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Michael Souček

Thomas Wasserek

European University Viadrina Frankfurt (Oder)

Department of Business Administration and Economics

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Michael Souček[a], Thomas Wasserek[b]

[a]*Department of Business Administration, European University Viadrina*
Große Scharrnstraße 59, 15230 Frankfurt (Oder), Germany
Email: soucek@europa-uni.de
[b]*Department of Business Administration, European University Viadrina*
Große Scharrnstraße 59, 15230 Frankfurt (Oder), Germany Email: thomas.wasserek@icloud.com

Abstract

The purpose of this article is to examine the impact of analysts' recommendation downgrades, upgrades, and reiterations on German stock returns and as to whether profitable investment strategies could potentially be designed around these recommendations. The paper provides a unique detailed descriptive analysis of financial analysts' recommendations changes on German stock market over the last decade. First, we show that changes in recommendations yield significant positive (negative) abnormal gross returns for upgrades (downgrades), respectively. Reiterations, on the other hand, do not cause statistically significant stock market reactions. We show, that stock price reactions following recommendation revisions are strongest at the announcement day and last up to six months for upgrades and four month for downgrades. A bulk of market reactions, appears on the recommendation event date and shortly before so that investors must trade in a timely manner to profit from analyst recommendations. A one-day delayed reaction to the change in recommendations do not allow for significant abnormal returns for most of the recommendation shifts.

Keywords: Asset Pricing, Analyst Recommendations, Efficient Market Hypothesis, Abnormal Returns

JEL Classification:

1. Introduction

The article examines the impact of analysts' recommendation downgrades, upgrades, and reiterations on stock returns of firms listed in the DAX 30 of the German stock exchange, and as to whether investors could potentially profit from these recommendations.

The academic theory and stock exchange practice are contradictory regarding this matter. Following the semi-strong form of market efficiency, investors should not be able to exploit analyst recommendations to generate excess returns as security prices fully reflect all publicly available information instantaneously (Fama, 1970). However, financial researchers of brokerage houses provide costly activities, presumably because these firms are convinced that certain stocks are more attractive than others yielding superior returns and that it is possible to identify these stocks.

Grossman and Stiglitz (1980) observe market prices to reflect publicly available information only partially when arbitrage is costly, otherwise individuals who are informed would not gain compensation for their research activities. Brokerage houses should be compensated for the search of information they use to rate the investment potential of stocks in the form of commensurate trading profits, underwriting fees, or brokerage commissions. Similarly, an investors' incentive to pay for the investment recommendations are sufficiently large expected profits. The motivation of the study is to test whether the analysts forecasting and stock picking ability and the related trading advices are valuable to investors. This study, as one of few, focuses solely on the German stock market and is unique in recent literature regarding to the length of analyzed period.[1] Furthermore, the paper provides a unique and very detailed descriptive statistics of analysts' recommendation changes for German stocks.

In general, stock recommendations can be accessed by investors and other interested parties, as these information are generally publicly available. The buy and sell recommendations, therefore, are likewise much of interest and achieve a large number of market participants.

In this study, we design abnormal returns around recommendations for three different types of recommendation changes, i.e. first recommendations, revisions and reiterations. We analyze the market reactions to these different types of recommendation changes at the announcement day and from one month before up to six months after the event. This allows us to observe the moment when stock prices began reflecting the newly added

[1]Most of the empirical studies that examine analyst recommendations focus on outstanding U.S. recommendations, for example Womack (1996), or Jegadeesh and Kim (2010).

information and to determine the length and magnitude of this change. To simulate real market situations, we also consider a trading strategy, where an investor starts trading on the day following the change in analysts' opinions.

We show that the two-or-three-day abnormal return around the announcement is, in general, significantly negative for recommendation downgrades and significantly positive for upgrades. For the analysts' initial coverage of a firm, a buy recommendation is accompanied by a significantly positive return, whereas a hold or sell recommendation is associated with a significantly negative return. Reiterations, on the other hand, are not generating abnormal stock returns significantly different from zero. Incorporating a one-day-delay in reaction time to recommendation revisions, we find that abnormal returns diminish. A large part of market reactions, therefore, occurs on the recommendation event date and shortly before so that investors must trade in a timely manner to profit from analyst recommendations.

This work differentiates from other studies by focusing on largest German stocks using an extensive an detailed dataset for the years 2000 through 2012. Moreover, we analyze the information content for all possible types of recommendation changes, while some older studies, for instance, Stickel (1995) and Womack (1996), examine the price reactions only to revised investment recommendations. On contrary to, for instance, Barber et al. (2001); Jegadeesh et al. (2004) we use individual rather than consensus (average) analyst recommendations. Ruhm et al. (2011) also analyze market price reactions of analyst recommendations on the German stock market, however, unlike us they use aggregated stock recommendations. This study is to be expected to address both financial economists and stock exchange practitioners. For financial academics, this research posits how analysts rate stocks, and enhances their understanding of market efficiency to publicly available recommendations on the German stock market. Investors benefit from our study, as they receive a decision aid whether analyst recommendations can yield abnormal profits.

The rest of this paper proceeds as follows. In section II, we review some interesing results in the related literature and highlight the contributions of our study. Section III describes the data and methodology and provides summary statistics of analyst recommendations. A discussion of our research design follows in section IV. Section V presents the stock price response to analyst recommendation announcements, and section VI summarizes and concludes the results.

2. Related Literature

A number of prior studies examine how publicly available recommendations by security analysts affect stock returns and as to whether investors are able to benefit from the analysts' opinion (Womack, 1996; Barber et al., 2001), as well as assessed the role of herding (Welch, 2000; Jegadeesh and Kim, 2010).

Elton et al. (1986) have already indicated that there is information in analysts' changes in recommendations which lasts up to three months after the brokerage firm revises the recommendation. The findings of Stickel (1995) and Womack (1996) suggest that changes in recommendations by sell-side analysts could be exploit for investment strategies showing positive (negative) abnormal gross returns followed by recommendation upgrades (downgrades) at the time of their announcement. In addition, they document a post-recommendation stock price drift that continue to reflect the information in recommendation downgrades (upgrades) up to six months (one month) into the future.

Different from Stickel (1995) and Womack (1996), Barber et al. (2001) are first to take a more investor-orientated perspective incorporating trading costs and delay in time into the analysis that incur by implementing a number of investment strategies and associated portfolio turnovers. These portfolios are constructed according to consensus analyst recommendations and dynamically adjusted to rating revisions. The authors conclude that traders, who buy (sell short) stocks with the most (least) favorable consensus recommendations associated with daily portfolio rebalancing and a timely response to changes in analyst recommendations can yield abnormal gross returns of more than 4% annually. Less frequent shifts in portfolio or delayed reactions diminish these returns, however, they remain significant for those stocks that are rated least favorably. However, abnormal net returns diminish after accounting for transaction costs.

A different approach analyzing analyst recommendations is given by Desai et al. (2000) and Barber et al. (2007). They evaluate the performance of individual financial analysts or compare the stock recommendation performance of investment banks and independent research firms, respectively. Desai et al. (2000) find that stocks recommended by *Wall Street Journal (WSJ)* all-star analysts outperform comparable benchmark stocks of their industry counterparts. Consequently, analysts ranked as experts in each industry in annual *WSJ* rankings show superior stock recommendation performance. Barber et al. (2007) document that independent research firms' buy recommendations outperform those of investment banks by 8 percentage points annualized. In contrast, investors are better off following investment banks' hold and sell recommendations rather than those of independent research firms, generating abnormal returns relatively of more than 4.5 percentage points per year. The authors argue, that the results indicate hesitance by investment banks to downgrade securities whose performance prospects are weak.

3. Data

The analyst recommendations data used in this study is obtained from the I/B/E/S database encompassing the period from January 2000 through September 2012.[2] Stock prices, as well as stock returns and index returns were sourced by the Datastream database. The sample period is from January 2000 to September 2012. This paper focuses on those DAX 30 firms as of the quarterly review effective on 24 September 2012. We follow analyst recommendations referred to their "Announce date" specified in I/B/E/S on which the recommendation can be accessed by traders, allowing us to determine to what extent market prices respond to publicly available information.[3] At each point in time, we track the recommendations for the firms followed by each analyst and the brokerage houses employing them.

As many security analysts often use different labels to convey their stock recommendations, such as "market outperform" and "market underperform", or "overweight" and "underweight", I/B/E/S assigns, therefore, a standardized numerical rating scale of 1 ("strong buy"), 2 ("buy"), 3 ("hold"), 4 ("underperform") to 5 ("sell") to ensure com-

[2]We thank to Prof. A. C. Harvey from the Faculty of Economics at the University of Cambridge for access to the Wharton Research Data Services.

[3]In contrast, the "Activation date" is the day that the analysts' forecast is recorded to the I/B/E/S databse. It holds that *Activation date* $\geq$ *Announce date* meaning that the analysts' stock opinion first is generally issued to the public before it appears in the database. Consequently, by considering analyst recommendations according to their "Activation date" may result in some delay in examining stock price reactions.

parability, both for investors and among academic articles. Additionally, assigning a numerical value to the estimator text enables to calculate a consensus recommendation. Rating codes of 0 ("restricted") also appear in the database, indicating the termination of coverage, however, they were excluded from the dataset for the analysis.

Analysts and brokerage firms contributing the forecasts can also be observed by means of their full names, as well as of a unique number assigned to them for all the time they operate. For the anatomy of the performance of analysts recommendations, we follow unequivocal numerical identification criteria as they are robust to different notations and changes in names minimizing our risk of errors.[4]

Simmilar to Jegadeesh and Kim (2010) the final sample consists of all stocks that fulfill the following criteria:

1. There should be at least one analyst who has active recommendations for the stock. A recommendation is considered to be active if an analyst offers a recommendation and revises or reiterates its opinion within a calendar year.[5] Exceeding 365 days, ceteris paribus, the forecast is applied as first recommendation, otherwise it is screened out. The 365-day criterion is imposed to filter out outdated recommendations without any reference to previous ones.
2. Stock return data should be available on all trading days of the event period, as well as on the estimation window.Therefore, we exclude those recommendations, that are issued on days during which the Frankfurt Stock Exchange is closed.

Dropping those database entries not satisfying these criteria leaves a recommendation sample of 12,998 observations with 1,446 analysts, working for 126 different brokerage houses for the years January 2000 through September 2012. Detailed summary statistics are given in the following section.

[4]Our sample contains 25 security analysts whose names are notated differently but recorded under a unique number.

[5]I/B/E/S provides a recommendations stop file itself including those analysts estimates that are not updated or confirmed for a total of 180 days. Recommendations are updated by a contributing analyst sending a confirmation, revision or drop in coverage.

3.1. Descriptive Statistics

Annual descriptive statistics are provided in table 1. For the years 2000 through 2005 the I/B/E/S database do not cover all firms from the DAX (column 2). In the first year the I/B/E/S coverage is incomplete for Deutsche Boerse, Deutsche Post, Infineon and Lanxess, resulting in a relatively smaller sample size (columns 3 and 4).[6] In the following years to 2005 (2001) there is a lack of database entries yet for Lanxess (Deutsche Boerse and Deutsche Post). The number of analysts providing forecasts ranges from a low of 219 in 2000 to a high of 436 in 2003, averaged 346 analysts for the entire sample period (column 3).

The number of brokerage houses contributing recommendations varies from 42 in 2000 to 70 in 2011 (column 4). From 2001 to 2007 the number of brokerages has been stable, at an average of 54, before steadily increasing over time, indicating an increased shift in focus to the German stock market after the recent banking and financial crisis. The brokerage firms in the recommendations' sample vary from large brokerages like Goldman Sachs, or JP Morgan Chase to small ones that comprise only one analyst. The mean number of analysts working in a brokerage on I/B/E/S is 6.10 (median 5). Most analysts were, on average, active in 2003, whereas the lowest mean number of analysts per brokerage house is in 2012.

Columns 7 and 8 show the mean and median of analysts following a firm. Per covered firm on average 16.85 analysts issue an estimate. From 2000 onward, the number of analysts following a firm increases to 23 in 2002 and 2003 before decreasing sharply below 20. Sell-side analysts cover on average 1.42 firms (column 9). The consensus recommendation for the sample period is 2.67, which corresponds to a hold rating (column 10).[7] Compared to the related literature considering U.S. recommendations, we observe by far less

[6]For example, because stock price information are incomplete for Infineon for the year 1999 and due to an estimation period of 12 months determining the market beta, we exclude those recommendations issued by analysts in the first calendar year.

[7]For comparison, Barber et al. (2001) document an average analyst rating of 2.27 for firms from the Zacks Investment Research database for the sample period 1985 through 1996. A further paper by Barber et al. (2003) reports a consensus recommendation of 2.05 obtaining their data from the First Call database for the years 1996 to 2001. After reversing the five-point scale ("strong buy" as 5, "sell" as 1) to allow for a more intuitive interpretation of the quantitative results, Jegadeesh et al. (2004) reports a mean consensus of 3.67 (or 2.33 regarding the conventional numerical score) for stocks that are included in the Zachs Investment Research database from 1985 to 1998. All findings correspond to a buy recommendation showing the analysts' reluctance to offer unfavorable recommendations.

Table 1

Annual Analyst Recommendation Ratios

This table lists descriptive statistics of the sample encompassing the period from 2000 through 2012, by year. The sample includes all firms listed in the Dax that have at least one active recommendation in the I/B/E/S detailed recommendations file, i.e. an analyst who issues a recommendation and revises or reiterates its opinion within a calendar year, and where stock return data are available on all trading days of the event period, as well as on the estimation window. The number of analysts and brokerage houses contain all analysts that issued at least one recommendation in a given year. We show the mean and median number of analysts working in a brokerage, as is the mean and median number of analysts per covered firm, and the mean number of firms per analyst. The last column is the average of all of the analysts estimates. Analyst recommendations rate stocks as 1 (“strong buy”), 2 (“buy”), 3 (“hold”), 4 (“underperform”) and 5 (“sell”). A mean recommendation below 2.5 is could be associated with a buy, a hold is given by a rating between 2.5 and 3.5, whereas ratings above 3.5 are sells.

				Number of Analysts per Brokerage		Number of Analysts per Covered Firm		Firms per Analyst†	
Year (1)	Number of Firms (2)	Number of Analysts (3)	Number of Brokerages (4)	Mean (5)	Median (6)	Mean (7)	Median (8)	Mean (9)	Average Rating (10)
2000	26	219	42	5.26	5	12.08	11.5	1.43	2.57
2001	27	306	50	6.20	5	16.19	16	1.43	2.78
2002	29	419	58	7.28	7	21.31	23	1.47	2.62
2003	29	436	56	7.80	7	21.66	23	1.44	2.75
2004	29	359	55	6.60	5	16.66	16	1.35	2.66
2005	29	337	56	6.09	5	16.48	17	1.42	2.83
2006	30	337	55	6.16	5	15.53	15	1.38	2.55
2007	30	302	50	6.12	5.5	13.37	13.5	1.33	2.46
2008	30	354	61	5.85	5	16.93	17.5	1.44	2.80
2009	30	375	67	5.70	4	19.27	19.5	1.54	2.80
2010	30	385	65	6.02	5	18.57	17.5	1.45	2.61
2011	30	387	70	5.54	4.5	18.13	19	1.41	2.51
2012*	30	279	58	4.81	4	12.47	12	1.34	2.65
All Years	30	1,446	126	6.10	5	16.85	17	1.42	2.67

∗ The year 2012 ends by the end of september.

† The overall median number of covered firms per analyst is one.

positively biased recommendations issued for the firms in our dataset. The lowest rating of 2.46, indicating a buy rating, is documented in 2007 before the start of the financial crisis. During the financial crisis, analysts issued more often sells recommendations which leads to an increased consensus recommendation of 2.80 in 2008 and 2009. The impact of risk and uncertainty in economic environment obviously entails more unfavorable recommendations by revising analysts, as is in 2001 as the mean recommendation of 2.78 is above the average of all years.

Table 2 shows the summary statistics for each firm of all of the analysts estimates. As this work examines only a group of firms listed in one market, we are able to provide statistics specifically to all firms separately.[8] The number of analysts following a firm who issues at least one recommendation for the stock and revises or confirms the recommendation within a calendar year range from 33 to 109 (column 3). For the entire sample period from 2000 through 2012 the mean number of analysts is between 9.54 and 22.77 (column 4). The brokerage houses and analysts working for them generally tend to cover larger capitalization firms, because these firms possess high liquidity, which generates also larger commissions revenues for the brokerages. Deutsche Telekom and SAP are the only firms that get recommended by more than 100 various analysts. In contrast, Lanxess gets recommended by only 33 differentiated security analysts. Daimler and Volkswagen are most followed by 22.77 analysts on average, whereas the mean number of analysts for Fresenius is 9.54 for the entire sample period.

The number of brokerage houses per firm range from 31 for Lanxess to 74 for Deutsche Bank (column 5). On average, the most brokerage houses counting 22.08 follow the Deutsche Bank and Daimler, whereas Fresenius is covered by 9.46 brokerages (column 6). The highest mean consensus recommendation level is reported for Beiersdorf and Commerzbank with a rating of 3.07 and 2.96, which corresponds to a hold, whereas analysts issue the most favorable recommendation for Lanxess and Fresenius, indicating a buy with a rating of 2.34 and 2.35 (column 7).

Table 3 shows a 5 $\times$ 5 transition matrix of all the possible changes in analysts' rec-

[8] As most related articles account for all outstanding U.S. recommendations from a database, none of these provide descriptive statistics on analyst recommendations specifically to all firms separately due to the large number of stocks.

Table 2
Descriptive Statistics on all Firms

This table shows summary statistics of analysts' recommendations seperately for each DAX firm as of the quarterly review effective on 24 September 2012 for the years 2000 to 2012. The number of analysts and brokerage houses includes all differentiated security analysts from brokerages that issued at least one recommendation during the years. The mean number of analysts is the mean number of brokerage houses show the average of all different analysts for a given firm during the sample period. The last column is the average of all of the analysts estimates. Analyst recommendations rate stocks as 1 ("strong buy"), 2 ("buy"), 3 ("hold"), 4 ("underperform") and 5 ("sell")

		Analysts		Brokerages		
Firms	Industry	Number of	Mean	Number of	Mean	Average Rating
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Adidas	Clothing	70	15.15	46	14.85	2.61
Allianz	Insurance	85	17.46	66	17.15	2.55
BASF	Chemicals	84	16.00	53	15.38	2.63
Bayer	Pharmaceuticals	90	17.54	58	17.15	2.67
Beiersdorf	Consumer goods	72	12.54	51	12.15	3.07
BMW	Manufacturing	83	18.00	56	17.69	2.62
Commerzbank	Banking	96	19.77	57	18.77	2.96
Continental	Manufacturing	71	13.31	43	12.85	2.73
Daimler	Manufacturing	99	22.77	62	22.08	2.68
Deutsche Bank	Banking	95	22.23	74	22.08	2.72
Deutsche Boerse	Securities	69	16.27	45	15.64	2.70
Deutsche Post	Logistics	57	14.55	42	14.36	2.53
Deutsche Telekom	Communications	104	21.92	69	20.92	2.67
E.ON	Energy	90	19.31	59	18.85	2.52
Fresenius	Medical	52	9.54	42	9.46	2.35
Fresenius Medical Care	Medical	72	13.62	50	13.46	2.44
HeidelbergCement	Building	59	10.54	41	10.54	2.78
Henkel	Consumer goods	77	14.08	45	13.85	2.73
Infineon	Manufacturing	94	22.17	70	21.58	2.82
K+S	Chemicals	52	11.00	39	10.85	2.67
Lanxess	Chemicals	33	12.29	31	12.43	2.34
Linde	Industrial gases	73	13.46	48	12.92	2.67
Lufthansa	Aviation	74	17.77	48	17.69	2.60
Merck	Pharmaceuticals	66	14.15	47	13.77	2.80
Munich RE	Insurance	93	18.54	60	17.92	2.56
RWE	Energy	98	20.00	58	19.62	2.82
SAP	IT	109	21.23	70	20.54	2.68
Siemens	Electronics	94	20.15	61	19.38	2.51
ThyssenKrupp	Conglomerate	77	15.54	45	15.31	2.70
Volkswagen	Manufacturing	97	22.46	60	21.92	2.75

ommendations. In each cell $\{i, j\}$ of the matrix, we present the number of observations at the top, and the mean number of calender days from a recommendation of i and its revision of j at the bottom. The diagonal elements of the matrix are the reiterations of analysts' recommendations, whereas the off-diagonal elements reflect the recommendation revisions.

The bulk of recommendations within the matrix appear in the upper 3 × 3 cells. That is, sell recommendations are less frequent than buy recommendations. This is to be expected, as analysts generally hesitate to disseminate pessimistic recommendations as they are well aware of substantial risks that can appear, both for the analyst and the

Table 3
Transition Matrix of Analyst Recommendations

Each cell of the matrix presents the number of observations at the top, and the mean calendar days between recommendation changes or reiterations at the bottom. The first row, for example, shows all changes from a recommendation of 1 ("strong buy") to 1, 2 ("buy"), 3 ("hold"), 4 ("underperform") or 5 ("sell"), and totals across the columns. The line entitled "First recommendation" signifies the analysts' initiation of a firm. The diagonal elements of the matrix are the reiterations of analysts' recommendations, whereas the off-diagonal elements represent recommendation revisions.

From a Recommendation of:	To a Recommendation of: 1	2	3	4	5	Total
1	164	388	613	38	159	1,362
	154	126	140	147	135	
2	449	628	1,155	240	7	2,479
	121	109	132	132	185	
3	685	1,220	1,236	632	253	4,026
	128	130	74	122	124	
4	42	275	599	365	87	1,368
	150	128	114	80	108	
5	222	16	229	69	44	580
	128	142	120	78	165	
First recommendation	481	856	1,246	400	200	3,183
Total	2,043	3,383	5,078	1,744	750	12,998
% of total	15.7	26.0	39.1	13.4	5.8	

brokerage firm employing them, in offering those opinions to the public (Barber et al., 2001). Unfavorable stock recommendations may limit or terminate a brokerage firm's present or potential underwriting relationship, therefore, analysts are imposed to offer more optimistic recommendations. Moreover, for the analysts career concerns, an incorrect sell rating is likely to be more risky for his reputation than an incorrect buy rating. This is largely because sell recommendation commonly command much more attention as they are issued less often. Nevertheless, the stock investment recommendations contributing to the firms in our dataset are apparently less biased than suggested by the findings of already existing papers considering U.S. data.[9] Of all the recommendations in the sample 41.7% are buys (1 or 2), 39.1% are holds, whereas 19.2% constitute sells (4 or 5). This observation is in line with the distribution of initial recommendations, that are also predominantly optimistic, reflecting again the hesitance of security analysts to

[9] Within the study by Barber et al. (2001), of all the analysts' stock recommendations only 6.5% are sells. Similarly, Loh and Stulz (2011) document underperform and sell recommendations to appear in 7.3%, confirming both the tendency of security analysts to issue more favorable investment potentials.

offer sell recommendations. Consistent with Loh and Stulz (2011) there is a tendency to revise the analyst recommendations across all ratings into holds. Hold recommendations themselves tend to get reiterated.

The interpretation of hold recommendations is not as clear as buys or sells. Given transaction costs the forecasted price changes generally do not allow an unequivocal course of action. A stock recommended as hold should be remained in the stockholders' portfolio, whereas potential buyers should not react to the analysts recommendation. Thus the existence of transaction costs accounts for that investors should not act in re-balancing their portfolios. Even though analysts do not estimate a number they give an unambiguous course of action, however, the interpretation of this information is up to the user (Elton et al., 1986). The mean time between the initial announcement of a recommendation and its reiteration is 116 days. In contrast analysts' recommendations are revised within 130 days. In contrast, Barber et al. (2001) state a mean time between a recommendation and its reiteration or revision of little less than 300 days or in the low 100-day range, respectively.

Table 4 summarizes all analyst recommendation changes according to the sign and magnitude. Reiterations (rating change of 0) comprehend with 2,437 observations the largest number of recommendations, making up 24.8% of all recommendation changes. Actual recommendation changes are revised largely by one rank (-1 or $+1$), comprised of 2,337 upgrades (23.8% of the sample) and 2,262 downgrades (23.0%), respectively. Totally, across all categories the dataset contains more upgrades rather than downgrades and recommendation revisions appear more often than reiterations.

4. Methodology

4.1. Research design

Security analysts generally form expectations about the future stock price updating their prior beliefs continuously by observing new information and decide as to whether they upgrade, downgrade, or make no revision to their investment recommendation of the stock. The analyst downgrades (upgrades) his recommendation if the expected price to some extent falls below (exceeds) the current stock price. Otherwise, the security analyst either reiterates its previous recommendation or does not disseminate any new information

Table 4
Changes in Recommendations

This table shows the number of analysts' recommendations according to the sign and magnitude of the rating change for the years 2000 through 2012. Each recommendation change is computed as an analyst's current rating minus his prior rating. Analysts' initiations are excluded. Recommendation changes lie between −4 and +4. A negative (positive) sign is associated with an upgrade (downgrade). For example, the first row reports all changes from a recommendation of 1 ("strong buy") to 5 ("sell"). Reiterations are indicated by a rating code of 0. The last column gives the frequency percentage of each rating change category.

Rating change	Number of observations	Percentage
+4	159	1.6
+3	45	0.5
+2	1,106	11.3
+1	2,262	23.0
0	2,437	24.8
−1	2,337	23.8
−2	1,189	12.1
−3	58	0.6
−4	222	2.3
Total	9,815	100

that could be potentially valuable for traders. The analyst is rewarded according to his compensation function. The models of Chen and Jiang (2006) and Jegadeesh and Kim (2010) specify the analysts' compensation as a function of their forecast accuracy given the conventional wisdom that analysts tend to get rewarded for accurate recommendations. However, other factors or even combinations of several criteria are also likely to follow such as career concerns like professional experience or the analysts status in the brokerage house.

The semi-strong form of market efficiency implies that the market is efficient, when fully revealing all publicly available information into prices such that investors should not be able to profit from analyst recommendations by trading on that information. To challenge this hypothesis, we measure market reactions to recommendation revisions based on abnormal stock returns. The abnormal return is defined as the difference between a stock's actual and expected rate of return (Barber and Lyon (1997)).

Assuming an investor who acquires a stock i at time t holding a passive investment strategy over a period of $t+T$, we adopt T-day buy-and-hold abnormal returns $BHAR_i(t, t+T)$ around the analyst recommendations as follows:

$$BHAR_i(t, t+T) = \prod_{t}^{t+T}(1 + R_{i,t}) - \prod_{t}^{t+T}(1 + E(R_{i,t})), \tag{1}$$

where $R_{i,t}$ denotes the discrete daily raw return of stock i at date t, $\mathrm{E}(R_{i,t})$ signifies the expected rate of return of the same stock. Day 0 is the revision and reiteration date, and the analysts' first recommendation announcement day, respectively. We analyze the market reactions to these different types of recommendation changes at the announcement day (a length of two or three days, respectively), and from one month before up to six months after the event. By assuming an efficient market no significant price reactions are to be expected prior to the event time. However, there is a chance that the market anticipates the upcoming information having already an impact on stock price changes. In addition, also insiders who gain access to the analysts forecasts prior to the announcement day could potentially move the security prices. Analyzing the information content only at the recommendation announcement day would leave out these effects. The same holds for the period after the event. If market participants will need some time to react to recommendation revisions, either because they gain access to the analysts' recommendations only after a couple of days, or due to impractical reasons engaging in a timely manner, there may be a delay in market response. Moreover, we could also observe potential stock price reverse reactions that may arise from overvaluing (undervaluing) the recommendations' information.

4.2. Abnormal returns

To determine a stock's i expected return $\mathrm{E}(R_{i,t})$ to calculate abnormal returns with respect to analysts' recommendations, we employ the theoretical framework of the Capital Asset Pricing Model (CAPM) as follows:

$$\mathrm{E}(R_{i,t}) = R_{f,t} + \hat{\beta}_{i,t}(R_{m,t} - R_{f,t}), \tag{2}$$

where $R_{f,t}$ is the day t return on the German treasury bill having ten years until maturity, $\hat{\beta}_{i,t}$ is the estimated market beta and $R_{m,t}$ is the day t return on the CDAX market index.

For the market beta, we design a sufficiently large estimation window determining a length of one year or 250 trading days, respectively. That gives us stable parameters for our asset pricing model. Furthermore, the estimation period is set at a distance of one month or 21 trading days, respectively, to changes in recommendations preventing the model parameters to include potential influences due to anticipated information. Figure 1

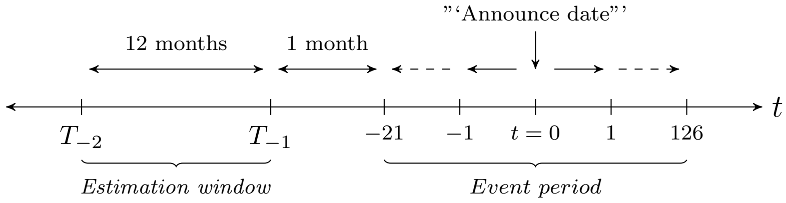

Figure 1. Estimate of the market beta and testing horizon. This figure presents the timeline for the time-series regression, and the analyst recommendations event period at a glance. The length of the estimation period is set to a calendar year ranges from T_{-1} to T_{-2}, whereas stock price changes following analysts recommendations are tested across various horizons from $t = -21$ to $t = 126$. Additionally, the estimation period is set at a distance of one month or 21 trading days, respectively, to changes in recommendations shown as $t = -21$ to T_{-1}. For example, this figure shows of how to estimate the market beta at time $t = -21$. Estimating beta at the announcement date would shift the estimation window and distance in between to the right by 21 trading days. Day 0 is the revision and reiteration date and the analysts first recommendation announcement, respectively, to be publicly available. The dashed line within the event period represents the entire testing horizon. For further research, to take a more investor-orientated perspective, the testing period then is reduced to the solid line ranging from $t = -1$ to $t = 1$.

illustrates the relationship between the event period issuing the analyst recommendations and the estimation window for the market beta.

To test whether abnormal returns differ significantly from zero ($H_0 : \overline{BHAR_{t,t+T}} = 0$ vs. $H_1 : \overline{BHAR_{t,t+T}} \neq 0$), we employ cross-sectional t-statistics. First, we compute T-day buy-and-hold mean returns over n numbers of analyst recommendations as

$$\overline{BHAR_{t,t+T}} = \frac{1}{n}\sum_{i=1}^{n} BHAR_{t,t+T}. \tag{3}$$

The parametric t-statistics, then, are formally given by Saens and Sandoval (2005):

$$t_{BHAR} = \overline{BHAR_{t,t+T}}/\sigma(BHAR_{t,t+T}), \tag{4}$$

with

$$\sigma(BHAR_{t,t+T}) = \sqrt{\frac{1}{n(n-1)}\sum_{i=1}^{n}(BHAR_{t,t+T} - \frac{1}{n}\sum_{i=1}^{n} BHAR_{t,t+T})^2}, \tag{5}$$

where $\overline{BHAR_{t,t+T}}$ is the average buy-and-hold abnormal return formed into groups of different types of recommendation changes and $\sigma(BHAR_{t,t+T})$ denotes the cross-sectional standard deviation.[10]

[10] The cross-sectional t-test assumes that the abnormal returns are independent and identically distributed. Brown and Warner (1985) show that even for relatively small samples of size 50, the abnormal returns are close to normal. The significance of t-statistics, therefore, is not affected even though using

For robustness-check purposes, we have additionally considered various multi-factors models to estimate expected returns. For German data, the literature is inconclusive which asset pricing model should be preferred, pointing out the differences across the stocks and strong sensitivity to data choice (Artmann et al., 2012; Brueckner et al., 2012). Beside the well known three factor model by Fama and French (1993) and four factor extension by Carhart (1997), for every in-sample we used recursive model selection approach based on AkaIke information criterion (AIC), starting wit the following model:

$$R_{i,t} = R_{f,t} + \beta_{i,t} MRP_t + s_{i,t} SMB_t + h_{i,t} HML_t + w_{i,t} WML_t + \epsilon_i t, \tag{6}$$

where $R_{f,t}$ is the day t risk free return, $\beta_{i,t}, s_{i,t}, h_{i,t}, w_{i,t}$ are regression coefficients. HML, SMB and WML are based on Brueckner et al. (2014).The best model based on AIC for a given in-sample period is used to calculate the next period expected return.

Generally, the results allow for a very similar interpretation as the evidence based on CAPM. However, especially in the second half of the sample, multi-factor models tend to overestimate the CAPM expected returns. This fact leads to a clear pattern in the abnormal returns, which exhibit a negative trend in the second half of the sample creating significantly negative abnormal returns for the analyzed stocks. Additionally, a simple analysis of forecasting accuracy based on mean squared error (MSE) and mean absolute error (MAE) show slightly better average forecasting performance of CAPM for most of the analyzed stocks in the sample. Because the focus of this paper is not the forecasting power of asset pricing model, but the economic value of the financial analysts' recommendations, we omit the presentation of the results for various multi-factor models. The results are available upon request.

5. Empirical Tests

5.1. Market Reactions to Recommendation Changes

To assess whether investors profit from security analysts' recommendations we investigate empirical evidence on stock price reactions following recommendation revisions. We

daily return data exhibits a distribution of abnormal returns to be fat-tailed deviating from normality Brown and Warner (1985).

assume an investor who acquires a stock one month prior to a change in recommendation holding a long-term investment strategy over the entire observation period. This allows us to determine to what extent market and at what time prices tend respond to publicly available information.

Table 5 presents average buy-and-hold abnormal stock returns over various horizons on different types of changes in analysts' recommendations. Day 0 is the revision and reiteration date, and the analysts first recommendation announcement day, respectively, on which the information can be publicly accessed by traders. The further days in the column headings reflect the number of trading days relative to the recommendation event date.

The average abnormal stock return on the recommendation announcement date is 0.727% for all upgrades and −0.678% for all downgrades. In contrast, reiterations are by far less influential on stock prices and do not show statistical significance over any horizon. This strongly indicates that reiterations are clearly uninformative in terms of abnormal returns. These results are in line with previous studies that analyze the impact of analyst forecasts on security returns.

Average market reactions following recommendation revisions are, as expected, strongest at the announcement day. The abnormal stock returns are significantly different from zero at the 1% level. Also, the market anticipates a somewhat large part of favorable recommendation changes also one day prior to the revision date exhibiting an abnormal gross return of 0.410% before even almost doubled at the day of the revision.

Table 5 also presents abnormal returns seperately for recommendation downgrades, and upgrades of different magnitude. Recommendation upgrades that skip at least two ranks do not show statistical significance over any horizon, which however, might be related to relatively small observation sizes. A recommendation change by two levels is accompanied by an average abnormal stock return of 0.977% at the revision date, whereas an optimistic stock revision by only one level exhibits a return of 0.632%. Similar results are obtained with respect to negative recommendation changes. A change in recommendation from 1 ("strong buy") to 5 ("sell") yields a return of −2.406% at the recommendation event date. In contrast, a recommendation downgrade that do not skip

Table 5
Average compound Stock Returns over various horizons

This table shows geometrically compounded mean abnormal returns (in %) across all firms before and after the recommendation change day. The abnormal return is the difference between a stock's actual and expected rate of return. The returns that are significant at least at a level of 5% are shown in bold, i.e. absolute critical value of t-statistics greater than 1.96. t-statistics, estimated using a cross-sectional test, are shown below the returns. Each t-statistic relates to the hypothesis that the mean abnormal return is equal to zero. Day 0 is the revision date and the other days in the column headings are the number of trading days relative to the recommendation event date. Recommendation upgrades, and downgrades are further classified according to the magnitude of the rating change. For example, favorable recommendation changes that skip two ranks reports all changes from a recommendation of 3 ("hold") to 1 ("strong buy"), 4 ("underperform") to 2 ("buy") or 5 ("sell") to 3 ("hold"). N is the number of observations. The sample period is from January 2000 to September 2012.

			Number of Trading Days Relative to Recommendation Event Day							
Recommendation change		N	−21	−2	−1	0	1	2	21	126
Upgrades	All	3.806	−0.021	0.112	**0.410**	**0.737**	**0.869**	**0.879**	**1.258**	**1.449**
			−0.702	0.741	2.491	4.413	5.008	4.987	5.286	2.907
	−4	222	0.086	0.036	0.169	0.366	0.684	0.866	0.917	3.840
			0.696	0.066	0.295	0.604	1.100	1.367	0.960	1.077
	−3	58	0.302	0.449	0.513	1.467	1.395	1.589	2.335	7.562
			1.295	0.329	0.394	1.046	1.014	1.097	1.137	1.727
	−2	1,189	−0.008	0.269	**0.728**	**0.977**	**1.133**	**1.131**	**1.389**	1.125
			−0.137	0.885	2.132	2.790	3.098	3.055	2.948	1.342
	−1	2,337	−0.045	0.031	0.269	**0.632**	**0.739**	**0.734**	**1.197**	**1.235**
			−1.255	0.171	1.384	3.253	3.668	3.581	4.180	2.087
Downgrades	All	3,572	−0.013	0.032	−0.246	**−0.678**	**−0.849**	**−0.893**	**−1.435**	−0.784
			−0.427	0.208	−1.495	−3.972	−4.838	−4.929	−5.831	−1.410
	+4	159	−0.059	−1.380	**−1.892**	**−2.406**	**−2.589**	**−2.848**	**−3.870**	0.530
			−0.374	−1.690	−2.093	−2.638	−2.830	−2.967	−3.261	0.169
	+3	45	0.295	−1.868	−2.257	−3.260	**−3.658**	−3.521	**−5.884**	−7.249
			1.043	−1.275	−1.594	−1.836	−2.040	−1.949	−2.311	−1.791
	+2	1,106	−0.058	0.251	0.079	−0.372	−0.544	−0.531	**−1.135**	−0.047
			−1.042	0.927	0.277	−1.269	−1.783	−1.681	−2.527	−0.040
	+1	2,262	0.006	0.062	−0.250	**−0.656**	**−0.821**	**−0.881**	**−1.322**	−1.108
			0.140	0.320	−1.202	−3.032	−3.703	−2.860	−4.334	−1.795
First recommendation	All	3,183	−0.043	−0.072	−0.064	−0.080	−0.133	−0.147	−0.214	**2.066**
			−1.268	−0.454	−0.393	−0.480	−0.771	−0.831	−0.848	4.215
	Buys	1,337	−0.059	−0.012	0.120	0.421	**0.497**	0.365	0.175	**2.005**
			−1.141	−0.055	0.545	1.850	2.131	1.529	0.478	2.886
	Holds	1,246	0.011	0.046	−0.006	−0.195	−0.333	−0.322	0.014	**3.112**
			0.201	0.184	−0.025	−0.742	−1.241	−1.159	0.036	3.774
	Sells	600	−0.120	−0.449	−0.592	**−0.958**	**−1.121**	−0.927	**−1.554**	0.028
			−1.542	−0.989	−1.288	−2.012	−2.217	−1.787	−2.397	0.024
Reiterations		2,437	0.006	0.255	0.209	0.224	0.255	0.280	0.074	−0.205
			0.220	1.604	1.299	1.355	1.474	1.553	0.283	−0.356

a rank is associated with a significantly negative return of -0.656%. Thus, the findings suggest that recommendation revisions of higher magnitude are, in general, accompanied also by stronger market reactions.

Analyzing all initiations of stock coverage seperately, they do not exhibit significant returns as buy and sell recommendations effects get reversed. Stock prices respond to newly added buy recommendations (rating of 1 or 2) one day after the announcement, whereas new sell recommendations (4 or 5) appear in market prices at the analysts' initiation day. The average abnormal return associated with a sell (buy) rating is roughly 1% (0.497%). Hold recommendations do not show statistical significance, although the market reaction results in declining stock prices.

Figure 2 illustrates market reactions following all changes and initiations of analysts' stock recommendations. Up to one month prior to the recommendation average buy-and-hold abnormal returns are not reliably greater than zero. The compound return, thereafter, steadily increases to 1.449% by the end of the sixth month for recommendation upgrades and decreases to -1.435% by the end of the first month for downgrades. Nevertheless, unfavorable recommendation changes continue to reflect the information further three months into the future. Consequently, we document a post-recommendation stock price drift that last to reflect the information in recommendation changes up to six months for upgrades and four months for downgrades. These results are consistent with the previous literature varying only in the length of the stock price drift. For the analysts' initation of a firm's coverage, stock prices gradually increase in the long-term following a buy or hold rating, whereas negative reactions to first sell recommendations quickly occur at the day of the announcement before they appear to be mean-reverting by the end of the observation period.

5.2. Investor-orientated Abnormal Returns

Stock price reactions thus far occur mostly on the day before, the day at, and the day following recommendation revisions. Therefore, we take a more in-depth examination of the announcement day, measured by a three-day window. Additionally, we change the article's perspective from an event-time to a more investor-orientated perspective incorporating delay in time into the analysis. On the one hand, abnormal stock returns

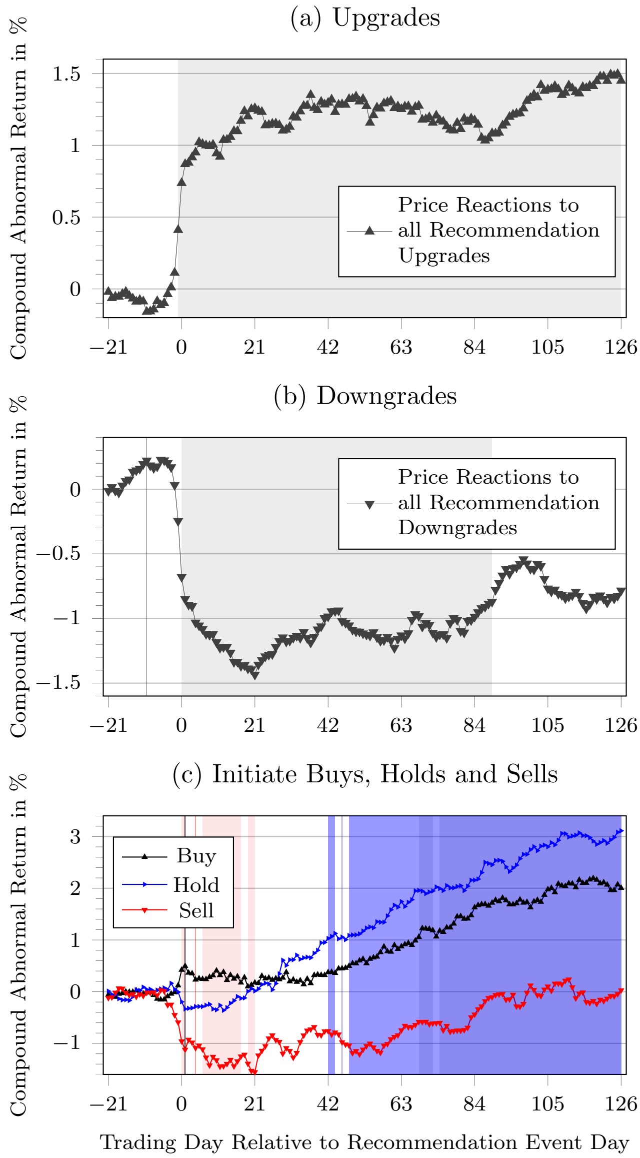

Figure 2. Average buy-and-hold abnormal returns for recommendation revisions, and analysts initiate recommendations. This figure presents cumulative mean excess returns (in %) following recommendation upgrades, downgrades, and analysts initiate opinions. Initiate buy (sell) recommendations comprise stocks rated as "strong buy" or 'buy'" ("underperform" or "sell"). BHARs are calculated as in equation 1. We assume an investor who acquires a stock 21 trading days before the security analyst is issuing or revising his recommendation, and holding this stock throughout a period of 147 days generating geometrically compounded excess returns. Day 0 is the revision date, and the analysts first recommendation announcement, respectively, to be publicly available. The shaded areas represent the period of trading days during which recommendations remain in effect after the recommendation change day.

are measured by a two-day window assuming that an investor purchases a security directly on the revision date. On the other hand, we investigate whether investors are still able to earn positive abnormal profits when they pursue an investment strategy of buying (selling short) stocks on the day following analysts' recommendation revisions for up to one month.

Table 6 presents percentage cumulative abnormal returns and t-statistics associated with all changes in and initiations of analysts' recommendations of different investment strategies. In Panel A, we report the informational content of analysts' recommendations for the three-day period centered on the revision date. Panel B reports a two-day investment strategy, where an investor buys a firms' stock directly after the recommendation is announced to the public by the contributing brokerage house. Finally, Panel C of table 6 shows the potential returns when we adopt a delay in time of one day to trade on new information in terms of stock recommendations.

Similar to the findings of Stickel (1995) and Womack (1996), we find that the compound three-day announcement return is, as expected, significantly negative for downgrades and significantly positive for upgrades, while reiterations, in general, do not exhibit significant results. However, a sell rating that has been confirmed within a calendar year yields, unexpectedly, yield a positive return of 1.625%. Furthermore, for the analysts' initiation of a firm, a buy recommendation (1 or 2) is associated with a significantly positive return, whereas a hold or sell recommendation (3, 4 or 5) entails a statistically significant negative return. A stock rated as 2 ("buy") yields a return of 0.528%, while a first unfavorable recommendation of 4 ("underperform") exhibits a return of −0.821%. An added new sell recommendation is associated, in general, with a greater stock price response than adding a new buy firm.

The largest market reaction occurs by revising a recommendation of 1 ("strong buy") to 4 accompanied by a return of −2.748%. Downgrades from 1 to 5 ("sell") or 2 to 4 also have a great impact on stock prices generating a return of roughly −1.5%. The average abnormal return associated with an upgrade from 4 to 2, or 3 ("hold") to 2 that appear to have the largest stock price reactions is 0.975%, or 0.897%. A recommendation downgrade yield, in general, an absolute higher abnormal return than a recommendation upgrade. If it is more risky for an analyst offering sell recommendations than issuing buy opinions, we believe that unfavorable recommendation changes are more predictive. Thus, this provides for us a potential explanation for the larger magnitude of returns following recommendation downgrades. Recommendation revisions that do not skip a rank are accompanied by the smallest market reactions. A change in stock recommendation by an analyst from 1 to 2, or reversely from 2 to 1, exhibits a return of −0.401%, or 0.458%.

Table 6
Buy-and-hold abnormal Returns of different Investment Strategies

This table shows the average buy-and-hold abnormal returns (in %) for all changes in and initiations of analysts' recommendations over various horizons. In Panel A, abnormal returns are measured on a three-day window centered on the revision date. In Panel B, we adopt a two-day event period from the recommendation event date. In Panel C, the return is measured for the day following the recommendation revision for up to one month in the future. The returns, shown as the top number of each cell, that are significant at least at a level of 5% are shown in bold (absolute critical value of *t*-statistics greater than 1.96). *t*-statistics, estimated using a cross-sectional test, are shown below the returns. Each t-statistic relates to the hypothesis that the mean abnormal return is equal to zero. The first row, for example, reports all changes from a recommendation of 1 ("strong buy") to 1, 2 ("buy"), 3 ("hold"), 4 ("underperform") or 5 ("sell"). (The frequency of recommendations in each cell is reported in table 3.)

Panel A: Three-day window from the Recommendation Event Date

From a Recommendation of:	To a Recommendation of: 1	2	3	4	5
1	−0.374	**−0.401**	**−0.751**	**−2.748**	**−1.349**
	−1.528	−2.539	−4.838	−1.962	−3.085
2	**0.458**	−0.083	**−1.078**	**−1.455**	1.505
	2.514	−0.714	−8.857	−4.065	0.918
3	**0.860**	**0.897**	0.021	**−1.084**	−0.513
	5.541	8.710	0.281	−6.478	−1.562
4	0.928	**0.975**	**0.654**	0.007	−0.085
	1.824	3.945	3.799	0.057	−0.144
5	**0.557**	0.767	0.380	−0.494	**1.625**
	1.968	0.685	1.620	−0.940	2.117
First recommendation	**0.488**	**0.528**	**−0.355**	**−0.821**	**−0.577**
	2.801	3.941	−3.245	−3.736	−2.015

Panel B: Two-day window from the Recommendation Event Date

From a Recommendation of:	To a Recommendation of: 1	2	3	4	5
1	−0.161	**−0.297**	**−0.614**	−2.330	**−0.751**
	−0.884	−2.351	−5.212	−1.895	−2.568
2	**0.340**	0.036	**−0.648**	**−1.164**	1.019
	2.125	0.385	−6.981	−3.933	0.575
3	**0.483**	**0.611**	0.039	**−0.753**	−0.275
	4.157	7.423	0.632	−5.525	−0.992
4	**1.040**	**0.472**	**0.462**	−0.059	0.069
	2.280	2.516	3.204	−0.608	0.132
5	**0.467**	0.377	−0.001	−0.152	**0.916**
	2.236	0.498	−0.005	−0.468	2.341
First recommendation	**0.284**	**0.467**	**−0.320**	**−0.645**	**−0.480**
	1.977	4.231	−3.714	−3.616	−2.265

These results pertain to the idea, that revisions in recommendations that skip at least one rank have greater price impact than revisions that do not skip a rank, which we maintain to be true, *a fortiori*, when only significant abnormal returns are incorporated into consideration.

Reducing the recommendation event date to a two-day window, as shown in Panel B, gives us a rather true perspective of a trader since investors, in general, should not

Tabelle 6—*continued*

Panel C: Holding Period of one Month with a Delay in Time of one Day					
	To a Recommendation of:				
From a Recommendation of:	1	2	3	4	5
1	0.474	0.824	**−1.082**	−0.006	**−2.411**
	0.442	1.392	−2.264	−0.003	−2.795
2	0.200	0.132	−0.483	0.647	1.129
	0.349	0.279	−1.419	0.765	0.119
3	0.421	0.065	−0.588	−0.649	0.420
	0.942	0.178	−1.849	−1.484	0.548
4	−0.413	0.301	0.562	**−2.012**	**−3.479**
	−0.193	0.382	1.128	−3.530	−2.458
5	−0.597	2.950	0.688	−2.064	−2.093
	−0.595	1.294	0.812	−1.376	−0.921
First recommendation	−0.145	0.274	0.547	**1.365**	0.731
	−0.273	0.656	1.585	2.172	0.709

able to guess the recommendation announcement day. Most of the returns remain statistically significant even though taking a more investor-orientated perspective diminish these returns. The average abnormal gross return accompanied by a downgrade from a recommendation of 1 to 5, or 2 to 4 is now −0.751%, or −1.164%. Considering favorable recommendation revisions, an investor profit most when an analyst revises the stock from 4 to 1, or 3 to 2 resulting in a two-day announcement return of 1.040%, or 0.611%.

Panel C accounts for a delay in time to react to changes in recommendations, which commonly affects indeed many smaller investors, either because it is impractical for them to engage in a daily search for new information, or they gain access to analyst recommendations only after some days. Nonetheless, incorporating these delay permits us to understand its impact on the returns. Almost all previously significant returns disappear when investors do not react to recommendation announcements in a timely manner. There a only few investment strategies that remain significantly—a recommendation downgrade from 4 to 5 is associated with a return of −3.479% having the largest impact. Furthermore, investors can earn abnormal gross returns of −1.082%, or more than −2% by trading on stocks being revised from 1 to 3, or 1 to 5. Surprisingly, favorable recommendation changes do not exhibit statistical significance. Therefore, stock recommendation upgrades do not provide an investment opportunity for investors after accounting for a trading delay. These results suggest that investors could not easily exploit all analyst recommendations to generate superior returns before transaction costs although market ineffficiencies exist.

6. Summary and Conclusions

The article examines the impact of analysts' recommendation downgrades, upgrades, and reiterations on stock returns of firms listed in the DAX and as to whether, absent transaction costs, investors could potentially profit from these recommendations.

We show that the abnormal returns around the announcement date are, in general, significantly negative for recommendation downgrades and significantly positive for upgrades. However, the market reaction to unfavorable changes in recommendations and upgrades in recommendation is apparently asymmetric. Stock price responses to recommendation downgrades are of greater magnitude. Additionally, we find that recommendation changes that skip at least one rank have, in general, a greater price impact than revisions that do not skip a rank. For the analysts' initial recommendation, a buy rating generates a significantly positive return, whereas a hold or sell rating leads to a significantly negative return. Reiterations are uninformative, which entails that abnormal stock returns are not reliably greater than zero.

Furthermore, we document a post-recommendation stock price drift, lasting to reflect the information in recommendation changes up to six months for upgrades and three months for downgrades. This results id consistent with the previous literature, it differs only in the length of the stock price drift.

As our paper's perspective change to a more investor-orientated perspective to account for a delay in reaction time to recommendation revisions of one day, we find only a few investment opportunities leftover for traders as abnormal returns markedly diminish. A bulk of market reactions, therefore, appears on the recommendation event date and shortly before, so that investors must trade in a timely manner to profit from analyst recommendations.

All returns presented in this paper thus far have been gross returns incurring none transaction costs. For further research, we need to investigate whether profitable investment strategies could potentially be designed around analyst recommendations after accounting for trading costs. Findings by Barber et al. (2001), for instance, suggest that transaction costs diminish abnormal profits such that they are no longer reliably greater than zero. However, it may be possible that through specific portfolio re-balancing of high trading volumes (to reduce trading costs) and a right investment strategy at least institutional investors might capture the excess returns. Summarizing the above results, we provide empirical evidence that although market inefficiencies exist, investors could not easily exploit them.

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