MARKET REACTIONS TO STOCK RECOMMENDATIONS IN BUSINESS MEDIA

AN EVENT STUDY ON PUBLICATIONS BY BÖRSPLUS

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Abstract:

The aim of this thesis was to further the understanding of how business media affects stock markets. That was achieved by studying market reactions to the publication of stock recommendations by Börsplus on the Swedish stock market during the minutes and days following the publication of the recommendations. The sample consisted of stock recommendations published by Börsplus during the time period 2015-2019. By employing a traditional event study methodology, it was shown that buy and sell recommendations were associated with positive and negative abnormal returns during the trading days around the publication day and that the cumulative abnormal returns did not reverse during the 20 trading days following the publication. Furthermore, it was shown that buy, hold, and sell recommendations were associated with abnormal trading volumes during the trading days surrounding the publication. By employing an intraday event study methodology, it was also shown that there was an initial reaction to buy recommendations consisting of cumulative returns of 1.22% that occurred immediately after the publication and lasted for roughly 30 minutes. The reaction to sell recommendations was larger in magnitude but more gradual. Hold recommendations were not associated with any immediate stock price reaction. The findings are interpreted as being consistent with the information hypothesis, that the information contained in the stock recommendations was relevant for the valuation of the recommended stock and had not been incorporated into stock prices prior to publication, and that it is unlikely that the findings are driven by confounding events.

Keywords:

Efficient Market Hypothesis, Price Pressure Hypothesis, Information Hypothesis, Business Media, Stock Recommendations

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Contents

1. Introduction

In this thesis, market reactions following the publication of stock recommendations by Börsplus, a Swedish digital subscription service for business news, are examined using both a traditional event study and an intraday event study approach.

Numerous studies have been published where a traditional event study methodology has been employed to research the stock price reactions to the publication of stock recommendations in US business media. The events, consisting of the publication of an article or the airing of a television program, have been shown to be associated with abnormal returns during the publication day (see for example Barber & Loeffler, 1993; Lloyd-Davies & Canes, 1978; Neumann & Kenny, 2007). Two main hypotheses, the price pressure hypothesis and the information hypothesis, for this publication day reaction has emerged in the literature. As Barber and Loeffler (1993) describes the hypotheses in their study on the Dartboard column in the Wall Street Journal:

> […] The price pressure hypothesis poses that the recommendation creates temporary buying pressure by naive investors in the recommended securities and this buying pressure causes the observed abnormal returns. The information hypothesis maintains that the analyst's recommendation reveals relevant information and, thus, the abnormal performance on the announcement of a recommendation represents a fundamental revaluation of the security.

Examples of studies presenting support for either the information hypothesis (Desai, Liang, & Singh, 2000; Foster, 1979; Lee, Chi-wen Jevons, 1986), the price pressure hypothesis (Greene & Smart, 1999; Sant & Zaman, 1996), or both (Barber & Loeffler, 1993) have been published with respect to US data. Research on Swedish data is limited, where the most comprehensive study presents support for the price pressure hypothesis with respect to buy recommendations published in Swedish business media and support for the information hypothesis with respect to sell recommendations in published in Swedish business media (Lidén, 2007).

However, there are two gaps in the literature that stems from the limitations of traditional event studies. First, the knowledge about the speed at which the stock market incorporates the information in stock recommendations published in business media is limited. Busse and Greene (2002) performed an intraday event study on a sample of the two-minute-long analyst call segments in the television programs Morning Call and Midday Call on the US business news channel CNBC from the year 2000. They found that there is a statistically significant initial reaction occurring within minutes following the mentioning of a stock on the program. Any intraday event study that has been performed on more comprehensive stock recommendations has, to my knowledge, not been published. Although, some attempts of measuring intraday returns have been done on samples with recommendations from the television program Mad Money that airs after trading hours by either measuring over-night returns (Gutierrez & Stretcher, 2015; Lim & Rosario, 2010; Neumann & Kenny, 2007), or using after-hours trading data (Engelberg, Sasseville, & Williams, 2012). Second, using daily data, it is hard to reject a third hypothesis for the publication day reaction, that the reaction occurs due to confounding events, even though attempts have been made to exclude or adjust for certain types of events that may cause the abnormal returns during the publication day.

The purpose of this thesis is threefold. The first is to further the understanding of the impact of business media on the price discovery process on the Swedish stock market by analyzing the stock market reactions to the publication of stock recommendations from a source that has not previously been studied. The second is to begin to fill in the gap in the literature with regards to the speed at which the stock market incorporates new information. The third is to begin to fill in the gap in the literature regarding whether there is a causal relationship between publication day abnormal returns and the publication of stock recommendations in business media. The purpose will be fulfilled by answering the following research question:

> What are the market reactions to the publication of stock recommendations by Börsplus on the Swedish stock market during the minutes and days following the publication of the recommendations?

To answer the research question, a sample consisting of stock recommendations published by Börsplus between December 2015 and July 2019 is analyzed. Methodologically, the question is answered by employing a traditional event study methodology on daily return data and daily trading volume, as well as an intraday event study using high-frequency data.

There are three main findings that are presented in this thesis that corresponds to the threefold purpose. First, the results give support for the information hypothesis with respect to the sample of buy recommendations published by Börsplus. This furthers the understanding of the impact of business media in the price discovery process since prior research on Swedish data using other sources has given support for the price pressure hypothesis. Second, the immediate stock price reaction for buy recommendations begins the minute the article is published and lasts on average for roughly 30 minutes after the publication of the recommendations. Third, by combining a traditional event study methodology with an intraday event study methodology, it was possible to establish causality between a considerable part of the daily returns for buy recommendations and the publication of the buy recommendations.

This thesis is outlined as follows. Chapter *2 Theory and Literature Review* comprises an introduction to the theoretical framework used to interpret the results from event studies on stock recommendations in business media and a review of prior research on the subject. The hypotheses that are tested in this thesis are developed in chapter *3 Hypotheses*. The methodology and hypothesis testing for the event study on daily data and intraday data is described in chapter *4 Method*. Chapter *5 Data Sample* contains background information on Börsplus and a description of the sample selection process. The results from the event studies are presented in chapter *6 Results*, some robustness checks are presented in chapter *7 Robustness Tests*, and the results are discussed in light of the theoretical framework and in relation to prior literature in chapter *8 Discussion*. Lastly, conclusions are presented and suggestions for further research is given in chapter *9 Concluding Remarks*.

2. Theory and Literature Review

The aim of this chapter is to provide an overview of the theory and prior research which this thesis builds upon. The first sub-chapter, *2.1 Theoretical Frameworks*, begins with a description of theory on market efficiency and the hypotheses for why the publication of stock recommendations in business media may be associated with abnormal returns during the publication day. In the second sub-chapter, *2.2 Stock Recommendations in Business Media*, prior research on the market reactions to the publication of stock recommendations in business media is reviewed.

2.1. Theoretical Frameworks

This sub-chapter consists of two sections. The first section, *2.1.1 Efficient Market Hypothesis*, contains a definition of the efficient market hypothesis, whereas the second section, *2.1.2 Hypotheses for Publication Day Reactions*, provides an overview of the hypotheses through which market reactions to the publication of stock recommendations in business media has been interpreted in prior literature.

2.1.1. Efficient Market Hypothesis

In his article on market efficiency, Eugene Fama (1970) wrote:

> In general terms, the ideal is a market in which prices provide accurate signals for resource allocation: that is, a market in which firms can make production-investment decisions, and investors can choose among the securities that represent ownership of firms' activities under the assumption that security prices at any time "fully reflect" all available information. A market in which prices always "fully reflect" available information is called "efficient."

The quote captures the essence of the efficient market hypothesis. If the market is efficient, then security prices should fully reflect all available information. To perform tests on market efficiency, Fama (1970) describes that observations of returns must be compared to the expected return which he the more formally denoted:

$$E\left(p_{j,t+1} \middle| \Phi_t\right) = \left[1 + E\left(r_{j,t+1} \middle| \Phi_t\right)\right] p_{j,t} \quad (1)$$

where $E(.)$ is the expected value operator, $p_{j,t}$ and $r_{j,t}$ is the price and return of security j at time t respectively, and Φ_t is the set of available information. Given that all information in the information set Φ_t is fully reflected in the security price, then the difference between realized prices at time t and expected prices conditional on the information set Φ_t at time t should be a random variable x_j that follows a distribution with mean of zero:

$$x_{j,t+1} = p_{j,t+1} - E(p_{j,t+1} | \Phi_t) \quad (2)$$

where

$$E\left(x_{j,t+1} \middle| \Phi_t\right) = 0 \quad (3)$$

Or equivalently, that the expected excess return of security j at time $t + 1$, $z_{j,t+1}$, is equal to zero:

$$z_{j,t+1} = r_{j,t+1} - E(r_{j,t+1}|\Phi_t) \tag{4}$$

where

$$E(z_{j,t+1}|\Phi_t) = 0 \tag{5}$$

By abstracting this definition to the market level, Fama (1970) defined the efficient market model equivalently to:

$$a(\Phi_t) = \{a_1(\Phi_t), a_2(\Phi_t), \dots, a_n(\Phi_t)\} \tag{6}$$

where $a(\Phi_t)$ is the set of amounts to be invested in the n available securities where the total excess market value at time $t+1$, V_{t+1}, should be a random variable with mean of zero:

$$V_{t+1} = \sum_{j=1}^{n} a_j(\Phi_t)\left[r_{j,t+1} - E\left(r_{j,t+1}\middle|\Phi_t\right)\right] \tag{7}$$

where

$$E(V_{t+1}|\Phi_t) = \sum_{j=1}^{n} a_j(\Phi_t)E\left(z_{j,t+1}\middle|\Phi_t\right) = 0 \tag{8}$$

In response to the critique by LeRoy (1976) that this definition of an efficient market is tautological due to the fact that any stochastic process which fulfills equations (2), (3), and the rate of return definition $r_{j,t+1} = \frac{p_{j,t+1} - p_{j,t}}{p_{j,t}}$ will also obey equations (1) and (8), Fama (1976) developed the concept and notation of the efficient market model by stating that the market should assess the joint distribution of securities prices correctly:

$$f(P_{t+1}|\Phi_t) = f_m(P_{t+1}|\Phi_t^m) \tag{9}$$

where P_{t+1} is a $1 \times n$ vector of securities prices with n being the number of available securities at time $t+1$, Φ_t is the available information at time t, Φ_t^m is the information set used by the market to assess the joint distribution of securities prices, $f(.)$ denotes the true probability density function, and $f_m(.)$ denotes the market assessed probability density function. Given $f_m(.)$ and that market equilibrium can be stated as expected returns the following relationship should hold between security prices at different point in time:

$$p_{i,t} = \frac{E_m\left(p_{j,t+1}\middle|\Phi_t\right)}{1 + E_m(R_{j,t+1}|\Phi_t)} \tag{10}$$

where $R_{j,t+1}$ is the return on security j at time $t+1$. Tests of market efficiency may then be performed in order to ascertain whether the following condition holds for a trading strategy that yields the amounts $a(\Phi_t)$ to be invested in the n available securities:

$$\sum_{j=1}^{n} a_j(\Phi_t)E\left(R_j\middle|\Phi_t\right) = \sum_{j=1}^{n} a_j(\Phi_t)E_m\left(R_{j,t+1}\middle|\Phi_t^m\right) \tag{11}$$

The tautological nature of the definition of the efficient market hypothesis as indicated by LeRoy (1976) is characterized by the fact that the efficient market hypothesis is not testable without the imposition of additional assumptions. With respect to an event study on the publication of certain information, as the study presented in this thesis, there are three additional assumptions that ought to be imposed to be able to perform a test on market efficiency. First, the event of publicizing the information does not itself cause a revaluation of securities prices. Second, the publicized information should have been incorporated into securities prices prior to the publication. Third, the model for estimating expected returns or prices employed in the empirical testing is accurate. When reviewing the literature on the efficient market, Fama (1970) specified three different tests of market efficiency based on how the second of the aforementioned assumptions has been specified. Strong form tests, semi-strong form tests, and weak form tests are based on the assumption that securities prices reflect all information relevant for price formation, obviously publicly available information, and historical prices respectively.

Furthermore, Grossman and Stiglitz (1980) expands on the theory of an efficient market by establishing that the assumption that information is costless is a necessary condition for the efficient model hypothesis. If information is costly, then prices cannot reflect all available information since the investors that acquire the information would not be compensated for information gathering process.

2.1.2. Hypotheses for Publication Day Reactions

Research from the past forty years, which is reviewed below in sub-chapter *2.2 Stock Recommendations in Business Media*, has documented significant stock price reactions to the publication of stock recommendations in business media during the publication day. In this section, the two main hypotheses, the information hypothesis and the price-pressure hypothesis, that has been proposed in the literature for why there are significant reactions to the publication of stock recommendations in business media are described. Thereafter two additional alternative hypotheses, the confounding events hypothesis and the attention-grabbing hypothesis are noted.

The first hypothesis, the information hypothesis, states that the information contained in the publicized stock recommendations are relevant for the valuation of the recommended stock and has not been incorporated into stock prices prior to publication. Conditioning on the fact that the information contained in the stock recommendation is correct, there are two types of information that may cause a revaluation of securities prices. Either the information has not previously been publicly available, or the information constitutes a superior analysis of already publicly available information than what has been incorporated into stock prices (Foster, 1979; 1987). Lloyd-Davies and Canes (1978) refines the information hypothesis with regards to second-hand information. Their research provided evidence of a significant reaction to second-hand information, as evidenced by the fact that analyst recommendations that has already been communicated to the analysts' customers may cause significant price reactions around the time that the analyses are published in business media. They theorize that analyses must be widely disseminated before the stock prices fully reflect the information due to the limitations to arbitrage faced by individual investors. Following a single-investor arbitrage model, an investor would arbitrage until the point where the increased amount of diversifiable risk due to an imbalance in the investor's portfolio offset the gains from further arbitrage.

If a reaction is consistent with the information hypothesis, it is predicted that the reaction to the publication of a stock recommendation in business media should be immediate and there should be no reversal of the publication day abnormal returns during the trading days following the publication. Furthermore, an asymmetric reaction would be expected from the publication of a buy recommendation and a sell recommendation, conditioned on the fact that the recommendations are accurate. The expected reaction to a buy recommendation would be a positive reaction and the expected reaction to a sell recommendation would be a negative reaction.

The second hypothesis, the price pressure hypothesis, is based on the work by Scholes (1972) and Krauss and Stoll (1972) who discusses the impact of short-term liquidity costs on securities prices. They argue that there is a price associated with finding willing buyers and sellers at the prevailing equilibrium price and that for larger transactions, there may be a need for the party that initiated the transaction to pay a premium to induce investors to participate in the transaction.

The stock price reactions around the time of publication of the stock recommendations are hypothesized to be the result of naïve investors acting on the recommendations, creating a temporary increase in the demand for the recommended stock (Barber & Loeffler, 1993). The price pressure hypothesis has also been denoted as the self-fulfilling prophecy, if investors act on analysts' recommendations that do not convey any new information, the recommendations becomes self-fulfilling since the reaction becomes consistent with the recommendation (Lloyd-Davies & Canes, 1978).

It is predicted that a publication day reaction that is consistent with the price pressure hypothesis would be reversed over the trading days following the publication of the stock recommendation. The reactions to buy and sell recommendations should be positive and negative respectively since the hypothesis suggest that the immediate reaction is due to price pressure driven by naïve investors acting in accordance with the recommendations.

There are two other hypotheses, the confounding events hypothesis and the attention-grabbing hypothesis, for the observed publication day reactions that is noted here. First, the confounding events hypothesis is that the publication day reactions are caused by some other event that is also associated with the publication of the stock recommendation, such as events that drives the selection process for which stocks the recommendations are written about. The attention-grabbing hypothesis is that private investors are net buyers of attention-grabbing stocks, that stock recommendations are an example of what may grab a private investors' attention, and that there should be no or a positive reaction to the publication of a recommendation regardless of whether it is a buy, hold, or sell recommendation. The attention-grabbing hypothesis was developed by Cervellati, Ferretti, and Pattitoni (2014) based on the observation that some studies have presented findings of asymmetric reactions to buy and sell recommendations, and that Barber and Odean (2008) had shown that that private investors are net buyers of attention-grabbing stocks and that media exposure is one of the elements that may grab the attention of private investors.

2.2. Stock Recommendations in Business Media

This sub-chapter covers prior literature on market reactions to the publication of stock recommendations in business media. The articles that are included in the literature review are studies on market reactions to the publication of stock recommendations or analyses in traditional business media, meaning that closely related studies on the association between analyst recommendations and the stock market, and how aggregations of business media are associated with the stock market are not included. The first five sections provide an excursion through the media landscape where the articles in the literature review are categorized by source and interpreted through the theoretical framework described in the prior sub-chapter. A review of the studies related to the three most thoroughly researched business media sources is presented in sections one through three, *2.2.1 Heard on the Street Column in the Wall Street Journal*, *2.2.2 The “Dartboard” Column in the Wall Street Journal*, and *2.2.3 The Television Program Mad Money*. Sections four and five, *2.2.4 US Business Media* and *2.2.5 National Business Media*, provides an overview of research on sources of business media in the US and outside of the US respectively. For each of the five sections, a table with a summary of the findings of the studies using a traditional event study methodology can be found in appendix I. The last section, *2.2.6 Intraday Analyses*, comprises a review of the intraday analyses that have been performed with respect to market reactions to the publication of stock recommendations in business media.

2.2.1. Heard on the Street Column in the Wall Street Journal

The studies reviewed in this section have been summarized in *Table A 1 – Panel A* in *Appendix I*. The literature on the Wall Street Journal’s “Heard on the Street” column had its inception when the early works by Lloyd Davies and Canes (1978) was published. They identified three characteristics of the column that has bearing on the interpretation of the findings. First, the opinions of the analysts referenced in the column is often presented as buy or sell recommendations. Second, the analyses published in the columns has been disseminated to the reference analysts’ clients before the publication of the column, meaning that the content in the column constitute second-hand information. Third, the recommendations in the column does not represent an endorsement by the Wall Street Journal due to the fact that the authors of the column do not edit the statements of the analysts. Using a sample of 597 buy recommendations and 188 sell recommendations from columns published from 1970 to 1971 they found significant price reactions during the publication day. For buy recommendations, there was a significant abnormal return on the day before the publication of 0.28% and 0.92% during the day of publication, with further positive abnormal returns up until two days after the publication. For sell recommendations, there was a significant abnormal return on the event day of -2.37% and -0.55% the day after. The abnormal returns were not subject to reversal during the following 20 trading days. The authors interpreted the results as being evidence of the information hypothesis. Using a sample from 1978-1979 Beneish (1991) finds similar results, also after controlling for certain confounding events. However, Pound and Zeckhauser (1990) did not find any abnormal returns following the publication of merger rumors.

On the 29 of March 1984, the insider trading scandal surrounding the “Heard on the Street” column became public (Liu, Smith, & Syed, 1992). Research on the impact of the trading scandal has been published in a series of articles starting with Syed, Liu and Smith (1989) that showed cumulative abnormal returns of 4.97% during the three days prior to the publication of the 16 recommendations that were subject to review by the Securities and Exchange Commission. These 16 recommendations were associated with a 13.19% cumulative abnormal return from 20 trading days prior to the publication to the day after publication which then reversed significantly during the following 20 trading days after the publication. Using a sample from 1982-1985, there is a significant cumulative abnormal return over the three days prior to publication of the column, a significant reaction on the publication date, and a partial reversal of the cumulative abnormal returns during the subsequent trading days (Liu, Smith, & Syed, 1990). Partitioning the sample based on whether the recommendations were published during the 18 months prior or after the insider trading scandal became public, it was shown that the cumulative abnormal returns prior to the publication, and the subsequent partial reversal, are more pronounced in the period prior to the insider trading scandal (Liu et al., 1992).

During the period after the insider trading scandal, research on the "Heard on the Street" column has shown that prior findings are not generalizable across time. Huth and Maris (1992) and Bauman, Datta and Iskandar-Datta (1995), using a sample from 1986 and 1987 respectively, find that the initial reaction to the publication of the column is smaller than in prior studies and that the reactions partially reverses over the trading days following the publication. These findings suggest that the reactions to the "Heard in the Street" column after the insider trading scandal was at least partially consistent with the price pressure hypothesis.

2.2.2. The "Dartboard" Column in the Wall Street Journal

The studies reviewed in this section have been summarized in *Table A 1 – Panel B* in *Appendix I.* The "Dartboard" column in the Wall Street Journal was a monthly contest where four investment analysts competed against Journal staffers. The investment analysts would recommend a stock that they thought would generate the largest total returns over the following six months, whereas the Journal staffers selected their stocks by throwing darts at the stock pages (Barber & Loeffler, 1993; Wright, 1994). The two best performing investment analysts were then, usually, invited back to compete in the contest one more time (Greene & Smart, 1999). The contest generates almost exclusively buy recommendations and, generally, the findings have been that there are no pre-event abnormal returns leading up to the announcement and abnormal returns of between 2.8% and 3.8% during the publication day. The focus of the studies has been on the medium-term performance of the stocks where the key issue has been on whether there has been a reversal of the abnormal returns of the publication day or not. That is, whether the price pressure hypothesis may explain the abnormal returns on the publication date or the information hypothesis.

Barber and Loeffler (1993) and Wright (1994), who studies a similar sample of the stock recommendations from 1988 to 1990, Liang (1999) who uses a sample from 1990 to 1994, and Greene and Smart (1999) who uses a sample from 1988 to 1992, all conduct their research with a similar traditional event study methodology. They calculate abnormal returns as the return less the expected returns based on the market model estimated on pre-event returns. Their studies show that the initial abnormal returns on the publication day reverses partially over the following 25 trading days and almost fully during the following 30 to 40 trading days, which would give support for the price pressure hypothesis. Their findings are consistent with the later findings presented by Pruitt, Van Ness and Van Ness (2000) who show that the abnormal trading volume following the publication date are more pronounced for smaller orders, suggesting that the reaction is driven by individual investors acting on the recommendations, and the findings of Metcalf and Malkiel (1994) who show that the additional returns that the investment analysts recommendations earn in comparison to the Journal staffers picks are largely attributed to differences in the riskiness of the stocks and that the experts cannot outperform the market consistently. In comparison to the early studies on the "Heard on the Street" column that found evidence for the information hypothesis, the research on the "Dartboard" column shows support for that the abnormal returns on the publication date is at least partially consistent with the price pressure hypothesis.

However, there are two studies providing evidence for the fact that the reversal of the cumulative abnormal returns during the trading days following the publication date are sensitive to the choice of model for estimating expected returns. The basis for the claim that the reversal is driven by methodological misspecifications is that the stocks recommended in the contest by the investment analysts have been experiencing positive abnormal returns prior to the recommendations. That is, estimating the market model on pre-event data may cause the alpha estimate, that is the intercept coefficient in the market model, to be biased upwards. Albert and Smaby (1996) show that the size of the reversal decreases when using a market model estimated using post-event data or a size adjusted return. Pettengill and Clark (2001) showed similar result using a market model estimated on pre-event data but calculating the abnormal returns using only the beta estimate from the market model regressions to calculate the abnormal returns using the capital asset pricing model.

2.2.3. The Television Program Mad Money

The studies reviewed in this section has been summarized in *Table A 1 – Panel C* in *Appendix I*. The television program Mad Money with past stockbroker and hedge fund manager Jim Cramer as host debuted in 2005 (Keasler & McNeil, 2010). The program is an hour long and airs at 6 pm Eastern Standard Time, that is after market close, and includes recommendations from Cramer on both stocks that were prepared in advance and in repose to stocks that viewers ask Cramer about (Lim & Rosario, 2010). Typically, the abnormal returns on the trading day following the program for buy recommendations on the segments where Cramer has prepared the recommendation in advance is between 0.8% and 1.9% whereas the corresponding abnormal return for sell recommendations are between -0.3% and -0.9%, and the abnormal return for the buy recommendation reverses over the trading days following the program. The abnormal returns associated with recommendations during the segments where Cramer has not prepared the recommendations are smaller.

Neumann and Kenny (2007), studied a sample of recommendations from the first couple of months from the debut of the program. They showed that buy recommendations are followed by significant abnormal returns the day after the program aired but that the abnormal returns are subject to reversal during the subsequent trading days. Later studies with larger data samples from the time period 2005 through 2009 show substantially similar results (Bolster & Trahan, 2009; Bolster, Trahan, & Venkateswaran, 2012; Gutierrez & Stretcher, 2015; Hobbs, Keasler, & McNeil, 2012; Keasler & McNeil, 2010; Roszkowski & Richie, 2016) Their findings are also substantiated by the fact that a later study has shown that the results are robust to other specifications of the method of calculating abnormal returns (Karniouchina, Moore, & Cooney, 2009).

Lim and Rosario (2010) show similar results in the short term but finds no reversal when comparing the returns to a size and industry adjusted portfolio, which would support the information hypothesis. However, estimating the market model and a four-factor model adjusting for market risk, size, book-to-market value, and momentum on the period following the recommendations for a strategy that follow the recommendations from the day the program airs does not produce significant alphas, which supports that the abnormal returns on the day following the program is caused by price pressure (Engelberg et al., 2012). The fact that the abnormal returns are substantially larger for small an illiquid stock further supports the price pressure hypothesis (Engelberg et al., 2012). Furthermore, Hobbs, Keasler, and McNeil (2012) finds increases in short selling the day after the program is aired, suggesting that investors except the reversal of the abnormal returns following the recommendations on Mad Money.

2.2.4. US Business Media

The studies reviewed in this section has been summarized in *Table A 1 – Panel D* in *Appendix I*. In this section, four main themes with respect to how research on stock recommendations in US business media other than the "Heard on the Street" and "Dartboard" columns in the Wall Street Journal and the television program Mad Money relates to the findings presented in the three previous sections. First, studies supporting the information hypothesis are mainly centered around studies focusing on stock recommendations by prominent authors. Second, abnormal returns with subsequent reversal which supports the price pressure hypothesis has been identified using samples from multiple different sources. Third, abnormal trading volumes have been identified the days surrounding the publication of second-hand information. Fourth, the findings of prior studies on a specific column from a specific source are not generalizable to all columns.

Multiple studies have been performed on the articles published in Barron's where the academic Abraham Briloff criticized the accounting practices of specific companies. The studies have shown large negative abnormal returns of between -8.1% to -8.6% during the day the articles were published with no medium-term reversal (Foster, 1979; Foster, 1987). In the long-term, the criticized companies have continued to underperform (Desai & Jain, 2004). Similar results, although with smaller abnormal returns of between 0.6% and 7.8% in absolute numbers, have followed both buy and sell recommendations for the articles written by Alan Abelson, the editor of Barron's in his column "Up and Down Wall Street" (Lee, C. Jevons, 1987; Trahan & Bolster, 1995). Moreover, second-hand information from prominent analysts have been shown to be associated with similar abnormal return patters, but with smaller magnitude of between 0.4% and 1.2% in absolute numbers (Desai & Jain, 1995; Desai et al., 2000). It has also been shown that recommendations in the regional versions of the "Heard on the Street" column that goes by the name "Heard in [insert name of region]" in the regional versions of the Wall Street Journal produce similar results to those published in "Heard on the Street" (Sarkar & Jordan, 2000).

Support for the price pressure hypothesis have been found using samples of recommendations from the weekly television program Wall $treet Week airing after closing on Friday evenings. Abnormal returns of 0.5% to 0.7% have been found on the following trading day (the Monday if the market was not closed that day) that has reversed during the subsequent trading days (Beltz & Jennings, 1997; Ferreira & Smith, 2003; Pari, 1987). Several studies have shown that following the recommendations published in different business media does not produce abnormal returns, for example the recommendations in Money and Changing Times (later Kiplinger) (Brody & Rees, 1996), Kiplinger (Borghesi & Pencek, 2010), the "SmartMoney" column in the Wall Street Journal (Borghesi & Pencek, 2011), and the fundamental analyses in the television program Talking Numbers (Avramov, Kaplanski, & Levy, 2018).

The studies that have researched a sample consisting of stock recommendations in the "Inside Wall Street" column in Business Week have, in addition to observing abnormal returns during the publication date with subsequent reversal, studied the trading volume surrounding the publication of the recommendations. The abnormal trading volume during the date of publication and the day after are significantly higher than the days prior to the publication (Tang, Palmon, & Sun, 1994) and the abnormal trading volume is significant during the nine trading days surrounding the publication (Mathur & Waheed, 1995). Sant and Zaman (1996) partition the sample based on the number of analysts following each of the recommended securities and found that the abnormal trading volume is more pronounced for securities with lower analyst following, which are also the stocks with lower normal trading volume, suggesting that the price pressure is more noticeable for illiquid stocks.

However, there are studies that show that not all stock recommendations published in business media are associated with abnormal returns around the date of publication. Event studies on Heinz H. Biel's column in Forbes (Lee, 1986), the "Small Stock Focus" column in the Wall Street Journal (Ferreira & Smith, 1999), and the "Smart Money Stock Screen" column in the Wall Street Journal (Habegger & Pace, 2008) has shown no significant abnormal returns during the publication date. Palmon, Sudit, and Yezegel (2009) used a sample of stock recommendations from Business Week, Forbes, and Fortune and found no unanimous reactions to the recommendations in the different magazines. The reaction was larges for recommendations in the "Inside Wall Street" column in Business Week, whereas the reaction, if any, to the other recommendations were smaller.

2.2.5. National Business Media

The studies reviewed in this section has been summarized in *Table A 1 – Panel E* in *Appendix I*. Similar results as those found on US data has been observed following the publication of stock recommendations in national business press in several different countries. A short summary of the findings supporting the information hypothesis and the price pressure hypothesis respectively is presented below, whereafter a prior study on Swedish data is reviewed further.

Consistent with the studies on the impact of stock recommendations that have given support for the information hypothesis, Brown, Ferguson, and Jackson (2009) find significant abnormal returns following the publication of Trevor Sykes's articles published under the alias Pierpont in the Australian Financial Review that did not reverse over the subsequent trading days. However, contrary to prior studies on the US data, the abnormal returns were observed over a longer time period instead of as an immediate reaction. Using the level of abnormal trading volume as a proxy for the information content of an article, Zhang, Song, Shen, and Zhang (2016) finds abnormal returns following articles in the "Ahead of Stock Market" and "Announcement Interpretation" column in NetEase, one of China's leading internet content providers, that did not reverse for recommendations with high information content.

Evidence of reactions consistent with the price pressure hypothesis and the studies on the "Dartboard" Column and the television program Mad Money has been observed following buy recommendations in for example the Canadian magazine Financial Post (Mehrotra, Yu, & Zhang, 1999), a collection of Dutch newspapers (Wijmenga, 1990), the Turkish economics journal Moneymatik (Yazici & Muradoğlu, 2002), the Turkish magazine Ekonomik Trend (Kiymaz, 2002), the German daily newspaper Frankfurter Allgemeine Zeitung (Brixner & Walter, 2007), a collection of German personal finance magazines (Kerl & Walter, 2007), a collection of Swedish newspapers and magazines (Lidén, 2007), and the Italian magazine Il Sole 24 Ore (Cervellati et al., 2014).

This study relates in particular to the prior study on Swedish data by Lidén (2007). His sample consisted of 1918 buy recommendations and 364 buy recommendations published in three business magazines Affärsvärlden, Privata Affärer, and Veckans Affärer, and three daily newspapers Aftonbladet, Finanstidningen, and Göteborgsposten from 1995 through 2000. Buy recommendations were associated with significant abnormal returns of 0.32%, 0.79%, and 0.19% during day prior to publication, the publication date and the day after publication respectively. For buy recommendations, there were only significant abnormal returns during the publication date of -1.50%. No reversal was found for the sell recommendations. Partitioning the sample between recommendations written by journalists and those that referred to an analyst's recommendation, the magnitude of the abnormal returns was higher for the journalist sample. Lastly, significant abnormal trading volumes was observed for the 41 days surrounding the publication of buy recommendations whereas significant abnormal trading volumes was observed only for the three days surrounding the publication of the sell recommendations. The results were interpreted as that the reactions to buy recommendations were consistent with the price pressure hypothesis whereas the reactions to sell recommendations were consistent with the information hypothesis.

2.2.6. Intraday Analyses

Intraday analyses have been most prevalent in studies on samples of stock recommendations from the television program show Mad Money. The show airs after market close, whereby researchers have compared the daily abnormal returns on the day after the program to the overnight returns, that is the difference between opening price the day following the program and the closing price prior to the program. It has been shown that the overnight returns constitute a significant part of the daily returns (Gutierrez & Stretcher, 2015; Lim & Rosario, 2010; Neumann & Kenny, 2007). Engelberg, Sasseville, and Williams (2012) contributes to the intraday analysis by using half-hour after-hours trade data for a small subsample to show that an economically significant price appreciation occurs during the duration of the program which is likely to drive the observed overnight returns.

The only study in this literature review that performs an intraday event study on stock recommendations issued during trading hours was conducted by Busse and Green (2002) who studied a sample of stock recommendations on the Morning Call and Midday Call segments on CNBC TV. Abnormal daily returns of between 0.29% and 0.79% in absolute numbers were observed and were statistically significant with the exception for a subsample of positive reports from the Morning Call. The time period during which the market incorporated the reports from the Morning Call and Midday Call was short, within a minute of the positive reports on the Midday Call, there was cumulative returns of 0.42% and during the 15 minutes after negative reports, there was cumulative returns of -0.93% and -0.75% for reports on the Morning Call and Midday Call respectively.

3. Hypotheses

The null hypothesis is that there should be no reaction to the publication of the stock recommendations by Börsplus. The null hypothesis is based on the efficient market hypothesis. Given the assumptions that the event of publicizing the information does not itself cause a revaluation of securities prices, that the publicized information should have been incorporated into securities prices prior to the publication, and that the model for estimating expected returns employed in the empirical testing is accurate, the publication of the stock recommendations should not be associated with any revaluation of securities prices.

Prior literature has shown that there have been reactions to the publication of certain stock recommendations in business media and that the reactions generally have been asymmetric between buy recommendations and sell recommendations, whereas the direction of the reaction to hold recommendations are uncertain. The first three hypotheses are posited in order to discern whether there is a publication day reaction and if so whether the reaction is consistent with the price pressure hypothesis or the information hypothesis:

H1: Buy recommendations published by Börsplus are associated with positive abnormal returns during the trading days around the publication.

H2: Hold recommendations published by Börsplus are associated with abnormal returns during the trading days around the publication.

H3: Sell recommendations published by Börsplus are associated with negative abnormal returns during the trading days around the publication.

Following prior literature that has found significant abnormal returns after the publication of stock recommendations in business media, the fourth hypothesis predicts positive abnormal trading volumes for buy, sell, and hold recommendations. The fourth hypothesis is:

H4: Buy, hold, and sell recommendations published by Börsplus are associated with positive abnormal trading volume during the trading days around the publication.

The last hypotheses concern the speed at which the market incorporates the stock recommendations into stock prices and the possibility to draw conclusions regarding the causality between the publication of stock recommendations and returns around the time of publication. Given the quick reactions found in prior literature with respect to other types announcements, a reaction is assumed to occur within minutes after the publication of the stock recommendations. Hypotheses five through seven are:

H5: Buy recommendations published by Börsplus are associated with positive returns during the minutes following the publication.

H6: Hold recommendations published by Börsplus are associated with returns during the minutes following the publication.

H7: Sell recommendations published by Börsplus are associated with negative returns during the minutes following the publication.

4. Method

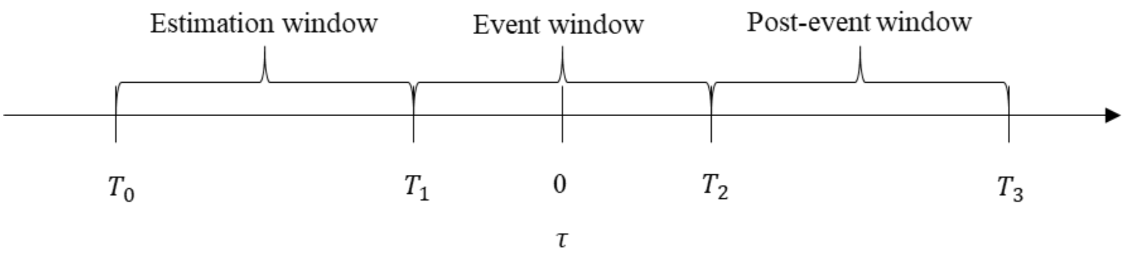
An event study methodology was applied in order to make inferences regarding whether the publication of stock recommendations by Börsplus affects the stock price and trading volume of the recommended stock. This chapter contains a description of the applied methodology. The outline of the chapter is as follows. First, sub-chapter *4.1 Event Study on Daily Data* contains a description of how the traditional event study on daily data that will be conducted. Thereafter, in sub-chapter *4.2 Intraday Event Study*, the intraday event study methodology employed in this thesis is described.

4.1. Event Study on Daily Data

Following the methodological choices by Lidén (2007), the traditional event study methodology for daily data used in this thesis is based on the procedures outlined in Brown and Warner (1980; 1985) and MacKinlay (1997) for event studies on daily return data and Ajinkya and Jain (1989) for event studies on daily trading volumes. The methodological choice ensures comparability with the previous study on Swedish data. This sub-chapter is outlined as follows. First, in section *4.1.1 Overview of Methodology*, an overview of the event study methodology is presented. Thereafter, in sections *4.1.2 Detecting Abnormal Returns* and *4.1.3 Detecting Abnormal Trading Volumes*, the estimation of, and test statistics for, abnormal returns and abnormal log transformed trading volumes are described.

4.1.1. Overview of Methodology

Figure 1: An illustration of the timeline for an event study.



The outline of the traditional event study methodology employed in this thesis follows the procedure outlined in MacKinlay (1997). The event day, $\tau = 0$, is the day when the event occurred. The event window, with length of $L_2 = T_2 - T_1$, is the time period during which the effects of the event is expected to be observable. In order to draw conclusions regarding the effects of the event, the observed variables during the event window must be compared to the expected magnitude of the variables conditioned on no stock market reaction to the event. The observations during the estimation window, with length of $L_1 = T_1 - T_0$, are used to estimate the expected magnitude of the variables during the event window. The estimation window and the event window are not overlapping, so that the estimates of the expected magnitude of the variables during the event window are not affected by the event. $L_3 = T_3 - T_2$ is the length of the post-event window.

In the case of publications of stock recommendations, the effects on the stock market should be observable within the trading days following the publication, if not solely on the same day as the publication. The event day, $\tau = 0$, is therefore defined as the day that the recommendations are publicized.

Following Lidén (2007), the event window is set to the 41 days surrounding the event day, meaning that $L_2 = 41$, $T_1 = -21$ and $T_2 = 20$ and the estimation window is set to a 120-day period prior to the event window so that $L_1 = 120$ and $T_0 = -141$. The motivation for the length of the estimation window is that the regression coefficients used to calculate the expected magnitude of the variables of interest can be estimated with a reasonable size of the standard errors of the estimates.

4.1.2. Detecting Abnormal Returns

This section is divided into two parts. In the first, mean abnormal returns and mean cumulative abnormal are defined, whereas the corresponding statistical tests and the calculation of confidence intervals are described in the second.

4.1.2.1. Return measure

Daily stock market data were obtained from Compustat – Capital IQ Securities Daily database available through Wharton Research data Service. The daily returns on each stock have been calculated as the buy and hold returns for each day:

$$R_{i,t} = \frac{\left(P_{i,t} - P_{i,t-1} + D_{i,t} + C_{i,t}\right) * S_{i,t}}{P_{i,t-1}} \tag{12}$$

where P_t is the closing price of stock i at time period t, $S_{i,t}$ is the stock split rate, $D_{i,t}$ is dividends, and $C_{i,t}$ is cash equivalent distributions. All returns are in SEK.[1]

Abnormal returns have been calculated as realized return less expected return, where expected returns have been estimated using the market model denoted as MM:

$$\mathrm{E}\left(R_{i,t}\right) = \hat{\alpha}_i + \hat{\beta}_i \mathrm{R}_{\mathrm{m,t}} \tag{13}$$

$$\mathrm{AR}_{i,t} = R_{\mathrm{i,t}} - \mathrm{E}\left(R_{i,t}\right) \tag{14}$$

where $E(.)$ is the expectation operator, R_m is the return of the market, approximated by OMXSGI[2], and $\hat{\alpha}_i$ and $\hat{\beta}_i$ are the OLS estimates of the market model coefficients.

Mean abnormal returns, $\overline{AR}_t$, are defined as:

[1] Dividends and cash equivalent distributions denoted in EUR were converted to SEK using the daily exchange rate available at the Central bank of Sweden (Sw. Sveriges riksbank), https://www.riksbank.se/sv/statistik/sok-rantor--valutakurser/.

[2] OMXSGI is a value weighted gross index with dividends reinvested including all shares on OMX Nordic Exchange Stockholm and is available through the website of Nasdaq OMX Nordic, http://www.nasdaqomxnordic.com/index/historiska_kurser?Instrument=SE0002416156.

$$\overline{AR}_{\mathrm{t}} = \frac{1}{N}\sum_{i=1}^{N} AR_{i,t} \tag{15}$$

where N is the number of events and mean cumulative abnormal returns are calculated as the sum of mean abnormal returns:

$$\overline{\mathrm{CAR}}_{\tau_1,\tau_2} = \frac{1}{\tau_2 - \tau_1 + 1}\sum_{\mathrm{t}=\tau_1}^{\tau_2} \overline{AR}_t \tag{16}$$

4.1.2.2. Statistical tests

In this part, the four test statistics employed in this thesis and the way confidence intervals are calculated will be described, and the reason for employing each test is explained. First, there is a description of how the parametric test statistics are calculated, whereafter the two nonparametric sign and rank tests are described, and lastly the way confidence intervals are calculated is explained.

4.1.2.2.1. Traditional t-test

The calculation of the test statistics employed to test the statistical significance of mean abnormal returns, $\overline{AR}_{\mathrm{t}}$, follows the procedure outlined in Brown and Warner (1985) appendix A.2, which is also used by Lidén (2007). Abnormal returns are standardized to obtain the standardized abnormal returns, $SAR_{i,t}$:

$$\mathrm{SAR}_{i,t} = \frac{AR_{i,t}}{\hat{S}(AR_{i,t})} \tag{17}$$

where

$$\hat{S}(AR_{i,t}) = \sqrt{\frac{1}{L_1 - k}\sum_{\tau=T_0+1}^{T_1}\left(AR_{i,t} - \frac{1}{L_1}\sum_{\tau=T_0+1}^{T_1} AR_{i,t}\right)} \tag{18}$$

where $L_1 - k$ is the degrees of freedom of the regression residuals. The mean standardized abnormal returns, $\overline{SAR}$, is defined as follows:

$$\overline{SAR}_t = \frac{1}{N}\sum_{i=1}^{N} SAR_{i,t} \tag{19}$$

The test statistic for mean abnormal returns, $\overline{AR}_{\mathrm{t}}$, is:

$$t(\overline{AR}_{\mathrm{t}}) = \overline{SAR}_t * \sqrt{N} \tag{20}$$

4.1.2.2.2. Adjusted BMP test

In order to discern between whether the abnormal returns are driven by event induced volatility or shifts in the mean abnormal returns, the adjusted BMP test statistic described in Kolari and Pynnönen (2010), denoted as A_BMP, is also reported. The A_BMP incorporates a correction term for the increase in variance due to prediction outside the estimation window (see Patell, 1976), makes an adjustment for event induced volatility (see Boehmer, Musumeci, & Poulsen, 1991), and an adjustment for cross-sectional correlation of abnormal returns in the estimation window (Kolari & Pynnönen, 2010).

The abnormal returns are standardized as above, with a correction term for the increase in variance due to prediction outside the estimation window:

$$\mathrm{SAR}_{i,t}^{*} = \frac{AR_{i,t}}{\hat{S}\left(AR_{i,t}\right) * \sqrt{1 + x_t'(X'X)^{-1}x_t}} \tag{21}$$

where x is a vector of the explanatory variables and X is a matrix with the explanatory variables during the estimation window. The standardized abnormal returns are then re-standardized using the cross-sectional standard deviation at each point in time and corrected for the cross-sectional correlation of abnormal returns in the estimation period:

$$A\_BMP(\overline{AR}_{\mathrm{t}}) = \frac{\frac{1}{N}\sum_{i=1}^{N} SAR_{i,t}^{*} * \sqrt{N}}{\sqrt{\frac{1}{N-1}\sum_{i=1}^{N}\left(SAR_{i,t}^{*} - \frac{1}{N}\sum_{i=1}^{N} SAR_{i,t}^{*}\right)^{2}}} * \sqrt{\frac{1-\bar{r}}{1+(\mathrm{N}-1)\bar{r}}} \tag{22}$$

where $\bar{r}$ is the average of the sample cross-correlations of the estimation window residuals.

4.1.2.2.3. *Nonparametric generalized sign test*

The nonparametric generalized sign test described in Cowan (1992) was performed to relax the assumption of normality of daily abnormal returns which the parametric tests relies upon. The expected fraction of positive abnormal returns, $\hat{p}_{+}$, is estimated using observations from the estimation window:

$$\hat{p}_{+} = \frac{1}{N}\sum_{i=1}^{N}\frac{1}{L_1}\sum_{t=T_0+1}^{T_1} s_{i,t} \tag{23}$$

where

$$s_{i,t} = \begin{cases} 1 \; if \; AR_{i,t} > 0 \\ 0 \; othervise \end{cases} \tag{24}$$

The test statistic is defined as:

$$Z(w_t) = \frac{w_t - N\hat{p}_{+}}{\sqrt{N\hat{p}_{+}(1-\hat{p}_{+})}} \tag{25}$$

were w_t is the number of positive abnormal returns:

$$w_t = \sum_{i=1}^{N} s_{i,t} \tag{26}$$

That is, the normal approximation to the binomial distribution is applied in order to estimate the probability of observing w_t number of positive abnormal returns in a sample of N abnormal returns.

4.1.2.2.4. Nonparametric rank test

The nonparametric rank test described by Corrado (1989) was performed to take the magnitude of the abnormal returns into account without imposing the assumption of normality of daily abnormal returns. The abnormal returns during the estimation window and event window are ranked:

$$K_{i,t} = rank\left(AR_{i,t}\right), \qquad t = (T_0 + 1), \dots T_2 \tag{27}$$

The average rank of the abnormal returns during a specific period is defined as:

$$\overline{K}_t = \sum_{i=1}^{N} K_{i,t} \tag{28}$$

The test statistic for the average rank of the abnormal returns is:

$$t(\overline{K}_t) = \frac{\overline{K}_t - \left(\frac{L_1 + L_2}{2} + 0.5\right)}{\hat{S}(\overline{K}_t)} \tag{29}$$

where the estimated standard deviation of the average rank of the abnormal returns, $\hat{S}(K_t)$, is the time-series standard deviation of the average rank of the abnormal returns:

$$\hat{S}(\overline{K}_t) = \sqrt{\frac{1}{L_1 + L_2} \sum_{t=T_0+1}^{T_2} \left(\overline{K}_t - \left(\frac{L_1 + L_2}{2} + 0.5\right)\right)^2} \tag{30}$$

4.1.2.2.5. Confidence intervals of mean cumulative abnormal returns

The calculation of confidence intervals for the mean cumulative abnormal returns, $\overline{\mathrm{CAR}}_{\tau_1,\tau_2}$, is based on the test statistic for a multiday event window outlined in Brown and Warner (1985) appendix A.3. Mean cumulative abnormal returns are assumed to be approximately normally distributed with unit variance under the assumption of no abnormal returns during the event window. The standard deviation of the mean cumulative abnormal returns is estimated using the time-series standard deviation of the mean cumulative abnormal returns during the estimation window. The upper bound of a 95% confidence interval for the mean cumulative abnormal returns, $UB^{95\%}\left(\overline{\mathrm{CAR}}_{\tau_1,\tau_2}\right)$, may then be calculated by taking the sum of the mean cumulative abnormal returns and 1.96 times the estimated standard deviation of the mean cumulative abnormal returns, and the lower bound, $LB^{95\%}\left(\overline{\mathrm{CAR}}_{\tau_1,\tau_2}\right)$, may be calculated by taking the sum of the mean cumulative abnormal returns and -1.96 times the estimated standard deviation of the mean cumulative abnormal returns:

$$UB^{95\%}\left(\overline{\text{CAR}}_{\tau_1,\tau_2}\right) = \overline{\text{CAR}}_{\tau_1,\tau_2} + 1.96\,\hat{S}\left(\overline{\text{CAR}}_{\tau_1,\tau_2}\right) \tag{31}$$

and

$$LB^{95\%}\left(\overline{\text{CAR}}_{\tau_1,\tau_2}\right) = \overline{\text{CAR}}_{\tau_1,\tau_2} - 1.96\,\hat{S}\left(\overline{\text{CAR}}_{\tau_1,\tau_2}\right) \tag{32}$$

where:

$$\hat{S}\left(\overline{\text{CAR}}_{\tau_1,\tau_2}\right) = \sqrt{\tau_2 - \tau_1 + 1} * \sqrt{\frac{1}{L_1 - 1}\sum_{t=T_0+1}^{T_1}\left(\overline{\text{AR}}_t - \frac{1}{L_1}\sum_{t=T_0+1}^{T_1}\overline{\text{AR}}_t\right)} \tag{33}$$

4.1.3. Detecting Abnormal Trading Volumes

Daily stock market data were obtained from Compustat – Capital IQ Securities Daily database available through Wharton Research data Service. The calculation of abnormal trading volume follows the procedure outlined in Ajinkya and Jain (1989) as specified in Lidén (2007). The log-transformed trading volume is defined as:

$$v_{i,t} = \ln\left(1 + P_{i,t} * V_{i,t}\right) \tag{34}$$

where $\ln(.)$ is the natural logarithm operator and $V_{i,t}$ is the number of shares of stock i traded on day t.

Abnormal log-transformed trading volumes have been calculated as realized log-transformed trading volumes less expected log-transformed trading volumes, where expected log-transformed trading volumes have been estimated using a market model:

$$\text{E}\left(v_{i,t}\right) = \hat{\alpha}_i + \hat{\beta}_i v_{\text{m,t}} \tag{35}$$

$$\text{AV}_{i,t} = v_{\text{i,t}} - \text{E}\left(v_{i,t}\right) \tag{36}$$

where $E(.)$ is the expectation operator, $\hat{\alpha}_i$ and $\hat{\beta}_i$ are the OLS estimates of the market model coefficients, and $v_{m,t}$ is the log-transformed trading volumes of the market, approximated here by the natural logarithm of the sum of the product of daily number of shares traded times the closing price of all stocks listed on the Stockholm Stock Exchange with data available in Compustat – Capital IQ Securities Daily:

$$v_{m,t} = \ln\left(1 + \sum_{n=1}^{N_t} P_{i,t} * V_{i,t}\right) \tag{37}$$

where N_t is the number of stocks listed on the Stockholm Stock Exchange with data available in Compustat – Capital IQ Securities Daily for day t.

Mean abnormal log transformed trading volumes, $\overline{AV}_t$, are defined as:

$$\overline{AV}_{\text{t}} = \frac{1}{N}\sum_{i=1}^{N} AV_{i,t} \tag{38}$$

The test statistic, as outlined by Ajinkya and Jain (1989), is the ratio of the abnormal log-transformed trading volumes over the time-series standard deviation of the regression residuals:

$$\mathrm{t}(\overline{\mathrm{AV}}_{\mathrm{t}}) = \frac{\overline{AV}_{\mathrm{t}}}{\sqrt{\frac{1}{L_1 - 1} * \sum_{t=T_0+1}^{T_1} \left(\overline{AV}_{\mathrm{t}} - \frac{1}{L_1} \sum_{i=1}^{L_1} \overline{AV}_{\mathrm{t}}\right)}} \tag{39}$$

The expected abnormal log transformed trading volumes are calculated using the OLS estimates as in Lidén (2007). However, the OLS estimates are not efficient and the abnormal log transformed trading volumes may be autocorrelated since log transformed trading volumes are autocorrelated (Ajinkya & Jain, 1989). Cumulative abnormal log transformed trading volumes and their corresponding test statistics will not be presented due to the fact that multi-period event tests are poorly specified when the OLS estimates are used.

4.2. Intraday Event Study

The intraday event study methodology employed in this thesis is based on the methodology used by Busse and Green (2002). They employed an intraday event study using raw returns where the statistical significance of the raw returns was determined using the bootstrap procedure as specified in Barclay and Litzenberger (1988). In this sub-chapter, the calculation of cumulative raw returns and the bootstrap procedure is described.

The intraday data is gathered from the database NASDAQ HFT - Reconstructed Order Book provided by Swedish House of Finance Research Data Center. The reconstructed order book is based on NASDAQ OMX Historical ITCH files. Data was gathered with the periodicity of every minute for the publication day for all stock recommendations. The transaction price for a stock i during a certain minute m, $P_{i,m}$, has been calculated as the average price of stock transactions that occurred during the following minute:

$$P_{i,m} = \frac{\sum_{a=1}^{A} P_{i,m,a} * V_{i,m,a}}{\sum_{a=1}^{A} V_{i,m,a}} \tag{40}$$

where A is the number of transactions that occurred during minute m, $P_{i,m,a}$ is the price at which a certain transaction occurred, and $V_{i,m,a}$ is the number of stocks traded at that specific transaction. The average transaction price is calculated for the minute following the timestamp in the reconstructed order book. For example, the transaction price for minute 09:00 is the average price of the transactions that occurred in between 09:00:00 and 09:00:59. If the transaction price was missing due to the fact that no transaction occurred during that minute, the price from the previous minute was carried forward. The raw return for a specific stock i during minute m, $R_{i,m}$, is defined as:

$$R_{i,m} = \frac{P_{i,m} - P_{i,m-1}}{p_{i,m-1}} \tag{41}$$

Cumulative raw returns between minute m_1 and minute m_2, CR_{i,m_1,m_2}, is defined as:

$$CR_{i,m_1,m_2} = \frac{1}{m_2 - m_1 + 1} \sum_{m=m_1}^{m_2} R_{(i,m)} \tag{42}$$

Mean returns, $\bar{R}_m$, and mean cumulative returns, $\overline{CR}_{m_1,m_2}$, are the average of the returns and cumulative returns respectively:

$$\bar{R}_m = \frac{1}{N} \sum_{i=1}^{N} R_{i,\mathrm{m}} \tag{43}$$

$$\overline{CR}_{m_1,m_2} = \frac{1}{N} \sum_{i=1}^{N} CR_{i,m_1,m_2} \tag{44}$$

where N is the number of stocks in the sample.

To estimate the statistical significance of the average cumulative returns, $\overline{CR}_{m_1,m_2}$, the nonparametric bootstrap procedure outlined in Barclay and Litzenberger (1988) is employed. The cumulative returns $\left(CR_{1,m_1,m_2},\ CR_{2,m_1,m_2},\ \ldots, CR_{N,m_1,m_2}\right)$ may be seen as independent drawings from an unknown distribution F. The probability that the mean cumulative returns, $\overline{CR}_{m_1,m_2}$, is higher than a specified constant K can be calculated using the following algorithm:

1. Estimate the distribution function F with the nonparametric empirical distribution $\hat{F}$ putting probability mass $\frac{1}{N}$ on each CR_{i,m_1,m_2}.
2. Draw a bootstrap sample from $\hat{F}$, $\left(CR^*_{1,m_1,m_2},\ CR^*_{2,m_1,m_2},\ \ldots, CR^*_{N,m_1,m_2}\right)$, where each CR^*_{i,m_1,m_2} is drawn randomly, with replacement from the observed values $\left(CR_{1,m_1,m_2},\ CR_{2,m_1,m_2},\ \ldots, CR_{N,m_1,m_2}\right)$, and calculate $\overline{CR}^*_{m_1,m_2}$.
3. Independently repeat step (2) 10,000 times, obtaining $\overline{CR}^{*1}_{m_1,m_2}, \overline{CR}^{*2}_{m_1,m_2}, \ldots, \overline{CR}^{*10{,}000}_{m_1,m_2}$, and calculate

$$p \equiv Prob(\overline{CR}_{m_1,m_2} > K) = \frac{Number\ of\ times\ \overline{CR}^*_{m_1,m_2} > K}{10{,}000} \tag{45}$$

The probability of the mean cumulative returns, $\overline{CR}_{m_1,m_2}$, being lower than or equal to the constant K is $1 - p$. The 97.5$^{\text{th}}$ and the 2.5$^{\text{th}}$ percentile of the bootstrap mean cumulative returns, $\overline{CR}^*_{m_1,m_2}\left(\overline{CR}^{*1}_{m_1,m_2}, \overline{CR}^{*2}_{m_1,m_2}, \ldots, \overline{CR}^{*10{,}000}_{m_1,m_2}\right)$, were used as estimates of the upper and lower bound respectively of a 95 % confidence interval for the observed mean cumulative returns during the event window.

5. Data Sample

In this chapter, some background information about Börsplus is provided and the sample selection process is described. The chapter is divided into two sub-chapters. Sub-chapter *5.1 Stock Recommendations Published by* Börsplus contains the historical background to Börsplus and general information about relevant editorial policies and the structure of their stock recommendations. Sub-chapter *5.2 Sample Selection* contains a description of the sample selection process and an overview of the number of observations in the sample.

5.1. Stock Recommendations Published by Börsplus

The following description is based on information available at the websites of Svenska Dagbladet, svd.se and Affärsvärlden, affarsvarlden.se, and from an interview with Peter Benson, editor of Börsplus during the relevant time period, on 20 November 2020. Börsplus officially started as a digital subscription service provided by Svenska Dagbladet as of 1 April 2016 where stock market analyses and stock recommendations by the editorial staff of Börsplus were published. New articles were published almost every weekday and the subscribers received an email when new articles had been published. The availability of the articles, as of the publication day, varied between only the subscribers of Börsplus, all subscribers to Svenska Dagbladet, and everyone reading Svenska Dagbladet.

The stock recommendations typically include both quantitative analyses of company fundamentals and qualitative analyses of the company's strategy, which often includes an analysis of information gained through contact with the management of the company. In the end of most stock recommendations there is a graphical illustration of the recommendation with one of the two following appearances:

1) a colored graph representing expected total return on the stock over a two to three-year window in three scenarios with the title "SvD Börsplus om [Company Name]: [Recommendation]", where the recommendation is buy, hold, or sell, or
2) a dice where one or two dots indicate a sell recommendation, three or four dots indicate a hold recommendation, and five or six dots represents a buy recommendation.

All editorial staff had to follow the securities policy for employees at Svenska Dagbladet, including the prohibition of short-term trading, an obligation to report securities transactions, and of course the prohibition of insider trading and market manipulation. The private stock portfolios of the staff that writes the stock recommendations were disclosed and it was noted in the stock recommendations whether the author owned stocks or had other interests in the recommended stock.

As of the end of July 2019, Börsplus separated from Svenska Dagbladet, and from April 2020, Börsplus is published under the name Affärsvärlden since Börsplus became the publisher of the Swedish business magazine Affärsvärlden in March of 2020 and decided to join the editorial teams of Börsplus and Affärsvälden under the brand Affärsvärlden.

5.2. Sample Selection

The stock recommendations published by Börsplus was gathered from Svenska Dagbladet's website svd.se/om/borsplus where articles by Börsplus are available for the duration that Börsplus was sold as an add on to Svenska Dagbladet. The sample consists of stock recommendations published during the time period December 2015 through July 2019. For an article to be included in the sample, it had to fulfill the following five criteria:

1) At least one common stock must be recommended in the article.
2) The recommendation must be clear, which was defined as there being a graphical illustration of the conclusion by the author(s) included in the article.
3) The recommend stock should have an ISIN with SE as the country code.
4) The recommended stock should have been listed at either Nasdaq Stockholm or First North GM Sweden during the day that the article was published.
5) The recommended stock should have been published during trading hours.

The aim of having the five criteria is that the sample should consist of recommendations of common stocks listed on a Swedish stock exchange where there should be stock data available in the databases Compustat – Capital IQ Securities Daily and NASDAQ HFT - Reconstructed Order Book, and that there should be no recommendation where the conclusion of the author(s) may be interpreted differently by different investors, since that would obscure the data. The recommendation, which stock was recommended, if the author owned the stock, and the date of publication was gathered from svd.se.

The time of publication of the articles are not available at svd.se, therefore the time of publication was sourced from affarsvarlden.se, which is the new website of Börsplus. Due to the fact that the stock recommendations from the relevant time period was imported from svd.se to affarsvarlden.se, the time of publication available at affarsvarlden.se is in GMT/UTC+0, which was confirmed by the publication time of the stock recommendations available in the database Retriever Research News Archive (formerly known as Mediearkivet). The time of publication was adjusted by one hour for articles published during Swedish wintertime, UTC+1, and by two hours for articles published during Swedish summertime, UTC+2. The number of articles in the final sample is displayed in *Table 1* below.

Table 1: Summary of Number of Recommendations in the Sample of Stock Recommendations Published by Börsplus During the Time Period 2015 Through 2019.

	Type of Recommendation		
	Buy	Hold	Sell
Total Sample	**234**	**298**	**43**
Of which with price data available in Compustat – Capital IQ Securities Daily	209	265	36
Of which with volume data available in Compustat – Capital IQ Securities Daily	187	242	35
Of which with price data available in NASDAQ HFT – Reconstructed Order Book	185	256	35

6. Results

The results presented below are divided into two sub-chapters. Sub-chapter *6.1 Event Study on Daily Data* contains the results from the event study on daily abnormal returns and daily abnormal log transformed trading volume. That is the results with respect to hypotheses H1, H2, and H3, that buy, hold, and sell recommendations published by Börsplus are associated with positive abnormal returns, abnormal returns, and negative abnormal returns, respectively, during the trading days around the publication, and hypothesis H4 that buy, hold, and sell recommendations published by Börsplus are associated with positive abnormal trading volume during the trading days around the publication. Sub-chapter *6.2 Intraday Event Study* contains the results from the intraday return event study. That is the results with respect to hypotheses H5, H6, and H7, that buy, hold, and sell recommendations published by Börsplus are associated with positive returns, returns, and negative returns respectively during the minutes following the publication.

6.1. Event Study on Daily Data

The results for the event study on daily data is split into two sections. In the first section, *6.1.1 Abnormal Returns*, the event study on abnormal returns is reported. The cumulative mean abnormal returns for buy, hold, and sell recommendations are presented jointly in a graph whereafter the results for the buy, hold, and sell recommendations are presented separately in both a graph over the mean cumulative abnormal returns with its corresponding confidence interval and a table of the daily mean abnormal returns with its corresponding t-statistic. In the second section, *6.1.2 Abnormal Log Transformed* Trading Volume, the event study on log transformed trading volume is reported in a single table with the daily log transformed abnormal trading volume and its corresponding t-statistic for buy, hold, and sell recommendations.

6.1.1. Abnormal Returns

The mean cumulative abnormal returns for buy, hold, sell recommendations over the event window is summarized in *Figure 2* below. The graph is presented in order to give an overview of the abnormal returns to illustrate that the sign of the mean cumulative abnormal returns and the relative magnitude of the mean cumulative abnormal returns following buy, hold and sell recommendations respectively. It is shown that the mean cumulative abnormal returns are positive for buy recommendations, but negative for hold and sell recommendations. The magnitude of the mean cumulative abnormal returns for sell recommendations over the event window is larger than the magnitude for buy recommendations. The magnitude of the mean abnormal returns is the largest during the publication day for buy, hold, and sell recommendations. Furthermore, the mean abnormal returns during the publication day for neither buy nor sell recommendations reverses over the 20 trading days following the publication. The results are presented in *Table 2* in a comparable manner to *Table A 1* in *Appendix I* where prior research is summarized.

Table 2: Summary of the Event Study on Daily Abnormal Returns for Stock Recommendations Published Between 2015 and 2019.

Observations			Pre-event	Event day			Post-event
No.	Type	$\overline{CAR}_{-3,-1}$(%)	$t(\overline{CAR}_{-3,-1})$	$\overline{AR}_0$(%)	$t(\overline{AR}_0)$	$\overline{CAR}_{1,20}$(%)	$t(\overline{CAR}_{1,20})$
209	Buy	0.37	0.94	1.48	8.96	0.51	1.49
265	Hold	0.31	0.52	-0.62	-3.38	-0.61	-0.95
36	Sell	0.24	1.00	-3.29	-7.58	-7.21	-2.67

More detailed information on the mean cumulative abnormal returns for buy, hold, and sell recommendations are presented in *Figure 3*, *Figure 4*, and *Figure 5* respectively. The mean abnormal returns for each day for buy, hold, and sell recommendations with their corresponding t-statistics are present jointly in *Table 3*. A more detailed table with mean abnormal returns for each day for buy, hold, and sell recommendations with all four of their corresponding test statistics is presented in *Table A 2* in *Appendix II*.

For buy recommendations it is shown that the positive mean cumulative abnormal return is statistically significant from the event day and onwards and that the event day mean abnormal return of 1.48% is statistically significant at the 1 percent level for a one-sided test according to all four statistical tests. No reversal of the cumulative abnormal returns is observed during the 20 trading days following the publication.

For hold recommendations, the mean cumulative abnormal return over the event window is not statistically significant. The mean abnormal return during the event day of -0.62% is statistically significant at the 1 percent level for a one-sided t-test, however the mean abnormal return is not statistically significant according to the adjusted BMP test and the nonparametric sign and rank tests. Similarly, there is a positive mean abnormal return during the day prior to the event day of 0.45% that is statistically significant at the 1 percent level for a one-sided t-test, but that is not statistically significant according to the adjusted BMP test and the nonparametric sign and rank tests.

For sell recommendations, the mean cumulative abnormal return over the whole event window of -10.00% is statistically significant and there is no tendency for the mean abnormal returns of the publication day of -3.29% to reverse during the 20 trading days following the publication. To the contrary, there is a downward drift of the mean cumulative abnormal returns during the 20 trading days following the publication of the sell recommendations. The negative mean abnormal return during the publication day of -3.29% is statistically significant at the 1 percent level for a one-sided test according to all statistical tests except for the nonparametric sign test. During the trading day following the publication day, there is a negative mean abnormal return of -2.16% that is statistically significant at the 1 percent level for a one-sided test according to all statistical tests.

Figure 2: Mean Cumulative Abnormal Returns for 209 Buy Recommendations, 265 Hold Recommendations, and 36 Sell Recommendations Published Between 2015 and 2019.

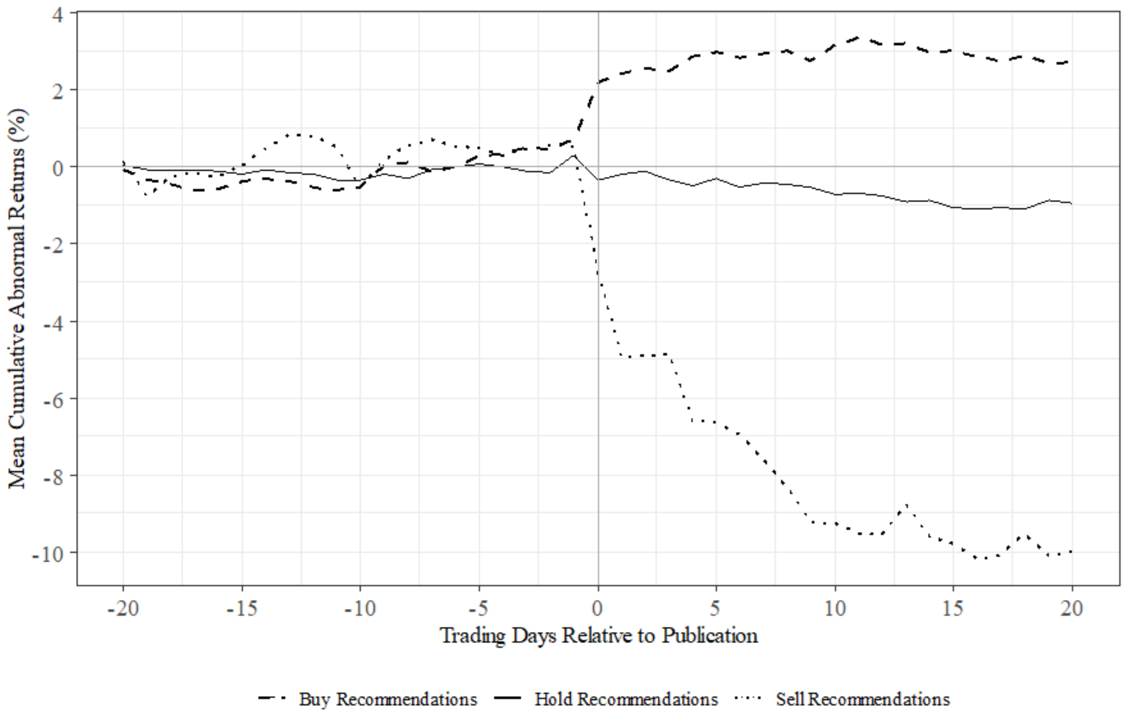
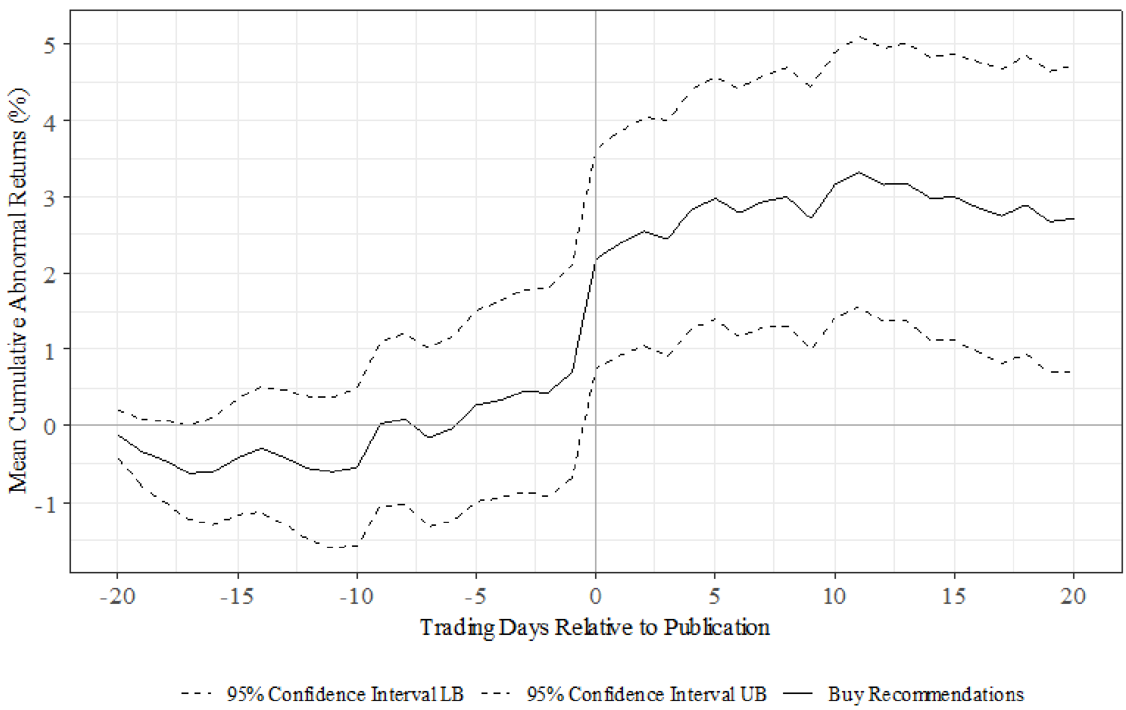
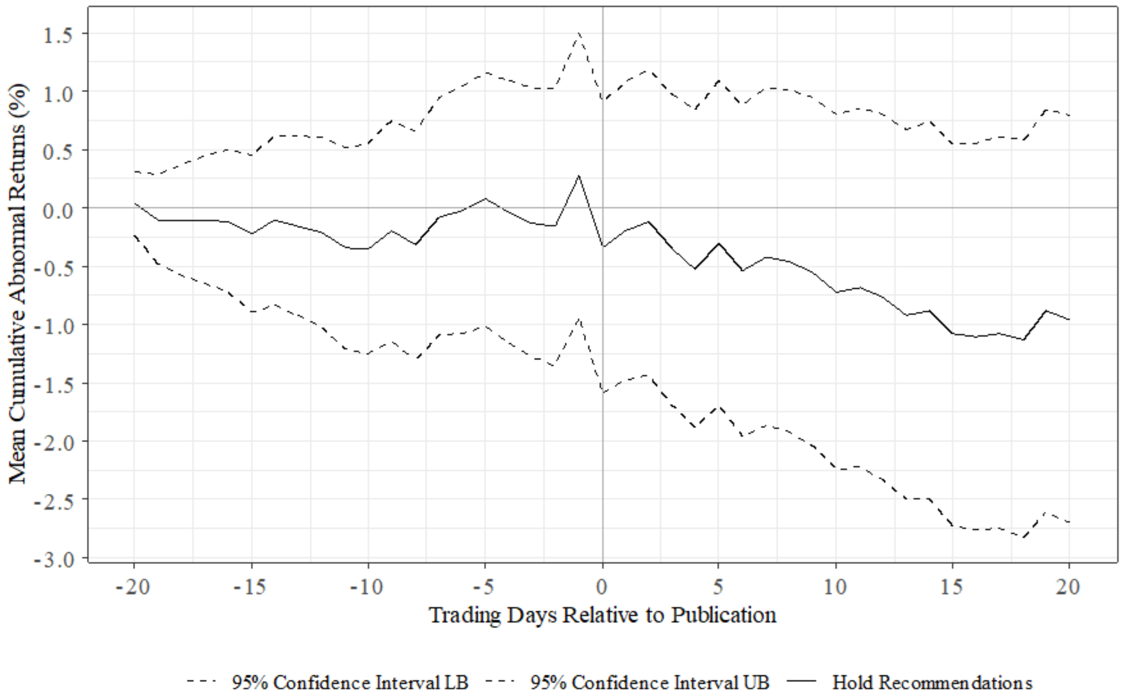


Figure 3: Mean Cumulative Abnormal Returns for 209 Buy Recommendations Published Between 2015 and 2019 with a 95% Confidence Interval.



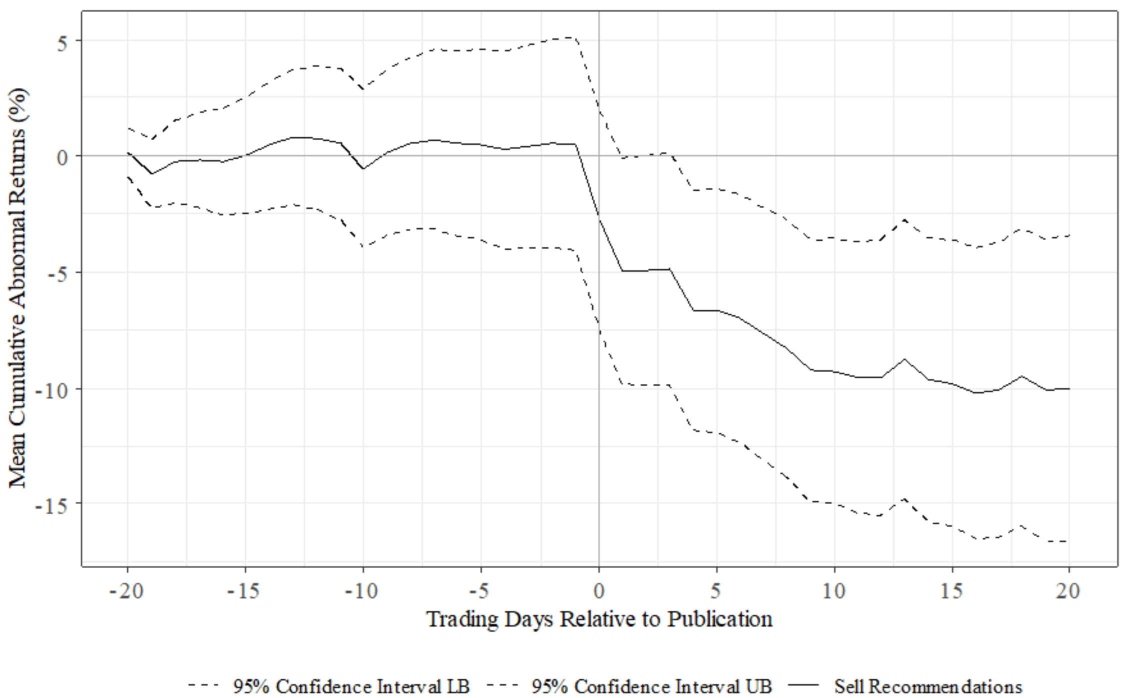
Note: LB means lower bound and UB means upper bound.

Figure 4: Mean Cumulative Abnormal Returns for 265 Hold Recommendations Published Between 2015 and 2019 with a 95% Confidence Interval.



Note: LB means lower bound and UB means upper bound.

Figure 5: Mean Cumulative Abnormal Returns for 36 Sell Recommendations Published Between 2015 and 2019 with a 95% Confidence Interval.



Note: LB means lower bound and UB means upper bound.

Table 3: Mean Abnormal Returns for 209 Buy Recommendations, 265 Hold Recommendations, and 36 Sell Recommendations Published Between 2015 and 2019.

	Buy Recommendations		Hold Recommendations		Sell Recommendations	
Day	$\overline{AR}_{\mathrm{t}}$	$t(\overline{AR}_{\mathrm{t}})$	$\overline{AR}_{\mathrm{t}}$	$t(\overline{AR}_{\mathrm{t}})$	$\overline{AR}_{\mathrm{t}}$	$t(\overline{AR}_{\mathrm{t}})$
-20	-0.11	-0.92	0.04	0.42	0.15	0.44
-19	-0.23	-1.66	-0.14	-0.20	-0.95	-2.02
-18	-0.12	-0.89	-0.01	0.06	0.58	1.05
-17	-0.15	-0.97	0.01	0.45	0.03	-0.17
-16	0.02	-0.08	-0.01	-0.76	-0.05	0.46
-15	0.18	0.90	-0.11	-0.67	0.29	0.75
-14	0.11	1.15	0.11	0.87	0.42	0.44
-13	-0.11	-0.37	-0.05	-0.37	0.35	1.16
-12	-0.15	-2.42	-0.06	-0.54	-0.03	-1.13
-11	-0.05	-0.60	-0.13	-0.76	-0.25	-0.06
-10	0.06	0.00	-0.01	-0.32	-1.07	-1.47
-9	0.57	2.62	0.16	0.27	0.70	1.32
-8	0.06	0.34	-0.12	-0.93	0.41	0.89
-7	-0.24	-1.89	0.25	1.93	0.14	0.53
-6	0.11	0.30	0.05	-0.21	-0.18	-0.74
-5	0.30	1.97	0.10	0.83	-0.04	0.28
-4	0.07	-0.48	-0.11	-0.92	-0.21	0.08
-3	0.12	-0.01	-0.09	-0.48	0.16	1.06
-2	-0.01	0.54	-0.04	-0.99	0.12	0.68
-1	0.27	1.08	0.45	2.38	-0.04	-0.01
0	**1.48**	**8.96**	**-0.62**	**-3.38**	**-3.29**	**-7.58**
1	0.20	2.53	0.14	1.15	-2.17	-3.44
2	0.15	0.93	0.07	0.79	0.04	-0.19
3	-0.09	-0.24	-0.24	-1.81	0.05	-0.12
4	0.38	2.50	-0.16	-1.08	-1.77	-3.25
5	0.14	0.96	0.22	1.74	-0.04	0.46
6	-0.18	-1.19	-0.24	-1.87	-0.30	-0.79
7	0.14	0.83	0.12	1.14	-0.67	-2.17
8	0.06	-0.44	-0.03	-0.23	-0.66	-1.45
9	-0.27	-1.41	-0.09	-0.76	-0.93	-1.81
10	0.44	2.66	-0.17	-1.38	-0.03	0.39
11	0.17	1.55	0.04	0.14	-0.27	-0.14
12	-0.16	-0.21	-0.09	-0.58	-0.03	0.15
13	0.03	-0.36	-0.15	-1.42	0.79	0.97
14	-0.21	-1.12	0.03	0.60	-0.88	-1.65
15	0.02	0.04	-0.20	-1.63	-0.16	-0.01
16	-0.15	-0.75	-0.02	-0.04	-0.42	-0.41
17	-0.11	-0.20	0.04	-0.15	0.14	-0.71
18	0.14	1.22	-0.05	0.54	0.56	1.78
19	-0.22	-1.20	0.24	1.40	-0.59	-0.27
20	0.03	0.57	-0.07	-0.82	0.11	0.71

Note: $\overline{AR}_t$ is the mean abnormal returns during day t and $t(\overline{AR}_{\mathrm{t}})$ is the t-statistic calculated in accordance with Brown and Warner (1985) appendix A.2. Day zero is the day that the stock recommendation was published.

6.1.2. Abnormal Log Transformed Trading Volume

The mean abnormal log transformed trading volume for buy, hold and sell recommendations are presented jointly in *Table 4* below. The mean abnormal log transformed trading volumes during the event day are statistically significant for buy, hold, and sell recommendations with values of 1.41, 1.19, and 1.04, and corresponding t-statistics of 21.28, 7.90, and 16.20 respectively. The magnitude of the mean abnormal log transformed trading volumes may be understood better by comparing with the mean trading volume of all stock relative to their corresponding average trading volume during the estimation window. For buy, hold and sell recommendations, the mean trading volume relative to the average trading volume during the estimation window is 4.43, 4.67, and 3.96 respectively. That means, for example, that the trading volume during the publication day for a buy recommendation is on average 4.43 times larger than the average trading volume for the stock during the estimation window.

For buy recommendations, the mean abnormal log transformed trading volume is positive and statistically significant for all days from three days prior to the recommendation through trading day eleven after the publication. For hold and sell recommendations the mean abnormal log transformed trading volume is positive and statistically significant for a shorter period of time, from one to two days prior to the publication through day six to seven after the publication.

Table 4: Mean Abnormal Trading Volume for 187 Buy Recommendations, 242 Hold Recommendations, and 35 Sell Recommendations Published Between 2015 and 2019.

	Buy Recommendations		Hold Recommendations		Sell Recommendations	
Day	$\overline{AV}_t$	$t(\overline{AV}_t)$	$\overline{AV}_t$	$t(\overline{AV}_t)$	$\overline{AV}_t$	$t(\overline{AV}_t)$
-20	-0.02	-0.38	0.01	0.05	-0.16	-2.43
-19	-0.04	-0.68	-0.12	-0.97	-0.13	-2.04
-18	-0.09	-1.46	0.15	1.16	-0.05	-0.70
-17	0.02	0.38	0.07	0.54	-0.24	-3.68
-16	0.02	0.33	-0.11	-0.87	-0.08	-1.19
-15	-0.07	-1.15	0.08	0.65	0.01	0.21
-14	-0.02	-0.36	0.02	0.17	-0.10	-1.55
-13	-0.02	-0.39	0.15	1.15	-0.10	-1.60
-12	-0.03	-0.49	0.00	-0.03	-0.12	-1.90
-11	0.04	0.62	0.02	0.13	-0.13	-2.02
-10	0.06	1.02	0.17	1.32	-0.12	-1.87
-9	0.03	0.55	0.11	0.89	-0.08	-1.21
-8	0.05	0.75	0.11	0.86	0.01	0.11
-7	-0.05	-0.89	0.19	1.47	-0.10	-1.59
-6	0.09	1.56	0.22	1.76	-0.13	-1.94
-5	0.02	0.38	0.16	1.24	-0.05	-0.83
-4	0.05	0.77	0.31	2.41	-0.07	-1.09
-3	0.20	3.35	0.31	2.43	-0.06	-0.97
-2	0.18	2.97	0.33	2.57	0.14	2.10
-1	0.58	9.64	0.53	4.15	0.38	5.78
0	**1.39**	**23.16**	**1.24**	**9.74**	**1.00**	**15.22**
1	0.80	13.31	0.81	6.35	0.56	8.57
2	0.55	9.24	0.70	5.53	0.33	4.98
3	0.43	7.26	0.44	3.47	0.26	4.01
4	0.35	5.84	0.53	4.20	0.25	3.82
5	0.26	4.29	0.34	2.64	0.22	3.32
6	0.31	5.17	0.34	2.71	0.16	2.45
7	0.25	4.18	0.28	2.18	0.07	1.12
8	0.20	3.42	0.13	1.06	0.09	1.32
9	0.21	3.55	0.20	1.57	0.12	1.77
10	0.21	3.52	0.05	0.41	0.00	-0.05
11	0.17	2.82	0.13	1.03	-0.03	-0.46
12	0.06	1.05	-0.05	-0.39	-0.05	-0.83
13	0.24	3.97	-0.12	-0.92	-0.05	-0.81
14	0.22	3.64	0.02	0.19	-0.07	-1.08
15	0.21	3.49	0.04	0.28	-0.07	-1.07
16	0.18	3.01	-0.03	-0.21	-0.10	-1.48
17	0.22	3.69	0.01	0.05	0.00	-0.06
18	0.18	2.98	0.19	1.51	0.07	1.09
19	0.25	4.18	-0.20	-1.60	-0.02	-0.25
20	0.25	4.23	0.09	0.74	0.03	0.52

Note: $\overline{AV}_t$ is the mean abnormal log transformed trading volume during day t, $t(\overline{AV}_t)$ is the t-statistic calculated according to Ajinkya and Jain (1989). Day zero is the day that the stock recommendation was published.

6.2. Intraday Event Study

This sub-chapter is outlined as follows. The intraday mean cumulative returns for buy, hold, and sell recommendations are presented jointly in a graph. Thereafter, the results for buy, hold, and sell recommendations are presented separately in graphs over the mean cumulative returns with their corresponding confidence interval, lastly there is a table of the intraday returns with their corresponding p-value from the nonparametric bootstrap procedure.

The mean cumulative returns for buy, hold, sell recommendations from one hour before the publication of the articles through two hours after the publication of the articles are shown in *Figure 6* below. The graph is presented in order to give an overview of the returns to illustrate the sign of the mean cumulative returns and the relative magnitude of the mean cumulative returns following buy, hold and sell recommendations respectively. It is shown that the mean cumulative returns are positive for buy recommendations and negative for hold and sell recommendations. The magnitude of the mean cumulative return for sell recommendations is larger than the magnitude for buy recommendations. Furthermore, the mean cumulative returns for neither buy nor sell recommendations reverses during the two hours following the publication.

More detailed information on the mean cumulative returns with confidence intervals and mean abnormal returns with their corresponding p-values from the nonparametric bootstrap procedure for buy, hold, and sell recommendations are presented in *Figure 7*, *Figure 8*, *Figure 9* and *Table 5*.

For buy recommendations, it is shown that the positive mean cumulative returns are statistically significant from minute one and onwards and that the returns for minute minus one through six are all statistically significant at the 10 percent level for a one-sided test according to the nonparametric bootstrap procedure.

Regarding hold recommendations, the mean cumulative returns are economically small and not statistically significant during the minutes following the publication of the recommendations.

The mean cumulative returns for sell recommendations are statistically significant prior to the publication of the articles but increases in magnitude during the two hours following the publication. The returns during minute two through four after the publication are statistically significant at the 10 percent level for a one-sided test according to the nonparametric bootstrap procedure.

Figure 6: Mean Cumulative Returns for 185 Buy Recommendations, 35 Sell Recommendations, and 256 Hold Recommendations Published Between 2015 and 2019.

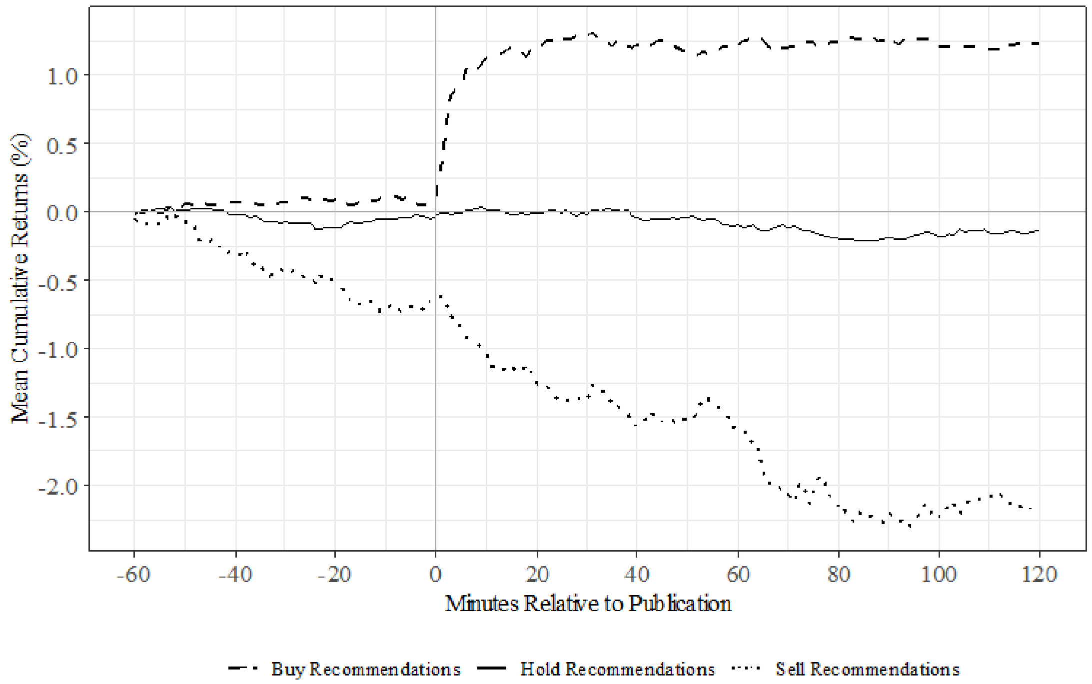
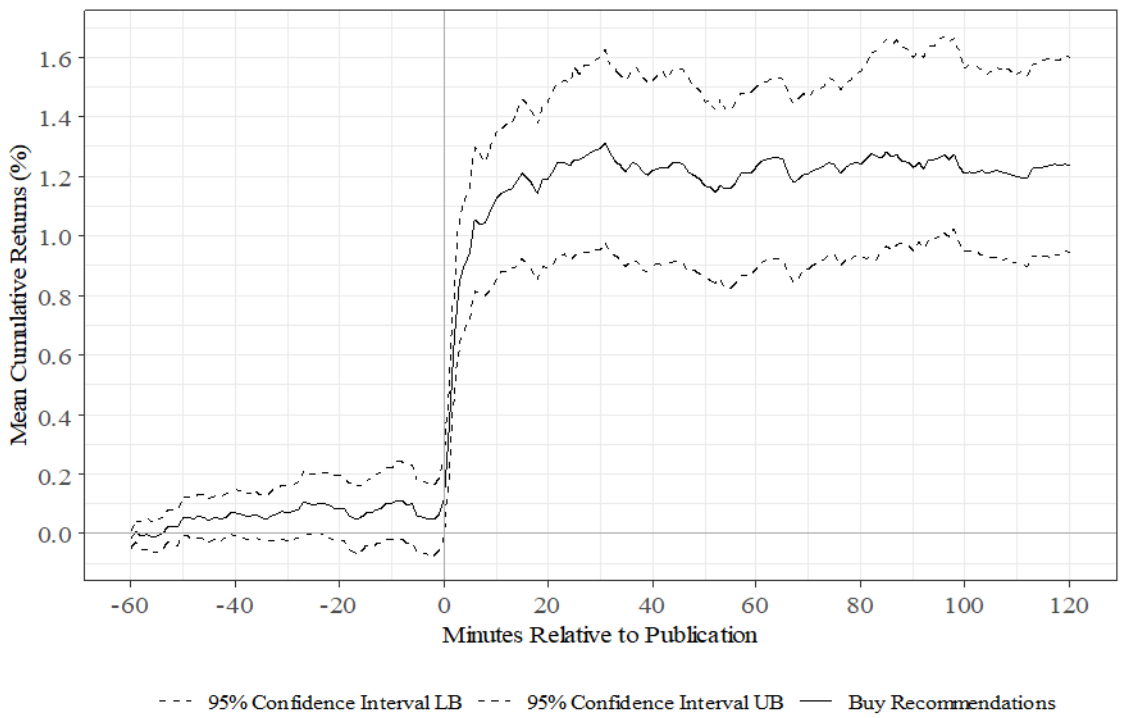
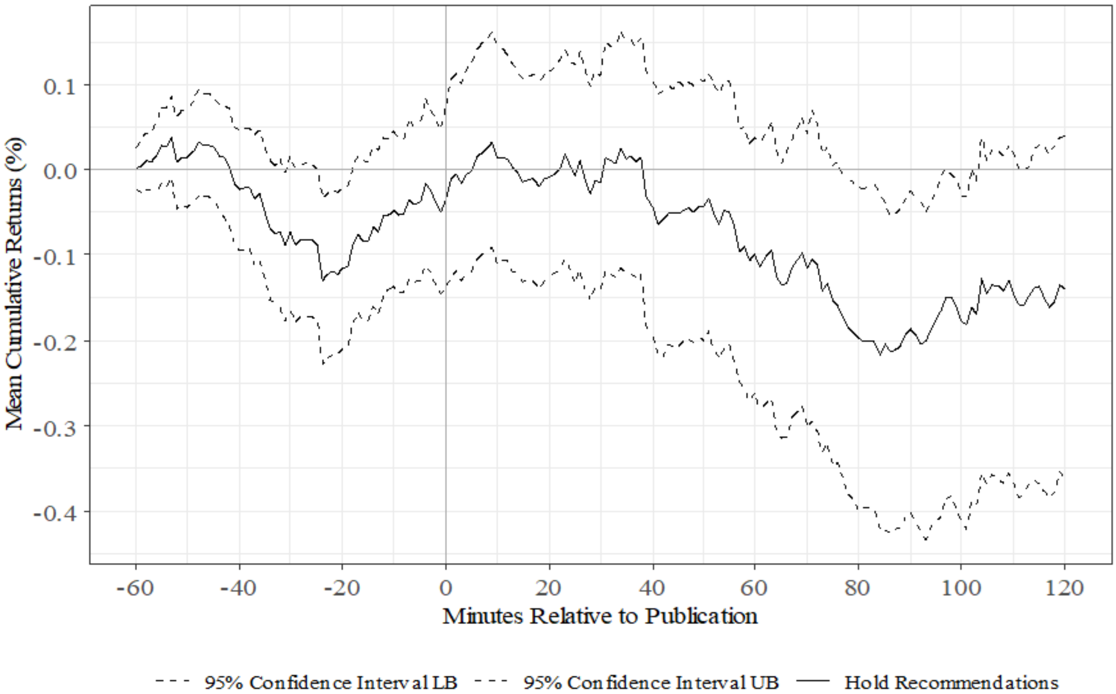


Figure 7: Mean Cumulative Returns for 185 Buy Recommendations Published Between 2015 and 2019 with a 95% Confidence Interval.



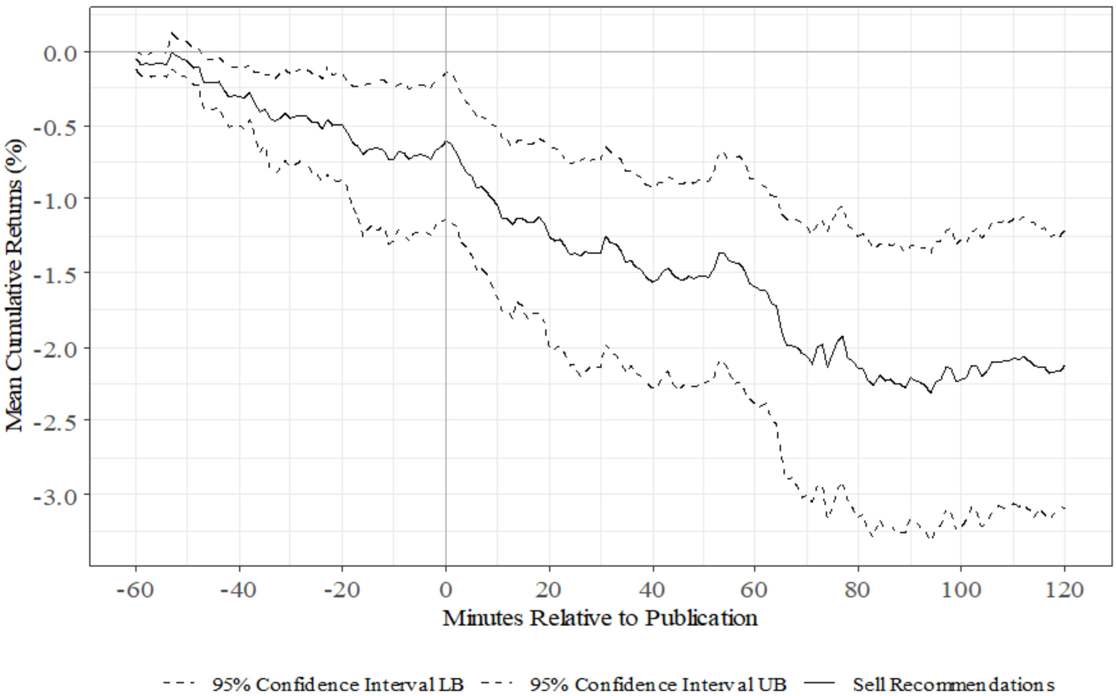
Note: LB means lower bound and UB means upper bound.

Figure 8: Mean Cumulative Returns for 256 Hold Recommendations Published Between 2015 and 2019 with a 95% Confidence Interval.



Note: LB means lower bound and UB means upper bound.

Figure 9: Mean Cumulative Returns for 35 Sell Recommendations Published Between 2015 and 2019 with a 95% Confidence Interval.



Note: LB means lower bound and UB means upper bound.

Table 5: Mean return for 185 Buy Recommendations, 35 Sell Recommendations, and 256 Hold Recommendations Published Between 2015 and 2019.

	Buy Recommendations		Hold Recommendations		Sell Recommendations	
Minute	$\bar{R}_m(\%)$	$p(\bar{R}_m \leq 0)$	$\bar{R}_m(\%)$	$p(\bar{R}_m \leq 0)$	$\bar{R}_m(\%)$	$p(\bar{R}_m \leq 0)$
-20	0.00	0.3369	0.01	0.2406	-0.01	0.6396
-19	0.00	0.5374	0.00	0.3937	-0.05	0.9766
-18	-0.03	0.9816	0.03	0.0139	-0.07	0.8875
-17	-0.01	0.7939	0.01	0.1941	-0.03	0.8975
-16	0.01	0.3096	-0.01	0.8081	-0.04	0.7843
-15	0.02	0.1001	0.00	0.4617	0.03	0.1132
-14	0.00	0.5244	0.02	0.1427	0.01	0.2434
-13	0.01	0.0216	-0.01	0.8257	0.00	0.4788
-12	0.00	0.3302	0.02	0.0110	-0.01	0.7649
-11	0.02	0.1004	0.00	0.5304	-0.07	0.9335
-10	0.00	0.5086	0.01	0.3208	0.01	0.4254
-9	0.01	0.2409	-0.01	0.6805	0.04	0.0961
-8	0.00	0.5057	0.00	0.4624	-0.01	0.5821
-7	-0.02	0.8749	0.02	0.1408	-0.04	0.9652
-6	0.01	0.2908	-0.01	0.6262	0.02	0.0980
-5	-0.04	0.9812	0.00	0.2871	0.01	0.3013
-4	-0.01	0.7225	0.02	0.0664	-0.01	0.6744
-3	0.00	0.6158	-0.01	0.7694	-0.02	0.9165
-2	0.00	0.5975	-0.01	0.7670	0.06	0.0020
-1	0.02	0.0257	-0.01	0.8014	0.03	0.2077
0	**0.05**	**0.0112**	**0.02**	**0.2234**	**0.03**	**0.0648**
1	0.24	0.0000	0.02	0.1940	-0.02	0.7207
2	0.29	0.0000	0.01	0.3226	-0.06	0.9497
3	0.19	0.0009	-0.01	0.7511	-0.08	0.9923
4	0.06	0.0615	0.01	0.2664	-0.06	0.9980
5	0.04	0.0613	0.00	0.3483	-0.03	0.7922
6	0.12	0.0000	0.02	0.1660	-0.08	0.9137
7	-0.01	0.6776	0.01	0.1398	0.01	0.3275
8	0.01	0.4174	0.00	0.2297	-0.04	0.9398
9	0.03	0.1459	0.01	0.3007	-0.04	0.8737
10	0.05	0.0146	-0.02	0.8998	-0.04	0.8593
11	0.01	0.2814	0.00	0.4522	-0.09	0.9882
12	0.01	0.2835	0.00	0.5835	0.00	0.4872
13	0.01	0.4048	-0.01	0.7159	-0.04	0.9097
14	0.02	0.2519	-0.01	0.7856	0.04	0.0285
15	0.03	0.1508	-0.01	0.8652	0.00	0.4326
16	-0.01	0.7666	0.00	0.4946	-0.03	0.8228
17	-0.02	0.7706	0.00	0.4555	0.00	0.5328
18	-0.03	0.7984	-0.01	0.9048	0.04	0.0406
19	0.05	0.0934	0.01	0.2845	-0.05	0.9842
20	0.00	0.4379	0.00	0.4188	-0.08	0.9873

Note: $\bar{R}_m$ is the mean return during minute m and $p(\bar{R}_m \leq 0)$ is the probability of the mean return being lower than zero calculated using the nonparametric bootstrap procedure described in Barclay and Litzenberger (1988). Minute zero is the minute that the stock recommendation was published.

7. Robustness Tests

In this chapter, the results of applied robustness tests are presented. The results presented below are divided into five sub-chapters. The first, *7.1 Estimation of Expected Returns*, contains the results for the impact on the results from changing estimation of expected returns for the event study on daily returns. In the second, *7.2 Post-Publication Drift*, it is illustrated how the cumulative abnormal returns for buy recommendations drift over the following 125 trading days after the publication. The third, *7.3 Authors' Stock* Ownership, contains the results from partitioning the sample based on whether the author of the stock recommendation owns the recommended stock or not. In the fourth, *7.4 Differences Between Stock* Market, the sample of buy recommendations is partitioned based on whether the stocks are listed on Nasdaq Stockholm or on First North Stockholm. In the fifth, *7.5 Prior Recommendations*, it is shown that the abnormal returns during the publication day for hold recommendations are sensitive to whether there has been a prior recommendation or not. Robustness tests that did not materially alter the results such as changing the length of the estimation window for the event study on daily abnormal returns and log transformed trading volumes, excluding the top and bottom one and five percent of the observations from the event study on daily abnormal returns and log transformed trading volumes and the intraday event study, and splitting the sample between repeat recommendations and non-repeat recommendations are not reported.

7.1. Estimation of Expected Returns

For an event study on daily data, the choice of model for estimating expected returns is essential. If a model does not include all risk factors, the abnormal returns observed during the event window may be biased, which may in turn result in erroneous conclusions. Therefore, 7 different models for the estimation of expected returns were used as a robustness test. The models were the market adjusted model, the mean adjusted model, the capital asset pricing model (CAPM) (Lintner, 1965; Mossin, 1966; Sharpe, 1964), the Fama-French three-factor model (FF3) (Fama & French, 1993), the Carhart four-factor model (FF4) (Carhart, 1997), the Fama-French five-factor model (FF5) (Fama & French, 2015), and a six-factor model that is a combination of the Fama-French five-factor model and the momentum factor from the Carhart four-factor model (FF6). In order, they are defined as follows:

$$\mathrm{E}(R_{i,t}) = R_{m,t} \tag{46}$$

$$\mathrm{E}(R_{i,t}) = \bar{R}_i \tag{47}$$

$$\mathrm{E}(R_{i,t}) = \widehat{\alpha}_{\mathrm{i}} + R_{f,t} + \hat{\beta}_{1,i}(R_{m,t} - R_{f,t}) \tag{48}$$

$$\mathrm{E}(R_{i,t}) = \widehat{\alpha}_{\mathrm{i}} + R_{f,t} + \hat{\beta}_{1,i}(R_{m,t} - R_{f,t}) + \widehat{\beta}_{2,\mathrm{i}}\mathrm{SMB_t} + \widehat{\beta}_{3,\mathrm{i}}\mathrm{HML_t} \tag{49}$$

$$\begin{aligned}\mathrm{E}(R_{i,t}) = \hat{\alpha}_i + R_{f,t} + \hat{\beta}_{1,i}(R_{m,t} - R_{f,t}) + \widehat{\beta}_{2,\mathrm{i}}\mathrm{SMB_t} + \widehat{\beta}_{3,\mathrm{i}}\mathrm{HML_t} \\ + \widehat{\beta}_{4,\mathrm{i}}\mathrm{MOM_t}\end{aligned} \tag{50}$$

$$\begin{aligned}\mathrm{E}(R_{i,t}) = \hat{\alpha}_i + R_{f,t} + \hat{\beta}_{1,i}(R_{m,t} - R_{f,t}) + \widehat{\beta}_{2,\mathrm{i}}\mathrm{SMB_t} + \widehat{\beta}_{3,\mathrm{i}}\mathrm{HML_t} \\ + \widehat{\beta}_{4,\mathrm{i}}\mathrm{RMW_t} + \widehat{\beta}_{5,\mathrm{i}}\mathrm{CMA_t}\end{aligned} \tag{51}$$

$$\mathrm{E}(R_{i,t}) = \hat{\alpha}_i + R_{f,t} + \hat{\beta}_{1,i}(R_{m,t} - R_{f,t}) + \hat{\beta}_{2,i}\mathrm{SMB_t} + \hat{\beta}_{3,i}\mathrm{HML_t} + \hat{\beta}_{4,i}\mathrm{RMW_t} + \hat{\beta}_{5,i}\mathrm{CMA_t} + \hat{\beta}_{6,i}\mathrm{MOM_t} \quad (52)$$

where $\bar{R}_i$ is the mean return during the estimation window, R_f is the risk free rate, SMB is the difference between the returns of small stocks and big stocks, HML is the difference between the returns of value stocks and growth stocks, MOM is the difference between the returns of stocks with high prior returns and stocks with low prior returns, RMW is the difference between the returns of stocks with high operating profitability and stocks with low operating profitability, and CMA is the difference between the returns of stocks with small investments and stocks with large investments. The Fama-French factors were gathered from data library of Kenneth French.[3] The CAPM and the market adjusted model were estimated using the three-month treasury bill[4] as the risk-free rate and OMXSGI[5] as the market return. $\hat{\alpha}_i$, $\hat{\beta}_{1,i}$, $\hat{\beta}_{2,i}$, $\hat{\beta}_{3,i}$, $\hat{\beta}_{4,i}$, $\hat{\beta}_{5,i}$, and $\hat{\beta}_{6,i}$ are the OLS estimates of the respective model coefficients.

Due to the fact that prior research has shown that the reversal of cumulative abnormal returns during the trading days following the publication day may be due to bias in the estimated intercept parameter in the market model (see Albert & Smaby, 1996; Pettengill & Clark, 2001), the market model, the Fama-French three-factor model, Carhart four-factor model, Fama-French five-factor model, and the six-factor model were also estimated without an intercept (denoted as $MM_{\alpha=0}$, $CAPM_{\alpha=0}$, $FF3_{\alpha=0}$, $FF4_{\alpha=0}$, $FF5_{\alpha=0}$, and $FF6_{\alpha=0}$), which is a procedure similar to the procedure used by Pettengill and Clark (2001) where they only used the beta estimate from the market model to estimate expected returns.

The magnitude of the mean event day expected returns and cumulative expected returns for the event window are presented in *Table 6* and *Table 7* below, where the mean expected returns and cumulative expected returns are defined as follows:

$$\overline{E(R_t)} = \frac{1}{\mathrm{N}}\sum_{i=1}^{N} E(R_{i,t}) \quad (53)$$

and

$$\overline{E(CER_{\tau_1,\tau_2})} = \frac{1}{\tau_2 - \tau_1 + 1}\sum_{t=\tau_1}^{\tau_2} \overline{E(R_t)} \quad (54)$$

Thereafter, the event day abnormal return, $\overline{AR}_0$, and cumulative abnormal returns for the event window, $\overline{\mathrm{CAR}}_{-20,20}$, for the model that maximizes and minimizes the respective measure for buy, hold and sell recommendations are presented in *Table 8* and *Table 9.*

[3] The data is available at: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. The datasets used was Fama/French European 3 Factors [Daily], Fama/French European 5 Factors [Daily], and European Momentum Factor (Mom) [Daily].
[4] Data on treasury bills are available through the website of the Central bank of Sweden (Sw. Sveriges riksbank), https://www.riksbank.se/sv/statistik/sok-rantor--valutakurser.
[5] OMXSGI is a value weighted gross index with dividends reinvested including all shares on OMX Nordic Exchange Stockholm and is available through the website of Nasdaq OMX Nordic, http://www.nasdaqomxnordic.com/index/historiska_kurser?Instrument=SE0002416156.

Table 6: Mean Event Day Expected Return for 209 Buy Recommendations, 265 Hold Recommendations, and 36 Sell Recommendations Published Between 2015 and 2019.

Model	Buy Recommendations	Hold Recommendations	Sell Recommendations
MM	0.08	0.02	0.17
Market Adjusted	0.12	0.01	-0.01
Mean Adjusted	0.02	0.02	0.19
$CAPM$	0.08	0.02	0.17
$FF3$	0.07	0.02	-0.03
$FF4$	0.08	0.02	0.05
$FF5$	0.11	0.06	-0.06
$FF6$	0.11	0.08	0.04
$MM_{\alpha=0}$	0.08	0.02	-0.01
$CAPM_{\alpha=0}$	0.08	0.02	-0.01
$FF3_{\alpha=0}$	0.05	0.00	-0.21
$FF4_{\alpha=0}$	0.07	0.01	-0.14
$FF5_{\alpha=0}$	0.09	0.04	-0.26
$FF6_{\alpha=0}$	0.10	0.06	-0.16
Largest Positive Difference from MM	0.04	0.06	0.02
Largest Negative Difference from MM	-0.06	-0.02	-0.43
Spread	0.10	0.08	0.45

Note: The definitions of the models are given in equations 15 and 50 through 56. $\alpha = 0$ indicates that the model is estimated without the intercept coefficient $\hat{\alpha}_i$. All numbers are in percent.

Table 7: Mean Cumulative Expected Return over the Event Window for 209 Buy Recommendations, 265 Hold Recommendations, and 36 Sell Recommendations Published Between 2015 and 2019.

Model	Buy Recommendations	Hold Recommendations	Sell Recommendations
MM	1.20	1.47	8.58
Market Adjusted	1.38	1.71	1.75
Mean Adjusted	0.86	0.96	7.79
$CAPM$	1.20	1.47	8.58
$FF3$	1.11	0.88	7.41
$FF4$	1.28	1.10	7.62
$FF5$	1.46	1.44	7.03
$FF6$	1.59	1.62	7.20
$MM_{\alpha=0}$	1.14	1.48	1.20
$CAPM_{\alpha=0}$	1.12	1.46	1.18
$FF3_{\alpha=0}$	0.60	0.21	0.99
$FF4_{\alpha=0}$	0.76	0.43	1.25
$FF5_{\alpha=0}$	0.81	0.50	0.40
$FF6_{\alpha=0}$	0.98	0.74	0.69
Largest Positive Difference from MM	0.39	0.24	0.00
Largest Negative Difference from MM	-0.60	-1.27	-8.18
Spread	0.99	1.50	8.18

Note: The definitions of the models are given in equations 15 and 50 through 56. $\alpha = 0$ indicates that the model is estimated without the intercept coefficient $\hat{\alpha}_i$. All numbers are in percent.

Table 8: Spread of Mean event day abnormal returns for 209 Buy Recommendations, 265 Hold Recommendations, and 36 Sell Recommendations Published Between 2015 and 2019.

Types	$\overline{\mathbf{AR}}_0^{min}$	$t\left(\overline{\mathbf{AR}}_0^{min}\right)$	$\overline{AR}_0(\%)$	$t(\overline{\mathbf{AR}}_0)$	$\overline{\mathbf{AR}}_0^{max}$	$t(\overline{\mathbf{AR}}_0^{max})$
Buy	1.44	8.18	1.48	8.96	1.54	8.81
Hold	-0.68	-3.67	-0.62	-3.38	-0.60	-3.19
Sell	-3.31	-7.15	-3.29	-7.58	-2.86	-7.04

Note: $\overline{AR}_0$ is the mean abnormal return during the publication day and $t(\overline{AR}_0)$ is the t-statistic calculated in accordance with Brown and Warner (1985) appendix A.2. The superscripts max and min indicates that the calculation has been made in accordance with the model for estimating expected returns that minimizes and maximizes the mean abnormal return during the publication day out of the models given in equations 50 through 56 in combination with the models given in equations 15 and 52 through 56 estimated without the intercept coefficient $\hat{\alpha}$ respectively.

Table 9: Spread of Mean cumulative abnormal returns for 209 Buy Recommendations, 265 Hold Recommendations, and 36 Sell Recommendations Published Between 2015 and 2019.

Type	$\overline{\mathbf{CAR}}_{-20,20}^{min}$	$t\left(\overline{\mathbf{CAR}}_{-20,20}^{min}\right)$	$\overline{\mathbf{CAR}}_{-20,20}$	$t\left(\overline{\mathbf{CAR}}_{-20,20}\right)$	$\overline{\mathbf{CAR}}_{-20,20}^{max}$	$t\left(\overline{\mathbf{CAR}}_{-20,20}^{max}\right)$
Buy	2.31	2.06	2.70	2.23	3.31	2.67
Hold	-1.19	-1.30	-0.96	-1.19	0.31	0.31
Sell	-10.00	-2.48	-10.00	-2.49	-1.82	-0.13

Note: $\overline{CAR}_{-20,20}$ is the mean cumulative abnormal return over the event window and $t(\overline{CAR}_{-20,20})$ is the t-statistic calculated in accordance with Brown and Warner (1985) appendix A.3. The superscripts max and min indicates that the calculation has been made in accordance with the model for estimating expected returns that minimizes and maximizes the mean abnormal return during the publication day out of the models given in equations 50 through 56 in combination with the models given in equations 15 and 52 through 56 estimated without the intercept coefficient $\hat{\alpha}$ respectively.

It should be noted that the spread between the maximum and minimum mean event day expected return, $\overline{E(R_0)}$, of 0.10% and 0.45%, for buy and sell recommendations respectively are small in comparison to the mean event day abnormal return, $\overline{AR}_0$, of 1.48% and -3.29% for buy and sell recommendations respectively. The conclusions regarding the mean event day abnormal returns are therefore robust to misspecifications in the model for estimating expected returns.

However, as the event window lengthens, the magnitude of a possible alpha bias amplifies. The spread between the maximum and minimum mean cumulative expected return for the event window, $\overline{E\left(CER_{-20,20}\right)}$, is 0.99%, 1.50%, and 8.18% for buy, hold, and sell recommendations respectively. Regardless of model specification, the cumulative abnormal returns for buy recommendations does not reverse during the days following the publication. On the other hand, the magnitude of the spread for the sell recommendations casts doubt on the finding that the abnormal returns drifts downwards after the publication day for sell recommendations, since there is a drift if the model for estimating expected returns include an intercept coefficient but not if they do not include an intercept coefficient.

Furthermore, it should be noted that there are additional methodological issues with using the Fama-French factors from data library of Kenneth French for an event study on Swedish data with returns in SEK. First, the returns are denoted in USD. Second, the data is aggregated for the whole of Europe. Therefore, the factors for the Carhart four factor model were also estimated using a limited sample of all stocks on the Stockholm stock exchange with financial year equal the calendar year and available data in Compustat – Capital IQ Securities Daily. The results from estimating expected returns using the Fama-French three-factor model and the Carhart four-factor model with the factors estimated solely on Swedish data in SEK does not differ materially from the results presented above. The choice of whether to include an intercept coefficient in the model or not produces larger differences than the choice of model and method for estimating the factors used in the model.

7.2. Post-Publication Drift

In this sub-chapter, the post-publication drift for buy recommendations are shown in *Figure 10* below to illustrate that the positive mean abnormal return during the publication day does not reverse during the 125 trading days following the publication. To the contrary, the mean cumulative abnormal returns drifts upward during the 40 trading days following the publication whereafter the mean cumulative abnormal returns stabilizes. The significance of the continued upward drift is sensitive to the choice of model for estimating expected returns. However, the positive sign of the mean cumulative abnormal returns over the 125 trading days following the publication is robust to the choice of model for estimating expected returns described in sub-chapter *7.1 Estimation of Expected Returns*, to eliminating repeat buy recommendations, and to including the sample of stocks that were delisted during the 125 trading days following the publication.

Figure 10: Mean Cumulative Returns for the 125 Trading Days Following the Publication of 191 Buy Recommendations Between 2015 and 2019.

Note: LB means lower bound and UB means upper bound.

7.3. Authors' Stock Ownership

In this sub-chapter, sub-samples of the buy recommendations based on whether the author owned the recommended stock or not is analyzed. Out of the 209 buy recommendations in the sample with daily return data, there are 42 observations where the author of the article owns the stock that is recommended, and 167 observations where the author does not. The daily mean cumulative abnormal returns and minute mean cumulative returns for these two sub-samples are presented in *Figure 11* and *Figure 12* below. It is shown that the cumulative abnormal returns for the buy recommendations where the author owns the recommended stock is close to zero and that the abnormal returns during the event day is close to zero as well. The cumulative returns during the minutes after the publication is positive and statistically significant for buy recommendations where the author owns the stock, although smaller in magnitude than for buy recommendations where the author does not own the recommended stock.

Figure 11: Mean Cumulative Abnormal Returns for 209 Buy Recommendations Published Between 2015 and 2019 Split Based on Authors' Stock Ownership.

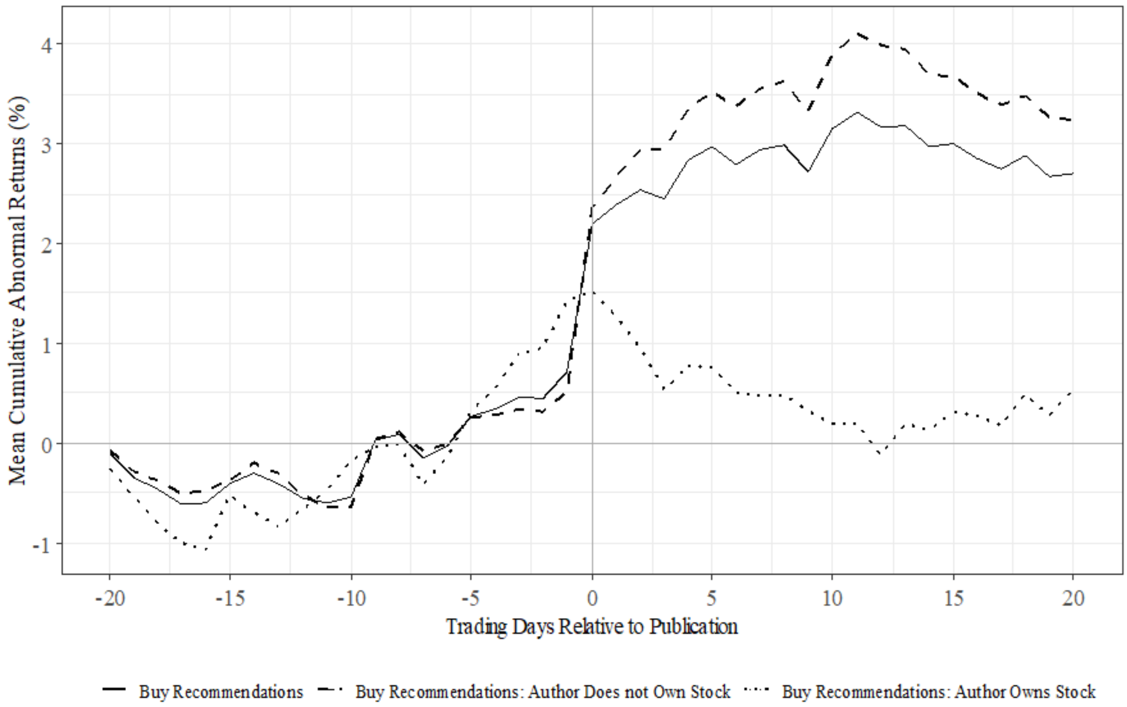
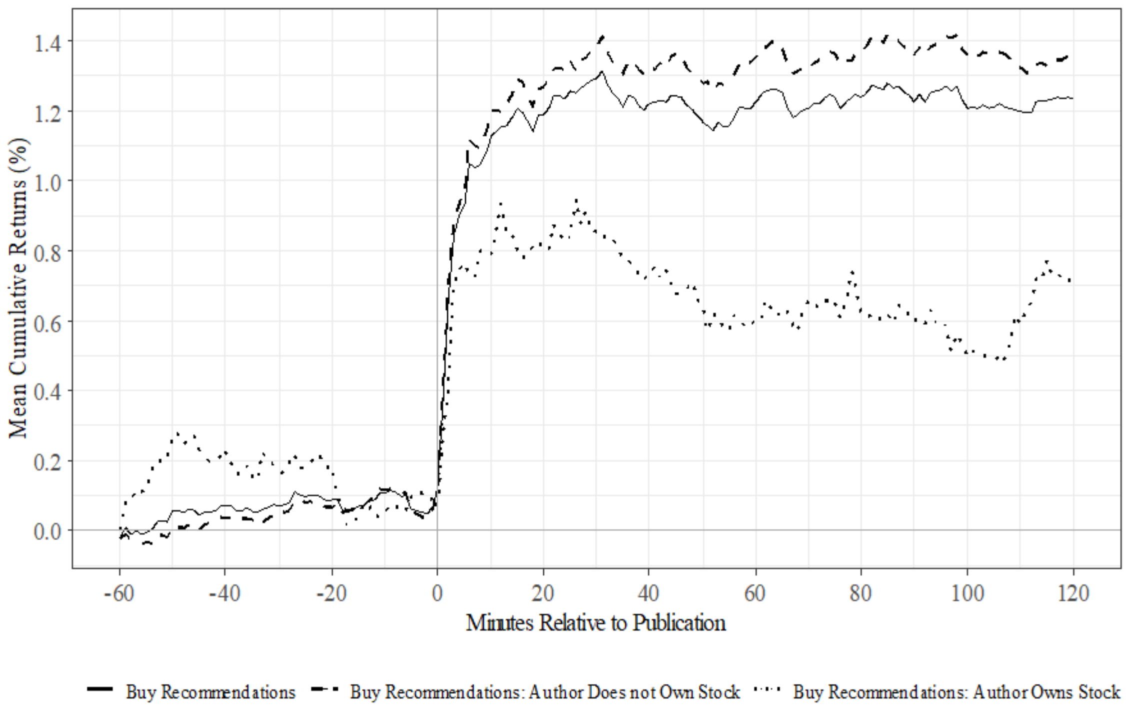


Figure 12: Mean Cumulative Returns for 185 Buy Recommendations Published Between 2015 and 2019 Split Based on Authors' Stock Ownership.



7.4. Differences Between Stock Markets

The sample includes stocks listed on both Nasdaq Stockholm and First North Stockholm. Nasdaq Stockholm is the main market whereas First North is a market for small- and medium-sized companies. In the sample, 163 of the 209 buy recommended stocks with daily return data are listed on Nasdaq Stockholm and 46 on First North Stockholm. The daily mean cumulative abnormal returns and minute mean cumulative returns for these two sub-samples are presented in *Figure 13* and *Figure 14* below. It can be noted that the magnitude of both the mean cumulative abnormal returns during the days following the publication and the cumulative returns during the minutes following the publication is larger for stocks listed on First North than for stocks listed on Nasdaq Stockholm. The publication day abnormal returns of 0.59% and 4.64% respectively for the two sub-samples are statistically significant according to all four test statistics at the 5 percent level for a two-sided test. The reversal of the mean cumulative abnormal return for stocks listed on First North of -2.81% during the 20 trading days following the publication is not statistically significant and if the post-event window is extended, the mean cumulative abnormal returns during the 40 trading days following the publication is 2.23% and not statistically significant. The immediate price reaction to the stock recommendations is 0.62% during the first six minutes following the publication for stocks listed on Nasdaq Stockholm and 2.68% during the first 30 minutes following the publication for stocks listed on First North.

Figure 13: Mean Cumulative Abnormal Returns for 209 Buy Recommendations Published Between 2015 and 2019 Split Based on Stock Market.

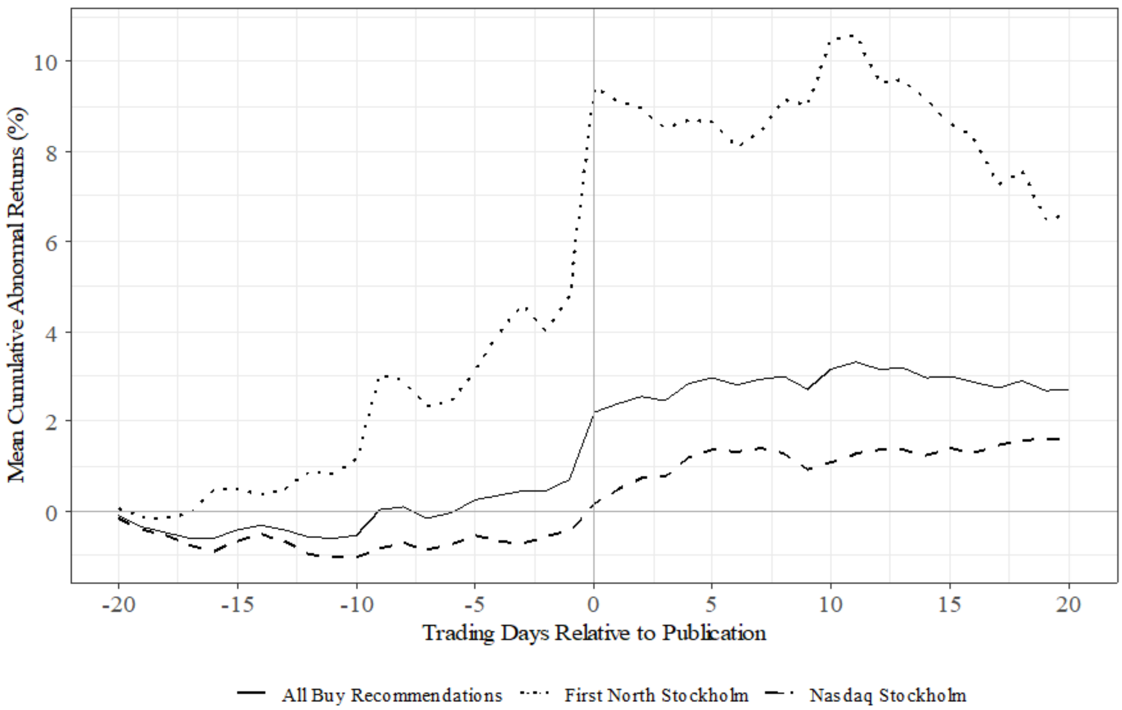
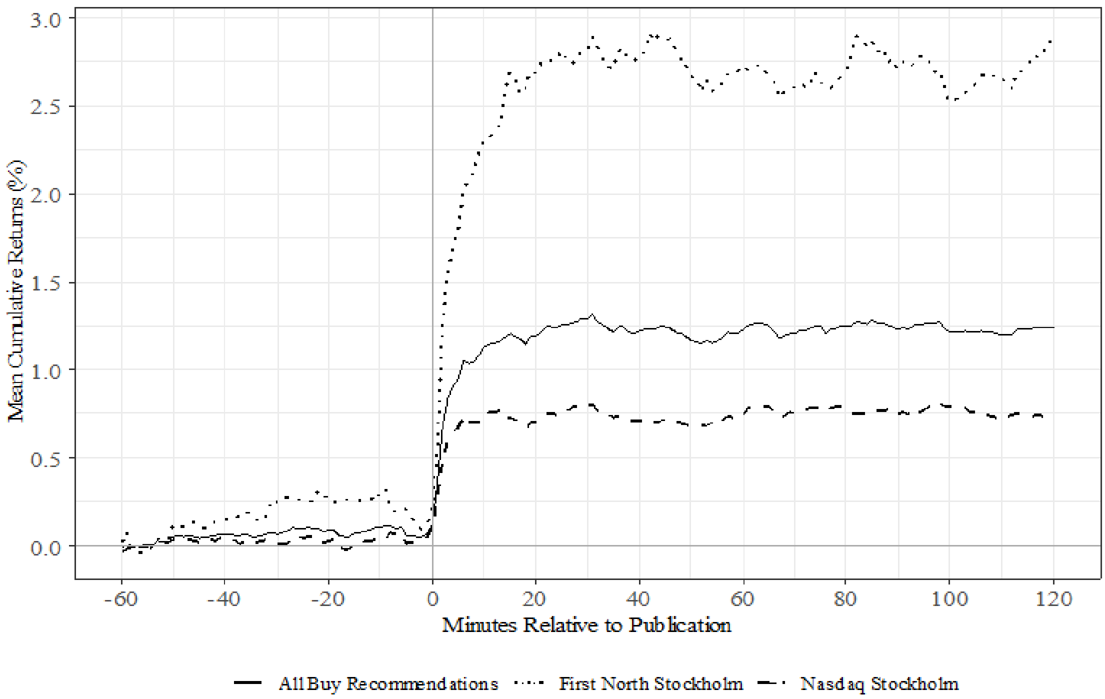


Figure 14: Mean Cumulative Returns for 185 Buy Recommendations Published Between 2015 and 2019 Split Based on Stock Market.



7.5. Prior Recommendations

The hold recommendations published by Börsplus may be split into four categories based on whether or not Börsplus has previously published a recommendation regarding the company and in that case whether the prior recommendation was a buy, hold or sell recommendation. A new hold recommendation is when there is no prior recommendation in the sample. In the sample of hold recommendations with daily return data, there are 47 hold recommendations where the latest recommendation regarding the company was a buy recommendation, 5 where the latest was a sell recommendation, 88 where the latest recommendation was a hold recommendation, and 125 hold recommendations where there were no prior recommendations in the sample. The results with respect to the mean abnormal returns from the analysis on each sub-sample are presented in *Table 10* below. The negative mean abnormal returns for hold recommendations where there is a prior buy recommendation and for new hold recommendations are statistically significant at the 1 percent level for a two-tailed test according to the t-test. However, they are not statistically significant according to the adjusted BMP test and the nonparametric sign or rank tests. The mean abnormal returns during the publication day for hold recommendations where there is a prior sell or hold recommendation are positive, although not statistically significant at the 10 percent level for a two-tailed test according to the parametric t-test.

Table 10: Mean Abnormal Returns for 265 Hold Recommendations Published Between 2015 and 2019 Split Based on Latest Prior Recommendation.

		Prior Buy		Prior Sell		Prior Hold		New Hold
Day	$\overline{AR}_t$(%)	$t(\overline{AR}_t)$	$\overline{AR}_t$(%)	$t(\overline{AR}_t)$	$\overline{AR}_t$(%)	$t(\overline{AR}_t)$	$\overline{AR}_t$(%)	$t(\overline{AR}_t)$
-20	0.05	0.08	-0.53	-0.92	0.09	0.32	0.02	0.48
-19	-0.25	-0.44	-1.50	-1.31	-0.23	0.06	0.02	0.19
-18	0.39	1.41	-0.93	-0.85	0.03	-0.23	-0.15	-0.42
-17	-1.02	-2.48	1.26	1.35	0.17	0.69	0.23	1.32
-16	-0.52	-1.72	-1.65	-2.21	0.47	1.57	-0.10	-0.92
-15	0.06	0.36	-1.02	-0.56	-0.09	-0.58	-0.15	-0.60
-14	0.50	2.08	0.49	0.37	-0.07	-0.07	0.08	-0.02
-13	0.29	0.69	1.16	0.82	-0.43	-2.06	0.05	0.60
-12	0.00	-0.15	-0.81	-0.58	0.16	0.89	-0.20	-1.33
-11	-0.43	-1.24	-0.67	-0.86	-0.12	-0.54	0.00	0.29
-10	-0.08	-0.51	-0.14	-0.27	0.17	0.18	-0.09	-0.26
-9	-0.31	-1.10	0.57	-0.01	-0.05	-1.01	0.46	1.91
-8	-0.02	-0.21	0.44	0.11	0.05	0.21	-0.31	-1.42
-7	0.15	0.66	0.72	0.57	-0.08	0.31	0.49	2.04
-6	0.16	0.23	0.13	0.44	0.40	1.07	-0.24	-1.43
-5	0.18	0.27	0.95	1.38	-0.14	-0.50	0.20	1.18
-4	-0.53	-2.11	-0.13	0.23	-0.03	-0.72	0.00	0.52
-3	-0.39	-0.79	-0.12	-0.16	-0.25	-0.78	0.14	0.47
-2	0.12	0.57	0.74	0.63	-0.03	-0.51	-0.14	-1.49
-1	1.84	3.74	-0.78	-0.41	0.05	0.55	0.25	0.79
0	**-2.79**	**-6.74**	**1.48**	**1.65**	**0.30**	**1.93**	**-0.54**	**-2.73**
1	0.67	2.02	0.46	-0.14	0.24	1.23	-0.14	-0.56
2	-0.02	0.56	0.05	0.36	0.36	1.58	-0.09	-0.58
3	0.06	0.25	2.41	1.51	-0.62	-2.46	-0.19	-1.03
4	-0.29	-0.70	0.57	0.15	0.25	1.15	-0.42	-2.13
5	-0.26	-0.43	-1.95	-1.16	0.27	1.17	0.44	2.04
6	0.01	-0.25	1.37	0.66	-0.29	-1.12	-0.36	-1.76
7	-0.16	-0.06	1.17	0.61	0.50	1.98	-0.08	-0.09
8	0.05	0.44	-0.10	-0.23	0.36	1.38	-0.34	-1.72
9	-0.42	-1.25	1.62	1.32	-0.14	-0.64	-0.01	-0.07
10	-0.38	-1.36	-0.59	-0.27	-0.15	-0.53	-0.08	-0.68
11	-0.51	-1.55	-0.51	-0.16	0.15	0.03	0.18	1.17
12	-0.37	-1.03	-0.81	-0.81	-0.16	-0.70	0.10	0.55
13	-0.65	-1.71	0.20	-0.29	0.00	-0.06	-0.08	-0.91
14	-0.06	-0.03	0.07	-0.39	0.33	1.69	-0.14	-0.44
15	-0.20	-0.38	0.45	0.55	-0.24	-1.04	-0.21	-1.38
16	0.02	-0.29	0.51	0.25	-0.08	-0.24	-0.02	0.27
17	-0.58	-1.88	2.59	1.46	-0.10	-0.19	0.26	0.80
18	0.26	1.19	1.39	1.38	-0.19	-0.50	-0.13	0.21
19	0.73	2.40	1.63	2.07	0.02	0.02	0.16	0.14
20	0.12	0.07	-0.07	0.03	-0.10	-0.95	-0.12	-0.44

Note: $\overline{AR}_t$ is the mean abnormal returns during day t and $t(\overline{AR}_t)$ is the t-statistic calculated in accordance with Brown and Warner (1985) appendix A.2. Day zero is the day that the stock recommendation was published.

8. Discussion

In this chapter, the results presented above will be discussed with respect to the hypotheses, the efficient market hypothesis, and in relation to prior literature. Sub-chapter *8.1 Reactions to the Publication of Stock Recommendations* contains the discussion regarding the event study on daily data and sub-chapter *8.2 Intraday Returns Following Stock Recommendations* contains the discussion with respect to the intraday event study.

8.1. Reactions to the Publication of Stock Recommendations

This sub-chapter is divided into four sections. In the first section, *8.1.1 Publication Day Reactions*, the results are interpreted in light of the hypotheses outlined in *3 Hypotheses*, prior international research and the efficient market hypothesis. In the second section, *8.1.2 Drift in Cumulative Abnormal Returns*, the results are discussed in relation to the information hypothesis and price pressure hypothesis described in *2.1.2 Hypotheses for Publication Day Reactions* and compared to the findings in prior research. In the third and fourth sections, *8.1.3 Differences Based on Ownership and Between Stock Markets* and *8.1.4 Reactions to Changes in* Recommendations, the findings regarding the sub-samples of the buy recommendations and hold recommendations are briefly discussed.

8.1.1. Publication Day Reactions

The four hypotheses that was tested on daily data were based on the null hypothesis that there is no association between the stock recommendations published by Börsplus and abnormal returns or abnormal log transformed trading volume during the days around the publication of the recommendations:

- H1: Buy recommendations published by Börsplus are associated with positive abnormal returns during the trading days around the publication.
- H2: Hold recommendations published by Börsplus are associated with abnormal returns during the trading days around the publication.
- H3: Sell recommendations published by Börsplus are associated with negative abnormal returns during the trading days around the publication.
- H4: Buy, hold, and sell recommendations published by Börsplus are associated with positive abnormal trading volume during the trading days around the publication.

The observed mean abnormal returns of 1.48%, -0.62%, and -3.29%, and mean abnormal log transformed trading volumes of 1.39, 1.24, and 1.00 during the publication day for buy, hold, and sell recommendations respectively, are all statistically significant according to a two-sided t-test at the 1 percent significance level. However, due to the fact that the negative mean abnormal returns for hold and sell recommendations are not statistically significant according to all four statistical tests, the statistical significance of the negative mean abnormal returns for hold recommendations are sensitive to the assumption of normality of the abnormal returns. However, for sell recommendations, there is a statistically significant negative mean abnormal return of -2.17% during the trading day following the publication day.

The null hypothesis that there is no association between the stock recommendations published by Börsplus and abnormal returns during the days around the publication of the recommendations may therefore be rejected in favor of the directional hypotheses *H1* and *H3*. Buy and sell recommendations published by Börsplus are associated with positive and negative abnormal returns respectively. The null hypothesis may not be rejected in favor of hypothesis *H2*, that hold recommendations published by Börsplus are associated with abnormal returns. The conclusions are robust to misspecification in the model for estimating expected returns.

Regarding the magnitude of the publication day returns for buy recommendations, the positive abnormal returns are slightly higher than the average of the publication day returns presented in the summary of research on stock recommendations in national business media summarized in *Table A1 Panel E* in *Appendix I* of 1.05% (Brixner & Walter, 2007; Brown et al., 2009; Cervellati et al., 2014; Kerl & Walter, 2007; Kiymaz, 2002; Lidén, 2007; Mehrotra et al., 1999; Yazici & Muradoğlu, 2002; Zhang et al., 2016). This study therefore adds to the growing literature on the impact of stock recommendations in national business media on the stock market, where stock price reactions have been observed across a variety of countries and across multiple time periods. Although, as Palmon, Sudit, and Yezegel (2009) notes, the results are not generalizable to all stock recommendations in business media.

The null hypothesis that there is no association between the stock recommendations published by Börsplus and abnormal trading volume during the days around the publication of the recommendations may also be rejected in favor of the directional hypotheses *H4*. Buy, hold, and sell recommendations are associated with positive abnormal trading volumes during the days around the publication. That stock recommendations in business media are associated with abnormal trading volume and that the abnormal trading volume persists over the following trading days are consistent with prior research on the association between stock recommendations in business media and abnormal trading volumes (Barber & Loeffler, 1993; Kerl & Walter, 2007; Liang, 1999; Lidén, 2007; Pruitt et al., 2000).

Regarding market efficiency as definition by Fama (1970; 1976), the following may be noted, given the assumptions that the event of publicizing the information does not itself cause a revaluation of securities prices, that the publicized information should have been incorporated into securities prices prior to the publication, that the model for estimating expected returns employed in the empirical testing is accurate, and that there is a causal relationship between the observed publication day abnormal returns and the publication of the stock recommendations. If the market was efficient, the relative complement of the information content of the stock recommendations published by Börsplus, denoted as θ_{t+1}, to the set of available information incorporated into stock prices at time t, Φ_t^m, should be an empty set, $\theta_{t+1} \backslash \Phi_t^m = \{\}$, where the symbol {} represents an empty set, and the expected abnormal returns during the publication day conditioned on the available information incorporate into stock prices is zero:

$$E\left(\sum_{j=1}^{N} r_{j,t_j+1} - E\left(r_{j,t_j+1} \middle| \Phi_{\mathrm{t}}^m\right)\right) = 0 \tag{55}$$

where $E(.)$ is the expected value operator and r_{j,t_j} is the return on stock j during time period t_j.

However, it has been shown that the expected abnormal return during the publication day conditioned on both the available information incorporated into stock prices and the information content of the stock recommendations is not zero:

$$E\left(\sum_{j=1}^{N} r_{j,t_j+1} - E\left(r_{j,t_j+1} \middle| \Phi_{\mathrm{t}}^{m} \cup \theta_{t_j+1}\right)\right) \neq 0 \tag{56}$$

It is therefore possible to draw the conclusion that the relative complement of the information content of the stock recommendations to the set of available information incorporated into stock prices at time t is not an empty set $\theta_{t+1} \backslash \Phi_t^m \neq \{\}$, which means that the market is not efficient with respect to the information content in the stock recommendations. The hypothesis that the Swedish stock market is strong-form efficient may therefore be rejected if the additional assumption imposed above are accepted. Börsplus has access to not obviously publicly available information, such as interviews with company management. The hypothesis that the Swedish stock market is semi-strong form efficient may therefore not be rejected based on the observed abnormal returns during the publication day.

8.1.2. Drift in Cumulative Abnormal Returns

In prior research, the cumulative abnormal returns over the trading days following the publication of stock recommendations in business media have been used to discern between whether the information hypothesis or the price pressure hypothesis may explain the observed abnormal returns during the publication day. A statistically significant reversal of the publication day abnormal returns during the days following the publication has been interpreted as evidence for the price pressure hypothesis whilst a continued drift in the same direction as the publication day reaction or no drift has been interpreted as support for the information hypothesis.

The continued drift over the 20 trading days following the publication for buy, hold, and sell recommendations are all in the same direction as the publication day reactions. The drift is not statistically significant for buy and hold recommendations and it was shown that the existence of a drift in cumulative abnormal returns for sell recommendations is sensitive to the choice of model for estimating expected returns. If the post-event window is extended to 125 trading days, it is shown that the drift of the buy recommendations is positive but not statistically significant over the whole period.

When extending the post-event window in an event study, the critique against long-run traditional event studies becomes increasingly more relevant (see Kothari & Warner, 1997). The critique which has not been adjusted for in the event study presented above in sub-chapter *7.2 Post-Publication Drift* is mainly the fact that the sample suffers from survivorship bias. The bias presents itself in two ways when estimating the standard deviation of the cumulative abnormal returns. First, since no stock has been delisted for any reason during the 140 trading days prior to the publication day, the estimated standard deviation may be understated due to increased variance during the time period before delisting. Second, the estimated standard deviation may be understated due to decreasing sample size over the post-event window. As a note on the severity of the concerns, the estimated time-series standard deviation of the cumulative abnormal returns over the 125 trading days following the publication estimated using the market model is roughly 2.3 times lower than the corresponding estimated cross-sectional standard deviation. Although this difference may also be caused by event induced volatility in the cumulative abnormal returns, the critique warrants caution in the interpretation of the post-event drift in cumulative abnormal returns. The findings in this study on the continued drift of the cumulative abnormal returns after the publication day should therefore not be interpreted as evidence for an underreaction to the stock recommendations during the publication day or the existence of a continued drift.

Although the existence of a continued drift in the same direction as the publication day reaction may be disputed, the findings gives support for the fact that the publication day abnormal returns does not reverse over the 20 trading days following the publication. This fact would give support for the information hypothesis, that the stock recommendations contain information that changes the perception of investors regarding the value of the recommended stocks, which would suggest that business media has a non-trivial role in the stock price discovery process.

The findings are contradictory to the prior study on buy recommendations in Swedish business media by Lidén (2007) who finds that the positive publication day abnormal returns for buy recommendations reverses over the trading days following the publication. However, the findings are consistent with the prior study on sell recommendations in Swedish business media by Lidén (2007). There are multiple differences between the studies, such as the time-period that was studied, the source of data, the type of articles included in the sample, and the means of distribution of the articles, that may explain the differences in results. Alternatively, the results in the study by Lidén (2007) may be driven by alpha bias in the market model estimates, which has been shown to be a plausible explanation for the reversal of publication day abnormal returns during the trading days following the publication that has been observed in prior research (Albert & Smaby, 1996; Pettengill & Clark, 2001).

8.1.3. Differences Based on Ownership and Between Stock Markets

Sub-samples based on whether the author owns the recommended stocks or not and whether the recommended stock was listed on Nasdaq Stockholm or First North were analyzed in more detail. It was shown that the findings regarding buy recommendations may not be generalizable to all sub-samples.

For the sub-sample of recommendations where the author owns the recommended stocks, there were no significant abnormal returns during the publication day nor any statistically significant mean cumulative abnormal returns over the post-event window. The results may be interpreted as a credibility issue for the author when writing about stocks the author owns or that a buy recommendation for a stock that the author owns is not considered as news since the editorial staff discloses their private portfolios.

It was shown that the publication day abnormal returns were larger for stocks listed on First North than for stocks listed on Nasdaq Stockholm. The fact that the publication day reaction for small and illiquid stocks is larger than the publication day reaction for large and liquid stock is consistent with prior research (see for example Engelberg et al., 2012).

However, this fact has been interpreted as support for the price pressure hypothesis due to a larger reversal of the cumulative abnormal returns during the trading days following the publication of the article or airing of the television program. In this study it was shown that similar reactions may be found with respect to data supporting the information hypothesis.

8.1.4. Reactions to Changes in Recommendations

The negative abnormal returns during the publication day for hold recommendations were further investigated by analyzing different sub-samples of hold recommendations based on the existence of prior recommendations in the sample. Although the split into sub-samples is not completely accurate since Börsplus has written other articles and stock recommendations that are not included in the sample, the results show differences between the four sub-samples. If Börsplus has published a buy recommendation prior to the hold recommendation, there is a statistically significant negative abnormal return during the publication day and the change in recommendation is likely seen as a downgrade. Similarly, for a prior sell recommendation, the change in recommendation is likely seen as an upgrade, although there are too few accessible observations to draw any conclusions in this regard. For a prior hold recommendation, there is no change in recommendation and the abnormal returns during the event day is not statistically significant. For new hold recommendations, the publication day mean abnormal returns are negative and statistically significant. Given that the editorial staff of Börsplus are actively searching for undervalued stocks to write about, a hold recommendation may be seen as a stock that prima facie looks undervalued but during further investigations turns out not to be, which might be interpreted as a light sell recommendation by the readers.

8.2. Intraday Returns Following Stock Recommendations

The three hypotheses that was tested on intraday data were based on the null hypothesis that there is no association between the stock recommendations published by Börsplus and returns during the minutes around the publication of the recommendations:

- H5: Buy recommendations published by Börsplus are associated with positive returns during the minutes following the publication.
- H6: Hold recommendations published by Börsplus are associated with returns during the minutes following the publication.
- H7: Sell recommendations published by Börsplus are associated with negative returns during the minutes following the publication.

The observed mean cumulative returns of 1.24%, -0.14%, and -2.13% during the hour prior to through two hours after the publication of the buy, hold, and sell recommendations respectively are statistically significant for buy and sell recommendations according to the nonparametric bootstrap test at all conventional significance levels.

The null hypothesis that there is no association between the stock recommendations published by Börsplus and returns during the days around the publication of the recommendations may therefore be rejected in favor of the two directional hypotheses *H5* and *H7*. Buy and sell recommendations published by Börsplus are associated with positive and negative returns respectively during the minutes following the publication of the recommendations. The null hypothesis may not be rejected in favor of hypothesis *H6*, that hold recommendations published by Börsplus are associated with returns.

The purpose of the intraday event study was twofold. First, the study was conducted to rule out any plausibility of confounding events being the cause of the abnormal returns during the publication day. Second, the study was conducted to further understand the speed at which the stock market incorporates new information into stock prices.

The differences between the immediate price reaction of buy recommendations and sell recommendations need to be addressed. Similarly to the prior study on how the stock market incorporates stock recommendations into stock prices, the response for sell recommendations is more gradual (compare to Busse & Green, 2002). The intraday data is also noisier in comparison to daily data with a significant amount of non-trading periods of one-minute intervals, especially for illiquid stocks. The small number of sell observations may be one plausible source of discrepancy that can explain the dissimilar reactions to buy and sell recommendations. It might also be that it is harder to act upon the sell recommendations unless you own the stock, since the investor then ought to short the stock. The time required to disseminate the article to enough investors that may be able to act on sell recommendations for the stock price to adjust may be greater than the corresponding time for buy recommendations. Yet another explanation is that the sell recommendations are associated with confounding events prior to the publication that is causing the negative returns over the publication day, which is partially supported by the fact that the mean cumulative return over the 60 minutes before the publication is negative and statistically significant.

The following part of this sub-chapter is dedicated to a discussion on the intraday returns following buy recommendations. One of the plausible explanations for what drives the observed mean abnormal returns during the publication day is confounding events. The daily raw returns during the publication day is 1.56% out of which an increase of 1.22% occurs during the first 30 minutes following the publication of the buy recommendations. The immediate reaction begins the minute that the buy recommendations are published. Given the accuracy of the timing of the increase it the intraday mean cumulative returns and that the cumulative returns during the hour before the publication are not statistically significant, it is not likely that the abnormal returns during the publication day is primarily driven by confounding events. The recommendations are published across different weekdays and across different points in time during the day, meaning that it is unlikely that the results are driven by any recurring events. Therefore, causality may be established between the publication of the buy recommendation and at least a major part of the mean abnormal return during the publication day.

The cumulative return during the 90 minutes following the first 30 minutes after the publication when the initial reaction occurs is -0.05%. The continued reaction during the days following the publication is therefore likely not caused by the publication of the recommendations since the causal link between the returns and the recommendations are broken after roughly half an hour. When estimating the impact of business media on the price discovery process, the importance may be overstated if returns over longer time-periods are attributed to the publication an article.

Partitioning the sample of buy recommendations based on whether the author owned the recommended stock or not yields interesting results. The magnitude of the immediate reaction following the publication of the articles is almost twice as large for stocks that the author does not own compared to the stocks that the author owns. This too supports that a buy recommendation on a stock that the author owns is not interpreted as news or that there is a credibility issue when the author writes about stocks that the author owns. The traditional event study on daily returns showed that the abnormal returns during the publication day were 0.09% and not statistically significant, and the mean raw returns were 0.08%, whereas the intraday event study shows that there is a statistically significant positive return of 0.65% during the first five minutes following the publication of the recommendations. However, this difference is driven by the fact that the samples are slightly different between the event study on daily data and the intraday event study due to differences in data availability.

Partitioning the sample of buy recommendations based on whether the recommended stock was listed on Nasdaq Stockholm or First North yields results that show differences between how information is incorporated into securities prices on different markets. Consistently with prior research, the effects of the publication of buy recommendations are greater for stocks listed on First North, which are generally smaller and more illiquid stocks, than for stocks listed on Nasdaq Stockholm. There are two notes regarding the intraday event study on the sub-samples based on stock market listing that contributes to the extant literature. First, the initial reaction to the publication of buy recommendations occurs over a longer time period for stocks listed on First North than for stocks listed on Nasdaq Stockholm, suggesting that size or liquidity of stocks may explain not just differences in magnitude of the initial response, but also the speed at which it occurs. The second, if limiting the sample to stocks listed on First North with data available in both Compustat and Nasdaq HFT, it may be observed that the returns during the time period one hour before through two hours after the publication is 3.01% whereas the daily mean raw return is 4.04%, suggesting that the effects of the publication observed on daily data may be overstated due to confounding events for this sub-sample.

In so far, the possibility that the results are driven by an overreaction to the publication explained by the price pressure hypothesis or confounding events has been ruled out and the information hypothesis has been proposed as a plausible explanation for the results. There are at least two different interpretations of the information hypothesis that have been discussed in prior literature. Either the information contained in the stock recommendations was not publicly available, or the editorial staff has provided superior insights regarding already publicly available information than what is incorporated into securities prices (see for example Foster, 1979; 1987). It is known that Börsplus, when writing the stock recommendations, often analyzes both publicly available information such as company reports and press releases and non-public information such as correspondence with company management, which means that both interpretations are plausible and not necessarily mutually exclusive. It is therefore not possible to discern between the two interpretations based on the data used to perform the study presented in this thesis.

9. Concluding Remarks

This last concluding chapter includes four parts. A summary of the findings, a note regarding the research contributions, a discussion on the implications of the findings, and suggestions for further research.

Both a traditional event study methodology and an intraday event study was employed to analyze the stock market reactions to the publication of stock recommendations by Börsplus over the period December 2015 through July 2019. The primary objective was to establish whether there is a stock price reaction and to further investigate whether the stock price reaction may be explained by the price-pressure hypothesis, the information hypothesis, or confounding events.

The results regarding buy recommendations favor the information hypothesis. Buy recommendations are associated with statistically significant positive mean abnormal return of 1.48% during the publication day and there is no tendency for the publication day reaction to reverse over the trading days following the publication. It was shown that the immediate reaction began the minute that the articles were published and that the mean cumulative raw return over the first 30 minutes was 1.22%, suggesting that there is a causal relationship between the publication of the recommendations and the observed abnormal returns during the publication day, since it is not likely that the results are driven by confounding events. Partitioning the sample based on whether the recommended stock was listed on Nasdaq Stockholm or First North revealed that the initial reaction is typically smaller in magnitude and occurs over a shorter time period, six minutes, for stocks listed on Nasdaq Stockholm than the initial reaction for stocks listed on First North.

Sell recommendations are associated with a negative mean abnormal return of -3.29% during the publication day. The results regarding the abnormal returns during the post-event window are not as clear as the corresponding results for buy recommendations. The methodological issues with the estimation of expected returns are significant due to large positive returns for the sell recommended stocks during the estimation window and a small sample size. Post-event mean cumulative abnormal returns are negative and statistically significant when estimating expected returns using the market model, but the findings are sensitive to model specification. Neither the intraday event study may establish causality between the publication and the publication day returns. The mean cumulative returns for the hour prior to publication is negative and statistically significant, there is no clear reaction during the minutes directly after the publication, and the magnitude of the mean cumulative return over the two hours after the publication of the sell recommendations is 1.48%. Analyzing the results with respect to sell recommendations in light of the results for the buy recommendations, the findings show some support for the information hypothesis, but that there are likely confounding events that at least partially drive the results.

The mean abnormal return during the publication day is -0.62% for hold recommendations and statistically significant according to the traditional t-test, whereas it is not statistically significant according to the adjusted BMP test and nonparametric sign and rank tests. The sign of the post-event cumulative abnormal returns is sensitive to the specification of the model for estimating expected returns. No causal relationship between the publication and the mean cumulative returns over the hours surrounding the publication could be deduced from the intraday event study. Partitioning the sample based on the type of latest prior recommendation showed that hold recommendations that follow a buy recommendation and hold recommendations where there is no prior recommendation are associated with negative mean abnormal return during the publication day. For the small subsample of five hold recommendations where the latest prior recommendation was a sell recommendation, there is a positive mean abnormal return during the publication day, although not statistically significant.

In the study on daily abnormal log transformed trading volumes, it was concluded that buy, hold, and sell recommendations are all associated with abnormal trading volume during the publication day and the days following the publication day. It should be noted that abnormal trading volumes during the days after publication has been found in research supporting both the information hypothesis and the price-pressure hypothesis and that abnormal trading volumes are consistent with both hypotheses.

This thesis contributes to the extant literature in three ways. The methodological addition of an intraday event study in combination to a traditional event study methodology yields results that limits some of the methodological limitations of a traditional event studies. First, the speed at which the market reacts to an event may be captured more accurately. Second, the intraday event study may be used to establish causality between an event and returns. The speed at which the initial reaction to the publication of a stock recommendation on the Swedish stock market suggest that claims of causality between an event and changes in stock prices longer than the first minutes after the event ought to be made with caution since the magnitude of the impact of the event may be misinterpreted. The third contribution consists of the fact that the analyzed sample has not been studied previously and that the sample is unique in terms of source and time-period.

There are practical implications of the findings, especially for market participants and regulatory bodies on the Swedish stock market. Given the quick initial reaction to an event such as the publication of a stock recommendation by Börsplus, it is not unlikely that the initial market reaction to other events occurs immediately and during a short time period as well. This fact may impact the decisions of when events ought to occur and how news ought to be distributed, when investors chose to act on events, how regulatory bodies should design regulations, and how to establish whether an event has had a causal impact on stock prices.

There are significant limitations to this study which will now be presented as suggestions for further research. Research on a more recent sample from the same sources as was studied by Lidén (2007) may contribute by establishing whether the support for the information hypothesis presented in this study is dependent on the source of the recommendations or whether it depends on the time-period during which the recommendations were published. Furthermore, there are multiple analyzes that have been performed on samples of events where a traditional event study has shown support for the price pressure hypothesis but that has not been performed on samples where a traditional event study has shown support for the information hypothesis. For example, research on the long-term performance of the stock recommendations similar to the one performed in Lidén (2006) and research on the amount of shorting of the stocks following a recommendation as in Hobbs, Keasler, and McNeil (2012). Furthermore, the source of the immediate reaction to the publication of the stocks may be further investigated to determine whether it is possible to discern between whether the orders following the publication are made through algorithmic trading or whether it is the subscribers that first receive the email that trades on the information. Lastly, research on the specificity and power of intraday event study tests is lacking on Swedish high frequency data.

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Appendices

Appendix I

Table A 1: Event Studies on Stock Recommendations Published in Traditional Business Media.

Panel A: Stock Recommendations in the Wall Street Journal's Heard on the Street Column.

		Observations		Pre-event		Event day		Post-event	
Empirical Study	Period	No.	Type	CAR	EW	AR	t-stat	CAR	EW
		597	Buy	0.34	[-3,-1]	0.93	9.55	-0.01	[+1,+10]
Lloyd-Davies & Canes (1978)	1970-1971	188	Sell	0.34	[-3,-1]	-2.37	3.30	0.52	[+1,+10]
Syed, Liu & Smith (1989)	1983-1984	16	Recommendations	4.97	[-3,-1]	2.97	4.40	-2.82	[+1,+10]
		566	Buy	1.43	[-3,-1]	1.54	16.37	-0.70	[+1,+10]
Liu, Smith & Syed (1990)	1982-1985	286	Sell	-1.61	[-3,-1]	-1.99	-15.46	-0.46	[+1,+10]
Pound & Zeckhauser (1990)	1983-1985	42	Takeover rumors	-	-	0.07	0.12	-	-
		286	Buy	0.69	[-2,-1]	1.01	8.01	0.40	[+1,+10]
Beneish (1991)	1978-1979	118	Sell	-1.43	[-2,-1]	-1.00	-2.00	-0.09	[+1,+10]
		111	Buy	0.49	[-3,-1]	0.62	3.31	-0.44	[+1,+10]
Huth & Maris (1992)	1986	15	Sell	-0.93	[-3,-1]	-4.92	-10.65	2.09	[+1,+10]
		332	Buy	1.91	[-3,-1]	1.87	12.86	-1.26	[+1,+10]
	1982-March 29 1984	172	Sell	-1.76	[-3,-1]	-2.30	-14.04	-1.68	[+1,+10]
		234	Buy	0.76	[-3,-1]	1.09	10.13	0.10	[+1,+10]
Liu, Smith & Syed (1992)	30 March 1984-1985	114	Sell	-1.40	[-3,-1]	-1.53	-7.24	0.47	[+1,+10]
		168	Buy	1.18	[-3,-1]	0.84	4.90	-1.09	[+1,+10]
Bauman, Datta & Iskandar-Datta (1995)	1987	92	Sell	-0.16	[-3,-1]	-0.55	-2.30	1.35	[+1,+10]

Panel B: Stock Recommendations in the Wall Street Journal's Dartboard Column.

		Observations			Pre-event		Event day		Post-event
Empirical Study	Period	No.	Type	CAR	EW	AR	t-stat	CAR	EW
Barber & Loeffler (1993)	1988-1990	95	Buy	-0.26	[-3,-1]	3.53	12.19	-1.55	[+1,+25]
Wright (1994)	1988-1990	80	Buy	0.11	[-3,-1]	3.73	5.40	-3.96	[+2,+40]
Albert & Smaby (1996)	1988-1991	140	Buy	-0.13	[-3,-1]	3.11	13.27	-3.11	[+2,+25]
Greene & Smart (1999)	1988-1992	199	Buy	-	-	3.00	-	0.10	[-1,+30]
Liang (1999)	1990-1994	216	Buy	0.65	[-3,-1]	2.84	12.81	-1.88	[+1,+25]
Pruitt, Van Ness & Van Ness (2000)	1994-1995	92	Buy	0.02	[-3,-1]	3.46	4.27	0.53	[+1,+5]
Pettengill & Clark (2001)	1990-1999	480	Buy	0.89	[-3,-1]	2.89	18.18	-0.81	[+1,+25]

Panel C: Stock Recommendations on the Television Program Mad Money.

		Observations			Pre-event	Event day			Post-event
Empirical Study	Period	No.	Type	CAR	EW	AR	t-stat	CAR	EW
		127	Buy	0.68	[-2,-1]	1.06	5.72	-2.12	[+2,+20]
Neumann & Kenny (2007)	2005	44	Sell	-0.26	[-2,-1]	-0.35	-1.46	-0.33	[+2,+11]
Karniouchina, Moore & Cooney (2009)	2005-2007	8160	Buy	0.86	[-3,-1]	0.50	16.59	-1.49	[+1,+19]
		1339	Buy	3.24	[-30,-1]	1.94	30.64	-2.03	[+1,+29]
Bolster & Trahan (2009)	2005-2007	528	Sell	-2.17	[-30,-1]	-0.71	-6.00	-2.57	[+1,+29]
		4916	Caller Buy[b]	2.95	[-20,-1]	0.30	10.50	-0.10	[+1,+20]
		2971	Caller Sell[b]	1.35	[-20,-1]	-0.38	-5.50	-0.48	[+1,+20]
		2260	Buy	3.24	[-20,-1]	1.56	17.24	0.85	[+1,+20]
Lim & Rosario (2010)[a]	2005-2006	445	Sell	-1.22	[-20,-1]	-0.88	-3.91	-0.43	[+1,+20]
		2799	Caller Buy[b]	-	-	0.17	3.84	-	-
		1500	Caller Sell[b]	-	-	-0.40	-2.52	-	-
		1511	Buy	0.62	[-3,-1]	1.48	25.50	-2.13	[+1,+19]
Keasler & McNeil (2010)	2005-2006	396	Sell	-0.29	[-3,-1]	-0.88	-7.31	0.89	[+1,+19]
		1538	Buy	3.52	[-30,-1]	1.88	32.20	-2.10	[+1,+29]
Bolster, Trahan & Venkateswaran (2012)	2005-2008	693	Sell	-3.25	[-30,-1]	-0.73	-7.28	-2.39	[+1,+29]
Engelberg, Sasseville & Williams (2012)	2005-2009	826	Buy	-	-	2.40	-	-	-
		779	NYSE Buy	0.54	[-3,-1]	0.84	-	-1.52	[+1,+19]
		455	Nasdaq Buy	0.65	[-3,-1]	1.72	-	-3.12	[+1,+19]
		161	NYSE Sell	-0.78	[-3,-1]	-0.28	-	1.58	[+1,+19]
Hobbs, Keasler & McNeil (2012)	2006	135	Nasdaq Sell	-0.09	[-3,-1]	-1.71	-	0.55	[+1,+19]
		1730	Buy	-	-	0.35	-	-	-
Gutierrez & Stretcher (2014)	2011-2012	526	Sell	-	-	-0.36	-	-	-
		890	Buy	0.98	[-3,-1]	1.00	9.26	-0.25	[+1,+4]
Roszkowski & Richie (2014)	2005-2009	668	Sell	0.34	[-3,-1]	-0.27	-2.01	-0.3	[+1,+4]

Panel D: Stock Recommendations in US Business Media Other Than the Heard on Wall Street Column and the Dartboard Column in the Wall Street Journal and the Television Program Mad Money.

				Observations		Pre-event		Event day		Post-event	
Empirical Study	Business Media	Column(-ist)	Period	No.	Type	CAR	EW	AR	t-stat	CAR	EW
Foster (1979)	Barron's	Abraham Briloff	1968-1976	15	Sell	-	-	-8.60	-	-	-
Lee (1986)	Forbes	Heinz H. Biel	1962-1979	374	Buy	-	-	0.87[a]	-	-	-
Foster (1987)	Barron's	Abraham Briloff	1968-1984	21	Sell	-	-	-8.11	-	-3.36	[+1,+30]
				23	Buy	-0.74	[-5,-1]	2.56	3.74	0.98	[+1,+29]
				15	Sell	-2.05	[-5,-1]	-0.59	-1.30	-1.86	[+1,+29]
				20	Sell	2.95	[-5,-1]	-2.77	-2.92	-0.24	[+1,+29]
Lee (1987)	Barron's	Alan Abelson	1978-1981	13	Sell	5.63	[-5,-1]	-7.78	-4.33	-0.71	[+1,+29]
Pari (1987)	Wall $treet Week	-	1983-1984	349	Buy	0.04	[-3,-1]	0.66	5.55	-1.57	[+1,+9]
				280	Buy	1.12	[-3,-1]	1.91	13.08	0.45	[+1,+10]
Palmon, Sun & Tang (1995)	Business Week	Inside Wall Street	1983-1989	49	Sell	-0.825	[-3,-1]	-0.67	-1.86	-1.33	[+1,+10]
Trahan & Bolster (1995)	Barron's	Two major columns	1995	144	Buy	0.01	[-3,-1]	2.10	10.22	-0.72	[+1,+20]
				1599	Buy	-	-	1.04	5.83	0.33	[+1,+25]
Desai & Jain (1995)[a]	Barron's	Annual Roundtable	1968-1991	152	Sell	-	-	-1.16	-2.83	0.11	[+1,+25]
Mathur & Waheed (1995)	Business Week	Inside Wall Street	1983-1989	233	Buy	0.9	[-3,-1]	1.71	8.26	0.57	[+1,+3]
				238	Buy	0.66	[-1,-1]	1.16	7.44	-6.80	[+2,+126]
Sant & Zaman (1996)	Business Week	Inside Wall Street	1976-1988	40	Sell	0.05	[-1,-1]	-0.25	-0.11	-12.83	[+2,+126]
				734	Buy	0.60	[-3,-1]	0.52	-	0.20	[+1,+10]
Beltz & Jennings (1997)	Wall $treet Week	-	1990-1992	67	Sell	0.35	[-3,-1]	-0.62	-	0.5	[+1,+10]
				398	Buy	9.87	[-3,-1]	-0.36	-1.65	-1.19	[+1,+5]
Ferreira & Smith (1999)	Wall Street Journal	Small Stock Focus	1993	376	Sell	-10.19	[-3,-1]	0.12	0.47	-0.62	[+1,+5]
Desai, Ling & Singh (2000)[a]	Wall Street Journal	All-Star Analyst Survey	1993-1996	1158	Buy	-0.44	[-10,-1]	0.42	3.25	0.37	[+1,+10]
				129	Buy	0.13	[-3,-1]	2.48	8.20	-0.31	[+1,+10]
Sakar & Jordan (2000)	Five regional Newspapers	Heard in [the Region]	1993-1996	182	Buy	-0.31	[-3,-1]	0.48	1.96	0.21	[+1,+10]
Ferreira & Stanley (2003)	Wall $treet Week	-	1997	200	Buy/ Sell	-0.11	[-3,-1]	0.65	4.55	-1.33	[+1,+14]
Desai & Jain (2004)[be]	Barron's	Abraham Briloff	1968-1998	31	Sell	-2.23	[-1,-1]	-9.95	-	-15.51	[+1,+12]
				361	Buy	-0.18	[-30,-1]	0.25[d]	1.24	0.63	[+2,+30]
Habegger & Pace (2008)	Wall Street Journal	Smart Money Stock Screen	2005	15	Sell	-5.75	[-30,-1]	-0.97[d]	-0.76	-1.16	[+2,+30]
Palmon, Sudit & Yezegel (2009)	Three Magazines	-	2000-2003	2503	Buy	0.37	[-5,-2]	1.41[d]	11.27	-1.60	[+2,+20]

Panel E: Stock Recommendations in National business media

Empirical study	Country	Business media	Period	Observations No.	Observations Type	Pre-event CAR	Pre-event EW	Event day AR	Event day t-stat	Post-event CAR	Post-event EW
				244	Buy	1.36	[-3,-1]	1.23	5.10	-1.94	[+1,+20]
Mehrotra, Yu & Zhang (1999)	Canada	Financial Post	1994-1995	26	Sell	-4.04	[-3,-1]	-2.00	-2.13	1.84	[+1,+20]
Yazici & Muradoğlu (2002)	Turkey	Moneymatik	1993-1998	206	Buy	´2.90	[-3,-1]	2.35	4.30	-3.35	[+1,+20]
Kiymaz (2002)[a]	Turkey	Ekonomike Trend	1996-1997	355	Buy	2.16	[-5,-1]	0.85	2.80	-1.78	[+1,+20]
Brixner & Walter (2007)	Germany	Frankfuter Allgemeine Zeitung	1999-2005	2170	Buy	0.38	[-3,-1]	0.19	3.19	0.10	[+1,+20]
Kerl & Walter (2007)	Germany	Five Personal Finance Magazines	1995-2003	2860	Buy	1.74	[-3,-1]	0.64	12.61	-0.34	[+1,+20]
				1918	Buy	0.48	[-3,-1]	0.79	13.49	-0.58	[+1,+20]
Lidén (2007)	Sweden	Six Newspapers and Magazines	1995-2000	364	Sell	-0.94	[-3,-1	-1.50	-8.89	-2.31	[+1,+20]
				61	Buy	-0.07	[-3,-1]	0.46	-	4.26	[+1,+20]
Brown, Ferguson & Jackson (2009)[a]	Australia	Australian Financial Review	1995-2005	258	Sell	-0.45	[-3,-1]	-0.49	-	-2.71	[+1,+20]
				80	Buy	-	-	1.16	4.05	-	-
Cervellati, Ferretti & Pattitoni (2014)	Italy	Il Sole 24 Ore	2005-2009	35	Sell	-	-	0.36	1.17	-	-
				136	Buy	-	-	1.62	4.83	-	-
Zhang et al. (2016)	China	NetEase	2013-2014	106	Buy	-	-	1.18	3.75	-	-

Notes: CAR means cumulative abnormal returns in percent. AR means abnormal returns in percent. EW means estimation window in days. The event day refers to the first trading day following the date when the newspaper was published, or the television program was aired (note that the studies regarding the television program Mad Money usually refers to the date when the program was aired as the event day). The sign – indicates that the data is not available

[a] The authors report the buy and hold returns and not cumulative abnormal returns.

[b] Caller buy and sell recommendations refers to the recommendations issued by Jim Cramer during the program segment lightning round where Jim Cramer disuses stocks that the audience has chosen.

[c] The authors report the cumulative abnormal returns over the event window [-3,+5].

[d] The authors report the cumulative abnormal returns over the event window [-1,+1].

[e] The study is made on monthly data.

Appendix II

Table A 2: Mean Abnormal Returns for 209 Buy Recommendations, 265 Hold Recommendations, and 36 Sell Recommendations Published Between 2015 and 2019.

Panel A: Buy Recommendations $(N = 209)$.

Day	$\overline{\boldsymbol{AR}}_{\mathbf{t}}$(%)	$\boldsymbol{t}(\overline{\boldsymbol{AR}}_{\mathbf{t}})$	$\boldsymbol{A\_BMP}(\overline{\boldsymbol{AR}}_{\mathbf{t}})$	$\boldsymbol{Z}(\boldsymbol{w_t})$	$\boldsymbol{t}(\boldsymbol{K_t})$
-20	-0.11	-0.92	-1.02	-0.46	-0.42
-19	-0.23	-1.66	-1.66	-1.02	-0.98
-18	-0.12	-0.89	-1.07	-1.57	-1.44
-17	-0.15	-0.97	-0.90	-1.29	-1.51
-16	0.02	-0.08	-0.07	0.37	0.55
-15	0.18	0.90	0.89	1.90	1.47
-14	0.11	1.15	0.73	1.20	1.33
-13	-0.11	-0.37	-0.36	-0.88	-0.82
-12	-0.15	-2.42	-1.48	-1.02	-1.06
-11	-0.05	-0.60	-0.56	-1.02	-1.03
-10	0.06	0.00	0.00	1.20	1.11
-9	0.57	2.62	1.65	0.51	0.62
-8	0.06	0.34	0.32	0.09	0.10
-7	-0.24	-1.89	-1.90	-0.88	-1.14
-6	0.11	0.30	0.27	-0.18	-0.13
-5	0.30	1.97	1.74	2.45	1.34
-4	0.07	-0.48	-0.43	-0.18	0.16
-3	0.12	-0.01	0.02	0.93	0.39
-2	-0.01	0.54	0.44	1.06	0.60
-1	0.27	1.08	0.46	0.79	0.46
0	**1.48**	**8.96**	**2.88**	**4.81**	**5.51**
1	0.20	2.53	1.83	1.48	1.44
2	0.15	0.93	0.74	1.20	0.41
3	-0.09	-0.24	-0.22	-0.32	-0.48
4	0.38	2.50	1.97	0.65	1.37
5	0.14	0.96	0.89	0.23	0.38
6	-0.18	-1.19	-0.95	0.09	-0.43
7	0.14	0.83	0.74	-0.60	-0.25
8	0.06	-0.44	-0.38	-0.60	-0.50
9	-0.27	-1.41	-1.38	-0.32	-1.05
10	0.44	2.66	2.13	1.90	1.55
11	0.17	1.55	1.51	1.20	0.79
12	-0.16	-0.21	-0.23	0.93	0.50
13	0.03	-0.36	-0.30	-0.18	-0.39
14	-0.21	-1.12	-1.14	0.09	-0.55
15	0.02	0.04	0.04	1.20	0.38
16	-0.15	-0.75	-0.76	0.51	-0.19
17	-0.11	-0.20	-0.17	0.51	-0.22
18	0.14	1.22	1.14	-0.46	0.50
19	-0.22	-1.20	-1.12	0.23	-1.01
20	0.03	0.57	0.60	0.51	0.29

Panel B: Hold Recommendations ($N = 265$).

Day	$\overline{AR}_t$(%)	$t(\overline{AR}_t)$	$A\_BMP(\overline{AR}_t)$	$Z(w_t)$	$t(K_t)$
-20	0.04	0.42	0.47	0.59	0.09
-19	-0.14	-0.20	-0.23	-1.25	-0.85
-18	-0.01	0.06	0.06	-0.88	-0.51
-17	0.01	0.45	0.49	0.72	0.75
-16	-0.01	-0.76	-0.74	-0.39	-0.54
-15	-0.11	-0.67	-0.67	-1.38	-0.65
-14	0.11	0.87	0.98	2.19	1.14
-13	-0.05	-0.37	-0.38	0.10	0.63
-12	-0.06	-0.54	-0.66	-0.64	-0.61
-11	-0.13	-0.76	-0.95	-1.38	-0.68
-10	-0.01	-0.32	-0.29	0.72	0.45
-9	0.16	0.27	0.26	0.22	0.46
-8	-0.12	-0.93	-0.84	-1.25	-1.16
-7	0.25	1.93	1.91	-0.51	0.92
-6	0.05	-0.21	-0.24	-0.15	0.05
-5	0.10	0.83	0.89	0.59	0.86
-4	-0.11	-0.92	-0.86	-0.39	-0.15
-3	-0.09	-0.48	-0.46	-1.13	-1.11
-2	-0.04	-0.99	-0.72	1.94	1.45
-1	0.45	2.38	1.34	1.33	0.99
0	**-0.62**	**-3.38**	**-0.94**	**0.22**	**-1.01**
1	0.14	1.15	0.92	-0.39	0.28
2	0.07	0.79	0.78	0.22	0.04
3	-0.24	-1.81	-1.92	-2.24	-2.11
4	-0.16	-1.08	-1.13	-0.27	-0.40
5	0.22	1.74	1.90	0.10	1.59
6	-0.24	-1.87	-2.04	-0.64	-1.63
7	0.12	1.14	1.22	0.47	0.67
8	-0.03	-0.23	-0.22	0.35	-0.23
9	-0.09	-0.76	-0.93	-0.15	-0.79
10	-0.17	-1.38	-1.48	-0.27	-0.86
11	0.04	0.14	0.15	-0.15	0.63
12	-0.09	-0.58	-0.69	-0.27	-0.38
13	-0.15	-1.42	-1.37	-1.01	-1.84
14	0.03	0.60	0.66	-0.64	-0.39
15	-0.20	-1.63	-1.80	-0.64	-1.53
16	-0.02	-0.04	-0.03	-0.39	-0.41
17	0.04	-0.15	-0.14	-0.88	-0.59
18	-0.05	0.54	0.55	1.21	0.55
19	0.24	1.40	1.06	1.21	0.81
20	-0.07	-0.82	-0.91	-0.15	0.02

Panel C: Sell Recommendations ($N = 36$).

Day	$\overline{AR}_t$(%)	$t(\overline{AR}_t)$	$A\_BMP(\overline{AR}_t)$	$Z(w_t)$	$t(K_t)$
-20	0.15	0.44	0.46	0.01	0.32
-19	-0.95	-2.02	-2.91	-1.66	-2.23
-18	0.58	1.05	1.41	2.68	1.70
-17	0.03	-0.17	-0.24	0.34	0.16
-16	-0.05	0.46	0.62	0.68	0.67
-15	0.29	0.75	1.12	1.01	1.24
-14	0.42	0.44	0.32	-0.99	-0.39
-13	0.35	1.16	1.46	2.01	1.51
-12	-0.03	-1.13	-1.26	-2.33	-1.52
-11	-0.25	-0.06	-0.07	1.01	0.56
-10	-1.07	-1.47	-1.49	-1.66	-1.50
-9	0.70	1.32	0.97	1.01	0.78
-8	0.41	0.89	0.86	0.34	0.77
-7	0.14	0.53	0.44	2.01	1.73
-6	-0.18	-0.74	-0.80	-0.66	-0.18
-5	-0.04	0.28	0.35	0.34	0.43
-4	-0.21	0.08	0.09	0.01	0.17
-3	0.16	1.06	0.89	0.34	0.31
-2	0.12	0.68	0.81	0.34	0.61
-1	-0.04	-0.01	-0.01	0.34	-0.08
0	**-3.29**	**-7.58**	**-2.66**	**-1.33**	**-2.38**
1	-2.17	-3.44	-2.41	-2.33	-2.50
2	0.04	-0.19	-0.16	-0.66	-0.67
3	0.05	-0.12	-0.15	1.01	0.61
4	-1.77	-3.25	-2.46	-2.33	-2.10
5	-0.04	0.46	0.47	-0.33	0.08
6	-0.30	-0.79	-0.92	-0.33	-0.79
7	-0.67	-2.17	-2.72	-2.66	-2.50
8	-0.66	-1.45	-1.85	-0.33	-0.86
9	-0.93	-1.81	-2.64	-1.99	-1.70
10	-0.03	0.39	0.66	-0.66	0.27
11	-0.27	-0.14	-0.28	0.01	-0.02
12	-0.03	0.15	0.18	0.68	0.40
13	0.79	0.97	0.75	-0.33	-0.04
14	-0.88	-1.65	-2.19	-1.33	-1.40
15	-0.16	-0.01	-0.01	-0.66	0.25
16	-0.42	-0.41	-0.70	-0.33	-0.66
17	0.14	-0.71	-0.53	-1.99	-1.68
18	0.56	1.78	1.52	1.34	1.36
19	-0.59	-0.27	-0.46	-0.66	-0.25
20	0.11	0.71	0.76	-0.66	0.52

Note: $\overline{AR}_t$ is the mean abnormal returns during day t, $t(\overline{AR}_t)$ is the t-statistic calculated in accordance with Brown and Warner (1985) appendix A.2, $A\_BMP(\overline{AR}_t)$ is the adjusted BMP test statistic calculated in accordance with Kolari and Pynnönen (2010). $Z(w_t)$ is the test statistic of the nonparametric sign test described in Cowan (1992), and $t(K_t)$ is the test statistic of the nonparametric rank test described in Corrado (1992). Day zero is the day that the stock recommendation was published.