Credit and Capital Markets, 49. Jahrgang, Heft 1, Seiten 57–91
Abhandlungen

Stock Returns Following Large Price Changes and News Releases – Evidence from Germany

Rainer Baule and Christian Tallau*

Abstract

We revisit the overreaction hypothesis in the light of information effects. Using a sample period from 2005–2012 covering 2,542 large price changes in the German stock market, our results indicate that information effects can explain both overreaction and underreaction patterns. Specifically, we find that large positive price changes without public information signals are followed by short-term price reversals. In contrast, negative price shocks concurrent with a public announcement are associated by price continuations. The results are robust to size effects and sub-periods. Furthermore, we design a trading strategy to show that the observed return predictability could have been exploited for large negative price changes.

Kursreaktionen auf große Aktienkursänderungen – Eine empirische Untersuchung für den deutschen Markt unter Berücksichtigung der Informationswirkung von Pressemeldungen

Zusammenfassung

In diesem Beitrag wird die Überreaktionshypothese für den deutschen Aktienmarkt vor dem Hintergrund von Informationen analysiert. Für einen Untersuchungszeitraum von 2005 bis 2012 können wir zeigen, dass sich die Aktienkursreaktion nach außergewöhnlich hohen täglichen Kursänderungen mit der Existenz öffentlicher Informationen erklären lässt. So ist bei hohen positiven Renditen ohne gleichzeitige Bekanntgabe unternehmensrelevanter Informationen eine

* Prof. Dr. Rainer Baule, University of Hagen, E-Mail: rainer.baule@fernuni-hagen.de.

Prof. Dr. Christian Tallau, Corresponding author. Münster University of Applied Sciences, Corrensstr. 25, 48149 Münster, Germany. Phone: +49 251 83-65553. Fax: +49 251 83-65532. E-Mail: tallau@fh-muenster.de.

The authors thank Sandy Suardi, participants at the Southern Finance Association 2014 Annual Meeting, Hendrik Hakenes (the editor), and an anonymous referee for valuable comments and suggestions. The authors gratefully acknowledge the provision of data from dpa-AFX.

Überreaktion zu beobachten, d.h., im Mittel folgt dem Anstieg ein Rückgang der Aktienkurse. Betrachtet man dagegen außergewöhnlich hohe negative Renditen, welche von unternehmensrelevanten Meldungen begleitet werden, lassen sich nachfolgend im Mittel weiterhin negative Renditen und damit eine Unterreaktion beobachten. Die Ergebnisse sind unabhängig von der Unternehmensgröße feststellbar und gelten auch für Unterabschnitte innerhalb der Untersuchungsperiode. Die Vorhersagbarkeit zukünftiger Renditen lässt sich – zumindest für negative Aktienkursveränderungen – im Rahmen einer Handelsstrategie zur Generierung signifikanter Überrenditen ausnutzen, was die ökonomische Signifikanz der Ergebnisse unterstreicht.

Keywords: overreaction, market efficiency, event study

JEL Classification: G14

I. Introduction

Inspired by the seminal paper of *De Bondt* and *Thaler* (1985), a large body of literature explores stock returns subsequent to large price changes. Numerous studies in this field present evidence supporting an overreaction hypothesis, where a large price change leads to subsequent return reversals. In contrast however, some studies support an underreaction hypothesis, where large price changes are followed by price continuations. Other studies, yet again, do not find any significant return patterns or attribute reversals to other factors such as size, risk, or market microstructure effects. These mixed and contradictory results, obtained over more than two decades for several markets, time periods, investment horizons, and through various research design approaches, are puzzling and unsatisfying. Of course, any kind of return predictability would be a violation of the efficient market hypothesis that demands further investigation.

In this paper, we argue that returns following large price changes are conditional on information effects: Overreaction occurs for price changes without public information, while underreaction effects are present in the course of public signals. This information hypothesis follows from theoretical predictions of the models by *Daniel* et al. (1998) and *Hong* and *Stein* (1999).

The argumentation of *Daniel* et al. (1998) is based on overconfidence and attribution bias. They assume that investors are overconfident about the precision of private information, and biased self-attribution of their investment outcomes causes asymmetric changes in their confidence. As a result, investors hold too strongly to their own information and underweight public signals, leading to overreaction to private information and underreaction to public information. In a similar, yet different setting, *Hong* and *Stein* (1999) presume two classes of traders: “News watchers” observe some private information, but fail to extract other news watchers’ information from prices, whereas “momentum traders” ignore the news, but react to prices. The result is initial underreaction and subsequent overreaction. According to both lines of reasoning, investors will underreact to news and overreact to pure (non-information based) price movements.

We test the information hypothesis for the German market by employing a unique news database from the largest news agency for German language real-time financial news. Our study is the first comprehensive analysis for an important stock market outside the US. Using a sample period from 2005–2012 covering 2,542 price events, we are able to confirm the significance of information effects in explaining both overreaction and underreaction patterns. We find that large positive price changes without public information signals are indeed followed by price reversals for short-term horizons of up to 20 trading days. On the other hand, negative price shocks coincident with a public announcement are associated with significant price continuations. The subsequent drift is even more pronounced for events accompanied with information releases that are more likely to contain price-relevant information, i.e., ad hoc disclosures. Hence, we can confirm the information hypothesis, concluding that investors tend to underreact to public signals and overreact to private information. The results are robust to size effects and sub-periods. Using a simple trading strategy, we show that the observed return predictability could have been exploited for large negative price changes.

The paper proceeds as follows. In section II. we briefly review the existing body of relevant literature. Section III. describes the sample selection procedure and the methodology to calculate abnormal returns. In Section IV. we present and discuss the results. Section V. concludes.

II. Prior Work

The development of the overreaction hypothesis can be traced back to *De Bondt* and *Thaler* (1985). In their pathbreaking paper, *De Bondt* and *Thaler* form portfolios of winner and loser stocks based on a five-year period of monthly stock data and find that prior losers outperform winners over the following three years. Referring to *Kahneman* and *Tversky*

(1979), they suggest that individuals tend to overweight recent information and underweight prior data when revising their beliefs (*Kahneman* and *Tversky* call this rule representativeness heuristic). Hence, prices initially overreact to new information but eventually market participants realize their misinterpretation and the stock prices reverse. The findings of *De Bondt* and *Thaler* have been put to the test in numerous subsequent studies, since they represent a clear violation of the efficient market hypothesis.

Studies of monthly data and long-term horizons for the US such as *De Bondt* and *Thaler* (1987) and *Chopra* et al. (1992) confirm the initial finding. However, some authors argue that the observed overreaction is flawed. Reversal results are attributed to size effects (*Fama/French* (1988), *Zarowin* (1990)), time-varying risk effects (*Chan* (1988), *Ball/Kothari* (1989)), and market microstructure-related effects (*Ball* et al. (1995)).

Nonetheless, research from several countries such as *Alonso* and *Rubio* (1990) for Spain, *da Costa* (1994) for Brazil or *Schiereck* et al. (1999) for Germany support the overreaction hypothesis for long-term horizons. In an international study of seven developed stock markets, *Baytas* and *Cakici* (1999) also report significant returns to contrarian strategies in all countries but the United States, even after accounting for confounding factors. More recently, *Ising* et al. (2006) for Germany report overreaction following large price increases, whereas large price declines are followed by price continuations.

The overreaction hypothesis has also been analyzed from a short-term perspective, where daily returns after a large day-to-day price event are considered. Studies in this field broadly provide support for the overreaction hypothesis. For example, *Bremer* and *Sweeney* (1991) document abnormal positive stock returns after large price decreases. *Atkins* and *Dyl* (1990) argue that earlier studies failed to consider transaction costs. They find, consistent with prior studies, that stocks exhibiting a large price change subsequently earn significant abnormal returns. However, when considering the bid-ask spread, these price reversals are not exploitable. *Cox* and *Peterson* (1994) also find significant reversals after large one-day declines. They however argue that the bid-ask bounce accounts for a substantial part of the reversal. *Park* (1995) further explores the bid-ask bounce explanation for return predictions and finds that price reversals persist for short-run periods, even after eliminating the bid-ask bounce bias. Also *Sturm* (2003) provides evidence for the overreaction hypothesis, however, only for negative price shocks.

Research for markets outside the US also provide support for the overreaction hypothesis from a short term perspective. Studies include *Bremer* et al. (1997) for Japan, *Otchere* and *Chan* (2003) for Hong Kong, *Lee* et al. (2003) for Australia and *Lobe* and *Rieks* (2011) for Germany. However, after considering transaction costs investors cannot earn excess profits from a contrarian trading strategy. In a study of market indices from 39 stock exchanges, *Lasfer* et al. (2003) obtain results not consistent with the overreaction hypothesis. They report return continuations indicating underreaction following large price shocks.

While there is a large body of literature on price reversal and momentum after large price changes, only a few studies address the role of information effects brought up by the theoretical works of *Daniel* et al. (1998) and *Hong* and *Stein* (1999). *Pritamani* and *Singal* (2001) collect daily news stories from the Wall Street Journal and Dow Jones News Wire for a subset of stocks from 1990 to 1992 that had large abnormal daily returns, and study returns over the subsequent days after a news release. They find that large price changes concurrent with a public announcement display significant price continuations. In contrast, extreme returns without any accompanying news do not exhibit price continuations nor do they show overreaction. *Larson* and *Mandura* (2003) identify informed events of large price changes by consulting the Wall Street Journal Index from 1988 to 1995. In line with the information hypothesis, they report that uninformed positive events are associated with overreaction, even after controlling for confounding factors such as size and calendar effects. Informed positive events, on the other hand, are not associated with any significant subsequent abnormal returns. However, for both informed and uninformed negative events, the authors find evidence for underreaction. *Chan* (2003) analyses a sample of firms that are mentioned in at least one headline of the Dow Jones Interactive Publications Library in a given month for the period 1980 to 2000. Stocks that had no news stories in the event month tend to reverse in the subsequent month. On the other hand, stocks with bad public news display negative drift. More recently, *Savor* (2012) uses analyst reports as a proxy for information presence and shows that price events accompanied by information are followed by drift, while no-information events in contrast result in reversals.

All these empirical studies relating overreaction effects to public and private information are restricted to the US stock market. While they broadly provide support for the short-term overreaction hypothesis, some studies do not find significant subsequent price changes, especially for positive price shocks, while others even observe underreaction. We revisit the information hypothesis for the German stock market. To the best of our knowledge, this is the first empirical study in this field for an important stock market outside the US. Our evidence is based on a recent time period that covers both bull and bear markets and the financial crisis period.

III. Data and Methodology

1. Data

We focus on those 160 companies of the Frankfurt Stock Exchange's Prime Standard segment that are listed in the major German stock market indices DAX, MDAX, TecDAX and SDAX.[1] Since these shares are selected according to market capitalization and free float, they exhibit sufficient liquidity for our investigation. Particularly, they are continuously traded eliminating potential autocorrelation effects due to infrequent trading.

A daily stock return that represents a large abnormal price change is called an event. We define a large price change as an abnormal stock return that is more than three standard deviations away from the mean, based on mean and standard deviation calculated over the preceding 250 trading days for that firm.[2] Abnormal returns are calculated as the stock's raw return minus the return on the CDAX market index. The CDAX represents the entire range of the German equity market by encompassing all domestic companies across the Prime Standard and General Standard segment. Stock prices for the period January 2005 to December 2012 are taken as daily last bid and ask prices from the electronic trading system XETRA via Datastream, adjusted for corporate actions such as stock splits. As *Campbell* et al. (1997) show, even if the fundamental value of a stock is fixed, its return may exhibit negative serial correlation as a result of the bid-ask bounce. Prior studies indeed found that a price reversal can, at least in part, be attributed to a shift across the bid-ask spread (see *Cox/Peterson* (1994), *Park* (1995)). With this issue

[1] Our set of companies is not constant over time since we replace companies dropping out of an index by their successor at the date of the index change.

[2] In line with previous literature we also considered an absolute percentage trigger of ±10 % in addition to the variable trigger. The results are similar and are available from the authors upon request. However, we believe that the stock-specific trigger is more adequate since a fixed trigger may bias the sample towards smaller and more volatile stocks.

in mind, we calculate log returns by employing the mid-point of the last bid-ask prices instead of transaction prices.

The initial sample consists of 5,692 events with large price changes. The events account for 1.5 % of the total return universe.[3] We eliminate those events that coincide with dividend payments, which reduces the sample to 5,556 events. Similar to *Bremer* and *Sweeney* (1991), *Peterson* (1995) and others, we exclude events where firms had closing prices of less than 10 euros on the event date. We do this because higher relative transaction costs of low price stocks may inhibit the incorporation of new relevant information. This reduces the sample to 4,063 events. A final screen eliminates events that have been preceded by further large abnormal price changes over the last 20 trading days. Applying this restriction leads to a final sample of 2,542 events.

To analyze the effect of public information signals, we obtain news releases for exchange-listed firms during the sample period from the dpa-AFX news database. dpa-AFX is the largest news agency for German language real-time financial and economic news.[4] Their database should cover almost all relevant news items. Each item of the database contains the headline, the message content, the ISINs of the mentioned firms as well as a time stamp to the second. The time stamp allows us to assign news items released later than the close of trading to the next trading day. We match the dpa-AFX database by date and ISIN with our event sample. 1,509 events (59 % of the total sample) are accompanied by at least one news item on the event day. We refer to those events as "informed events". In contrast, "uninformed events" are events which occur without any public information signals.

As a matter of fact, there might be a number of news items we assigned to the price events that do not actually contain price-relevant information for the firm in question; e.g., a press release where the event firm is only mentioned alongside other firms or events. To focus on price-relevant information, we analyze those news items separately that are classified as ad hoc disclosures. According to Section 15 of the German Securities Trading Act, issuers of listed securities must immediately publish any information that is not publicly known via an ad hoc disclosure if it might significantly influence the stock price. By nature, these disclosures and the news items related to them should contain price-relevant information.

[3] Apparently, the return distribution is leptokurtic with an excess kurtosis of 40.9.

[4] See Singer et al. (2013), p. 1236.

Table 1: **Descriptive Statistics**

	Sample		Event day abnormal return (%)			Event day spread (%)			Firm size (m EUR)	
	Obs.	*Percent of total*	*Mean*	*Median*	*Standard deviation*	*Mean*	*Median*	*Standard deviation*	*Mean*	*Median*
Positive events										
All	1,434	100.0	6.89	6.09	3.83	0.48	0.26	0.78	6,446	1,326
Uninformed	562	39.2	6.56	6.09	2.88	0.79	0.51	1.09	1,931	649
Informed	872	60.8	7.09	6.07	4.32	0.29	0.16	0.36	9,356	2,584
Ad hoc disclosure	187	13.0	8.95	6.81	6.69	0.31	0.19	0.35	7,782	1,163
Other	685	47.8	6.59	5.79	3.21	0.28	0.15	0.37	9,786	3,085
Negative events										
All	1,108	100.0	–7.40	–6.32	4.33	0.46	0.24	0.66	6,643	1,450
Uninformed	471	42.5	–7.00	–6.38	3.49	0.70	0.44	0.86	1,818	663
Informed	637	57.5	–7.70	–6.23	4.84	0.28	0.15	0.37	10,212	3,141
Ad hoc disclosure	148	13.4	–10.25	–8.35	6.64	0.29	0.16	0.37	7,632	1.487
Other	489	44.1	–6.93	–5.76	3.82	0.28	0.14	0.37	10,992	3.635

Descriptive statistics of daily large abnormal price changes. A change is defined as large when the abnormal return is more than three standard deviations away from the historical mean for that firm. Informed events are events which are accompanied by at least one news item on the same day. Uninformed events occur without any public information signals. Event day spread is the relative bid-ask spread on the day the large price change occurred. Firm size is measured as equity market value in million EUR.

The sample is divided into positive and negative events, depending on the sign of the event day abnormal return. Table 1 reports descriptive statistics of the sample.

Mean event day abnormal returns amount to 6.89 % for positive and –7.40 % for negative events. Ad hoc disclosures exhibit significantly larger positive (8.95 %) as well as negative (–10.25 %) returns. Noticeably, the mean and median firm size is substantially larger for informed events, indicating that large firms are more likely to be covered by (general) media attention. A size effect may also drive the observation that uninformed events exhibit considerably larger relative bid-ask spreads on average.

2. *Methodology*

We employ a standard event study approach and analyze cumulative abnormal returns for up to 20 trading days following the event. The daily abnormal stock return for firm i on day t, $AR_{i,t}$, is defined as the observed logarithmic stock return, $R_{i,t}$, minus the expected return:

$$AR_{i,t} = R_{i,t} - E\left[R_{i,t}\right]. \tag{1}$$

Expected returns $E[R_{i,t}]$ are obtained by employing the market model:[5]

$$E\left[R_{i,t}\right] = \alpha_{i,t} + \beta_{i,t} R_{M,t} \tag{2}$$

with $R_{M,t}$ being the market return. Parameters $\alpha_{i,t}$ and $\beta_{i,t}$ of the market model are estimated by ordinary least squares and by applying the CDAX performance index as a market proxy. To estimate $\alpha_{i,t}$ and $\beta_{i,t}$, we use a 250 trading day rolling window until day $t - 20$.[6] We calculate compounded abnormal returns, $CAR_i(\tau_1, \tau_2)$, for several event windows from day τ_1 to day τ_2 relative to the event day τ:

$$CAR_i(\tau_1, \tau_2) = \sum_{t=\tau_1}^{\tau_2} AR_{i,\tau+t} \; . \tag{3}$$

The average cumulative abnormal return, $\overline{CAR}(\tau_1, \tau_2)$, across all observations from day τ_1 to day τ_2 is simply the mean of the N cumulative abnormal returns for the respective event window:

[5] We also employed a simple mean adjusted model where we calculate the abnormal return for firm i on day t as the difference between the actual return for that security, $R_{i,t}$, and the market return, $R_{M,t}$, on the CDAX market index on day t. The results are similar.

[6] We also estimated market model parameters using shorter estimating windows. The results are similar.

$$\overline{CAR}(\tau_1, \tau_2) = \frac{1}{N}\sum_{i=1}^{N} CAR_i(\tau_1, \tau_2). \tag{4}$$

We assess the statistical significance of $\overline{CAR}(\tau_1, \tau_2)$ being different from zero by calculating a t-statistic of

$$t(\tau_1, \tau_2) = \sqrt{N}\,\frac{\overline{CAR}(\tau_1, \tau_2)}{s(\tau_1, \tau_2)}, \tag{5}$$

where $s(\tau_1, \tau_2)$ is the cross-sectional sample standard deviation for cumulative abnormal returns from day τ_1 to day τ_2 and N the number of observations.[7] If the size of a sub-sample is smaller than 30 observations, we employ a Wilcoxon signed-rank test. Various event windows (day +1, days +1 to +5, +6 to +10, +11 to +20, +1 to +20 as well as day –1 and days –5 to –1 to test for lead effects) are analyzed to pinpoint the timing of any under- or overreaction.

We also calculate the proportion, POS, of positive abnormal returns for each event window. To asses the statistical significance of POS (difference from 0.5), we use a normal approximation of the binomial distribution and calculate the following z-statistic:

$$z\text{-statistic} = \frac{POS - 0.5}{\sqrt{0.25 / N}}\ . \tag{6}$$

IV. Results

1. *Univariate Analysis of Abnormal Returns*

We start with a univariate analysis of the average cumulative abnormal returns for several event windows. Table 2 reports buy and hold mean abnormal returns and the fraction of positive returns for the total sample as well as separately for uninformed and informed events. The last column reports mean differences in abnormal returns between uninformed and informed events.

Starting with all events, both positive and negative price changes are followed by negative abnormal returns. Although the significance is restricted to particular event windows, results suggest that the full sample

[7] To minimize potential problems with across-sample correlation, we build portfolios for contemporaneous events and calculate standard errors based on these portfolios' returns.

Table 2

Abnormal Returns

	All events		*Uninformed events*		*Informed events*		
	Mean abnormal return (%)	*Proportion of positive abnormal returns*	*Mean abnormal return (%)*	*Proportion of positive abnormal returns*	*Mean abnormal return (%)*	*Proportion of positive abnormal returns*	*Difference in abnormal returns*
Panel A: Positive events							
Obs.	1,434		562		872		
Event window							
[–5; –1]	–0.39***	0.47**	–0.33	0.47	–0.43**	0.47*	0.11
–1	0.13**	0.52	0.32***	0.56***	0.01	0.50	0.31**
0	6.89***	1.00***	6.56***	1.00***	7.09***	1.00***	–0.53***
+1	–0.10	0.47**	–0.33***	0.43***	0.05	0.49	–0.38**
[+1; +5]	–0.36**	0.47**	–1.02***	0.41***	0.07	0.51	–1.09***
[+6; +10]	–0.03	0.50	–0.40*	0.47	0.21	0.52	–0.60**
[+11; +20]	0.27	0.49	0.19	0.49	0.33	0.49	–0.14
[+1; +20]	–0.11	0.49	–1.22***	0.42***	0.60**	0.54**	–1.82***

(Continue next page)

(Table 2: Continued)

	All events		Uninformed events		Informed events		
	Mean abnormal return (%)	Proportion of positive abnormal returns	Mean abnormal return (%)	Proportion of positive abnormal returns	Mean abnormal return (%)	Proportion of positive abnormal returns	Difference in abnormal returns
Panel B: Negative events							
Obs.	1,108		471		637		
Event window							
[–5;–1]	–0.83***	0.42***	–1.56***	0.36***	–0.30	0.46**	–1.26***
–1	–0.40***	0.43***	–0.39***	0.41***	–0.41***	0.44***	0.02
0	–7.40***	0.00***	–7.00***	0.00***	–7.70***	0.00***	0.71***
+1	–0.07	0.49	0.23	0.54	–0.29**	0.46**	0.51**
[+1; +5]	0.16	0.49	0.93***	0.56***	–0.41*	0.44***	1.34***
[+6; +10]	–0.33*	0.47*	–0.12	0.48	–0.48**	0.47*	0.36
[+11; +20]	–0.70***	0.48	–0.65	0.49	–0.74***	0.48	0.09
[+1; +20]	–0.88***	0.46***	0.16	0.50	–1.64***	0.43***	1.79***

Buy and hold mean abnormal returns and proportion of positive abnormal returns for several event windows relative to the event day 0, where a large price change occurred. A change is defined as large when the abnormal return is more than three standard deviations away from the historical mean. We report results for all events as well as separately for events with ("informed") and without ("uninformed") the release of news associated with the event firm. The last column reports mean differences in abnormal returns between uninformed and informed events. Significance is indicated at the 10 % level as *, at the 5 % level as **, and at the 1 % level as ***.

of positive events experienced price reversals while negative events seem to trigger subsequent price continuations.

However, analyzing uninformed and informed events separately reveals a different picture. Although both sub-samples exhibit similar mean event day price changes, the subsequent return patterns differ substantially. The reversal for positive events is driven by uninformed events. For example, the average abnormal return for the next five days following a large uninformed price increase amounts to –1.02 %, where 59 % of the subsequent returns are negative. In contrast, informed positive events are barely followed by any abnormal returns, except for the 20 days event windows with a significantly positive abnormal return indicating a price continuation. Specifically, informed winners outperform uninformed winners by 1.82 % over the next 20 trading days following a large price increase. Negative uninformed events exhibit subsequent positive price drifts indicating a reversal, however, significant only for days 1–5 following the event. On the other hand, informed negative events display significant price continuations for up to 20 days following the event. Thus, results suggest that investors are overoptimistic when repricing stocks in response to new information. Overall, in line with the theoretical predictions, results indicate overreaction effects to uninformed events and underreaction to informed events. The effects are most pronounced for uninformed positive events and informed negative events.

Table 3 reports the average buy and hold returns and the fraction of positive returns for informed events where we distinguish between ad hoc disclosures and news items not classified as ad hoc disclosure ("other news items"). Since ad hoc disclosures and the news items related to them should contain price-relevant information, we expect underreaction to ad hoc disclosure events to be more pronounced compared to all other (presumably less relevant) news item events.

While results for positive events (Panel A) are still insignificant, the price continuation for negative events (Panel B) is indeed significantly larger for price changes that coincide with the release of an ad hoc disclosure. After such a disclosure, shares exhibit on average an abnormal return of –3.03 % over the next 20 trading days. 61 % of these 20-day abnormal returns have a negative sign. Other news item events still exhibit a negative price drift, however considerably smaller in magnitude. Overall, results for ad hoc disclosures support the conclusion that investors underreact to public information.

Table 3

Abnormal Returns for Informed Events

	Ad hoc disclosures		*Other news items*		
	Mean abnormal return (%)	*Proportion of positive abnormal returns*	*Mean abnormal return (%)*	*Proportion of positive abnormal returns*	*Difference in abnormal returns*
Panel A	*Positive events*				
Obs.	187		685		
Event window					
[–5;–1]	–0.07	0.51	–0.53**	0.46**	0.47
–1	0.08	0.52	–0.01	0.50	0.09
0	8.95***	1.00***	6.59***	1.00***	2.36***
+1	0.14	0.52	0.02	0.49	0.11
[+1;+5]	0.48	0.54	–0.04	0.50	0.52
[+6;+10]	–0.01	0.47	0.27	0.54*	–0.28
[+11;+20]	0.15	0.51	0.37	0.48	–0.22
[+1;+20]	0.61	0.58**	0.60	0.53	0.02
Panel B	*Negative events*				
Obs.	148		489		
Event window					
[–5;–1]	–0.54*	0.46	–0.22	0.46*	–0.32
–1	–0.38***	0.43	–0.42***	0.45**	0.04
0	–10.25***	0.00***	–6.93***	0.00***	–3.32***
+1	–1.13***	0.35***	–0.03	0.49	–1.10***
[+1;+5]	–1.62***	0.36***	–0.05	0.47*	–1.58***
[+6;+10]	–0.78**	0.42*	–0.39	0.48	–0.38
[+11;+20]	–0.63	0.47	–0.78**	0.48	0.15
[+1;+20]	–3.03***	0.39***	–1.22**	0.44***	–1.81*

Buy and hold mean abnormal returns and proportion of positive abnormal returns for several event windows relative to the event day 0, where a large price change occurred that was accompanied by a press report. A change is defined as large when the abnormal return is more than three standard deviations away from the historical mean. We report results separately for events associated with an ad hoc disclosure and without ("other news items"). The last column reports mean differences in abnormal returns between ad hoc disclosure events and other news item events. Significance is indicated at the 10 % level as *, at the 5 % level as **, and at the 1 % level as ***.

2. *Firm Size Effects*

Since larger companies are more likely to be the subject of media attention and news releases, one might argue that the different reaction to uninformed and informed events depends on firm size. For example, *Zarowin* (1990) argues that the overreaction effect is mainly a small firm effect. Indeed, Table 1 reveals that the mean and median firm size is significantly larger for informed events compared to uninformed events.

To investigate a potential size effect, we divide the sample by median firm size measured in equity market value at the event day to obtain a group of small and large firms, respectively. While 71 % of the price changes for large companies are accompanied by a public announcement, informed events account for only 37 % of the events for small firms. Table 4 reports the mean buy and hold returns and the fraction of positive returns for small and large firms separately.

Both sub-samples of positive uninformed events exhibit reversals, where the effect is even more pronounced for large firms. For negative uninformed events, results are fairly similar with significance only for days 1–5. Furthermore, for informed events both sub-samples exhibit price continuations over the next 20 days after a large price decrease, where the underreaction effect is stronger for smaller firms. This is again in line with our expectations since media reports on smaller firms are more likely to contain price-relevant information compared to news items related to larger firms. Overall, we conclude that the observed return patterns after large price changes are not attributable to firm size effects.

3. *Sub-Period Analysis*

To assess whether our results are driven by a specific period – our sample period covers the financial crisis period – we conduct sub-period analyses. We consider three sub periods relative to the financial crisis bear market 2007–2009, which we define – in line with previous literature (e.g. *Wang* et al. (2011)) – from 2007/10/9 to 2009/03/09. Hence, the pre-crisis period extends from 2005/01/01 to 2007/10/8 and the post-crisis period from 2009/03/10 to 2012/12/31. Table 5 reports mean abnormal returns and proportions of positive returns separately for the three sub-periods.

Results for the sub-periods confirm the previous findings. For positive events (Panel A), all sub-periods exhibit overreaction to uninformed events. All abnormal returns have negative signs, except for the (insignif-

Table 4: **Abnormal Returns for Small and Large Firm Events**

	Small firms (Median size = 335)				*Large firms (Median Size = 3,201)*			
	Uninformed events		*Informed events*		*Uninformed events*		*Informed events*	
	Mean abnormal return (%)	*Proportion positive (%)*	*Mean abnormal return (%)*	*Proportion positive (%)*	*Mean abnormal return (%)*	*Proportion positive (%)*	*Mean abnormal return (%)*	*Proportion positive (%)*
Panel A	*Positive events*							
Obs.	300		188		262		684	
Event window								
[–5;–1]	–0.25	0.49	–0.82*	0.46	–0.41	0.45	–0.33*	0.47
–1	0.66***	0.63***	0.12	0.51	–0.06	0.47	–0.02	0.50
0	6.85***	1.00***	9.24***	1.00***	6.23***	1.00***	6.50***	1.00***
+1	–0.24	0.45*	0.20	0.52	–0.44***	0.40***	0.00	0.49
[+1;+5]	–0.67**	0.44**	0.57	0.54	–1.41***	0.39***	–0.07	0.50
[+6;+10]	–0.42	0.47	0.22	0.53	–0.37	0.47	0.20	0.52
[+11;+20]	0.33	0.50	0.55	0.46	0.03	0.47	0.27	0.49
[+1;+20]	–0.76	0.45*	1.34*	0.56*	–1.75***	0.39***	0.40	0.53*

	Small firms (Median size = 335)				Large firms (Median Size = 3,201)			
	Uninformed events		Informed events		Uninformed events		Informed events	
	Mean abnormal return (%)	Proportion positive (%)	Mean abnormal return (%)	Proportion positive (%)	Mean abnormal return (%)	Proportion positive (%)	Mean abnormal return (%)	Proportion positive (%)
Panel B	*Negative events*							
Obs.	247		127		224		510	
Event window								
[–5;–1]	–2.10***	0.32***	–0.13	0.47	–0.95**	0.40***	–0.34	0.46*
–1	–0.45***	0.39***	–0.81***	0.37***	–0.32**	0.44*	–0.31***	0.46*
0	–7.69***	0.00***	–10.07***	0.00***	–6.23***	0.00***	–7.11***	0.00***
+1	0.06	0.56*	–0.92**	0.46	0.41	0.51	–0.13	0.46*
[+1;+5]	0.95	0.60***	–2.24***	0.37***	0.89**	0.53	0.04	0.46*
[+6;+10]	–0.15	0.48	–0.50	0.47	–0.09	0.49	–0.48*	0.46
[+11;+20]	–0.26	0.51	–0.43	0.50	–1.08*	0.46	–0.82***	0.48
[+1;+20]	0.55	0.53	–3.17***	0.35***	–0.28	0.46	–1.25***	0.45**

Buy and hold mean abnormal returns and proportion of positive abnormal returns for several event windows relative to the event day 0, where a large price change occurred. A change is defined as large when the abnormal return is more than three standard deviations away from the historical mean. We distinguish "small" and "large" firms by the median firm size at the event day where firm size is measured as market value of equity. Significance is indicated at the 10 % level as *, at the 5 % level as **, and at the 1 % level as ***.

Table 5: **Sub-Period Abnormal Returns**

Panel A	*Positive events*					
	Uninformed events		*Informed events*			
			Ad hoc disclosures		*Other news item*	
	Mean abnormal return (%)	*Proportion positive (%)*	*Mean abnormal return (%)*	*Proportion positive (%)*	*Mean abnormal return (%)*	*Proportion positive (%)*
Panel A1	*Pre-crisis period*					
Obs.	241		109		298	
Event window						
[–5;–1]	–0.21	0.49	0.23	0.54	–0.07	0.49
–1	0.19	0.52	0.21	0.51	0.10	0.50
0	5.79***	1.00***	7.13***	1.00***	5.76***	1.00***
+1	–0.44***	0.40***	0.12	0.50	0.06	0.49
[+1;+5]	–1.14***	0.38***	0.42	0.54	–0.03	0.48
[+6;+10]	–0.72**	0.40***	–0.60	0.43	0.12	0.53
[+11;+20]	–0.57*	0.44*	–0.24	0.45	–0.21	0.45*
[+1;+20]	–2.43***	0.38***	–0.42	0.51	–0.12	0.50

DOI https://doi.org/10.3790/ccm.49.1.57 | Generated on 2024-07-22 16:55:59

Panel A	Positive events					
	Uninformed events		Informed events			
			Ad hoc disclosures		Other news item	
	Mean abnormal return (%)	Proportion positive (%)	Mean abnormal return (%)	Proportion positive (%)	Mean abnormal return (%)	Proportion positive (%)
Panel A2	Crisis period					
Obs.	159		27		171	
Event window						
[–5;–1]	–1.09*	0.39***	–1.04	0.52	–1.24*	0.48
–1	0.42	0.52	–0.36	0.52	0.02	0.56
0	7.82***	1.00***	13.41***	1.00***	7.56***	1.00***
+1	–0.13	0.48	0.60	0.59	0.08	0.49
[+1;+5]	–0.84*	0.47	0.56	0.56	0.28	0.50
[+6;+10]	–0.24	0.49	1.91*	0.63	0.38	0.56
[+11;+20]	1.59	0.53	1.04	0.59	1.38**	0.55
[+1;+20]	0.51	0.46	3.51**	0.70**	2.05**	0.60**

(Continue next page)

(Table 5: Continued)

Panel A	*Positive events*					
	Uninformed events		*Informed events*			
			Ad hoc disclosures		*Other news item*	
	Mean abnormal return (%)	*Proportion positive (%)*	*Mean abnormal return (%)*	*Proportion positive (%)*	*Mean abnormal return (%)*	*Proportion positive (%)*
Panel A3	*Post-crisis period*					
Obs.	162		51		216	
Event window						
[–5;–1]	0.25	0.53	–0.20	0.43	–0.61*	0.40***
–1	0.42**	0.64***	0.05	0.51	–0.18	0.44*
0	6.48***	1.00***	10.48***	1.00***	6.96***	1.00***
+1	–0.36*	0.41**	–0.09	0.51	–0.08	0.48
[+1;+5]	–1.01***	0.41**	0.55	0.55	–0.32	0.52
[+6;+10]	–0.07	0.54	0.22	0.47	0.37	0.53
[+11;+20]	–0.05	0.50	1.37**	0.59	0.38	0.47
[+1;+20]	–1.13*	0.43*	2.14**	0.67**	0.43	0.51

Panel B	*Negative events*					
	Uninformed events		*Informed events*			
			Ad hoc disclosures		*Other news item*	
	Mean abnormal return (%)	*Proportion positive (%)*	*Mean abnormal return (%)*	*Proportion positive (%)*	*Mean abnormal return (%)*	*Proportion positive (%)*
Panel B1	*Pre-crisis period*					
Obs.	161		61		136	
Event window						
[–5;–1]	–1.61***	0.31***	–0.10	0.59	–0.44	0.40**
–1	–0.36**	0.40**	–0.33*	0.41	–0.46***	0.38***
0	–6.48***	0.00***	–8.60***	0.00***	–6.01***	0.00***
+1	0.79***	0.61***	–0.95**	0.38*	0.02	0.48
[+1;+5]	1.08**	0.59**	–1.56**	0.34**	–1.11**	0.39**
[+6;+10]	–0.26	0.50	–0.62	0.43	–0.80	0.46
[+11;+20]	–1.47**	0.43*	–0.76	0.49	–0.95**	0.45
[+1;+20]	–0.65	0.49	–2.94***	0.34**	–2.86***	0.35***

(Continue next page)

(Table 5: Continued)

Panel B	*Negative events*					
	Uninformed events		*Informed events*			
			Ad hoc disclosures		*Other news item*	
	Mean abnormal return (%)	*Proportion positive (%)*	*Mean abnormal return (%)*	*Proportion positive (%)*	*Mean abnormal return (%)*	*Proportion positive (%)*
Panel B2	*Crisis period*					
Obs.	193		30		165	
Event window						
[–5;–1]	–1.83***	0.38***	–0.40	0.47	–0.09	0.44
–1	–0.62***	0.38***	–0.20	0.47	–0.88***	0.42**
0	–8.21***	0.00***	–13.43***	0.00***	–8.06***	0.00***
+1	0.02	0.51	–0.54	0.40	–0.05	0.52
[+1;+5]	1.43**	0.53	–1.32	0.43	1.02	0.55
[+6;+10]	0.41	0.49	–0.53	0.43	–0.31	0.52
[+11;+20]	–0.15	0.54	–1.33	0.50	–1.69**	0.48
[+1;+20]	1.68*	0.53	–3.18	0.43	–0.98	0.47

Panel B	*Negative events*					
	Uninformed events		*Informed events*			
			Ad hoc disclosures		*Other news item*	
	Mean abnormal return (%)	*Proportion positive (%)*	*Mean abnormal return (%)*	*Proportion positive (%)*	*Mean abnormal return (%)*	*Proportion positive (%)*
Panel B3	*Post-crisis period*					
Obs.	117		57		188	
Event window						
[–5;–1]	–1.03***	0.39**	–1.09**	0.32***	–0.18	0.52
–1	–0.06	0.49	–0.53**	0.44	0.01	0.52
0	–5.70***	0.00***	–10.34***	0.00***	–6.61***	0.00***
+1	–0.19	0.47	–1.64***	0.30***	–0.05	0.48
[+1;+5]	–0.11	0.57	–1.85**	0.33**	–0.21	0.46
[+6;+10]	–0.05	0.44	–1.08*	0.40	–0.17	0.47
[+11;+20]	–0.28	0.47	–0.12	0.44	0.15	0.52
[+1;+20]	–0.47	0.45	–3.04***	0.40	–0.23	0.48

Buy and hold mean abnormal returns and proportion of positive abnormal returns for several event windows relative to the event day 0, where a large price change occurred. A change is defined as large when the abnormal return is more than three standard deviations away from the historical mean. We distinguish between a pre-crisis period (before 2007/10/9), a crisis period (2007/10/9–2009/03/09) and a post-crisis period (after 2009/03/09). We report results for all events as well as separately for events without ("uninformed") and with ("informed") the release of news associated with the event firm, where we distinguish between ad hoc disclosure releases and other news items. Significance is indicated at the 10 % level as *, at the 5 % level as **, and at the 1 % level as *** icant) 20-days return during the crisis period. Informed positive events for the crisis and post-crisis period exhibit price continuations over the next 20 days following an event. For negative uninformed events (Panel B), results are ambiguous. While there are significant positive abnormal returns indicating price reversals for the pre-crisis and crisis period, abnormal returns for the post crisis period have negative signs, however insignificant. Finally, informed negative events exhibit a (significant) price continuation for all sub-periods, where the effect is again considerably stronger for ad hoc disclosures.

4. *Cross-Sectional Analysis*

To test the overreaction hypothesis while simultaneously controlling for other influencing factors we apply a regression model. Particularly, we regress cumulative abnormal returns for several event windows on event type dummys and a set of control variables. We control for firm size and we include dummy variables to account for potential January and December as well as day-of-the-week (Monday) effects. Furthermore, we analyze the influence of stock liquidity. Since liquidity is inversely related to market inefficiency (see e.g. *Chordia* et al. (2008)), we expect the degree of overreaction as a type of market inefficiency to decrease with higher stock liquidity. To measure liquidity, we follow *Amihud* (2002), who proposes a price impact measure which represents the daily price response associated with one euro of trading volume. The Amihud (illiquidity) measure is defined as:

$$AMH_i = \frac{1}{N}\sum_{t=1}^{250}\begin{cases}\dfrac{|r_{i,t}|}{Volume_{i,t}} & \text{if } Volume_{i,t} > 0\\ 0 & \text{otherwise}\end{cases} \quad (7)$$

where $r_{i,t}$ is the (raw) return for stock i on day t and $Volume_{i,t}$ is the euro trading volume on day t. The average is calculated over all positive-volume days N, since the ratio is undefined for zero volume days. We consider 250 trading days starting 20 days before the event. The larger the measure, the less volume is needed to move the price and hence the less liquid the security. The regression model reads:

$$\begin{aligned} CAR_i(\tau_1,\tau_2) = {} & \beta_1 NNWS_i + \beta_2 AHO_i + \beta_3 ONI_i + \beta_4\, SIZE_i \\ & + \beta_5 MON_i + \beta_6 JAN_i + \beta_7 DEC_i + \beta_8 AMH_i + \varepsilon_i \end{aligned} \quad (8)$$

$NNWS_i$ is a dummy variable equal to 1 if the event was not accompanied by any news item, AHO_i is a dummy variable equal to 1 if the event coincided with the release of an ad hoc disclosure and ONI_i is a dummy variable equal to 1 if the event was accompanied by any other press release. $SIZE_i$ is defined as percentile ranking of the firm based on the firm's market value of equity 20 days prior to the event. MON_i is a dummy variable equal to 1 if the event occurred on Monday, JAN_i (DEC_i) is a dummy variable equal to 1 if the event occurred in January (December) and AMH_i is the Amihud illiquidity measure as defined above.

The regression is carried out separately for positive and negative events. Consistent with the observed return reversal to uninformed events, we expect the sign of the coefficient on $NNWS_i$ to be negative for positive events and positive for negative events. Underreaction to informed events implies positive (negative) signs of the coefficients on the news dummies for positive (negative) events. In line with the univariate analyses we expect the coefficient on the ad hoc disclosure dummy to be larger in absolute terms than the coefficient on the other news items' dummy. Inversely related liquidity and overreaction should lead to a negative coefficient on AMH_i for positive events and vice versa. Estimation results are reported in Table 6.

Even after controlling for potentially confounding factors, coefficients on *NNWS* for positive events (Panel A) exhibit the expected signs with significance for day 1, days 1–5 and days 1–20. However, for negative events (Panel B), we do not observe any significant overreaction after including the control variables – coefficients on *NNWS* are even negative. Parts of the reversal seem to be attributable to a calendar effect (dummy variables on January are significantly positive). Consistent with the univariate analyses, coefficients on the news dummies are significantly negative for negative events. Hence, the release of firm-specific negative information causes prices to continue after large price changes. As expected, the coefficient on the ad hoc disclosure dummy is larger in absolute terms than for the other news item dummy. For positive events, as in the univariate analyses, we do not observe such a significant underreaction effect. Finally, coefficients on the liquidity measure *AMH* exhibit the expected signs, however, significant only for days 1–20 (positive events) as well as day 1 and days 1–5 (negative events). These results suggest that the return reversal is indeed stronger for illiquid stocks.

To sum up, results of the multivariate analyses broadly support the previous univariate findings. We find significant reversals after positive uninformed events. For negative uninformed events, significance of the reversal disappears after controlling for size and calendar day effects.

Table 6

Regression Results

Panel A	*Positive events*								
Obs.	1,368								
	NNWS	*AHO*	*ONI*	*SIZE*	*MON*	*JAN*	*DEC*	*AMH*	R^2 *(adj.)*
+1	–0.007***	–0.002	–0.003	0.004	0.002	–0.002	0.000	0.014	0.004
	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.013)	
[+1;+5]	–0.010**	0.005	–0.001	–0.003	0.007*	0.008*	0.001	–0.020	0.013
	(0.005)	(0.006)	(0.006)	(0.007)	(0.004)	(0.005)	(0.007)	(0.026)	
[+6;+10]	–0.006	–0.001	0.002	–0.001	0.006	0.008*	0.007	–0.019	0.004
	(0.004)	(0.006)	(0.005)	(0.007)	(0.004)	(0.004)	(0.007)	(0.024)	
[+11;+20]	0.005	0.005	0.006	–0.007	–0.004	0.015***	0.014*	–0.034	0.004
	(0.006)	(0.007)	(0.007)	(0.008)	(0.005)	(0.006)	(0.008)	(0.031)	
[+1;+20]	–0.011*	0.010	0.008	–0.011	0.008	0.031***	0.022*	–0.073*	0.020
	(0.006)	(0.010)	(0.009)	(0.012)	(0.007)	(0.008)	(0.012)	(0.044)	

Panel B	Negative events								
Obs.	1,058								
	NNWS	AHO	ONI	SIZE	MON	JAN	DEC	AMH	R^2 (adj.)
+1	–0.004	–0.017***	–0.007	0.008	0.000	0.003	–0.003	0.063**	0.010
	(0.004)	(0.005)	(0.005)	(0.006)	(0.003)	(0.004)	(0.005)	(0.027)	
[+1;+5]	–0.010	–0.034***	–0.022***	0.025**	0.002	0.013*	–0.012	0.140***	0.020
	(0.007)	(0.009)	(0.008)	(0.010)	(0.005)	(0.007)	(0.009)	(0.047)	
[+6;+10]	–0.005	–0.012	–0.008	0.001	0.004	0.018***	0.003	0.020	0.006
	(0.006)	(0.008)	(0.008)	(0.009)	(0.005)	(0.006)	(0.008)	(0.042)	
[+11;+20]	–0.005	–0.002	–0.004	–0.010	0.003	0.030***	0.002	–0.048	0.016
	(0.008)	(0.010)	(0.010)	(0.012)	(0.006)	(0.008)	(0.011)	(0.055)	
[+1;+20]	–0.019	–0.048***	–0.034**	0.017	0.009	0.061***	–0.007	0.113	0.038
	(0.012)	(0.015)	(0.014)	(0.017)	(0.008)	(0.011)	(0.015)	(0.078)	

Abnormal returns following large price changes for several event windows are regressed on a dummy variable, *NNWS*, equal to 1 if the event was not accompanied by any news item, a dummy variable, *AHO*, equal to 1 if the event was accompanied by an ad hoc disclosure release, a dummy variable, *ONI*, equal to 1 if the event was accompanied by any other press release, Monday (*MON*), January (*JAN*) and December (*DEC*) dummy variables, and the Amihud liquidity measure, *AMH* (scaled by 10^3). Standard errors are reported in parentheses. Significance is indicated at the 10 % level as *, at the 5 % level as **, and at the 1 % level as ***.

Furthermore, we document price continuation after negative informed events.

5. *Trading Strategy*

Results above provide strong evidence of overreaction to uninformed positive events and underreaction to informed negative events. However, considering a mean bid-ask spread on the event day of 0.75 % (see Table 1) for uninformed events, it is unclear whether abnormal profits can actually be earned. To test the economic significance of the previous results in the light of transaction costs, we design simple trading rules to take advantage of the observed return predictability. For uninformed events, the strategy involves short selling (buying) a stock with a large abnormal positive (negative) price change at the last bid (ask) price of the event day and rebuying (selling) the stock after the holding period at the daily last ask (bid) price. For informed events, the strategy works vice versa to take advantage of the underreaction. The strategy is self-financing by taking an opposite position in the market index. In cases where more than one event occurs, the respective returns are equally weighted. In times of zero events, the strategy return is defined as zero.

To assess the significance of the results on a risk-adjusted basis, we regress excess trading strategy returns ($R_{TS,i} - R_{f,t}$) on the factors of the *Carhart* (1997) framework, that is, the excess market return according to the CAPM, the size and book-to-market factors of *Fama* and *French* (1993), and the momentum factor of *Carhart* (1997):

$$R_{TS,i} - R_{f,t} = \alpha + \beta(R_{M,t} - R_{f,t}) + s\,SMB_t + h\,HML_t + w\,MOM_t + \varepsilon_t\,. \tag{9}$$

$R_{TS,i}$ is the trading strategy return und $R_{M,t}$ is the return on the market index. The euro overnight index average (EONIA) is used as proxy for the short term risk-free interest rate $R_{f,t}$.[8] *SMB*, *HML* and *MOM* are returns on factor-mimicking portfolios for size, book-to-market ration, and momentum in stock returns. Data for the German market is obtained from *Brückner* et al. (2014).

Table 7 reports the regression results, together with unadjusted average returns. The intercept α represents the excess risk-adjusted trading strategy return.

[8] EONIA is the effective overnight interest rate computed as a weighted average of all euro-denominated overnight unsecured lending transactions in the interbank market. EONIA rates are obtained from the Deutsche Bundesbank on a daily basis.

Table 7

Trading Strategy Results

Holding period	*Mean (%)*	*Alpha (%)*	$R_M - r_f$	*SMB*	*HML*	*MOM*	R^2 *(adj.)*
Panel A1: Uninformed positive events (n = 562)							
+1	–0.44***	–0.44***	+0.034	–0.010	+0.222	–0.263***	0.008
	(0.14)	(0.14)	(0.076)	(0.116)	(0.189)	(0.096)	
[+1;+5]	+0.41*	+0.33	–0.020	–0.428***	–0.017	–0.018	0.021
	(0.23)	(0.23)	(0.084)	(0.126)	(0.146)	(0.080)	
[+1;+20]	+0.46	+0.39	+0.051	–0.234**	+0.010	–0.090	0.009
	(0.42)	(0.45)	(0.084)	(0.120)	(0.117)	(0.067)	
Panel B1: Uninformed negative events (n = 471)							
+1	–0.50***	–0.57***	+0.052	–0.113	–0.236	–0.027	0.006
	(0.19)	(0.21)	(0.095)	(0.113)	(0.221)	(0.063)	
[+1;+5]	+0.36	+0.45	+0.344***	+0.252	–0.091	–0.322***	0.090
	(0.35)	(0.36)	(0.112)	(0.162)	(0.192)	(0.082)	
[+1;+20]	+0.22	+0.88	+0.081	+0.206*	–0.029	–0.113*	0.015
	(0.53)	(0.59)	(0.091)	(0.121)	(0.111)	(0.065)	

(Continue next page)

(Table 7: Continued)

Holding period	*Mean (%)*	*Alpha (%)*	$R_M - r_f$	*SMB*	*HML*	*MOM*	R^2 *(adj.)*
Panel A2-1: Informed positive events—ad hoc disclosures (n = 187)							
+1	−0.22	−0.14	−0.858***	+0.190	+0.178	+0.070	0.105
	(0.21)	(0.20)	(0.171)	(0.227)	(0.328)	(0.261)	
[+1;+5]	+0.24	+0.31	−0.383**	+0.190	−0.025	+0.030	0.038
	(0.34)	(0.35)	(0.186)	(0.274)	(0.243)	(0.099)	
[+1;+20]	+0.48	+0.47	−0.136	+0.358**	−0.202	+0.270**	0.056
	(0.60)	(0.65)	(0.139)	(0.174)	(0.181)	(0.127)	
Panel A2-2: Informed positive events—other news items (n = 685)							
+1	−0.29***	−0.32***	−0.108*	−0.099	+0.052	−0.087	0.003
	(0.11)	(0.11)	(0.063)	(0.100)	(0.141)	(0.080)	
[+1;+5]	−0.50**	−0.43*	+0.087	+0.006	+0.016	−0.302***	0.028
	(0.23)	(0.23)	(0.094)	(0.130)	(0.144)	(0.070)	
[+1;+20]	−0.26	−0.08	+0.020	+0.214**	−0.014	−0.061	0.013
	(0.35)	(0.36)	(0.072)	(0.095)	(0.089)	(0.058)	

Holding period	*Mean (%)*	*Alpha (%)*	$R_M - r_f$	*SMB*	*HML*	*MOM*	R^2 *(adj.)*
Panel B2-1: Informed negative events—ad hoc disclosures (n = 148)							
+1	+0.83***	+0.92***	+0.212	+0.073	+0.143	–0.220	0.011
	(0.29)	(0.32)	(0.227)	(0.375)	(0.402)	(0.277)	
[+1;+5]	+1.23***	+1.03**	+0.04	–0.185	+0.896***	–0.026	0.046
	(0.47)	(0.48)	(0.188)	(0.269)	(0.311)	(0.211)	
[+1;+20]	+2.55***	+1.78**	–0.248*	–0.570***	–0.029	+0.242*	0.114
	(0.76)	(0.72)	(0.136)	(0.217)	(0.202)	(0.124)	
Panel B2-2: Informed negative events—other news items (n = 489)							
+1	–0.17	–0.95	–0.116	+0.234**	+0.182	–0.022	0.009
	(0.16)	(0.17)	(0.090)	(0.114)	(0.187)	(0.067)	
[+1;+5]	–0.15	–0.19	–0.014	+0.111	+0.456**	+0.235***	0.047
	(0.31)	(0.31)	(0.114)	(0.150)	(0.179)	(0.081)	
[+1;+20]	+0.90*	–0.06	–0.022	–0.048	+0.300**	+0.314***	0.066
	(0.53)	(0.54)	(0.099)	(0.122)	(0.131)	(0.070)	

Results of a trading strategy that short-sells (buys) a stock with a large abnormal positive (negative) price change at the daily last bid (ask) price and re-buys (sells) the stock after the holding period at the last ask (bid) price for uninformed events. For informed events, the strategy works vice versa. The trading strategy is self-financing by taking an opposite position in the market index. Reported are mean returns (over the respective holding period, in %) and results of the Carhart regressions. Significance is indicated at the 10 % level as *, at the 5 % level as **, and at the 1 % level as ***.

The observed return predictability is exploitable only for a subset of events. For uninformed events, returns are either too small to compensate for transaction costs or exhibit insignificant values for mean return and alpha. In contrast, for negative informed events the trading strategy yields significantly positive returns. The average returns over 20 days amount to 2.55 % for ad hoc disclosures and 0.90 % for other news items. For ad hoc disclosures, all values for alpha are significantly positive. Hence, buying stocks after large price decreases coincident with an ad hoc disclosure release leads to abnormal returns for up to 20 trading days after the price event, even on a risk-adjusted basis.

V. Conclusion

In this article, we have investigated the return predictability after large stock price changes in the light of public and private information. While prior studies report mixed and contradictory results, we show that over- and underreaction is conditional on the release of public information. As predicted by the theories of *Daniel* et al. (1998) and *Hong* and *Stein* (1999), we find that large (positive) prices changes without public information signals are followed by price reversals. On the other hand, large (negative) price changes concurrent with a public announcement are associated with significant price continuations. This subsequent drift is even more pronounced for events accompanied with more price-relevant information, announced by ad hoc disclosures. Hence, we conclude that investors tend to underreact to public signals and overreact to private information. We further find that the observed return predictability is also economically meaningful, at least for negative informed events: A simple trading rule yields a significantly positive average return after transaction costs of 2.55 % over 20 trading days.

Our study contributes to the literature on return patterns following large price changes in the light of information effects. We present the first comprehensive analysis in this field for an important stock market outside the US. Our findings confirm the results of studies such as *Chan* (2003) and *Savor* (2012) for the US market. Overall, information effects are important to consider when analyzing return behavior subsequent to price shocks.

References

Alonso, A./*Rubio, G*. (1990): Overreaction in the Spanish equity market. Journal of Banking and Finance 14, pp. 469–481.

Amihud, Y. (2002): Illiquidity and stock returns: Cross-section and time-series effects. Journal of Financial Markets 5, pp. 31–56.

Atkins, A. B./*Dyl*, E. A. (1990): Price reversals, bid-ask spreads, and market efficiency. Journal of Financial and Quantitative Analysis 25, pp. 535–547.

Ball, R./*Kothari*, S. P. (1989): Nonstationary expected returns: Implications for tests of market efficiency and serial correlations in returns. Journal of Financial Economics 25, pp. 51–74.

Ball, R./*Kothari*, S. P./*Shanken*, J. (1995): Problems in measuring portfolio performance: An application to contrarian investment strategies. Journal of Financial Economics 38, pp. 79–107.

Baytas, A./*Cakici*, N. (1999): Do markets overreact: International evidence. Journal of Banking and Finance 23, pp. 1121–1144.

Bremer, M./*Hiraki*, T./*Sweeney*, R. J. (1997): Predictable patterns after large stock price changes on the Tokyo stock exchange. Journal of Financial and Quantitative Analysis 32, pp. 345–365.

Bremer, M./*Sweeney*, R. (1991): The reversal of large stock-price decreases. Journal of Finance 46, pp. 747–754.

Brückner, R./*Lehmann*, P./*Schmidt*, M. H./*Stehle*, R. (2014): Fama/French Factors for Germany: Which Set Is Best? Working Paper, Humboldt University of Berlin.

Campbell, J. Y./*Lo*, A. W./*MacKinlay*, A. C. (1997): The econometrics of financial markets. Princeton.

Carhart, M. M. (1997): On Persistence in Mutual Fund Performance, The Journal of Finance, 52, pp. 57–82.

Chan, K. C. (1988): On the contrarian investment strategy. Journal of Business 61, pp. 147–164.

Chan, W. S. (2003): Stock price reaction to news and no-news: Drift and reversal after headlines. Journal of Financial Economics 70, pp. 223–260.

Chopra, N./*Lakonishok*, J./*Ritter*, J. R. (1992), Measuring abnormal performance: Do stocks overreact? Journal of Financial Economics 31, pp. 235–268.

Chordia, T./*Roll*, R./*Subrahmanyam*, A. (2008): Liquidity and market efficiency. Journal of Financial Economics 87, pp. 249–268.

Cox, D. R./*Peterson*, D. R. (1994): Stock returns following large one-day declines: Evidence on short-term reversals and longer-term performance. Journal of Finance 49, pp. 255–267.

Da Costa, N. C. A. (1994): Overreaction in the Brazilian stock market. Journal of Banking and Finance 18, pp. 633–642.

Daniel, K./*Hirshleifer*, D./*Subrahmanyam*, A. (1998): Investor psychology and security market under- and overreactions, Journal of Finance 53, pp. 1839–1885.

De Bondt, W. F. M./*Thaler*, R. H. (1985): Does the stock market overreact? Journal of Finance 40, pp. 793–805.

– (1987): Further evidence on investor overreaction and stock market seasonality. Journal of Finance 42, pp. 557–581.

Fama, E. F./*French*, K. R. (1988): Permanent and temporary components of stock prices. Journal of Political Economy 96, pp. 246–273.

– (1993): Common Risk Factors in the Returns on Stocks and Bonds, Journal of Financial Economics 33, pp. 3–56.

Hong, H./*Stein*, J. C. (1999): unified theory of underreaction, momentum trading and overreaction in asset markets. Journal of Finance 54, pp. 2143–2184.

Ising, J./*Schiereck*, D./*Simpson*, M. W./*Thomas*, T. W. (2006): Stock returns following large 1-month declines and jumps: Evidence of overoptimism in the German market. Quarterly Review of Economics and Finance 46, pp. 598–619.

Kahneman, D./*Tversky*, A. (1979): Intuitive prediction: Biases and corrective procedures. Management Science 12, pp. 313-327.

Larson, S. J./*Madura*, J. (2003): What drives stock price behavior following extreme one-day returns? Journal of Financial Research 26, pp. 113–127.

Lasfer, M. A./*Melnik*, A./*Thomas*, D. C. (2003): Short-term reaction of stock markets in stressful circumstances. Journal of Banking and Finance 27, pp. 1959–1977.

Lee, D. D./*Chan*, H./*Faff,* R. W./*Kalev*, P. S. (2003): Short-term contrarian investing – is it profitable? … Yes and No. Journal of Multinational Financial Management 13, pp. 385–404.

Lobe, S./*Rieks*, J. (2011): Short-term market overreaction on the Frankfurt stock exchange. Quarterly Review of Economics and Finance 51, pp. 113–123.

Otchere, I./ *Chan*, J. (2003): Short-term overreaction in the Hong Kong stock market: Can a contrarian trading strategy beat the market? Journal of Behavioral Finance 4, pp. 157–171.

Park, J. (1995): A market microstructure explanation for predictable variations in stock returns following large price changes. Journal of Financial and Quantitative Analysis 30, pp. 241–256.

Peterson, D. R. (1995): The influence of organized options trading on stock price behavior following large one-day stock price declines. Journal of Financial Research 18, pp. 33–44.

Pritamani, M./*Singal*, V. (2001): Return predictability following large price changes and information releases. Journal of Banking and Finance 25, pp. 631–656.

Savor, P. G. (2012): Stock returns after major price shocks: The impact of information. Journal of Financial Economics 106, pp. 635–659.

Schiereck, D./*De Bondt*, W./*Weber*, M. (1999): Contrarian and momentum strategies in Germany. Financial Analysts Journal 55, pp. 104–116.

Singer, N./*Laser*, S./*Dreher*, F. (2013): Published stock recommendations as investor sentiment in the near-term stock market. Empirical Economics 45, pp. 1233–1245.

Sturm, R. R. (2003): Investor confidence and returns following large one-day price changes. The Journal of Behavioral Finance 4, pp. 201–216.

Wang, J./*Meric*, G./*Liu*, Z./*Meric*, I. (2011): The determinants of stock returns in the October 9, 2007–March 9, 2009 bear market. The Journal of Investing 20, pp. 18–24.

Zarowin, P. (1990): Size, seasonality and stock market overreaction. Journal of Financial and Quantitative Analysis 25, pp. 113–125.