and third rows of Table 2, respectively. The confirming LSUE firms earn a daily return of 0.01% (t = 0.34), while confirming HSUE firms earn an average daily return of 0.50% (t = 13.34) over the three-day period surrounding their earnings announcement for Q_{t+1}. On the other hand, disconfirming HSUE firms generate an average daily return of −0.16% (t = −4.60) compared to an average daily return of 0.30% (t = 7.10) for disconfirming LSUE cohorts, as shown in the third row under the HSUE and LSUE columns, respectively.

The return differentials between confirming and disconfirming SUE firms and their initial SUE counterparts are reported in the last two rows of Table 2. The average daily return spread between the confirming SUE (CSUE) firms and the initial SUE (ISUE) firms (i.e., ISUE – CSUE) is 0.15% (t = 3.14) and −0.15 (t = 3.31) for the initial HSUE and the initial LSUE stocks, respectively. However, the average daily return differentials between the disconfirming SUE (DSUE) stocks and their initial SUE (ISUE) cohorts are more pronounced; they are −0.44% (t = −8.30) for disconfirming LSUE stocks and 0.81% (t = 16.26) for the disconfirming HSUE stocks, as shown on the last line.

Results reported in Table 2 indicate that the market reaction to the initial SUE news is stronger than the market response to the confirming SUE signal as shown under the HSUE and LSUE columns. These results are consistent with the overreaction hypothesis. For example, the average daily raw return for the HSUE firms is 0.65% (t = 18.97) for the initial SUE news, but only 0.50% (t = 13.42) for the confirming SUE announcement over the three-day period around the earning announcement date (see under the HSUE column). The average daily return differential between the initial HSUE firms and the confirming high SUE stocks, i.e., ISUE – CSUE, is 0.15% (t = 3.14) as shown in the second-to-last row of Table 2 under the HSUE column.

The return for the LSUE portfolio tells a similar story, but in the opposite direction. The average daily return for the initial low SUE firms (LSUE) is −0.14% (t = −4.54) while the average daily returns for the confirming low SUE stocks is more muted, 0.01% (t = 0.34). This results in an average daily return spread of −0.15% (t = 3.31) between the initial LSUE stocks and their confirming low SUE counterparts, i.e., ISUE – CSUE as reported in the last row of Table 3 under the LSUE column.

These results for confirming SUEs are consistent with our prediction that if the market overreacts to the initial SUE, the price impact of the confirming SUE news will be less than that of the initial SUE; i.e., $|r_{q+1}| < |r_q|$.

For disconfirming SUEs, the HSUE column of Table 2 shows that the average daily raw return for HSUE firms falls from 0.65% (t = 18.97) for the initial SUE announcement to −0.16% (t = −4.60) for the disconfirming SUE (DSUE) news.

Results for disconfirming LSUE firms are reported under the LSUE column. The low SUE firms exhibit a similar return reversal as that of their high SUE cohorts. The average daily return for the LSUE portfolio rises from −0.14% (t = −4.54) for the initial SUE (ISUE) announcement to 0.30% (t = 7.10) for the disclosure of disconfirming SUE (DSUE) news.

5.2. Abnormal returns (regression) test results

In this section, we report the average daily alpha of the three-factor Fama-French daily regression (Market – RF, size and book) extended by the momentum factor (UMD) over the three-day earnings announcement period, i.e., day t − 1 to t + 1, where day t is the earnings announcement day. The average daily regression alphas are estimated for the three group portfolios considered in this study i.e., the initial high (low) SUE firms, HSUE (LSUE) and confirming (disconfirming) SUE stocks, CSUE (DSUE). The return differential between the initial SUE firms and their confirming SUE counterparts, that is, the ISUE – CSUE, is reported in the second-to-last row of Table 3, for the HSUE and LSUE portfolios. Analogously, the difference in return between the initial SUE stocks and their disconfirming SUE cohorts, i.e., the ISUE – DSUE, is shown in the last row of Table 3 under the HSUE and LSUE columns for the HSUE and LSUE portfolios, respectively.

Table 3
Average daily abnormal returns for SUE portfolios.

Holding periods	Earnings signals	Portfolios	
		HSUE	LSUE
3 day returns - quarter Q_t	Initial SUE (ISUE)	0.59	−0.20
		19.61	**−7.24**
3 day returns - quarter Q_{t+1}	Confirming SUE (CSUE)	0.45	−0.01
		12.90	**−0.23**
	Disconfirming SUE (DSUE)	−0.19	0.27
		−5.45	**6.58**
	ISUE – CSUE	0.14	−0.19
		3.03	**−4.25**
	ISUE – DSUE	0.77	−0.48
		16.73	**−9.46**

In this table, we provide the average daily alphas of the three-factor Fama-French regression (Market – RF, size and book) extended by the momentum factor (UMD) over a three-day period (i.e., day t − 1 to t + 1, where day t is the earnings announcement day) surrounding the earnings announcement for three portfolios – the initial SUE, confirming and disconfirming SUE firms. At the end of each quarter from the first quarter of 1977 to the fourth quarter of 2012, all firms with required data are sorted by their standardized unexpected earnings (SUE), which is calculated as the seasonally differenced quarterly earnings divided by the estimated standard deviation of the same measure for the last eight quarters, into quintiles. Firms in the highest (lowest) SUE quintile are defined as initial high (low) SUE firms. For simplicity, we refer to these groups as the HSUE, LSUE portfolios. The abnormal returns for the initial SUE portfolios are measured as the average daily return over the three-day period around the earnings announcement date for quarter Q_t. Furthermore, at the end of the first quarter (i.e., quarter Q_{t+1}) following the initial SUE ranking quarter, we divide our initial SUE firms into two groups: confirming and disconfirming SUE firms. The first group includes firms reporting SUE for quarter Q_{t+1} that allow them to maintain their position in the top (bottom) SUE quintile for the second consecutive quarter. These firms are referred to as confirming SUE firms (CSUE). The second group consists of firms that fail to keep their initial SUE rankings. These firms are defined as disconfirming SUE firms (DSUE). ISUE – CSUE refers to the return differential between initial SUE firms and the confirming SUE firms for both the initial high SUE firms and the initial low Sue firms. The returns for high SUE stocks are reported in the second column from the right while the returns for low SUE stocks are shown in the last column. All returns are measured as the average daily return over the three-day period around the earnings announcement for quarters Q_t and Q_{t+1} for initial SUE and CSUE and DSUE firms, respectively. The dependent variables in these cross-sectional daily regressions are the daily returns for each portfolio less the risk-free rate, except for the return differentials, i.e., the ISUE – CSUE and ISUE – DSUE. The Newey-West *t*-statistics are reported in **bold** below portfolio returns.

Results presented in Table 3 tell a similar story to that documented in the previous section (see Table 2). For example, the risk-adjusted return performance for the initial SUE firms reported in the first row of Table 3 shows that this group has a strong investor reaction to the initial SUE announcement: 0.59% (t = 19.61) a day for the HSUE firms and −0.20% (t = −7.24) per day for their LSUE counterparts over the three-day period surrounding their earnings announcement.

The confirming SUE portfolios display a similar price reaction in response to the announcement of the confirming SUE signal, but the price impact of the confirming SUE news is weaker than that of the initial SUE signal; this is consistent with an initial overreaction to the initial earnings announcement. The average daily abnormal return for the confirming high SUE (CSUE) firms over the three-day surrounding the announcement of the confirming SUE news is 0.45% (t = 12.90) while the average daily abnormal return for the confirming low SUE firms −0.01% (t = −0.23). The average daily return spread between the initial HSUE stocks and the confirming high SUE stocks, i.e., ISUE – CSUE, is 0.14% (t = 3.03) as shown in the second-to-last row of Table 3 under the HSUE column. Similarly, the return differential between the initial LSUE

firms and their confirming low SUE cohorts, i.e., ISUE – CSUE, is −0.19% (t = −4.25) as shown in the second-to-last row under the LSUE column. Because $|r_{q+1}| < |r_q|$ for confirming announcements, the results are supportive of overreaction.

The regression results for disconfirming stocks are reported in the last row of Table 3. The average abnormal daily return of the HSUE portfolio drops from 0.59% (t = 19.61) for the announcement of the initial high SUE to −0.19% (t = −5.45) for disconfirming stocks, with a return gap between these two groups of 0.77% (t = 16.73) per day for the announcement of the disconfirming high SUE news.

The average abnormal daily return for the LSUE portfolio increases from −0.20% (t = −7.24) for the initial low SUE signal to 0.27% (t = 6.58), resulting in a return differential between the initial LSUE firms and their disconfirming low SUE counterparts of −0.48% (t = −9.46).

Our tests for underreaction or overreaction focus only on confirming SUEs, and the evidence is not consistent with the prevailing belief that investors underreact to earnings announcement. Although the price impact of the confirming SUE news is statistically and economically significant, it is smaller than the market response to the announcement of the initial SUE measures. This evidence is reflected in the return gap between the confirming HSUE and LSUE portfolios.

The evidence reported in Tables 2 and 3 is not consistent with the traditional view that investors are inclined to discount recent earnings news (e.g., Bernard & Thomas, 1989, 1990). Rather, our findings suggest that markets might expect future earnings to continue to move in the same direction of the initial SUE. According to the earnings announcement literature, investors are inclined to dismiss a firm's current earnings change as a noise that has no predictive value for the firm's future earnings prospects (e.g., Barberis et al., 1998; Bernard & Thomas, 1989, 1990). If this is the case, the market reaction to confirming SUE news will be stronger than its response to the initial SUE as investors are assured that the initial SUE is not a standalone event. We do not find this result.

The results documented in this study cast serious doubt on the view that investors underestimate the implications of current extreme earnings innovations for future earnings prospects (e.g., Bernard & Thomas, 1989, 1990; Foster et al., 1984). To the contrary, our evidence suggests that investors are more inclined to overweight extremely good or bad earnings measures in their projection of future earnings performance. This is consistent with the findings of the experimental cognitive psychology literature. This literature includes Griffin & Tversky, 1992), who find that salient and extreme data is likely to be heavily weighted in subsequent decisions, and Andreassen (1990), who finds that predictions depend largely on the relative salience of information.

5.3. Robustness tests

5.3.1. Sub-sample period results

In this section, we examine the robustness of our findings across three equal sub-periods of our sample. Each sub-period consists of twelve years. The three sub-periods are 1977–1988, 1989–2000, and 2001–2012. Table 4 reports the average daily alphas (i.e. the average abnormal daily returns) of the Fama-French three-factor regression (Market – RF, size and book) and the momentum factor for the groups of portfolios considered in this study. These portfolios are the initial high (low) SUE firms, HSUE (LSUE), and confirming (disconfirming) SUE stocks, CSUE (DSUE). The results reported in Table 4 show that across the three subperiods, all confirming SUEs indicate that the initial SUE reactions were overreactions.

5.3.2. Large cap vs. small cap firms

One might expect that the mispricing evidence reported in this study is likely to be limited to small firms for a number of reasons. For example, unlike large stocks, small stocks are likely to be associated with greater information uncertainty (e.g., Zhang, 2010) and high arbitrage risk that may hinder trading activities of institutional investors (e.g., Mendenhall, 2004).

Table 4
Average daily abnormal returns for SUE portfolios.

Holding periods	Earnings signals	Sub-sample periods					
		1977–1988		1989–2000		2001–2012	
3 day returns - quarter Q_t	Initial SUE	HSUE	LSUE	HSUE	LSUE	HSUE	LSUE
		0.56	−0.22	0.61	−0.19	0.60	−0.18
		14.01	**−6.78**	**11.68**	**−4.63**	**12.81**	**−4.26**
3 day returns - quarter Q_{t+1}	Confirming SUE (CSUE)	0.44	−0.04	0.43	0.03	0.48	−0.03
		9.47	**−1.61**	**7.44**	**1.05**	**5.76**	**−1.21**
	Disconfirming SUE (DSUE)	−0.11	0.24	−0.21	0.28	−0.26	0.30
		−2.42	**3.91**	**−4.38**	**4.40**	**−3.58**	**3.95**
	ISUE – CSUE	0.12	−0.16	0.18	−0.22	0.12	−0.15
		1.96	**−3.47**	**2.30**	**−3.35**	**1.54**	**−1.84**
	ISUE – DSUE	0.66	−0.46	0.81	−0.47	0.86	−0.48
		11.46	**−6.38**	**11.43**	**−6.36**	**9.84**	**−5.62**

In this table, we provide the average daily alphas of the daily Fama-French three-factor model (Market – RF, size and book) and the momentum factor (UMD) for three sub-periods of our sample firms. The first sub-period is from 1977 to 1988; the second sub-period covers 1989 to 2000; and the final sub-period covers 2001 to 2012. At the end of each quarter from the first quarter of 1977 to the fourth quarter of 2012, all firms with required data are sorted by their standardized unexpected earnings (SUE), which is calculated as the seasonally differenced quarterly earnings divided by the estimated standard deviation of the same measure for the last eight quarters, into quintiles. Firms in the highest (lowest) SUE quintile are defined as initial high (low) SUE firms. For simplicity, we refer to these groups as the HSUE, LSUE portfolios. The abnormal returns for the initial SUE portfolios are measured as the average daily return over the three-day period around the earnings announcement date for quarter Q_t.
Furthermore, at the end of the first quarter (i.e., quarter Q_{t+1}) following the initial SUE ranking quarter, we divide our initial SUE firms into two groups: confirming and disconfirming SUE firms. The first group includes firms reporting SUE for quarter Q_{t+1} that allow them to maintain their position in the same top or bottom SUE quintile for the second consecutive quarter. These firms are referred to as confirming SUE firms (CSUE). The second group consists of firms that fail to keep their initial SUE quintile rankings. These firms are defined as disconfirming SUE firms (DSUE). ISUE – CSUE refers to the return differential between initial SUE firms and the confirming SUE firms for both the initial high SUE firms and the initial low SUE firms. All returns are measured as the average daily return over the three-day period around the earnings announcement for quarters Q_t and Q_{t+1} for initial SUE and CSUE and DSUE firms, respectively. The dependent variables in these cross-sectional daily regressions are the daily returns for each portfolio less the risk-free rate, except for the return differentials, i.e., the ISUE – CSUE and ISUE – DSUE. The Newey-West *t*-statistics are reported in **bold** below portfolio returns.

To test this possibility, we separately analyze the return performance for large and small firms. Stocks with equity market capitalizations above the median at the ranking quarter end are defined as large stocks, while firms with market capitalizations below the median are classified as small stocks.[9] In Table 5, we present the average daily alphas of the three-factor Fama-French regression (Market – RF, size and book) extended by the momentum factor (UMD) for the groups of portfolios considered in this study: the HSUE and LSUE portfolios and confirming and disconfirming SUE portfolios over the three-day earnings announcement period. The results are similar to that reported in Tables 2 and 3. CSUEs are consistent with initial overreaction for both large and small cap stocks.

5.3.3. Alternative measure of SUE

The results reported thus far are based on standardized unexpected earnings (SUE), which are calculated as the seasonally differenced quarterly earnings divided by the estimated standard deviation of the same measure for the last eight quarters. To test the robustness of our findings to an alternative measure of SUE, we define standardized unexpected earnings (SUE) as the difference between actual quarterly earnings and analysts' earnings forecasts (from IBES) for the same quarter divided by the stock price at the end of the quarter.

Table 6 provides the average daily alphas of the three-factor Fama-French regression (Market – RF, size and book) extended by the

[9] In unreported results, we use the median market capitalizations for NYSE-listed stocks to classify our sample firms into small and large stocks, and obtain similar results.

Table 5
Average daily abnormal returns for SUE portfolios.

Holding periods	Earnings signals	Portfolios			
		Large caps		Small caps	
		HSUE	LSUE	HSUE	LSUE
3 day returns - quarter Q_t	Initial SUE (ISUE)	0.42	−0.12	0.76	−0.25
		10.65	**−4.02**	**20.61**	**−6.89**
3 day returns - quarter Q_{t+1}	Confirming SUE (CSUE)	0.27	−0.03	0.61	0.01
		8.74	**−1.05**	**14.13**	**0.15**
	Disconfirming SUE (DSUE)	−0.11	0.19	−0.27	0.33
		−3.25	**5.07**	**−6.78**	**5.26**
	ISUE – CSUE	0.14	−0.09	0.15	−0.25
		2.86	**−1.98**	**2.50**	**−4.67**
	ISUE – DSUE	0.52	−0.31	1.02	−0.59
		10.26	**−6.52**	**16.85**	**−8.07**

In this table, we provide the average daily alphas of the three-factor Fama-French regression (Market – RF, size and book) extended by the momentum factor (UMD) over a three-day period (i.e., day t − 1 to t + 1, where day t is the earnings announcement day) surrounding the earnings announcement for the large and small firms of portfolios considered in our study: the initial SUE, confirming and disconfirming SUE firms. Firms with equity market capitalizations above the median are defined as large stocks, while firms with market capitalizations below the median are classified as small stocks. At the end of each quarter from the first quarter of 1977 to the fourth quarter of 2012, all firms with required data are sorted by their standardized unexpected earnings (SUE), which is calculated as the seasonally differenced quarterly earnings divided by the estimated standard deviation of the same measure for the last eight quarters, into quintiles. Firms in the highest (lowest) SUE quintile are defined as initial high (low) SUE firms. For simplicity, we refer to these groups as the HSUE, LSUE portfolios. The abnormal returns for the initial SUE portfolios are measured as the average daily return over the three-day period around the earnings announcement date for quarter Q_t.
Furthermore, at the end of the first quarter (i.e., quarter Q_{t+1}) following the initial SUE ranking quarter, we divide our initial SUE firms into two groups: confirming and disconfirming SUE firms. The first group includes firms reporting SUE for quarter Q_{t+1} that allow them to maintain their position in the same top or bottom SUE quintile for the second consecutive quarter. These firms are referred to as confirming SUE firms (CSUE). The second group consists of firms that fail to keep their initial SUE quintile rankings. These firms are defined as disconfirming SUE firms (DSUE). ISUE – CSUE refers to the return differential between initial SUE firms and the confirming SUE firms for both the initial high SUE firms and the initial low SUE firms. All returns are measured as the average daily return over the three-day period around the earnings announcement for quarters Q_t and Q_{t+1} for initial SUE and CSUE and DSUE firms, respectively. The dependent variables in these cross-sectional daily regressions are the daily returns for each portfolio less the risk-free rate, except for the return differentials, i.e., the ISUE – CSUE and ISUE – DSUE. The Newey-West *t*-statistics are reported in **bold** below portfolio returns.

momentum factor (UMD) for the three portfolio groups that take a long position on high SUE firms and a short position on low SUE firms, i.e., the HSUE – LSUE portfolios, for the three-day earnings announcement period. This analysis again indicates that firms that report confirming SUEs initially exhibit overreaction. Evidence reported in Table 6 shows that our findings are robust to an alternative measure of SUE.

5.3.4. Stock price behavior subsequent to earnings announcement events

As a final robustness test, we examine the market price behavior of firms considered in this study, i.e., the initial high (low) SUE firms, HSUE (LSUE), and confirming (disconfirming) SUE stocks, CSUE (DSUE), over a seven-trading day period (t + 2 to t + 8, where day t is the earnings announcement day) following the three-day earnings announcement event reported in Tables 2 and 3.

In Table 7, we present the average daily abnormal returns of the three-factor Fama-French regression (Market – RF, size and book) extended by the momentum factor (UMD) for seven-trading days (i.e., t + 2 to t + 8) subsequent to the earnings announcement event. Results reported in Table 7 exhibit the same patterns as those reported in Tables 2 and 3, indicating that market prices of firms with extreme earnings news continue to move in the same direction pointed to by earnings signals. This evidence confirms our findings and it is consistent with the empirical findings of the earning announcement drift literature (e.g., Bernard & Thomas, 1989).

Table 6
Average daily abnormal returns for SUE portfolios.

Holding periods	Earnings signals	Portfolios	
		HSUE	LSUE
3 day returns - quarter Q_t	Initial SUE (ISUE)	0.73	−0.36
		21.78	**−12.96**
3 day returns - quarter Q_{t+1}	Confirming SUE (CSUE)	0.48	−0.26
		8.76	**−4.38**
	Disconfirming SUE (DSUE)	−0.16	0.32
		−3.51	**8.05**
	ISUE – CSUE	0.25	−0.10
		2.75	**−1.67**
	ISUE – DSUE	0.89	−0.68
		17.41	**−14.15**

In this table, we provide the average daily alphas of the three-factor Fama-French regression (Market – RF, size, and book) extended by the momentum factor (UMD) over a three-day period (i.e., day t − 1 to t + 1, where day t is the earnings announcement day) surrounding the earnings announcement for three portfolios – the initial SUE, confirming SUE and disconfirming SUE firms. At the end of each quarter from the first quarter of 1984 to the fourth quarter of 2012, all firms are sorted by their unexpected earnings surprises, which are calculated as the difference between actual quarterly earnings and analysts' earnings forecasts for the same quarter divided by the stock price at the end of the quarter. Firms in the highest (lowest) SUE quintile are defined as initial high (low) SUE firms. For simplicity, we refer to these groups as the HSUE, LSUE portfolios. The abnormal returns for the initial SUE portfolios are measured as the average daily return over the three-day period around the earnings announcement date for quarter Q_t.
Furthermore, at the end of the first quarter (i.e., quarter Q_{t+1}) following the initial SUE ranking quarter, we divide our initial SUE firms into two groups: confirming and disconfirming SUE firms. The first group includes firms reporting SUE for quarter Q_{t+1} that allow them to maintain their position in the same top or bottom SUE quintile for the second consecutive quarter. These firms are referred to as confirming SUE firms (CSUE). The second group consists of firms that fail to keep their initial high or low SUE quintile rankings. These firms are defined as disconfirming SUE firms (DSUE). ISUE – CSUE refers to the return differential between initial SUE firms and the confirming SUE firms for both the initial high SUE firms and the initial low SUE firms. All returns are measured as the average daily return over the three-day period around the earnings announcement for quarters Q_t and Q_{t+1} for initial SUE and CSUE and DSUE firms, respectively. The dependent variables in these cross-sectional daily regressions are the daily returns for each portfolio less the risk-free rate, except for the return differentials, i.e., the ISUE – CSUE and ISUE – DSUE. The Newey-West *t*-statistics are reported in **bold** below portfolio returns.

6. Conclusions

We examine whether the market reaction to a firm's earnings announcement is a manifestation of an investor overreaction to salient and extreme earnings news as suggested by evidence of recent studies (e.g., Bai & Qin, 2015; Huang et al., 2013; Milian, 2015) or a market underreaction, as it is commonly characterized in the earnings announcement literature (e.g., Bernard & Thomas, 1989, 1990; Foster et al., 1984).

The evidence reported in this study shows a securities market that is prone to an overreaction to salient and extreme earnings measures. The market price reactions to initial extreme earnings surprises (SUEs) in quarter Q_t suggest investor exuberance that indicates that the current firm's earnings news is a strong predictor of its future earnings performance. When a firm reports a confirming SUE in quarter Q_{t+1}, the market reaction to the confirming earnings news is less than its response to the initial SUE. This is consistent with an initial overreaction as investors expect the firm's earnings performance will continue in the same trajectory at least for the subsequent quarter, Q_{t+1}.

This evidence casts doubt on the traditional view that investors underreact to extreme earnings news. First, firms reporting initial SUE surprises that place them in the top (bottom) quintile generate a strong market price reaction over the three-day period around the earnings announcement date. Second, confirming SUE signals, i.e., earnings surprises, falling in the same extreme SUE quintiles for two consecutive quarters, lead to an additional market reaction that is consistent with the sign of the initial SUE news. However the price impact of the confirming SUE report is weaker than that of the initial SUE counterpart.

Table 7
Average daily abnormal returns for SUE portfolios.

Holding periods	Earnings signals	Portfolios	
		HSUE	LSUE
7 day returns - quarter Q_t	Initial SUE (ISUE)	0.54	−0.17
		15.66	**−5.19**
7 day returns - quarter Q_{t+1}	Confirming SUE (CSUE)	0.42	−0.03
		12.31	**−0.74**
	Disconfirming SUE (DSUE)	−0.18	0.22
		−5.12	**6.83**
	ISUE – CSUE	0.12	−0.14
		2.91	**−3.13**
	ISUE – DSUE	−0.71	−0.39
		−9.46	**−7.01**

In this table, we provide the average daily alphas of the three-factor Fama-French regression (Market – RF, size and book) extended by the momentum factor (UMD) for a seven-day return (i.e., day t + 2 to t + 8, where day t is the earnings announcement day) following the three-day return surrounding the earnings announcement for three portfolios – the initial SUE, confirming and disconfirming SUE firms. At the end of each quarter from the first quarter of 1977 to the fourth quarter of 2012, all firms with required data are sorted by their standardized unexpected earnings (SUE), which is calculated as the seasonally differenced quarterly earnings divided by the estimated standard deviation of the same measure for the last eight quarters, into quintiles. Firms in the highest (lowest) SUE quintile are defined as initial high (low) SUE firms. For simplicity, we refer to these groups as the HSUE and LSUE portfolios. The abnormal returns for the initial SUE portfolios are measured as the average daily return over the seven-day period (i.e., t + 2 to t + 8) subsequent to the three-day return (i.e., t − 1 to t + 1) for the earnings announcement date for quarter Q_t.
Furthermore, at the end of the first quarter (i.e., quarter Q_{t+1}) following the initial SUE ranking quarter, we divide our initial SUE firms into two groups: confirming and disconfirming SUE firms. The first group includes firms reporting SUE for quarter Q_{t+1} that allow them to maintain their position in the top (bottom) SUE quintile for the second consecutive quarter. These firms are referred to as confirming SUE firms (CSUE). The second group consists of firms that fail to keep their initial SUE rankings. These firms are defined as disconfirming SUE firms (DSUE). ISUE – CSUE refers to the return differential between initial SUE firms and the confirming SUE firms for both the initial high SUE firms and the initial low Sue firms. The returns for high SUE stocks are reported in the second column from the right while the returns for low SUE stocks are shown in the last column. All returns are measured as the average daily return over the seven-day period (i.e., t + 2 to t + 8) subsequent to the three-day return (i.e., t − 1 to t + 1) for the earnings announcement date for quarters Q_t and Q_{t+1} for initial SUE and CSUE and DSUE firms, respectively. The dependent variables in these cross-sectional daily regressions are the daily returns for each portfolio less the risk-free rate, except for the return differentials, i.e., the ISUE – CSUE and ISUE – DSUE. The Newey-West *t*-statistics are reported in **bold** below portfolio returns.

This evidence is consistent with a market overreaction to the initial SUE signal.

Finally, firms reporting earnings performance that contradicts their initial SUE rankings, i.e., firms that fail to remain in the initial extreme SUE quintile, exhibit a strong price reversal. Disconfirming high SUE stocks underperform their initial high SUE counterparts. Our findings are robust to the Fama – French three-factor daily regression (Market – RF, size and book) and the momentum factor, as well as a number of sensitivity tests including an alternative measure of SUE as the difference between actual quarterly earnings and analysts' earnings forecasts for the same quarter divided by the stock price at the end of the quarter.

This study has three broad contributions to the literature. First, our findings provide insights into how salient financial measures (surprisingly good or bad earning signals) are likely to be weighted in investor expectations. Our evidence provides a plausible alternative explanation to the existing literature that characterizes market reaction to extreme earnings news as an underreaction (e.g., Bernard & Thomas, 1989, 1990). Our evidence is consistent with the findings of recent studies (e.g., Bai & Qin, 2015; Huang et al., 2013; Milian, 2015) that suggest that investors are inclined to overweight extreme and surprising events, which leads to overreaction.

Second, our study extends the evidence of recent theoretical and empirical studies on the link between the market under- and overreaction anomalies. Lee and Swaminathan (2000) argue that momentum returns are due to a market overreaction that is corrected by the long horizon price reversal in years 2 through 5 following the formation of momentum portfolios. Milian (2015) provides evidence of a market price overreaction to the earnings announcements of easy-to-trade firms (firms with publicly traded stock options). Bai and Qin (2015) document a return reversal following the earnings announcements of firms reporting negative earnings surprises; they attribute their findings to a possible investor overreaction to a negative information signal on the announcement day.

Third, we introduce a novel, two-step, intuitive research design to test whether the well-documented market reaction to firms' earnings announcements is a market underreaction or an investor overreaction to good or bad earnings news. Our research design provides a clear and sharp test to capture both the market reaction to the initial SUE announcement and to the subsequent confirming or disconfirming SUE event. The short window, a three-day period surrounding the extreme earnings announcement, along with other features of our research design allow us to isolate the immediate market price impact of the announcement of earnings performance and to determine whether the stock-price response to the initial SUE is a manifestation of a market overreaction or a market underreaction.

Our research design may have some limitations. To address them, we perform a number of tests to support the robustness of our findings and conclusions. In particular, we control for possible measurement error derived from using historical earnings to calculate earnings surprises. Our alternative SUE measure is the difference between actual quarterly earnings and IBES' analysts' earnings forecasts (from IBES). Another robustness test reflects the limitation that the relatively short-horizon 3-day we use to measure the market reaction to the announcement of earnings surprises may not capture the extent of the market response to extreme earnings news. Our robustness test examines the market price behavior of firms considered in this study over a seven day period (i.e., t + 2 to t + 8, where day t is the earnings announcement day) subsequent to the three day window surrounding the release of quarterly earnings report (t − 1 to t + 1). The result of this test supports our findings and it is consistent with that of the earnings announcement literature.

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