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LARGE PRICE CHANGES AND SUBSEQUENT RETURNS

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We investigate whether large stock price changes are associated with short-term reversals or momentum, conditional on the issuance of analyst price target or earnings forecast revisions immediately following these price changes. Our study provides evidence that prices of stocks exhibit momentum when analysts issue revisions after large price shocks, and suggests that the initial price changes were indeed based on new information. In contrast, when price changes are not followed by immediate analyst revisions, we document short-term reversals, indicating that the initial price shocks were likely caused by liquidity or noise traders. A trading strategy that is based on the direction of the price change and the existence of analyst revisions in the same direction earns significant abnormal monthly returns (over 1%).

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1 Introduction

A natural question when observing large changes in equity prices is whether these changes driven by new information, or they are just a temporary aberration caused by noise or liquidity trades. If the latter is true, these large price moves will likely be followed by corrections and price reversals in a relatively short period of time. On the other hand, if these moves are caused by new information, equity prices are unlikely to display the same pattern of corrective price reversals, and may be followed by momentum (if the initial price changes under react to new information). A related question is whether such large price swings can be used to predict future equity returns, and whether it is possible to construct

portfolio strategies that earn abnormal returns based on observing large price shocks. We explore these two questions in this study.

To determine whether large price swings in equity prices are caused by new information, we use the immediate reactions by analysts following these firms. We conjecture that if analysts become aware of new information that is driving the price swings, they will communicate this information by revising either their earnings forecasts or future (one-year ahead) target prices of equity, or both. Otherwise, we would expect to see no analyst revisions. We find that, by and large, the majority of large price changes are not followed by immediate analyst revisions. In instances when revisions do occur, they are more likely to be in the same direction as the price swing; that is, positive (negative) large price swings trigger positive (negative) earnings forecast or target price revisions. Furthermore, consistent with prior literature, analyst revisions are more prevalent when trading volumes around the price swings are high. We also find that the direction of the drift in future equity prices is consistent with the direction of analyst revisions. Relying on Dow Jones articles, Key Developments database and Forms 8-K to identify information events, we verify that large price changes and associated analyst revisions are indeed caused by new information. Contrary to the typical findings in the extant literature of short-term reversals, we find that, in general, stock returns continue to be negative after large price decreases.

To determine if we can use the combined information in the initial price shocks and immediate analyst revisions to construct a trading strategy, we take long positions in stocks with large daily price increases and immediate positive analyst revisions, and short positions in stocks with large daily price decreases and immediate negative analyst revisions.[1] We find significant positive abnormal returns for this strategy (relative to returns on similar stocks in terms of size, book-to-market ratio, and prior momentum), implying that the initial large price changes and/or the analyst revisions were incomplete.

Our study improves our understanding of the role of information in causing major movements in stock prices. It shows that most large return days are probably not associated with significant new information (at least significant enough to warrant analysts to revise their forecasts). This result contributes to the academic literature which relies on large return days to proxy for the arrival of new information (see, e.g., Jin *et al.*, 2012). We also document the crucial impact of new information on post-event performance, confirming and extending some prior studies (Chan, 2003; Savor, 2012). Our study is very relevant for practitioners and investors. We show how to take advantage of new information contained in large return days when it is confirmed by immediate subsequent earnings forecast or target price revisions, and also point out those large price swings that tend to experience reversals. In addition, we find that short-term reversals are far less likely for large negative-return days than for large positive-return days, especially when not accompanied by analyst forecast revisions.

The next section briefly discusses prior work in this area. Section 3 provides details about our sample and research design. Section 4 shows our results and sensitivity analysis. Section 5 concludes.

2 Prior literature

Many studies explore the behavior of returns after significant stock price movements. Most find evidence of price reversals following large price changes (Atkins and Dyl, 1990; Bremer and Sweeney, 1991; Cox and Peterson, 1994; Bremer *et al.*, 1997). However, others provide

support for return continuation (Schnusenberg and Madura, 2001; Lasfer *et al.*, 2003). All these studies focus only on shocks of a given magnitude and are not linked to information causing the price shock.

There are also some studies that examine price reversal and momentum after large stock price swings conditional on the existence of public information. One such study by Pritamani and Singhal (2001) shows that it is possible to earn abnormal returns from a strategy based on multiple signals including large price changes, trading volume, and whether there was public information in the news media accompanying the price changes. However, their study does not focus on the magnitude of price changes, and does not use analysts' earnings and target price forecast revisions. Chan (2003) uses news headlines as a proxy for information, and documents drift following price moves accompanied by news, and reversals for moves accompanied by no news (his findings are strongest for negative price events). His research design does not directly incorporate analyst revisions.

The closest study to ours is by Savor (2012), which focuses on firms that experience significant price moves and are actively covered by analysts. He then examines subsequent stock returns depending on whether analysts issue (or restate) their recommendations in the period surrounding the large price swing, using these recommendations as a proxy for new information. His findings are very similar to ours, documenting momentum after price shocks accompanied by information, and reversals otherwise. As in this study, momentum occurs only when the direction of the price move and the change in analyst recommendations have the same sign.

We believe that our research design is potentially more general than Savor (2012), because we use earnings forecast or price target revisions. As Feldman *et al.* (2012) show, there are about ten times more earnings forecast revisions than recommendation revisions, and over three times more target price revisions than recommendation revisions. Thus, requiring recommendation revisions immediately around significant price changes may omit many cases of significant information that resulted in earnings forecast or target price revisions, but not in recommendation revisions. Second, suppose there was a significant price increase due to new positive information. An analyst with a "buy" or "strong buy" recommendation may have no reason to revise that recommendation. However, this information may be more likely to cause an upward earnings forecast or a target price revision. Similarly, suppose an analyst has a "sell" recommendation on a firm that has just released significant negative information that caused a significant negative price change. The analyst will have little motivation to revise the prior recommendation, but will have a higher likelihood of revising downward the prior earnings or target price forecasts. Finally, our monthly calendar time tests are more similar to decision making of long-term investors who perform infrequent balancing of their portfolios. Savor's daily rebalancing is more suitable for higher frequency traders and is likely to incur higher transaction costs.

A focal point of our study, as well as in Savor (2012), is the information provided to the market through equity analysts. There exists a vast literature showing analysts' earnings forecasts to be informative (see, e.g., Feldman *et al.*, 2012 for a short summary). It has also been shown that target price revisions provide information to investors (Brav and Lehavy, 2003; Feldman *et al.*, 2012; Da and Schaumburg, 2011). While Gleason *et al.* (2012) show a positive association between earnings forecast accuracy and target price target, Feldman *et al.* (2012) find that analysts' target price revisions combined with earnings

forecasts jointly provide even more information to investors. Thus, actions of financial analysts, by way of earnings forecast or target price revisions, are perceived by market participants to be driven by new information, and are typically associated with drift returns. Consequently, we use these revisions immediately after large price swing days to highlight potentially new information that market participants can use.

3 Sample and research design

The sample period in our study ranges from 1982 to 2011 for earnings forecast revisions, and from 1999 to 2011 for target price revisions. We designate Day 0 as a "large return day" when a common stock yields returns of 5% or greater, and −5% or less in a single day.[2] These stocks are selected from the *Center for Research in Security Prices* (CRSP) database. In addition, we impose the following additional criteria in selecting our: (1) We select only those firms whose market value exceeds $100 million on the large return day. This ensures that highly volatile small firms are excluded from our sample; (2) To avoid the problem of confounding events, we require that two adjacent large return days for a given firm are not within five days of each other. In some analyses, we separate stocks that experience high trading volume (defined as volume greater than 1.1 times the average trading volume over the prior 45 days) on a large return day from those that had low (normal) volume.

To investigate whether significant price swings are caused by new information, we examine whether analysts revise their earnings forecasts or target prices on or within five days after the price event.[3] We obtain earnings forecast and target price data from the Institutional Brokers' Estimates System (IBES) database. For a firm to be included in our sample, we require that the firm has analyst coverage during the 12 months prior to the large price swing. We compare an analyst's forecast of annual earnings and one-year-ahead stock price target, announced on or within five days after the large price move day, with the same analyst's prior forecast for the same period and the same company. If the forecast following a large price swing is higher (lower) than the prior one, we label it is a positive (negative) revision. A typical firm is usually followed by more than one analyst. Therefore, if a majority of analysts covering the firm with a large price swing revise upward (downward), we classify the analysts' collective response as a positive (negative) revision.[4]

Next, we investigate the market reaction subsequent to the large price swing. We examine both the short-term excess return[5] for days in the window ([+1, +5]), where Day 0 is the date of the large stock price move, and the longer term excess returns across different windows following Day +5 ([+6, +30], [+6, +60], and [+6, +90]). We use the windows from six days onward because we use analyst forecasts during days zero through five as an indication of new information released to the market that caused the significant price swing on Day 0 (or lack thereof). Excess return is calculated as the buy-and-hold return over the designated window minus the average buy-and-hold return on a portfolio of stocks with similar size (two groups), book-to-market ratio (three groups), and momentum (three groups). We also cross-tabulate results for short- and long-term post-event returns for firms experiencing large price increases and decreases, and examine how analyst forecast revisions affect the these returns. We then perform regression analysis to ensure that our results are not driven by confounding factors.

Based on the above results, we build various calendar-time monthly trading strategies designed to capture positive abnormal returns. Specifically, at the end of each calendar month, we construct portfolios consisting of long and

short positions. We identify firms with large price swings and immediate analyst forecast revisions that occur during the calendar month but prior to the last day of the month. We hold the portfolio for one month and then rebalance. To ensure sufficient diversification, we require at least 15 stocks for both the short and long sides of the portfolio, otherwise that month is excluded from our analyses.

4 Results

4.1 How do analysts respond to large price swings?

Table 1 shows the frequency of earnings forecast revisions following large price increases ($\geq 5\%$) or decreases ($\leq -5\%$). We focus on the annual earnings forecast revisions. After observing large price swings, an analyst can either issue a forecast higher or lower than their earlier one, or choose not to issue any new forecast.

Panel A shows that during the 1982–2011 period there are 722,688 large return days. Only 21.91% of the observations have their earnings forecasts revised on or within five days after the day of the large price swing.[6] This shows that analysts usually do not respond to large price changes with forecast revisions. Additionally, if they do respond, analysts tend to revise in the same direction as the price change, i.e., when there is a large price increase (decrease), analysts tend to revise the earnings forecast upward (downward).

To investigate whether the earnings forecast revision is related to trading volume on the large return day, we next divide the sample into two groups based on the trading volume. Panel B shows the frequency analysis for earnings forecast revisions for the group with high trading volume on the large price swing day (defined as above 110% of the average volume in the prior 45 days). Panel C shows similar analysis for the group with low trading volume. As is evident from Panels B and C, when trading volume is high on a large price swing day, analysts are more likely to revise their earnings forecast (25.89% of the time) relative to low-trading volume days (15.84% of the time).

We conduct similar analysis for target price revisions. Table 2 shows the frequency analysis for target price revisions following large price increases ($\geq 5\%$) or decreases ($\leq -5\%$). During the 1999–2011 period, there are 444,164 high return days.[7] Of these, 18.21% are followed by target price revisions on or within five days after the large price swing. This is lower than the percentage of earnings forecast revisions, and is consistent with Feldman *et al.* (2012), who document significantly more earnings forecast revisions than target price revisions. As is the case with earnings forecast revisions, analysts are more likely to revise the target price when trading volume is high.

Overall, we find that only a small proportion of all large return days are associated with analyst earnings forecast or target price revisions, indicating that a majority of these events may not be driven by significant new information about the firm.[8]

4.2 Large price swings, analyst forecast revisions, and subsequent returns

Panel A in Table 3 shows short- and long-term returns after a large price swing during the 1982–2011 period. A breakdown of these post-event returns is provided for price moves that are associated with abnormal volume and those without. Contrary to the typical findings on short-term reversals, we find that after a significant drop in price, there is a short-term bounce-back in the five days immediately afterward, but then it reverses and price declines continue for the next 30, 60, and even for 90 days. Note, however, that when

Table 1 Frequency analysis of earnings forecast revisions following large price moves.

	Daily return		
Earnings forecast revision	$\leq -5\%$	$\geq 5\%$	Total
Panel A: Large price moves and earnings forecast revisions			
No revision	236,866	327,508	564,374
	32.78%	45.31%	78.09%
Negative	49,983	37,483	87,466
	6.92%	5.19%	12.11%
Positive	23,898	46,950	70,848
	3.30%	6.50%	9.80%
Total	310,747	411,941	722,688
	43.00%	57.00%	100%
Panel B: Large price moves and earnings forecast revisions when trading volume is high			
No revision	119,289	204,062	323,351
	27.34%	46.77%	74.11%
Negative	35,744	24,732	60,476
	8.19%	5.67%	13.86%
Positive	15,441	37,022	52,463
	3.54%	8.49%	12.03%
Total	170,474	265,816	436,290
	39.07%	60.93%	100%
Panel C: Large price swings and earnings forecast revisions when trading volume is low			
No revision	117,577	123,446	241,023
	41.06%	43.10%	84.16%
Negative	14,239	12,751	26,990
	4.97%	4.45%	9.42%
Positive	8,457	9,928	18,385
	2.95%	3.47%	6.42%
Total	140,273	146,125	286,398
	48.98%	51.02%	100%

Panel A reports whether and how analysts revise forecasts for annual earnings on or within five days after a large price move day. "No revision" means that analysts do not issue any earnings forecast on or within five days after a large price move day, or that the newly issued earnings forecast is the same as the previous one. "Negative" ("Positive") means that among the analysts following a given firm, the majority makes a downward (upward) revision. Panel B reports frequency analysis for the subsample with high trading volume on the large return day. Panel C reports frequency analysis for the subsample with low trading volume on the large return day. Trading volume is defined as high if it is greater than 1.1 times the average trading volume over prior 45 days and as low otherwise.

Table 2 Frequency analysis of target price revisions following large price moves.

	Daily return		
Target price revision	$\leq -5\%$	$\geq 5\%$	Total
Panel A: Large price moves and target price revisions			
No revision	160,820	202,446	363,266
	36.21%	45.58%	81.79%
Negative	26,809	12,584	39,393
	6.04%	2.83%	8.87%
Positive	11,058	30,447	41,505
	2.49%	6.85%	9.34%
Total	198,687	245,477	444,164
	44.74%	55.26%	100%
Panel B: Large price moves and target price revisions when trading volume is high			
No revision	80,059	118,914	198,973
	30.57%	45.40%	75.97%
Negative	20,996	8,096	29,092
	8.02%	3.09%	11.11%
Positive	7,967	25,891	33,858
	3.03%	9.89%	12.92%
Total	109,022	152,901	261,923
	41.62%	58.38%	100%
Panel C: Large price moves and target price revisions when trading volume is low			
No revision	80,761	83,532	164,293
	44.31%	45.84%	90.15%
Negative	5,813	4,488	10,301
	3.19%	2.46%	5.65%
Positive	3,091	4,556	7,647
	1.70%	2.50%	4.20%
Total	89,665	92,576	182,241
	49.20%	50.80%	100%

Panel A reports whether and how analysts revise one-year ahead target prices on or within five days after a large price move day. "No revision" means that analysts do not issue any target price forecast on or within five days after a large price move day, or that the newly issued target price is the same as the previous one. "Negative" ("Positive") means that, among the analysts following the same firm, the majority makes a downward (upward) revision. Panel B reports frequency analysis for the subsample with high trading volume on the large return day. Panel C reports frequency analysis for the subsample with low trading volume on the large return day. Trading volume is high if it is greater than 1.1 times the average trading volume over prior 45 days and as low otherwise.

Table 3 Returns following large price moves.

Panel A: Cross-tabulation

Daily return	Trading volume	Variable	Mean	*N*	Pr > |*t*|
< −5%	Low	xret[+1, +5]	0.0002	140,273	0.2846
		xret[+6, +30]	−0.0020	140,273	< 0.0001
		xret[+6, +60]	−0.0067	140,273	< 0.0001
		xret[+6, +90]	−0.0115	140,273	< 0.0001
	High	xret[+1, +5]	0.0007	170,474	< 0.0001
		xret[+6, +30]	−0.0008	170,474	0.019
		xret[+6, +60]	−0.0037	170,474	< 0.0001
		xret[+6, +90]	−0.0061	170,474	< 0.0001
> 5%	Low	xret[+1, +5]	−0.0026	146,125	< 0.0001
		xret[+6, +30]	−0.0073	146,125	< 0.0001
		xret[+6, +60]	−0.0094	146,125	< 0.0001
		xret[6, 90]	−0.0117	146,125	< 0.0001
	High	xret[+1, +5]	−0.0014	265,816	< 0.0001
		xret[+6, +30]	−0.0016	265,816	< 0.0001
		xret[+6, +60]	−0.0029	265,816	< 0.0001
		xret[+6, +90]	−0.0043	265,816	< 0.0001

This panel reports both short-term ([+1, +5]) and long-term ([+6, +30], [+6, +60], [+6, +90]) returns after a large return day (Day 0). A large return day is the day on which a firm's stock price increases or decreases by more than 5%. High (low) trading volume means that the trading volume on the high return day is greater (less) than 1.1 times the average trading volume of prior 45 days. xret[m, n] is the buy-and-hold return for a particular stock over the designated window [m, n] minus the average buy-and-hold return on a portfolio of stocks of similar size, book-to-market ratio, and momentum.

Panel B: Regression analysis

	xret[+1, +5]	xret[+6, +30]	xret[+6, +60]	xret[+6, +90]
Intercept	−0.002	−0.003	−0.004	−0.005
	(−5.00)	(−2.88)	(−1.84)	(−1.53)
$Dret_0$	**−0.003**	**−0.003**	**−0.007**	**−0.010**
	(−3.29)	(−1.63)	(−2.44)	(−2.83)
Down	0.004	0.008	0.007	0.007
	(5.66)	(5.58)	(3.35)	(2.86)
Dretdown	**0.005**	**0.017**	**0.024**	**0.034**
	(2.73)	(4.07)	(4.20)	(4.53)
Dmve	−0.001	−0.001	0.002	0.006
	(−1.16)	(−0.59)	(0.61)	(1.00)

Table 3 (*Continued*)
Panel B (*Continued*)

	xret[+1, +5]	xret[+6, +30]	xret[+6, +60]	xret[+6, +90]
Dbm	0.002	0.005	0.007	0.006
	(3.96)	(3.34)	(2.00)	(1.20)
Dmom	0.003	0.008	0.012	0.013
	(5.35)	(6.07)	(4.68)	(3.66)
Dvol	0.001	0.003	0.000	−0.003
	(1.03)	(1.20)	(0.02)	(−0.32)
N	100	100	100	100
R^2	0.68%	0.87%	1.24%	1.60%

This panel reports the average coefficient estimates for the following quarterly cross-sectional regression (Fama–MacBeth regressions):

$$XRET_{m,n} = \alpha + \beta_1 Dret_0 + \beta_2 Down + \beta_3 Dretdown + \beta_4 Dmve + \beta_5 Dbm + \beta_6 Dmom + \beta_7 Dvol + \varepsilon$$

$XRET_{m,n}$ is the buy-and-hold return for a particular stock over the designated window $[m, n]$ minus the average buy-and-hold return on a portfolio of stocks of similar size, book-to-market ratio, and momentum. $Dret_0$ is the decile of raw return on the large price swing day. *Down* is a dummy variable, which is equal to 1 if the stock return on large swing day is negative and zero otherwise. *Dretdown* is the $Dret_0$ multiplied by *Down*. *Dmve* is the decile of market value of equity. *Dbm* is the decile of book-to-market ratio. *Dmom* is the decile of momentum, which is the buy-and-hold return during the previous 12 months. *Dvol* is the decile of trading volume on the large price swing day. *t*-Statistics are reported in parentheses.

the initial price decline is associated with high volume, the subsequent drift returns are less negative on average than when price declines are associated with normal volume. This is consistent with the hypothesis that lower trading volumes indicate less investor attention, leading to more post-event drift.

In contrast, after a significant increase in price, we document reversals both over the short- and the long-term, irrespective of whether volume at the time of the initial price swing was high or low. Therefore, we show that price reversals are more likely after large positive returns, but not after large negative returns. This result is consistent with the existence of short-selling constraints, which may make it harder for arbitragers to immediately counteract price increases than price decreases.

To check that the return patterns documented in Panel A are not caused by confounding factors, we now estimate the following empirical model:

$$\begin{aligned} XRET_{m,n} = \alpha &+ \beta_1 Dret_0 + \beta_2 Down \\ &+ \beta_3 Dretdown + \beta_4 Dmve \\ &+ \beta_5 Dbm + \beta_6 Dmom \\ &+ \beta_7 Dvol + \varepsilon \end{aligned}$$

where

$XRET_{m,n}$: the buy-and-hold return for a stock over a designated window $[m, n]$ minus the average buy-and-hold return on a portfolio of stocks of similar size, book-to-market ratio, and momentum.

$Dret_0$: the decile of raw return on the large price swing day.

Down : a dummy variable, which is equal to 1 if the stock return on large swing day is negative and 0 otherwise.

Dretdown : $Dret_0$ multiplied by *Down*.

Dmve : the decile of market value of equity.

Dbm : the decile of book-to-market ratio.

Dmom : the decile of momentum, which is defined as the buy-and-hold return during the previous 12 months ($t - 12$ through $t - 1$).

Dvol : the decile of trading volume on the large price swing day.

We conduct our analysis using deciles to mitigate the influence of outliers on our results. We rank variables within each quarter into deciles (0–9), divide by 9, and subtract 0.5. Thus, each decile variable has a value between -0.5 and 0.5 and the coefficients of decile variables provide an estimate of the return differential between firms that are in the bottom and top deciles. We estimate coefficients and standard errors using quarterly Fama–MacBeth regressions.

In Panel B in Table 3, the negative and significant coefficient on $Dret_0$ implies that large price increases are followed by reversals. In contrast, the coefficient on the interaction term *Dretdown* is significant and positive, which further confirms that price reversals occur after large positive returns, but not after large negative returns. Additionally, the sum of the coefficients on $Dret_0$ and *Dretdown* is positive, suggesting that there is actually a negative drift after large price decreases, rather than reversal, as is the case after large price increases.

Next, we explore the impact of earnings forecast revisions on returns after large price swings. As mentioned earlier, analysts may choose to revise their earnings forecasts in the direction of the initial price swing or in the opposite direction. Panel A in Table 4 shows that, consistent with prior findings about the effects of earnings forecast revisions on stock prices (see, e.g., Feldman

Table 4 Returns after large price moves: The impact of analyst forecast revisions.

Panel A: Returns after large price moves: The impact of earnings forecast revisions

Daily return	EF revision	Variable	Mean	*N*	Pr > |*t*|
≤ −5%	No revision	xret[+1, +5]	0.0012	236,866	< 0.0001
		xret[+6, +30]	−0.0013	236,866	0.0001
		xret[+6, +60]	−0.0054	236,866	< 0.0001
		xret[+6, +90]	−0.0092	236,866	< 0.0001
	Negative	xret[+1, +5]	−0.0074	49,983	< 0.0001
		xret[+6, +30]	−0.0042	49,983	< 0.0001
		xret[+6, +60]	−0.0059	49,983	< 0.0001
		xret[+6, +90]	−0.0108	49,983	< 0.0001
	Positive	xret[+1, +5]	0.0094	23,898	< 0.0001
		xret[+6, +30]	0.0041	23,898	< 0.0001
		xret[+6, +60]	0.0006	23,898	0.6519
		xret[+6, +90]	0.0028	23,898	0.1079
≥ 5%	No revision	xret[+1, +5]	−0.0019	327,508	< 0.0001
		xret[+6, +30]	−0.0047	327,508	< 0.0001
		xret[+6, +60]	−0.0066	327,508	< 0.0001
		xret[+6, +90]	−0.0088	327,508	< 0.0001
	Negative	xret[+1, +5]	−0.0098	37,483	< 0.0001
		xret[+6, +30]	−0.0069	37,483	< 0.0001

Table 4 (*Continued*)

Panel A (*Continued*)

Daily return	EF revision	Variable	Mean	*N*	Pr > |*t*|
		xret[+6, +60]	−0.0108	37,483	< 0.0001
		xret[+6, +90]	−0.0152	37,483	< 0.0001
	Positive	xret[+1, +5]	0.0047	46,950	< 0.0001
		xret[+6, +30]	0.0066	46,950	< 0.0001
		xret[+6, +60]	0.0088	46,950	< 0.0001
		xret[+6, +90]	0.0126	46,950	< 0.0001

Panel B: Returns after large price moves: The impact of target price revisions

Daily return	TP revision	Variable	Mean	*N*	Pr > |*t*|
≤ −5%	No revision	xret[+1, +5]	0.0004	160,820	0.0189
		xret[+6, +30]	−0.0004	160,820	0.3791
		xret[+6, +60]	−0.0026	160,820	< 0.0001
		xret[+6, +90]	−0.0048	160,820	< 0.0001
	Negative	xret[+1, +5]	−0.0107	26,809	< 0.0001
		xret[+6, +30]	−0.0019	26,809	0.0283
		xret[+6, +60]	−0.0023	26,809	0.0642
		xret[+6, +90]	−0.0035	26,809	0.0259
	Positive	xret[+1, +5]	0.0120	11,058	< 0.0001
		xret[+6, +30]	0.0044	11,058	0.0004
		xret[+6, +60]	0.0069	11,058	0.0003
		xret[+6, +90]	0.0098	11,058	< 0.0001
≥ 5%	No revision	xret[+1, +5]	−0.0013	202,446	< 0.0001
		xret[+6, +30]	−0.0028	202,446	< 0.0001
		xret[+6, +60]	−0.0024	202,446	< 0.0001
		xret[+6, +90]	−0.0020	202,446	0.0039
	Negative	xret[+1, +5]	−0.0132	12,584	< 0.0001
		xret[+6, +30]	−0.0030	12,584	0.0225
		xret[+6, +60]	−0.0026	12,584	0.1589
		xret[+6, +90]	−0.0084	12,584	0.0003
	Positive	xret[+1, +5]	0.0069	30,447	< 0.0001
		xret[+6, +30]	0.0062	30,447	< 0.0001
		xret[+6, +60]	0.0110	30,447	< 0.0001
		xret[+6, +90]	0.0146	30,447	< 0.0001

Panels A and B report the impact of earnings forecast and target price revisions, respectively, on returns after large price swings. "No revision" means that analysts do not issue any forecast on or within five days after the large price swing day or the newly issued forecast is the same as the prior forecast. "Negative" ("Positive") means that among the analysts following the same firm, the majority makes a downward (upward) revision. xret[m, n] is the buy-and-hold return for stocks conditioned on large price changes and analyst forecast revisions over the designated window [m, n] minus the average buy-and-hold return on a portfolio of stocks of similar size, book-to-market ratio, and momentum.

et al., 2012), when analysts revise earnings forecasts upward the average drift is positive, and the opposite is true for downward revisions. However, the panel reveals an additional interesting phenomenon. When the initial large price swing is negative, and analysts revise their earnings forecasts upward, the return from that point onwards is positive and significant. This suggests that market participants tend to value analyst pronouncements more than the information, if any, conveyed by the initial price decline. Additionally, when a large price move is not accompanied by immediate earnings forecast revisions, we document reversals after large price increases, and downward drift after large price decreases. This is consistent with the findings in Table 3. Panel B replicates the results in Panel A when we rely on analyst target price revisions instead of earnings forecast revisions, and shows that the results are very similar.

As discussed earlier, volume may represent a proxy for investor attention, which could impact post-event return patterns. Consequently, we now examine whether trading volume can strengthen our results above. Panel A in Table 5 shows that when analysts revise their earnings forecast upward (downward) after an initial large price increase (decrease), stock returns exhibit positive (negative) drift, and this effect is stronger for large price increases (decreases) accompanied by high (low) volume. Panel B in Table 5 documents similar findings for target price revisions. These results confirm that trading volume on the large return day has a significant impact on post-price shock returns.

As before, to ensure that the impact of analyst forecast revisions on returns following large price changes is not driven by confounding factors, we estimate the following regression:

$$\begin{aligned} XRET_{m,n} = {} & \alpha + \beta_1 Dret_0 + \beta_2 confirm \\ & + \beta_3 Dretconfirm + \beta_4 conflict \\ & + \beta_5 Dretconflict + \beta_6 Dmve \\ & + \beta_7 Dbm + \beta_8 Dmom \\ & + \beta_9 Dvol + \varepsilon \end{aligned}$$

where

$XRET_{m,n}$: the buy-and-hold return for a stock the designated window $[m, n]$ minus the average buy-and-hold return on a portfolio of stocks of similar size, book-to-market ratio, and momentum.

$Dret_0$: the decile of raw return on the large price swing day.

Confirm : a dummy variable that takes the value of 1 if analysts revise earnings forecasts or target prices in a manner consistent with the initial large price change and 0 otherwise.

Dretconfirm : $Dret_0$ multiplied by *confirm*.

Conflict : a dummy variable that takes the value of 1 if earnings forecast or target price revisions are in the opposite direction to the initial large price change and 0 otherwise.

Dretconflict : Dret_0 multiplied by conflict.

Dretdown : Dret_0 multiplied by Down.

Dmve : the decile of market value of equity.

Dbm : the decile of book-to-market ratio.

Dmom : the decile of momentum, which is the buy-and-hold return during the previous 12 months.

Dvol : the decile of trading volume on the large price swing day.

In Panel A in Table 6, the coefficient on $Dret_0$ is negative, which implies that on average there is return reversal after the initial large price change when it is unaccompanied by earnings forecast revisions. However, when initial price shocks are followed by earnings forecast revisions in the same direction, we find evidence of drift, as the

Table 5 Returns after large price moves: The impact of trading volume and analyst forecast revisions.
Panel A: Returns after large price moves: The impact of earnings forecast revisions and trading volume

Daily return	Trading volume	EF revision	Variable	Mean	*N*	Pr > |*t*|
≤ −5%	Low	No revision	xret[+1, +5]	0.0006	117,577	0.0113
			xret[+6, +30]	−0.0021	117,577	< 0.0001
			xret[+6, +60]	−0.0073	117,577	< 0.0001
			xret[+6, +90]	−0.0124	117,577	< 0.0001
		Negative	xret[+1, +5]	−0.0097	14,239	< 0.0001
			xret[+6, +30]	−0.0061	14,239	< 0.0001
			xret[+6, +60]	−0.0088	14,239	< 0.0001
			xret[+6, +90]	−0.0151	14,239	< 0.0001
		Positive	xret[+1, +5]	0.0122	8,457	< 0.0001
			xret[+6, +30]	0.0066	8,457	< 0.0001
			xret[+6, +60]	0.0050	8,457	0.0498
			xret[+6, +90]	0.0074	8,457	0.0335
	High	No revision	xret[+1, +5]	0.0019	119,289	< 0.0001
			xret[+6, +30]	−0.0005	119,289	0.2566
			xret[+6, +60]	−0.0036	119,289	< 0.0001
			xret[+6, +90]	−0.0060	119,289	< 0.0001
		Negative	xret[+1, +5]	−0.0065	35,744	< 0.0001
			xret[+6, +30]	−0.0034	35,744	< 0.0001
			xret[+6, +60]	−0.0048	35,744	< 0.0001
			xret[+6, +90]	−0.0091	35,744	< 0.0001
		Positive	xret[+1, +5]	0.0078	15,441	< 0.0001
			xret[+6, +30]	0.0028	15,441	0.0054
			xret[+6, +60]	−0.0018	15,441	0.2275
			xret[+6, +90]	0.0003	15,441	0.8687
≥ 5%	Low	No revision	xret[+1, +5]	−0.0024	123,446	< 0.0001
			xret[+6, +30]	−0.0077	123,446	< 0.0001
			xret[+6, +60]	−0.0099	123,446	< 0.0001
			xret[+6, +90]	−0.0125	123,446	< 0.0001
		Negative	xret[+1, +5]	−0.0118	12,751	< 0.0001
			xret[+6, +30]	−0.0111	12,751	< 0.0001
			xret[+6, +60]	−0.0133	12,751	< 0.0001
			xret[+6, +90]	−0.0163	12,751	< 0.0001
		Positive	xret[+1, +5]	0.0066	9,928	< 0.0001
			xret[+6, +30]	0.0023	9,928	0.1038
			xret[+6, +60]	0.0025	9,928	0.2398
			xret[+6, +90]	0.0037	9,928	0.1796

Table 5 (*Continued*)
Panel A (*Continued*)

Daily return	Trading volume	EF revision	Variable	Mean	*N*	Pr > |*t*|
	High	No revision	xret[+1, +5]	−0.0016	204,062	< 0.0001
			xret[+6, +30]	−0.0029	204,062	< 0.0001
			xret[+6, +60]	−0.0045	204,062	< 0.0001
			xret[+6, +90]	−0.0066	204,062	< 0.0001
		Negative	xret[+1, +5]	−0.0087	24,732	< 0.0001
			xret[+6, +30]	−0.0047	24,732	< 0.0001
			xret[+6, +60]	−0.0096	24,732	< 0.0001
			xret[+6, +90]	−0.0146	24,732	< 0.0001
		Positive	xret[+1, +5]	0.0042	37,022	< 0.0001
			xret[+6, +30]	0.0077	37,022	< 0.0001
			xret[+6, +60]	0.0105	37,022	< 0.0001
			xret[+6, +90]	0.0150	37,022	< 0.0001

Panel B: Returns after large price moves: The impact of trading volume and target price revisions

Daily return	Trading volume	TP revision	Variable	Mean	*N*	Pr > |*t*|
≤ −5%	Low	No revision	xret[+1, +5]	−0.0002	80,761	0.4988
			xret[+6, +30]	−0.0019	80,761	0.0044
			xret[+6, +60]	−0.0057	80,761	< 0.0001
			xret[+6, +90]	−0.0095	80,761	< 0.0001
		Negative	xret[+1, +5]	−0.0187	5,813	< 0.0001
			xret[+6, +30]	−0.0047	5,813	0.0461
			xret[+6, +60]	−0.0064	5,813	0.0525
			xret[+6, +90]	−0.0162	5,813	< 0.0001
		Positive	xret[+1, +5]	0.0180	3,091	< 0.0001
			xret[+6, +30]	0.0079	3,091	0.0051
			xret[+6, +60]	0.0091	3,091	0.0313
			xret[+6, +90]	0.0088	3,091	0.0934
	High	No revision	xret[+1, +5]	0.0011	80,059	< 0.0001
			xret[+6, +30]	0.0011	80,059	0.0392
			xret[+6, +60]	0.0004	80,059	0.5901
			xret[+6, +90]	0.0000	80,059	0.9918
		Negative	xret[+1, +5]	−0.0085	20,996	< 0.0001
			xret[+6, +30]	−0.0011	20,996	0.2129
			xret[+6, +60]	−0.0012	20,996	0.3705
			xret[+6, +90]	0.0001	20,996	0.9644
		Positive	xret[+1, +5]	0.0097	7,967	< 0.0001
			xret[+6, +30]	0.0031	7,967	0.0222

Table 5 (*Continued*)
Panel B (*Continued*)

Daily return	Trading volume	TP revision	Variable	Mean	*N*	Pr > |*t*|
			xret[+6, +60]	0.0060	7,967	0.0039
			xret[+6, +90]	0.0101	7,967	0.0002
≥ 5%	Low	No revision	xret[+1, +5]	−0.0018	83,532	< 0.0001
			xret[+6, +30]	−0.0051	83,532	< 0.0001
			xret[+6, +60]	−0.0055	83,532	< 0.0001
			xret[+6, +90]	−0.0057	83,532	< 0.0001
		Negative	xret[+1, +5]	−0.0165	4,488	< 0.0001
			xret[+6, +30]	−0.0063	4,488	0.0102
			xret[+6, +60]	−0.0069	4,488	0.0403
			xret[+6, +90]	−0.0130	4,488	0.0017
		Positive	xret[+1, +5]	0.0120	4,556	< 0.0001
			xret[+6, +30]	0.0011	4,556	0.5884
			xret[+6, +60]	0.0072	4,556	0.0214
			xret[+6, +90]	0.0086	4,556	0.0344
	High	No revision	xret[+1, +5]	−0.0010	118,914	< 0.0001
			xret[+6, +30]	−0.0012	118,914	0.0106
			xret[+6, +60]	−0.0002	118,914	0.7461
			xret[+6, +90]	0.0005	118,914	0.5504
		Negative	xret[+1, +5]	−0.0113	8,096	< 0.0001
			xret[+6, +30]	−0.0011	8,096	0.4528
			xret[+6, +60]	−0.0002	8,096	0.9204
			xret[+6, +90]	−0.0058	8,096	0.0364
		Positive	xret[+1, +5]	0.0060	25,891	< 0.0001
			xret[+6, +30]	0.0071	25,891	< 0.0001
			xret[+6, +60]	0.0117	25,891	< 0.0001
			xret[+6, +90]	0.0157	25,891	< 0.0001

Panels A and B report the joint impact of trading volume and earnings forecast and target price revisions, respectively, on returns after large price moves. High (low) trading volume means that the trading volume on the large return day is greater (less) than 1.1 times the average trading volume of prior 45 days."No revision" means that analysts do not issue any forecast on or within five days after the large price move day, or that the newly issued forecast is the same as the prior forecast. "Negative" ("Positive") means that among the analysts following the same firm, the majority makes a downward (upward) revision. xret[m, n] is the buy-and-hold return for a particular stock over the designated window [m, n] minus the average buy-and-hold return on a portfolio of stocks of similar size, book-to-market ratio, and momentum.

sum of coefficients on $Dret_0$ and *Dretconfirm* is positive. If analysts revise earnings forecasts in the opposite direction to initial price changes, we find stronger reversal than in the case with no revisions, as evidenced by the negative and significant coefficient of *Dretconflict*. Panel B of Table 6 documents similar findings for target price revisions, though the impact of target price revisions on future returns is weaker than that of earnings forecast revisions.

Table 6 Regression analysis: The effect of analyst forecast revisions on returns after large price moves.

Panel A: The effect of earnings forecast revisions on returns after large price moves

	xret[+6, +30]	xret[+6, +60]	xret[+6, +90]
Intercept	−0.003	−0.005	−0.007
	(−2.63)	(−2.38)	(−2.33)
$Dret_0$	**−0.007**	**−0.006**	**−0.006**
	(−4.49)	(−3.30)	(−2.40)
Confirm	0.004	0.007	0.008
	(5.84)	(4.59)	(4.42)
Dretconfirm	**0.021**	**0.024**	**0.035**
	(10.07)	(6.68)	(7.88)
Conflict	0.000	−0.001	−0.001
	(0.43)	(−1.01)	(−0.72)
Dretconflict	**−0.009**	**−0.013**	**−0.023**
	(−3.13)	(−2.89)	(−4.22)
Dmve	−0.002	0.003	0.006
	(−0.80)	(0.68)	(1.11)
Dbm	0.005	0.007	0.007
	(3.50)	(2.10)	(1.31)
Dmom	0.007	0.010	0.012
	(5.46)	(4.30)	(3.25)
Dvol	0.002	−0.001	−0.004
	(0.94)	(−0.22)	(−0.54)
N	100	100	100
R^2	0.95%	1.36%	1.72%

Panel B: The effect of target price revisions on returns after large price moves

Intercept	−0.001	−0.001	0.000
	(−0.83)	(−0.31)	(−0.11)
$Dret_0$	**−0.008**	**−0.009**	**−0.009**
	(−4.62)	(−3.92)	(−2.74)
Confirm	0.005	0.008	0.009
	(2.78)	(2.70)	(2.47)
Dretconfirm	**0.017**	**0.014**	**0.024**
	(6.74)	(1.72)	(5.39)
Conflict	0.001	0.002	0.000
	(0.84)	(0.75)	(0.04)

Table 6 (*Continued*)
Panel B (*Continued*)

	xret[+6, +30]	xret[+6, +60]	xret[+6, +90]
Dretconflict	**−0.001**	**−0.006**	**−0.021**
	(−0.20)	(−0.77)	(−2.05)
Dmve	−0.004	0.001	0.005
	(−1.33)	(0.21)	(0.53)
Dbm	0.003	0.003	0.000
	(1.40)	(0.50)	(0.02)
Dmom	0.005	0.004	0.003
	(2.34)	(1.11)	(0.55)
Dvol	0.004	0.002	0.000
	(0.89)	(0.17)	(0.01)
N	52	52	52
R^2	0.97%	1.34%	1.70%

This table reports the average coefficient estimates for the following quarterly cross-sectional regression:

$$XRET_{m,n} = \alpha + \beta_1 Dret_0 + \beta_2 confirm + \beta_3 Dretconfirm + \beta_4 conflict + \beta_5 Dretconflict + \beta_6 Dmve + \beta_7 Dbm + \beta_8 Dmom + \beta_9 Dvol + \varepsilon$$

$XRET_{m,n}$ is the buy-and-hold return for a stock over the designated window $[m, n]$ minus the average buy-and-hold return on a portfolio of stocks of similar size, book-to-market ratio, and momentum. $Dret_0$ is the decile of raw return on the large price swing day. *Confirm* is a dummy variable that takes the value of 1 if analysts revise earnings forecasts or target prices in a manner consistent with the initial price change and zero otherwise. *Dretconfirm* is $Dret_0$ multiplied by confirm. *Conflict* is a dummy variable that takes the value of 1 if earnings forecast or target price revisions are in the opposite direction to initial price change and zero otherwise. *Dretconflict* is $Dret_0$ multiplied by conflict. *Dretdown* is $Dret_0$ multiplied by *Down*. *Dmve* is the decile of market value of equity. *Dbm* is the decile of book-to-market ratio. *Dmom* is the decile of momentum, which is the buy-and-hold return during the previous 12 months. *Dvol* is the decile of trading volume on the large price swing day. *t*-Statistics are reported in parentheses.

Overall, we find that we can predict subsequent returns following large price shocks better if we condition on whether analysts revise earnings forecasts or target prices in a manner consistent with the initial price change.

Before proceeding to examine a trading strategy based on the above findings, we verify that large price changes and associated analyst revisions are indeed caused by new information. We follow Chan (2003), who uses media news stories about companies to identify information events.[9]

We rely on three different sources to identify informative events. The first is the Dow Jones (DJ) articles on firms during the years 1997–2011. We use DJ stories that have at least 20 words. Prior to the year 1997, the number of stories captured in the database is significantly smaller, so our analysis spans the years from 1997–2011 period. The second is the Key Developments dataset compiled by Capital IQ, which is available from the year 2002. Key Developments refers to a dataset compiled by Capital IQ. The dataset includes many types of events that affect

firms, including earnings announcements, major customer and product announcements, board membership or key executive changes, M&A, dividend changes, etc. The data coverage is spotty prior to 2002, so we use it only for the 2002–2011 period.[10] The third is the original Form 8-K filed by companies since the year 2004. The SEC requires firms to file a Form 8-K whenever they experience a material event that falls into several defined categories. Covered events include material definitive contracts, bankruptcy, earnings announcements, board and key executive changes, auditor changes, restatements, etc. In 2004, the SEC expanded the required categories, and promulgated faster filings after the events. Thus, our data, which is based on the S&P Filing Dates database, is limited to the 2004–2011 period.

For each of these sources, we examine whether there is public information released during the period [−1, +5], where Day 0 is the large price change day. Since our analyst revision measures are released during the interval [0, +5], we are attempting to capture public information that was disclosed in the relevant period, causing either the large price change or the analyst revision (or both).

Panel A of Table 7 shows the probability of news releases from Dow Jones, Key Developments, and Form 8-K (in the window [−1, +5] relative to the large price change day, Day 0) conditional on whether there are earnings forecast or target price revisions in the window [0, +5]. As one can easily see, when there are analyst revisions, the probability of public news about the firm being released

Table 7 Analyst forecast revisions and public information.

Earnings forecast revisions	Dow Jones	Key Developments	Form 8-K
Panel A: All large price changes			
Yes	70%	72%	59%
No	38%	38%	21%
Prob. of Chi-Square statistics	< 0.0001	< 0.0001	< 0.0001
Target price revisions			
Yes	78%	75%	77%
No	41%	38%	41%
Prob. of Chi-Square statistics	< 0.0001	< 0.0001	< 0.0001
Panel B: All large price changes excluding earnings announcements			
Yes	63%	61%	43%
No	36%	35%	18%
Prob. of Chi-Square statistics	< 0.0001	< 0.0001	< 0.0001
Target price revisions			
Yes	71%	63%	65%
No	39%	36%	39%
Prob. of Chi-Square statistics	< 0.0001	< 0.0001	< 0.0001

The table shows the probability of news releases from Dow Jones, Key Developments, and Form 8-K (in the window [−1, +5] relative to the large price change day, Day 0) conditional on whether there are earnings forecast or target price revisions in the window [0, +5]. Panel A reports results for all large price changes observations with available data from Dow Jones, Key Developments, and SEC Form 8-K. Panel B repeats the analysis in Panel A, after excluding large price changes that occur simultaneously with earnings announcements.

is roughly twice as high compared to the case with no analyst revisions. For example, at least one Dow Jones story comes out for 70% of large price changes associated with analysts' earnings forecast revisions, but only for 38% of large price changes without earnings revisions. The probability of observing such percentages if forecast revisions were indeed random and equally likely are extremely small (less than 0.0001 according to the Chi-Square statistical test).

Panel B of Table 7 repeats the analysis in Panel A, after excluding large price changes that occur simultaneously with earnings announcements (about 40% of analyst revisions occur after earnings announcement). The percentage of firms with some form of public news when analysts revise their earnings forecasts or price targets drops for this case, but is still above 60%, and almost twice as high as when analysts do not revise. Thus, our results remain intact when we exclude earnings announcements.

Given these findings, we conclude that analyst revisions in our sample are indeed much more likely to be associated with new information about the company that is released during the same period.

4.3 Trading strategy and portfolio returns

In this subsection, we test whether the previous findings can lead to a profitable trading strategy. To make our analysis meaningful for practical applications, we use a calendar-time monthly portfolio approach.

Specifically, at the end of each calendar month we construct our portfolios of long and short positions, which are held for one month until the next rebalancing. We identify firms with large price swings and immediate analyst forecast revisions that occur during the calendar month but prior to the last day of the month.[11] This ensures that on the last day of the month we can actually form our portfolios using available information about daily returns, trading volume, and analyst forecast revision as of that day. We hold long positions in stocks with large daily price increases and immediate positive earnings forecast or target price revisions. We hold short positions in stocks with large daily price decreases and immediate negative target price or earnings forecast revisions (this strategy is referred as Strategy 1 hereafter). The resulting portfolio is held for a month. To ensure sufficient diversification, we require at least 15 stocks for both the short and long sides of the portfolio. Excess return is calculated as the buy-and-hold return on a portfolio stock minus the average buy-and-hold return on a portfolio of stocks with similar size, book-to-market ratio, and momentum characteristics. Additionally, as Table 5 shows that trading volume can strengthen our results, we analyze excess returns of portfolios constructed on information about large price moves, trading volume, and analyst forecast revisions.

Table 8 provides information on the average monthly excess return for various trading strategies. Panels A and B report the results for earnings forecast and target price revisions, respectively. For the case of earnings forecast revisions (Panel A), the average monthly excess return to Strategy 1 is 1.17% (t-stat = 8.06) during the 304 calendar months from 1982 to 2011 with enough securities on each side of the trading strategy. The average number of long and short positions in each monthly portfolio is 141 and 154, respectively. With respect to target price revisions (Panel B), the average monthly excess return to Strategy 1 is 1.09% (t-stat = 4.42) during the 148 calendar months from 1999 to 2011, with 191 long and 171 short positions on average.

When we also use trading volume in constructing our portfolios, conditioning on high volume for

Table 8 Calendar-time monthly portfolio strategy.

Panel A: Constructing portfolios based on large price moves and earnings forecast revisions

Trading strategy	Variable	*N*	Mean	Std. Dev.	*t*	Prob.
Strategy 1	hedge	304	0.0117	0.0254	8.06	< 0.0001
	long	304	0.0053	0.0251	3.67	0.0003
	short	304	0.0065	0.0261	4.32	< 0.0001
	*n*long	304	141			
	*n*short	304	154			
Strategy 2	hedge	309	0.0029	0.0151	3.40	0.0008
	long	309	−0.0015	0.0235	−1.12	0.2643
	short	309	0.0044	0.0198	3.91	0.0001
	*n*long	309	374			
	*n*short	309	853			
Strategy 3	hedge	309	0.0043	0.0149	5.10	< 0.0001
	long	309	−0.0005	0.0231	−0.34	0.7307
	short	309	0.0048	0.0197	4.27	< 0.0001
	*n*long	309	387			
	*n*short	309	935			
Strategy 4	hedge	309	0.0043	0.0131	5.80	< 0.0001
	long	309	0.0002	0.0217	0.13	0.8947
	short	309	0.0042	0.0198	3.71	0.0002
	*n*long	309	423			
	*n*short	309	963			

Panel B: Constructing portfolios based on large price moves and target price revisions

Strategy 1	hedge	148	0.0109	0.0299	4.42	< 0.0001
	long	148	0.0089	0.0211	5.12	< 0.0001
	short	148	0.0020	0.0283	0.86	0.3933
	*n*long	148	191			
	*n*short	148	171			
Strategy 2	hedge	153	0.0035	0.0148	2.9	0.0043
	long	153	0.0011	0.0209	0.65	0.5158
	short	153	0.0024	0.0179	1.63	0.1044
	*n*long	153	479			
	*n*short	153	1048			
Strategy 3	hedge	153	0.0037	0.0142	3.25	0.0014
	long	153	0.0014	0.0201	0.85	0.398
	short	153	0.0024	0.0180	1.62	0.1083
	*n*long	153	493			
	*n*short	153	1104			

Table 8 (*Continued*)
Panel B (*Continued*)

Trading strategy	Variable	*N*	Mean	Std. Dev.	*t*	Prob.
Strategy 4	hedge	153	0.0041	0.0120	4.23	< 0.0001
	long	153	0.0023	0.0181	1.56	0.1219
	short	153	0.0018	0.0183	1.24	0.2186
	*n*long	153	551			
	*n*short	153	1167			

This table reports the excess returns for hedge portfolios (hedge), long positions (long), and short positions (short), and also gives the number of stocks in the long (*n*long) and short (*n*short) portfolios. Results for four strategies are presented. All four strategies require holding portfolios for a month. To ensure sufficient diversification, we require at least 15 stocks for both the short and long sides of the portfolio.

Strategy 1: Hold long positions in stocks with large daily price increases and positive earnings forecast or target price revisions on or within the next five days. Hold short positions in stocks with large daily price decreases and negative earnings forecast or target price revisions on or within the next five days.

Strategy 2 (a pure reversal strategy): Hold long positions in stocks with initial large price decreases and no immediate subsequent analyst revisions, and short positions in stocks with initial large price increases and no immediate subsequent analyst revisions.

Strategy 3: Hold long positions in stocks with large price decreases and no immediate subsequent analyst forecast revisions or with immediate subsequent positive revisions. Hold short positions in stocks with large price increases and no immediately subsequent revisions or those with immediate subsequent negative revisions. This is equivalent to the union of Strategy 2 and a strategy where analysts revise in the opposite direction of the initial large price swing.

Strategy 4: Hold long positions in stocks with large price increases and subsequent positive analyst forecast revisions and stocks with large price decreases without immediate subsequent revisions. Hold short positions in stocks with large price decreases and immediate subsequent negative analyst forecast revisions, and stocks with large price increases and no subsequent revisions. Strategy 4 is equivalent to the union of Strategies 2 and 1.

long positions and low volume for short positions, we obtain higher portfolio returns. As shown in Table 9, the trading strategy based on the large price change, trading volume, and earnings forecast revisions in Panel A (target price revisions in Panel B) yields a monthly excess return of 1.52% (1.79%).

The above results show the profitability of trading strategies based on both large price change and subsequent analyst forecast revisions. To test whether analyst forecast revisions provide incremental value in constructing a hedge portfolio beyond the large price move itself, we construct a portfolio composed of stocks with large price change and no immediate analyst revisions, which is used as a benchmark portfolio. Specifically, we take long positions in stocks with initial large price decreases and no subsequent analyst revisions and short positions in stocks with initial large price increases and no subsequent analyst revisions. This strategy is referred to as Strategy 2, and represents a pure reversal strategy.

Next, we next examine the value of analyst forecast revisions in two cases: one when analyst forecast revisions are in the opposite direction to the initial price change, and the other when analyst forecast revisions are in the same direction as the initial price change. In the first case, we take long positions in stocks with large price decreases and no subsequent analyst forecast revisions or positive analyst revisions. We take short positions

Table 9 Calendar-time monthly portfolio strategy incorporating trading volumes.

Panel A: Constructing portfolios based on large price moves, trading volume, and earnings forecast revisions

Trading strategy	Variable	*N*	Mean	Std. Dev.	*t*	Prob.
Strategy 1	hedge	225	0.0152	0.0388	5.87	< 0.0001
	long	225	0.0074	0.0271	4.11	< 0.0001
	short	225	0.0078	0.0401	2.90	0.0041
	*n*long	225	120			
	*n*short	225	58			
Strategy 2	hedge	309	0.0021	0.0186	1.96	0.0503
	long	309	−0.0021	0.0216	−1.74	0.0836
	short	309	0.0042	0.0290	2.55	0.0111
	*n*long	309	300			
	*n*short	309	335			
Strategy 3	hedge	309	0.0069	0.0162	7.44	< 0.0001
	long	309	−0.0009	0.0221	−0.69	0.4931
	short	309	0.0077	0.0231	5.87	< 0.0001
	*n*long	309	328			
	*n*short	309	390			
Strategy 4	hedge	309	0.0076	0.0154	8.62	< 0.0001
	long	309	0.0008	0.0211	0.65	0.5153
	short	309	0.0068	0.0235	5.08	< 0.0001
	*n*long	309	384			
	*n*short	309	393			

Panel B: Constructing portfolios based on large price moves, trading volume, and target price revisions

Strategy 1	hedge	82	0.0179	0.0583	2.79	0.0066
	long	82	0.0105	0.0252	3.77	0.0003
	short	82	0.0075	0.0567	1.19	0.2364
	*n*long	82	138			
	*n*short	82	60			
Strategy 2	hedge	153	0.0036	0.0214	2.08	0.0394
	long	153	0.0013	0.0167	1.00	0.3212
	short	153	0.0022	0.0288	0.96	0.338
	*n*long	153	395			
	*n*short	153	458			
Strategy 3	hedge	153	0.0061	0.0160	4.71	< 0.0001
	long	153	0.0021	0.0175	1.51	0.1327
	short	153	0.0040	0.0216	2.27	0.0244
	*n*long	153	423			
	*n*short	153	505			

Table 9 (*Continued*)
Panel B (*Continued*)

Trading strategy	Variable	*N*	Mean	Std. Dev.	*t*	Prob.
Strategy 4	hedge	153	0.0073	0.0155	5.86	< 0.0001
	long	153	0.0038	0.0163	2.92	0.004
	short	153	0.0035	0.0220	1.97	0.0506
	*n*long	153	514			
	*n*short	153	511			

This table reports the excess returns for hedge portfolios (hedge), long positions (long), and short positions (short), and also gives the number of stocks in the long (*n*long) and short portfolios (*n*short). Results for four strategies are presented. All four strategies require holding portfolios for a month. To ensure sufficient diversification, we require at least 15 stocks for both the short and long sides of the portfolio.

Strategy 1: Hold long positions in stocks with large daily price increases, high trading volume, and positive earnings forecast or target price revisions on or within the next five days. Hold short positions in stocks with large daily price decreases, low trading volume, and negative earnings forecast or target price revisions on or within the next five days.

Strategy 2 (a pure reversal strategy): Hold long positions in stocks with initial large price decreases, high trading volume, and no immediate subsequent analyst revisions, and short positions in stocks with initial large price increases, low trading volume, and no immediate subsequent analyst revisions.

Strategy 3: Hold long positions in stocks with large price decreases, high trading volume, and no immediately subsequent analyst forecast revisions or with immediate subsequent positive revisions. Hold short positions in stocks with large price increases, low trading volume, and no immediate subsequent revisions or those with immediate subsequent negative revisions. This is equivalent to the union of Strategy 2 and a strategy where analysts revise in the opposite direction of the initial large price swing.

Strategy 4: Hold long positions in stocks with large price increases, high trading volume, and subsequent positive analyst forecast revisions and stocks with large price decreases, high trading volume, and no immediate subsequent revisions. Take short positions in stocks with large price decreases, low trading volume, and immediate subsequent negative analyst forecast revisions, and stocks with large price increases, low trading volume and no subsequent revisions. Strategy 4 is equivalent to the union of Strategies 1 and 2.

in stocks with large price increases and no subsequent revisions or negative analyst revisions. This strategy is referred as Strategy 3. It is intended to compare the returns on a pure reversal strategy (with no analyst revisions) to one that combines a pure reversal strategy with cases where analysts revise in the opposite direction of the original large price swing. If there is any value to the conflicting analyst revisions, Strategy 3 should yield significantly larger returns than Strategy 2.

In the second case, we take long positions in stocks with large price increases and subsequent positive analyst forecast revisions and stocks with large price decreases not followed by subsequent revisions. We take short positions in stocks with large price decreases and subsequent negative analyst forecast revisions and stocks with large price increases not followed by subsequent revisions. This strategy is referred as Strategy 4. It is a combination of a pure reversal strategy (Strategy 2) with the information-driven strategy (Strategy 1). Panel A of Table 8 clearly shows the value of earnings forecast revisions in constructing portfolios after large price swings. We find that the pure reversal trading strategy (Strategy 2), which does not take into account any analyst forecasts, yields an average monthly excess return of 0.29%, much lower than Strategy 1, where analyst revisions confirm the initial price swing. Similarly,

Strategy 2 is inferior to both trading Strategies 3 and 4, which use analyst revisions and yield an average monthly excess return of 0.43%.

If trading volume is also taken into consideration when constructing the portfolio strategies, then, as shown in Panel A of Table 9, Strategy 2 yields an average monthly excess return of 0.21%, while trading Strategies 3 and 4 yield an average monthly excess return of 0.69% and 0.76%, respectively. Similar findings are documented for target price revisions (Panel B).

In summary, the trading strategies based on both large price swings and analyst forecast revisions are profitable and yield higher excess returns than a pure reversal strategy, especially when analysts confirm the direction of the initial price swing. Also, we can use trading volume to strengthen portfolio results. Thus, analyst revisions immediately after an initial large price shock can help distinguish cases of information-driven price changes, which are expected to be associated with momentum, from no-information price changes, where reversals are more likely to occur.

4.4 Sensitivity and robustness analysis

(1) We check whether our main results hold in different time periods, among firms of different sizes, as well as firms with different book-to-market ratios. Overall, we find that our results are indeed robust across all these three dimensions. Specifically, we find for all three dimensions that:

   (a) In general, price reversals are more likely for initial large positive returns, but not for initial large negative returns;
   (b) When analysts revise forecasts (target price and/or earnings) upward immediately after a large price increase, we observe continued positive drift return;
   (c) When analysts revise forecasts (target price and/or earnings) downward immediately after a large price decrease, we observe continued negative drift returns;
   (d) Our calendar time monthly portfolio strategy is profitable and produces positive excess returns. However, it is more profitable in the early periods of our sample, among firms with small size (like most anomalies), and high book-to-market ratios.

(2) We repeat the analysis after excluding the years 2001 and 2008, which had potentially more large negative daily returns for many firms. Indeed, these two years had about 12% of our sample observations, about twice the average number of annual observations in our sample. Our results are unchanged for the remaining years, and are essentially unaffected by the recent financial crisis. Also, Strategy 1 returns, which in Panel A of Table 8 yields average monthly returns of 1.17%, shows returns of 1.31% when 2001 and 2008 are omitted.

(3) To mitigate concerns about industry-wide (or market-wide) news that may have affected the entire industry rather than a specific company, we have excluded all observations where there are more than three firms from the same 4-digit SIC industry on the same date. Our main conclusions remain unchanged, and Strategy 1 average monthly returns increase to 1.31%.

(4) We exclude from the sample all large price changes on days that coincided either with the day of an earnings announcement or the day after. This excludes about 8% of our sample observations. Implementing Strategy 1 yields average monthly return of 1.13% for the earnings forecast revisions compared with the 1.17% in Panel A of Table 8.

(5) We repeat the analysis when we define a large price change as one where the daily return is more than two standard deviations from the firm's normal return in the prior 180 days (with a minimum of 90 trading days). This screen decreases our sample size by 7.6%. While for Strategy 1 average monthly return changes slightly from 1.17% to 1.10% for the earnings forecast revisions, the main results remain intact.

(6) Given that most anomalies are less powerful for large companies than small companies, we repeat the trading strategies in Section 4.3 by using value-weighted returns. The average monthly portfolio return indeed drops from 1.17% for Strategy 1 to 1.00%, but still economically and statistically significant.

(7) Figures 1(a) and 1(b) portray the annual returns of the long positions implied by Strategy 1 (invest in firms that had large price increases and subsequent positive revisions) for the earnings forecast and the target price revisions. As can clearly be seen in the graphs, for most years the returns are positive, and when they are negative the magnitudes are really small (except for 1987 when earnings forecast revisions are used). We use long

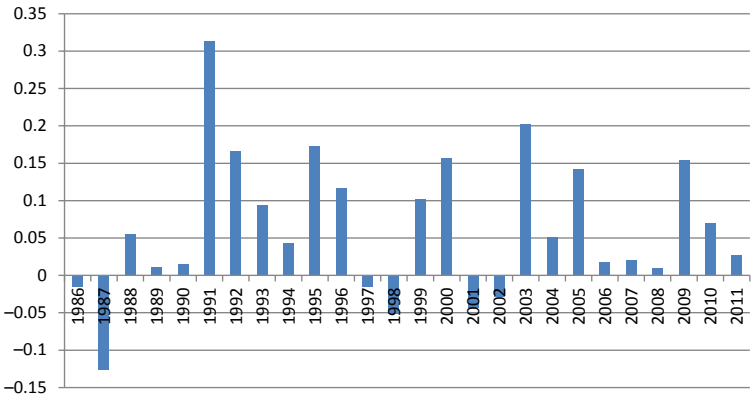

Figure 1(a) Annual abnormal returns (compounded monthly) for the long position in Strategy 1 using earnings forecast revisions.

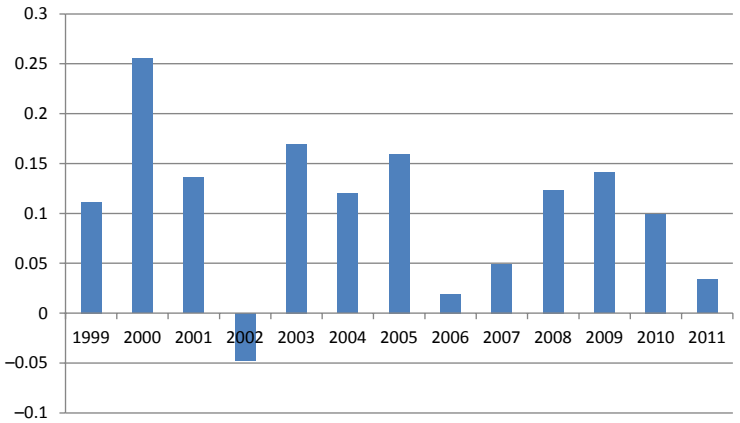

Figure 1(b) Annual abnormal returns (compounded monthly) for the long position in Strategy 1 using target price revisions.

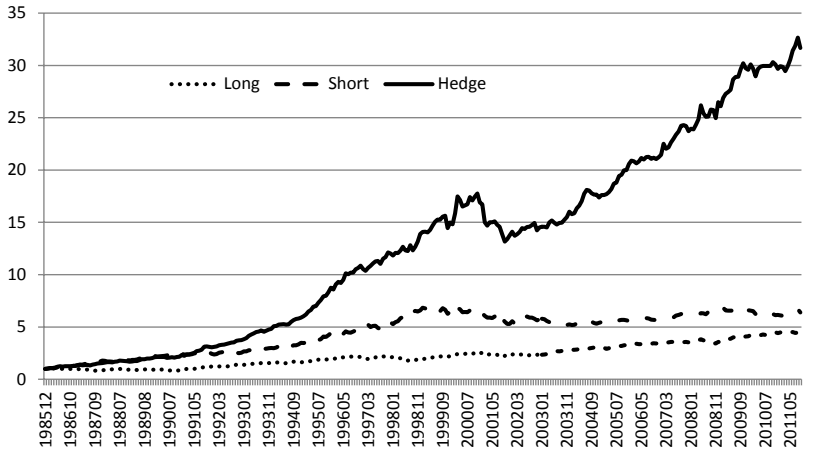

Figure 2(a) Cumulative abnormal returns (compounded monthly) for Strategy 1 using earnings forecast revisions.

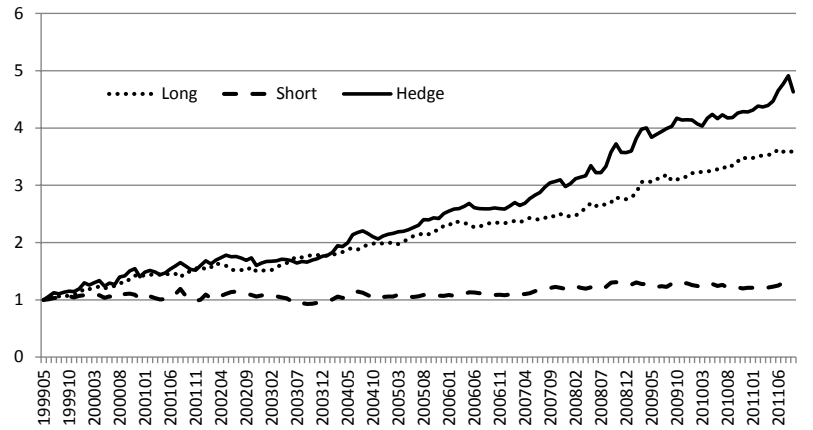

Figure 2(b) Cumulative abnormal returns (compounded monthly) for Strategy 1 using target price revisions.

positions in the graph to abstract from short constraints and costs.

(8) The cumulative returns on the returns of the trading Strategy 1 are provided in Figures 2(a) and 2(b). The figures portray a pattern of relatively smooth increasing returns for both sides of the strategy in most periods, and do not seem to be driven by any outlying months.

5 Conclusions

This study investigates whether large daily price moves are indicative of the arrival of new information, and whether subsequent returns exhibit reversals or drift. If large price changes occur due to aggressive trading by liquidity or noise traders, one should expect that subsequent returns will exhibit reversals. In contrast, if a large price move occurs due to new information and if the initial price reaction does not completely reflect this new information, one should expect to observe post-event momentum. To assess whether new information may have caused the initial price shock, we use as proxies analyst earnings forecast or target price revisions immediately after the price event.

We find that only a relatively modest proportion of all large price changes are followed by analyst

forecast or target price revisions, and that this proportion increases when the initial price change is associated with a higher than usual volume. We also find that when analysts do revise either their earnings or target price forecasts, the revisions are more likely to be in the same direction as the original price change. Contrary to the short-term reversal literature, we find that reversal typically occurs after initial large price increases, but not after initial large price decreases. We also find that large price moves associated with high volume have subsequent higher excess returns.

The main findings of our study are that, contrary to the short-term reversal literature, when analysts revise immediately after a large price swing in the same direction as the price swing, subsequent excess returns actually show momentum. This suggests that the original price move probably was due to new information that was not completely impounded in prices. We find that a trading strategy based on this information (i.e., the initial direction of the price move and the confirming analyst revisions) can generate significant excess returns of over 100 basis points per month before transaction costs. Our results are stronger for smaller firms and for value firms.

Our work has implications for both academics and practitioners. Academics who want to identify potential days when new information arrives in the market place cannot simply rely on days when stock prices change significantly. Many such price swings may simply be caused by noise or liquidity traders. Investors, who wish to rely on an incomplete market reaction to new information as a basis for a trading strategy, can do so by focusing on large price moves that are followed by analyst revisions in the same direction. Such a strategy yields significant abnormal returns. Value investors who may be attracted to stocks that have recently suffered from large price declines may actually do better if they avoid firms where analysts revised their forecasts downward after the initial price declines. Similarly, shorting or under weighting securities with large price increases may backfire if analysts revise their forecasts upward immediately after the initial price increase.

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Notes

1 We also provide results for a similar strategy but with the addition of abnormal volume as a conditioning variable in portfolio construction, as volume is a potential indicator of investor attention. For example, Lee and Swaminathan (2000) show that high volume is associated with positive future returns.

2 As described in the data robustness subsection, we also use 7% and 10% as cutoffs for large price changes and obtain similar results. Additionally, we condition the definition of a large price change on prior stock return volatility (computed over a 180-calendar-day window), studying only stock price changes that exceed a two-standard-deviation threshold. Our results hold for this definition as well.

3 We obtain similar results when we use a longer window of 10 days after the initial price change.

4 We also use the average magnitude of analyst revisions to determine whether the revision was positive or negative, and the results were very similar.

5 Excess returns in this study refer to raw buy-and-hold returns minus the average buy-and-hold returns on a portfolio of firms with similar size, book-to-market and momentum characteristics.

6 When we extend the window of analyst revisions to ten days after the initial price change, the percentage of price changes followed by earnings forecast revisions increases to 32%. Thus, over two-thirds of the large price changes are still not followed by analyst revisions, even over this longer period.

[7] IBES began providing target price information in 1999, so the sample reported in Table 2 spans the years 1999 to 2011.

[8] Earnings forecast revisions are more likely to occur immediately after earnings announcements, which, in turn, can also be associated with large price changes. In our sample of large price changes, only 8% of the days coincided either with the day of earnings announcements, or the day after the earnings announcement. Excluding those large price change days does not change our findings.

[9] We thank an anonymous reviewer for suggesting this analysis.

[10] Livnat and Zhang (2012) also use this dataset to claim that over 75% of all earnings forecast revisions are due to public information released by firms prior to the forecast revisions.

[11] Since we focus on analyst revisions in days 0 through 5, the large price move must have occurred at least six days prior to month end.

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