

EVIDENCE TO THE CONTRARY:  
EXTREME WEEKLY RETURNS ARE NOT  
OVERREACTIONS

Roberto C. Gutierrez Jr.  
and  
Eric K. Kelley\*

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\*Gutierrez is from the Lundquist College of Business, 1208 University of Oregon, 97403-1208, email:rcg@uoregon.edu. Kelley is from the Mays Business School, Texas A&M University, 4218 TAMU, 77843-4218, email:ekelley@mays.tamu.edu. We thank Wayne Ferson, Christo Pirinsky, and seminar participants at Auburn University, Indiana University – South Bend, Rutgers University – Camden, Texas A&M University, University of Oregon, Washington State University, and the 2004 FMA Meetings for their comments. Special thanks to Wes Chan for graciously providing his data on headline news. Kelley acknowledges financial support from the Mays Post-Doctoral Fellowship. Any errors are our own.

Evidence to the Contrary:  
Extreme Weekly Returns are Not Overreactions

**Abstract**

Reversal in weekly returns is attributed to a combination of microstructural issues and overreaction. We provide evidence eliminating overreaction as a source of reversal. We find that the brief reversal of weekly returns is followed by a robust and opposing stream of continuation in returns. These subsequent momentum profits are strong enough to offset the initial reversal and to produce a significant momentum effect over the full year following portfolio formation. Thus, extreme weekly returns ex post are not excessive. If anything, the finding of momentum is consistent with underreaction to weekly returns. Our findings extend to price movements with and without public news and provide guidance for potential theories of return anomalies.

# 1 Introduction

Returns of individual stocks reverse in the short-run. Lehmann [1990] and Jegadeesh [1990] find that stocks with the lowest returns over the prior week or month outperform stocks with the highest returns over the prior period. Jegadeesh and Titman [1995a], Cooper [1999], Subrahmanyam [2005] and others find that bid-ask bounce and other microstructural issues do not fully explain this reversal.<sup>1</sup> Accordingly, the extant literature interprets the remaining short-run reversal in returns as evidence of the market's overreaction to firm-specific news.

We present evidence that short-run reversal in returns is not the result of an overreaction. While prior studies concentrate on adjusting the short-run contrarian profits for microstructural effects and then observe if any profits remain, we take a different approach. We identify stocks with extreme weekly returns and evaluate their performance over the following year. Employing this longer horizon shows that, ex post, extreme weekly returns are not overreactions. Contrarian profits persist for only a couple of weeks. The remainder of the year is marked by a steady and robust stream of contrarian losses, i.e. momentum profits. This momentum easily offsets the initial and brief reversal in returns. In fact, the one-year holding-period performance reveals a statistically significant momentum in weekly returns. Cumulative momentum profits exceed 3% per year. If anything, extreme weekly returns are *underreactions*.

One of the strengths of our approach is that we can eliminate overreaction as a source of short-run reversal without having to estimate all possible microstructural effects that might produce reversal. This is important because estimating the microstructural effects beyond the bid-ask bounce, such as liquidity, order imbalance, and nonsynchronous trading, is difficult to precisely do. Regardless of

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<sup>1</sup>Kaul and Nimalendran [1990] and Conrad, Kaul, and Nimalendran [1991] show that part of return reversal is due to bid-ask bounce. Lo and MacKinlay [1990] and Boudoukh, Richardson, and Whitelaw [1994] note that nonsynchronous trading contributes to contrarian profits. Jegadeesh and Titman [1995b] observe that market-makers set prices in part to control their inventories, which induces a return reversal.

what the exact determinants of short-run reversal are, the set of causes does not include the market's overreacting to firm-specific news.

Our view is that weekly returns are partly determined by two influences – a microstructure-driven reversal and a news-driven momentum. Additional tests support this view. First, after adjusting for bid-ask bounce, we find that short-run reversal is only a feature of extreme-return stocks (top and bottom deciles). Less-extreme stocks in fact begin to display mild but detectable momentum *immediately* following portfolio formation. Second, the extreme winner and loser stocks experience substantial abnormal trading volume while the other stocks do not, suggesting that the pressure of illiquidity on prices is more straining for extreme-return stocks. Using the Amihud [2002] illiquidity ratio, we find evidence that price pressure is significantly greater in the extreme-return deciles.

Our findings offer a reasoned view of microstructural effects as the sole driver of short-run return reversal and of firm-specific news as the driver of a longer-persisting return momentum. In this setting, if any short-run contrarian profits can be realized, they should be viewed as compensation for providing liquidity, not as a reward for arbitrage.

Our findings contribute beyond just the elimination of overreaction as a potential source of short-run reversal in returns. Our findings are also important because they reduce the complexity of the anomaly landscape. Short-run reversal stands diametrically opposed to the evidence of momentum in returns at longer horizons of six to twelve months and to the evidence of post-event continuation in returns following abnormal earnings and other firm-specific news.<sup>2</sup> Our findings indicate that short-run reversal is not the weekly anomaly – momentum is. Short-run reversal seems due to illiquidity. Hence, the set of return-based anomalies consists only of momentum up to one year and reversal for longer horizons.

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<sup>2</sup>Some concerns about the robustness of post-event return continuation exist for stock splits, dividend changes, seasoned equity offerings, and share repurchases; but as Fama [1998] notes, the post-event drift in returns following abnormal earnings stands firm. Additionally, Chan [2003] provides evidence of continuation in returns following headline news controlling for many methodological concerns.

This justifies the omission of short-run reversal from the recent theories of Daniel, Hirshleifer, and Subrahmanyam [1998], Barberis, Shleifer, and Vishny [1998], and Hong and Stein [1999] which all attempt to jointly explain early momentum and late reversal.

Lastly, we provide further guidance to potential theories of return anomalies by examining the market's reactions to explicit versus implicit news. Weekly returns associated with public news releases are labeled explicit. Weekly returns not associated with any public news releases are labeled implicit. Daniel, Hirshleifer, and Subrahmanyam [1998], Hong and Stein [1999], and Daniel and Titman [2005] all suggest that individuals may react differently to explicit versus implicit news. The common thread of these studies is the suggestion that the market will overreact to implicit news, which they alternatively label private or intangible news. Chan [2003] examines this conjecture using a dataset of headline news and concludes that the market overreacts to price movements without headline news and underreacts to headline news. The latter finding is consistent with our prior results, but the overreaction finding is not. Although we find no evidence of the market overreacting to news in general, perhaps there is a subcategory of news that the market does overreact to.

We reconsider the market's reaction to implicit news by examining the one-year holding-period performance of stocks with extreme returns in a given week but no public news. We find for even these implicit-news stocks that a brief return reversal is followed by a steady stream of momentum profits. The same is true of course for explicit-news stocks. If anything, the market underreacts to both subcategories of news. Our conclusions differ from Chan's only because he focuses primarily on the short-run performance of stocks with implicit news, as the prior literature does. He does not identify the robust momentum profits that follow the brief reversal.

In sum, our findings show that overreaction is not a cause of short-run reversal in stock returns. To the contrary, underreaction seems to be the persistent phenomenon in the stock market, at least for horizons up to one year. Our findings for weekly returns fit nicely with the evidence of return continuations following firm-specific corporate events and headline news. Long-run reversal in returns for horizons beyond one year, such as those noted by DeBondt and Thaler [1985], still might be due to overreaction. However, we find that the market does not inherently overreact to implicit news. Potential explanations of long-run reversal require more than the current appeals to implicit news as the justification for an overreaction.

We discuss in Section 2 the data and the performances of stocks with extreme weekly returns over various holding periods. Section 2 also examines several estimates of price pressure induced by order flow. Section 3 shows the robustness of our findings with an extended time period and with transaction-based returns (instead of returns from bid-ask midpoints) and addresses potential concerns regarding the misspecification of our expected-return models. Explicit versus implicit news are separately examined in Section 4, and Section 5 concludes.

## **2 Performance of Stocks with Extreme Weekly Returns**

### **2.1 Data and Methods**

Prior research finds reversal in the weekly returns of individual stocks. When using returns formed with transaction prices, part of this reversal is certainly due to the spurious negative correlation induced by bid-ask bounce. We eliminate this spurious reversal, as Kaul and Nimalendran [1990] and Conrad, Kaul, and Nimalendran [1991] do, by forming returns using the midpoint of bid and ask quotes at the close of each day. Weekly returns are based on closing midpoint quotes from Wednesday to Wednesday from 1983 through 2003. Quote data for

stocks listed on NYSE and AMEX are from the Institute for the Study of Securities Markets (ISSM) and the New York Stock Exchange TAQ database (Trades and Automated Quotations). The ISSM data are from 1983 – 1992, and the TAQ data are from 1993 – 2003. Quote data for NASDAQ stocks are from CRSP. For all stocks, we get dividend and split data from CRSP and account for these events in our return calculations. We exclude all stocks priced below five dollars at the end of the formation week  $t$ .

With midpoint returns in hand, we rank all stocks in week  $t$  based on that week's return. The stocks in the highest decile are labeled winners, and the stocks in the lowest decile are labeled losers. Winner and loser portfolios are equally weighted across all component stocks. We then form a portfolio that is long in the winner portfolio and short in the loser portfolio. In all reported results, negative profits reflect reversal in returns and positive profits reflect momentum. To evaluate the performance of the winner-minus-loser portfolio over various holding periods, we employ the calendar-time method advocated by Fama [1998] and Mitchell and Stafford [2000] and used by Jegadeesh and Titman [1993]. The calendar-time method avoids overlapping returns and the accompanying positive cross-serial correlation in returns while allowing all possible formation periods to be considered.

For example, consider the performance of the portfolios in *event* holding-period weeks  $t + 1$  to  $t + 52$ . In a given *calendar* week  $\tau$ , there are fifty-two open strategies - one formed in week  $\tau - 1$ , one formed in week  $\tau - 2$ , and so on. The profit in calendar week  $\tau$  is the equally weighted profit across the fifty-two cohort portfolios. This procedure generates a single weekly calendar-time series of profits representing the event window  $t + 1$  through  $t + 52$ .

We consider several metrics for evaluating the performance of the winner-minus-loser portfolio in any given holding-period window. The raw strategy profit for a particular holding period window is simply the mean of the calendar-time series of profits. We also calculate weekly CAPM and Fama-French three-factor

alphas by regressing the calendar-time series of winner-minus-loser profits on the appropriate factor premia.<sup>3</sup> Since we detect positive serial autocorrelation in the profit series, we calculate all test statistics using the consistent variance estimator of Gallant [1987] with four lags.<sup>4</sup>

A possible concern regarding our use of the calendar-time method is that the factor loadings vary in the CAPM and Fama-French risk adjustments as the portfolio’s composition of stocks changes. To address this, we follow the recommendation of Mitchell and Stafford [2000] and use the factor loadings of each individual stock to estimate the portfolio’s loadings. We estimate each stock’s return sensitivities to the CAPM and Fama-French factors respectively over  $[t + 1, t + 52]$  requiring at least 26 weekly observations. The portfolio’s factor loadings are then estimated as the corresponding equally weighted factor loadings of the component stocks (the winner portfolio’s and the loser portfolio’s loadings are estimated separately). The calendar-time series of raw profits is then risk-adjusted using the estimated loadings and the factor realizations. These results are not provided in the tables since our conclusions are unaffected by using this procedure.

## 2.2 Performance Results

The primary contribution of this study is the evaluation of the performance of stocks with extreme weekly returns over a longer horizon than just a few weeks, as prior studies examine. Table 1 provides the mean weekly profits to the portfolio of last-week’s winner stocks minus last-week’s loser stocks over various holding periods. We see that extreme weekly returns reverse. Reversal in the first week after portfolio formation is strong averaging roughly 67 basis points per week across raw and risk-adjusted metrics. Since we are using midpoint returns, bid-ask bounce is clearly not the sole source of return reversal.<sup>5</sup> Lo and MacKinlay [1990]

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<sup>3</sup>We thank Kenneth French for providing daily data on the Fama-French factors and the risk-free rate via his website.

<sup>4</sup>Using eight lags does not affect our inferences.

<sup>5</sup>Using midpoint returns for NASDAQ stocks from 1983 to 1990, Conrad, Kaul, and Nimalendran [1991] do not find significant weekly reversal in returns. We confirm their finding and identify it to be sample specific.

and Jegadeesh and Titman [1995a,b] identify nonsynchronous trading, inventory management by dealers, and investor overreaction to firm-specific news as possible sources of the reversal found in Table I.<sup>6</sup>

Consistent with all three of these hypotheses, the reversal in returns diminishes quickly and is gone by week three. However, the performance of the extreme-return stocks over  $[t + 4, t + 52]$  eliminates overreaction as a possible explanation of weekly reversal in returns. The profits to the portfolio of winners minus losers across  $[t + 4, t + 52]$  is positive and at least 8.55 basis points per week. This strong turnabout in the portfolio's profits is the central finding of our study. Figure 1 plots the cumulative raw profits to the weekly portfolios across the fifty-two weeks, estimating the profits in each week separately. The figure shows a dramatic run-up in the cumulative profits after week four. The run-up is strong enough in fact to overcome the initial reversal. Cumulative profits exceed three percent one year after formation. Table 1 shows that the profits in weeks one to fifty-two are statistically *positive* across all performance metrics. In short, we see ex post that the extreme returns in the formation week are not extreme enough.<sup>7</sup>

This finding is a complete turnaround for the literature on the short-run predictability of individual stock returns. Reversal has been the stylistic fact of weekly returns. Consequently the potential underlying sources of reversals have been extensively examined and debated. Controlling for microstructural effects, Jegadeesh and Titman [1995a], Cooper [1999], and Subrahmanyam [2005], among others, conclude that investors' overreaction contributes to reversal. The supposed finding of overreaction in weekly reversals stands in contrast to the findings of momentum in firm-specific events and headline news and momentum in six- to twelve-month returns. Our findings indicate that overreaction is not a feature

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<sup>6</sup>Madhavan and Smidt [1993], Hasbrouck and Sofianos [1993], and Hansch, Naik, and Viswanathan [1998] find that prices quoted by dealers are inversely related to their inventory and that inventory is mean reverting. These findings indicate that dealers actively manage their inventories.

<sup>7</sup>When we extend the post-formation window to three years, profits are no longer statistically different from zero. Our conclusion that extreme weekly returns are not overreactions remains; however, the evidence for an underreaction is tempered.

of weekly returns, but underreaction possibly is. This conclusion is reinforced by additional analyses provided in the next sections.

Note that the magnitudes of the weekly profits in Table 1, across any of the holding periods, might not be realizable after trading costs are imposed. This should not discredit the importance of our finding of momentum in weekly returns. The realizability of profits to trading strategies speaks only to the persistence of an anomaly, not to the existence of the anomaly. Assume arbitrage traders are capitalizing on momentum profits up to the point where the marginal benefit of trading equals the marginal cost. There is truly momentum in returns; it is however being reduced by arbitragers to the extent possible. Consider this analogy. If you consistently mow the weeds in your lawn down to the same height as the grass, you would not easily see the weeds, but they are of course there. Weekly returns might not generate realizable momentum profits, but weekly returns can possibly provide information about the process of price formation that induces momentum.

### **2.3 Two Opposing Components in Weekly Returns**

The benefit of examining the longer horizon after portfolio formation is that we can eliminate overreaction as a source of reversal in returns without having to estimate all potential microstructural effects for each stock. Estimating such effects is difficult to precisely do. Our view of weekly returns is that they are determined in part by two opposing forces. First, there is a multifaceted microstructural component, which we broadly label illiquidity for ease of exposition. Illiquidity begets a short-lived reversal. Second, there is momentum in weekly returns, presumably related to firm-specific news. When illiquidity is high, reversals dominate. When illiquidity is low, momentum in firm-specific news dominates. Table 2 supports this depiction.

In Panel A of Table 2, we report the raw returns in week  $t + 1$  to each decile formed from the prior week's returns. Reversals in week one are evident only

in deciles one and ten. Profits in less-extreme winner-minus-loser portfolios are given in Panel B. Portfolio (10 – 1) produces a strong reversal while all other winner-minus-loser portfolios generate significant momentum profits in week one. (These results are similar when CAPM or Fama-French alphas are used.) To our knowledge, this finding is new to the literature. After eliminating bid-ask bounce by using midpoint returns, we see that momentum is the pervasive feature in weekly returns. Return reversal is isolated to the extreme portfolios.

We also provide in Panel A empirical evidence that extreme illiquidity is the reason for the return reversal in deciles ten and one. Our measures of illiquidity are trading volume and the illiquidity ratio of Amihud [2002]. We estimate the abnormal volume of stocks in the portfolio-formation week  $t$ . The simple notion is that abnormal volume is positively correlated with price pressure due to order flow. Alternatively, Hasbrouck [2005] examines the Amihud [2002] illiquidity ratio and other estimates of the price impact of trading in an individual stock and finds that the illiquidity ratio is the better measure.

To measure abnormal volume in each stock each week, the mean trading volume over  $[t - 52, t - 1]$  in number of shares and in dollars is subtracted from the respective quantity of each measure in week  $t$  to form two versions of abnormal trading volume in the formation week. Each of these abnormal volumes is divided by its own standard deviation estimated over  $[t - 52, t - 1]$ . We standardize the abnormal volumes so that we can compare volume across exchanges. NYSE and AMEX report volume differently than NASDAQ.

The third and fourth columns of Panel A in Table 2 show that share volume and dollar volume are substantially higher for extreme-winner and extreme-loser stocks in the formation week, consistent with an illiquidity-based pressure on prices being much stronger for extreme stocks. The  $t$ -statistics are not given in the table, but we can reject the hypotheses that mean abnormal volume in deciles ten or one is equal to abnormal volume across the other deciles. The  $t$ -statistics are all greater than 18.0 using share or dollar volume.

The last column provides a measure of the price impact of order flow. We estimate a weekly version of the Amihud [2002] illiquidity ratio as the absolute price change in week  $t$  per dollar of volume in week  $t$

$$ILLIQ_t = \frac{|r_t|}{vol_t}. \quad (1)$$

Mean  $ILLIQ_{t-1}$  for each stock over  $[t - 52, t - 1]$  is multiplied by dollar volume in week  $t$  to produce an estimate of price pressure in each stock in week  $t$  (absolute return due to order flow).

$$PRESS_t = \left( \frac{1}{weeks_{t-1}} \sum_{t-1}^{weeks_{t-1}} ILLIQ_{t-1} \right) \times vol_t \quad (2)$$

where  $weeks_{t-1}$  is the number of weeks available for each stock over the prior fifty-two weeks. We require at least 25 weeks of observations to calculate the mean of  $ILLIQ_{t-1}$ .

The last column of Panel A in Table 2 shows the estimates of price pressure to be substantially larger during the formation week for deciles ten and one than for the middle quintiles. The  $t$ -statistic testing the equality of mean price pressure in decile ten and the middle deciles and the  $t$ -statistic testing the equality of mean price pressure in decile one and the middle deciles are greater than 13.0, and are not in the tables.<sup>8</sup>

In sum, reversal in weekly returns is isolated to the extreme deciles. Less-extreme stocks actually display momentum in the week following portfolio formation. These findings add to the literature by showing that momentum is a pervasive feature of returns that extends to horizons as short as weekly returns. We also find that stocks with extreme returns seem to experience notable price pressure induced by abnormally high order flow. These findings suggest that two opposing forces are embedded within weekly returns: illiquidity-driven reversal

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<sup>8</sup>Avramov, Chordia, and Goyal [2004] also find that short-run reversal is correlated with the Amihud [2002] illiquidity ratio.

and news-driven momentum. If any weekly contrarian profits are realizable, such profits are then better viewed as compensation for providing liquidity to the market rather than as profits from arbitrage.

### 3 Further Analyses and Robustness

In this section, we perform several robustness checks on the prior findings. First, we examine possible misspecification concerns regarding our methods of modeling expected stock returns. Second, we also examine stock performance using transaction prices to estimate returns instead of midpoints of quoted bid and ask prices. Third, we extend the sample period back to 1963.

#### 3.1 Pre-Formation Performance

We begin by examining the pre-formation performance of extreme-return stocks. The potential concern is that our performance metrics in Table 1 are not well-specified and that our finding of momentum in weekly returns is possibly due to model misspecification. In other words, the momentum may not be from returns in week  $t$  but from an inherent characteristic of these selected stocks that we fail to capture. Table 3 shows the performance of the winners-minus-losers portfolio over various pre-formation windows. None of the windows from week  $t - 52$  to week  $t - 1$  display momentum profits. Hence, momentum in the post-formation windows is not due to misspecifying expected stock returns.

Table 3 does show negative profits in weeks  $t - 1$  and  $t - 2$ . This pre-formation reversal in returns is expected given our findings in Table 2; it is the mirror image of post-formation reversal. Panel B of Table 2 shows that reversal of extreme weekly returns is the larger effect relative to general momentum in returns. So we expect that winners (losers) in week  $t$  will be more likely to have been extreme losers (winners) in week  $t - 1$ . Untabulated results indicate this to be true. Stocks

in the highest decile of returns this week or more likely to have been in the lowest decile of returns last week (probability=18%). The lowest-return stocks this week are more likely to have been the highest-return stocks last week (probability=17%). Examining these conditional probabilities also reveals a momentum effect in less-extreme weekly returns, as Table 2 also shows, but the momentum effect is smaller on average than the reversal effect of extreme returns in the prior week. In short, the pre-formation findings only lend further support to the prior conclusions regarding two opposing forces in weekly returns.

It may be useful to note that the results in Tables 1, 2 and 3 are consistent with the findings of Chordia, Roll, and Subrahmanyam [2002] regarding imbalance in order flow. They find that daily order imbalance is negatively related to both prior and future returns. These findings are consistent with the existence of price pressure due to order imbalance and with dealer's actively controlling their inventory. Given the evidence in Table 2 that stocks with extreme returns in week  $t$  tend to have abnormally large order flow in week  $t$ , we expect reversals in these extreme stocks in week  $t+1$  and in week  $t-1$ . Performance of the winners-minus-losers portfolio in the weeks immediately surrounding portfolio formation seems to be explained by inventory theories of price formation (i.e. illiquidity).

### **3.2 Transaction Returns and Extended Time Period**

We replace our initial sample of midpoint returns from 1983 to 2003 with transaction returns formed using Wednesdays' closing transaction prices from CRSP for 1963 to 2003. The advantage of using midpoint returns is that we eliminate the spurious reversal due to bid-ask bounce. Reviewing performance in this section using transaction returns allows us to examine if the momentum after week  $t+3$  is strong enough to offset early reversal when the bid-ask bounce is included. Since our transaction returns data goes back to 1963, we can also comment on the robustness of our results in a much larger time period.

Table 4 provides the performances of the extreme winners-minus-losers portfolio over various holding periods. We see first that reversal in week  $t + 1$  is much stronger as expected using transaction returns with profits roughly twice as large as those formed using midpoint returns in Table 1. The last column of Table 4 though shows that the finding of momentum in weekly returns is robust when using transaction returns and when extending the sample period back to 1963. Profits remain significantly positive over  $[t + 1, t + 52]$ .

## 4 Explicit versus Implicit News

The prior results indicate that momentum, not reversal, is the pervasive feature of weekly returns. This finding complements nicely the literature on the market’s reactions to firm-specific news which generally finds a continuation in returns following specific corporate events (such as unexpected earnings, dividend changes, share repurchases, seasoned equity offerings, and stock splits) and continuation in returns following firm-specific headline news.<sup>9</sup> One finding that stands out as seemingly inconsistent with our results is the finding of Chan [2003] that the market overreacts to price movements not associated with firm-specific headline news. Our findings in Tables 1 and 2 indicate that the market does not overreact to short-run firm-specific news in general. Perhaps the market does overreact however to a particular subset of news. Perhaps the market overreacts to news that is not publicly and explicitly released – i.e. to price movements.

Several current and prominent behavioral theories of stock-return anomalies employ the general assumption that the market overreacts to price movements not associated with public firm-specific news. Daniel, Hirshleifer, and Subrahmanyam [1998] assume that investors’ overconfidence in their private information yields an overreaction to private information and an underreaction to public information. Hong and Stein [1999] assume that there are two types of investors, one type

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<sup>9</sup>See the appendix of Daniel, Hirshleifer, and Subrahmanyam [1998] for a list of studies finding return continuation following corporate events.

that observes only public fundamental news about firms and a second type that observes only price movements. With the additional assumption that information about fundamentals diffuses gradually across the marketplace, Hong and Stein predict that public news will be underreacted to and that price movements will be overreacted to. Daniel and Titman [2005] suggest that investors overreact to intangible news which they specify as price movements unrelated to accounting measures of performance. The central assertion of these theories is that the market overreacts to returns that are unassociated with public news. We label such news "implicit" since no explicit news is released.

Chan [2003] examines price movements that are not associated with headline news. He finds that implicit returns reverse. But is the reversal due to overreaction? Or is it solely microstructural? To answer these questions, we repeat the preceding approach and examine a longer post-formation window. We use Chan's headline data which are collected from the Dow Jones Interactive Publications Library from 1980 to 2000. He identifies each day if a given stock is mentioned in a headline or lead paragraph from a newspaper or newswire article. To make the data collection feasible, he selects a random subset of roughly 25% of CRSP stocks, varying from 766 in January 1980 to over 1,500 in December 2000.<sup>10</sup>

Using Chan's sample, we rank stocks into deciles each week from 1983 to 2000 based on midpoint returns from the prior week (the midpoint data begin in 1983). Stocks in the extreme deciles are further sorted into implicit-news and explicit-news stocks depending on whether a given stock has at least one headline news release during the formation week. Table 5 provides the profits to implicit-news and explicit-news portfolios comprised of implicit-news winners minus implicit-news losers and explicit-news winners minus explicit-news losers respectively.<sup>11</sup>

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<sup>10</sup>See the description of the data provided by Chan [2003] for more details. Comparing announcement dates of the firm-specific news data we have (earnings, seasoned equity offerings, stock splits, dividend initiations, and share repurchases) to Chan's headline-news data confirms that his data are comprehensive.

<sup>11</sup>We impose a 10-stock requirement on each side of the portfolio to mitigate potential consequences of heteroskedasticity and variations in factor loadings as a result of portfolio composition changing dramatically from calendar week to calendar week.

In Panel A, we find, as Chan [2003] does, that implicit news reverses immediately after portfolio formation. Information from the longer evaluation windows indicates that implicit news is not overreacted to. As before, there is a robust stream of momentum profits following the brief reversal that is strong enough to offset the initial reversal. Even for implicit news, we can conclude that the market does not overreact. The last column in Table 5 shows that the profits to the implicit-news portfolio are statistically positive in the fifty-two weeks following portfolio formation. Extreme price movements in week  $t$  that are not associated with headline news are actually not extreme enough ex post.

It is once again the robust stream of momentum profits during the post-formation year that is the new finding. Without this finding, it is difficult to distinguish whether short-run reversal of implicit news is due solely to illiquidity or due at least in part to overreaction. Extending the window shows that the market does not overreact to implicit news. For completeness, Panel B provides the profits to the explicit-news portfolio, and the patterns are similar to those of the implicit-news portfolio. Note however that the profits to explicit news are greater than the profits to implicit news over every holding period examined in Table 5 except  $[t + 4, t + 52]$ . The untabulated  $t$ -statistics over the other horizons are all greater than 2.0. While we find that the market does not overreact to implicit news, we reconfirm Chan's finding that the market reacts differently to implicit versus explicit news. Perhaps this is due to behavioral biases or to measurable differences in the information signals. Explaining the difference in reactions is an interesting future endeavor.

In sum, our findings reverse the conclusion that the market overreacts to price movements without public news. This finding implies that behavioral explanations of *long-run* reversal in returns cannot rely directly on the assumption that investors overreact to price movements, or to private or intangible news.

## 5 Conclusion

We employ a simple technique to reconsider if weekly reversal in individual stock returns are due in part to overreaction. Extending the holding-period window to one year after forming the portfolios of extreme-return winners minus losers shows that weekly return reversal is not due to overreaction. We find a robust stream of momentum profits that dominate the brief contrarian profits. In fact, weekly returns statistically display momentum in the fifty-two weeks following portfolio formation.

Weekly returns seem to be in part determined by two opposing forces, an illiquidity-driven reversal and a firm-specific-news driven momentum. Additional tests support this notion. The finding that momentum is pervasive even in weekly returns reconciles the weekly literature with the six- to twelve-month literature that finds momentum in returns and with the event literature that finds momentum as well. The consistency of momentum across formation horizons up to one year suggests that weekly returns might offer a new and better testing ground for momentum theories. Examining weekly returns should be more comfortable and reliable than examining six-month returns. Essentially, our findings simplify the anomaly landscape.

We also examine the market's reaction to price movements with and without public news. Contrary to prior studies, we conclude that the market does not overreact to price movements. Again, our innovation is to examine a longer post-formation window. There is a strong momentum in weekly returns with or without public news. This finding is important since several behavioral theories of long-run reversal in returns, such as Daniel, Hirshleifer, and Subrahmanyam [1998], Hong and Stein [1999], and Daniel and Titman [2005], assume that investors overreact to private, intangible, or implicit news.

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**Table 1**  
**Profits to Weekly Portfolios**  
**Winners minus Losers**

Each week from 1983 to 2003, we rank stocks based on their returns over the prior week and form a portfolio comprised of a long position in the top decile of stocks (winners) and a short position in the bottom decile (losers). Returns are formed from the midpoints of the quoted bid and ask prices at each day's close. Stocks priced below five dollars at the end of the formation week  $t$  are excluded. Calendar-time alphas, in basis points, are estimated over various holding periods using raw returns, the CAPM, and the Fama-French three-factor model. The  $t$ -statistics are in parentheses and are robust to heteroskedasticity and autocorrelation.

	Holding Period				
	Week 1	Week 2	Week 3	Weeks 4 to 52	Weeks 1 to 52
Raw	-69.02 (-7.84)	-35.61 (-5.30)	0.51 (0.09)	8.55 (4.88)	5.54 (3.15)
CAPM	-65.60 (-7.61)	-31.47 (-4.84)	2.85 (0.51)	8.91 (5.23)	6.06 (3.57)
Fama-French	-67.53 (-7.94)	-32.48 (-4.90)	0.36 (0.07)	8.96 (4.98)	5.98 (3.30)

**Table 2**  
**Abnormal Volume, Illiquidity, and Profits to Less-Extreme Portfolios**

Each week from 1983 to 2003, we sort stocks into deciles based on their returns over the prior week. Mean volume over weeks  $[t - 52, t - 1]$  in number of shares and in dollars is subtracted from the corresponding volume in week  $t$  to form two measures of abnormal volume. For each stock, each of these measures is divided by its standard deviation over  $[t - 52, t - 1]$ . The equally weighted values of these two standardized measures are reported for each decile below in Panel A.

Estimates of price pressure for each stock during the formation week  $t$  are obtained by multiplying dollar volume in week  $t$  by the mean of the Amihud [2002] illiquidity measure over  $[t - 52, t - 1]$ , where the illiquidity ratio is the absolute price change in a given week per dollar of volume in that week. The equally weighted values of this measure are reported for each decile below in Panel A.

Panel B provides the raw profits of winner-minus-loser portfolios from the most extreme case (10 - 1) to the least extreme case (6 - 5). The  $t$ -statistics are in parentheses and are robust to heteroskedasticity and autocorrelation.

A. Abnormal Volume and Illiquidity				
Return Decile	Return	Abnormal	Abnormal	Illiquidity-Based
Week 0	Week 1	Share Volume	Dollar Volume	Return
		Week 0	Week 0	Week 0
1(low)	71.86	0.48	0.31	0.14
2	14.71	0.02	0.00	0.08
3	9.57	-0.05	-0.05	0.06
4	15.87	-0.09	-0.07	0.06
5	21.44	-0.09	-0.06	0.06
6	31.03	-0.05	-0.02	0.06
7	39.86	0.00	0.05	0.06
8	44.38	0.12	0.18	0.08
9	38.93	0.33	0.41	0.10
10 (high)	2.84	1.17	1.44	0.28

B. Less-Extreme Portfolios		
Winner-Loser	Profits	$t$ -statistic
	Week 1	
10-1	-69.02	-7.83
9-2	24.22	5.08
8-3	34.81	11.02
7-4	23.99	8.95
6-5	9.59	5.03

**Table 3**  
**Pre-Formation Profits to Weekly Portfolios**  
**Winner minus Losers**

Each week from 1983 to 2003, we rank stocks based on their returns over the prior week and form a portfolio comprised of a long position in the top decile of stocks (winners) and a short position in the bottom decile (losers). Returns are formed from the midpoints of the quoted bid and ask prices at each day's close. Stocks priced below five dollars at the end of the formation week  $t$  are excluded. Calendar-time alphas, in basis points, are estimated over various pre-formation windows from week  $t - 52$  to week  $t - 1$  using raw returns, the CAPM, and the Fama-French three-factor model. The  $t$ -statistics are in parentheses and are robust to heteroskedasticity and autocorrelation.

	Holding Period			
	Weeks -52 to -4	Week -3	Week -2	Week -1
Raw	-0.24 (-0.17)	-7.83 (-1.42)	-46.58 (-6.85)	-93.59 (-9.62)
CAPM	0.63 (0.46)	-7.11 (-1.28)	-47.04 (-6.59)	-92.52 (-9.51)
Fama-French	-1.18 (-0.92)	-8.42 (-1.42)	-46.06 (-6.78)	-91.27 (-10.01)

**Table 4**  
**Profits to Weekly Portfolios using Transactions Returns**  
**Winners minus Losers**

Each week from 1963 to 2003, we rank stocks based on their returns over the prior week and form a portfolio comprised of a long position in the top decile of stocks (winners) and a short position in the bottom decile (losers). Returns are formed from closing transactions prices. Stocks priced below five dollars at the end of the formation week  $t$  are excluded. Calendar-time alphas, in basis points, are estimated over various holding periods using raw returns, the CAPM, and the Fama-French three-factor model. The  $t$ -statistics are in parentheses and are robust to heteroskedasticity and autocorrelation.

	Holding Period				
	Week 1	Week 2	Week 3	Weeks 4 to 52	Weeks 1 to 52
Raw	-129.65 (-30.76)	-41.61 (-10.78)	-7.48 (-2.31)	6.68 (6.65)	2.48 (2.42)
CAPM	-127.47 (-30.47)	-39.57 (-10.53)	-6.40 (-1.98)	7.02 (7.19)	3.20 (3.28)
Fama-French	-128.27 (-30.68)	-39.39 (-10.28)	-6.71 (-2.12)	7.23 (7.12)	3.37 (3.30)

**Table 5**  
**Profits to Explicit-News and Implicit-News Weekly Portfolios**  
**Winners minus Losers**

Using the random sample of stocks from Chan [2003], we identify the stocks with public news (headlines of lead paragraph) in each week from 1983 to 2000. We separate stocks into those with public news (explicit news) and those without public news (implicit news). Stocks from each subsample of news are then ranked based on their returns over the prior week and a portfolio is formed which is comprised of a long position in the stocks in the top decile (winners) and a short position in stocks in the bottom decile (losers). Calendar-time alphas, in basis points, are estimated over various holding periods using raw returns, the CAPM, and the Fama-French three-factor model. Panel A reports the profits to the implicit-news portfolio, and Panel B reports the profits to the explicit-news portfolio. The  $t$ -statistics are in parentheses and are robust to heteroskedasticity and autocorrelation.

	Holding Period				
	Week 1	Week 2	Week 3	Weeks 4 to 52	Weeks 1 to 52
A. Implicit News - no events in formation week					
Raw	-101.07 (-8.17)	-51.30 (-5.59)	-11.93 (-1.40)	8.29 (4.13)	4.80 (2.39)
CAPM	-97.88 (-7.99)	-47.61 (-5.34)	-9.04 (-1.05)	8.34 (4.16)	5.01 (2.51)
Fama-French	-99.89 (-8.37)	-48.68 (-5.03)	-10.65 (-1.22)	7.88 (3.71)	4.47 (2.11)
B. Explicit News - events in formation week					
Raw	-76.62 (-5.56)	-15.24 (-1.32)	28.01 (3.29)	11.28 (4.41)	8.92 (3.45)
CAPM	-73.33 (-5.40)	-8.65 (-0.78)	30.53 (3.63)	11.20 (4.39)	9.08 (3.54)
Fama-French	-75.28 (-5.64)	-12.61 (-1.10)	27.57 (3.35)	11.25 (4.27)	9.02 (3.41)

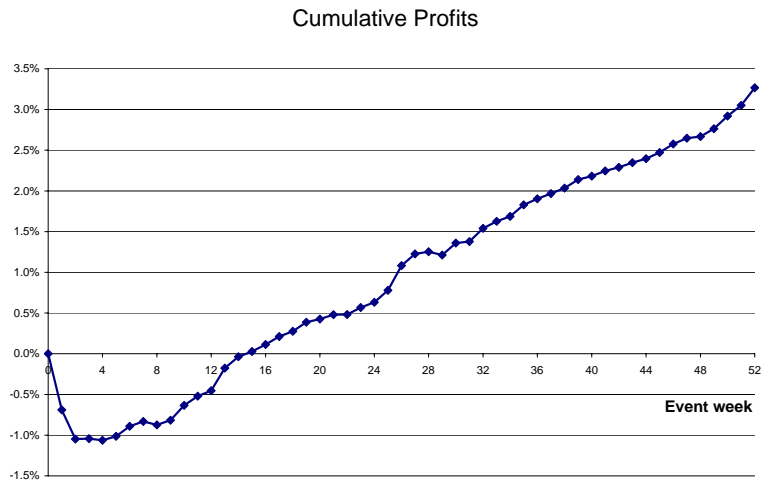


Figure 1: Each week from 1983 to 2003, we rank stocks based on their returns over the prior week and form a portfolio comprised of a long position in the top decile of stocks (winners) and a short position in the bottom decile (losers). Raw profits are calculated for each separate event week. Cumulative profits are plotted.