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Abstract

In this paper we investigate the relationship between firm-specific investor sentiment, measured by applying text analysis to news stories published by Thomson Reuters, and merger and acquisition (M&A) deals announced by US-listed companies between 1997 and 2018. We find that a more positive investor sentiment increases the probability of firms announcing acquisitions and we investigate a number of potential reasons capable of explaining such a relationship. In this respect, we do not find that the overvaluation hypothesis or the catering theory are able to account for the impact of investor sentiment on acquisition announcements. Instead, by studying the short- and long-run stock market reaction to merger announcements and its relationship with investor sentiment, we find a positive short-run correlation which is reversed in the long-run. These results provide evidence for the overoptimism theory of mergers, which states that, in periods characterized by more optimistic investor sentiment, managers are more induced to pursue acquisitions and that these are better perceived by the stock market, even though they perform worse in the long-run.

1 Introduction

In this paper we investigate the relationship between investor sentiment, measured by applying text analysis to news stories published by Thomson Reuters, and merger and acquisition (M&A) deals performed by US-listed companies between 1997 and 2018. Investor sentiment can be defined as "a belief about future cash flows and investment risks that is not justified by the facts at hand" (Baker and Wurgler, 2007). According to a large number of studies discussed in the literature review, such beliefs might cause a firm's stock price to deviate from its fundamental level, generating a mispricing. Yet, measuring mispricing, as well as investor sentiment, is not an easy task. In fact, one needs to disentangle

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the portion of the firm's stock price reflecting relevant information from the other part reflecting beliefs not based on the firm's fundamentals. Studies generally rely on proxies based on the likes of market-to-book ratios and earnings per share[1]. However, a large literature has recently developed which aims at more directly capturing sentiment from the tone of news stories[2]. These studies apply text analysis to news from different sources and demonstrate that words expressing a positive or negative attitude account, beyond more traditional measures, for a large portion of price movements of stocks (and other assets) and that these price movements are reversed in the long-run, implying that they reflect sentiment rather than information.

We adopt this approach ourselves and measure investor sentiment by applying text analysis to a large sample of news articles published by the media conglomerate Thomson Reuters, with the assumption that the news reflects and amplifies certain beliefs and narratives about the economy and about individual companies. Indeed, Tuckett and Nikolic (2017) propose their Conviction Narrative Theory (CNT), where the role of narratives as ways to interpret and organize reality is emphasized, a simplified version of which was previously tested empirically by Tuckett et al. (2014). In particular, conviction narratives enable people to draw on the beliefs, causal models and rules of thumb that they learn from their environment, to identify opportunities that they deem worth acting upon and to feel sufficiently convinced about the anticipated outcomes to indeed act. The role of newspapers in sharing such narratives also depends on the size of the audience reached: the broader the coverage of the news source, the larger their impact on people's beliefs. Thomson Reuters, with over a thousand newspapers, 13 of which are in the top 15 newspapers by circulation globally, of course have a broad global reach. The company website provides the figure of 33 million unique monthly visitors to the website, with Thomson Reuters across all platforms being read each day by more than a billion people worldwide[3].

The investor sentiment measure is obtained as follows: once we have collected all the news articles written in English from 1996 to 2018, we link it to the US companies that are referred to therein, according to a number of criteria outlined below. Next, we compute the quarterly sum of the number of positive and negative words belonging to the dictionary developed by McDonald (2012), which adapts The General Inquirer's Harvard-IV-4 classification dictionary[4] for economic contexts. According to numerous studies in psychology, such as the above-mentioned Tuckett and Nikolic (2017), distinguishing between rational and emotional elements of people's evaluations and choices is not meaningful, in

[1] With regard to non-firm-specific investor sentiment, a measure that is commonly employed is that developed by Baker and Wurgler (2007).

[2] Cfr., among others, Tetlock (2007), Tetlock et al. (2008), Garcia (2013) and Soo (2018).

[3] https://www.thomsonreuters.com/content/dam/openweb/documents/pdf/reuters-news-agency/fact-sheet/reuters-fact-sheet.pdf.

[4] This dictionary was developed by the Harvard University and contains a list of positive and negative words. It was used in the General Inquirer software, i.e. a program for processing natural language text with a focus on content analysis, developed in the 1960s at the Harvard Laboratory of Social Relations.

that they are deeply interdependent, but here we nonetheless take the view that separating them is helpful in disentangling different economic theories. In fact, we ensure that our investor sentiment measure does not reflect information on firms' fundamentals[5]. The focus on words expressing a certain positive or negative attitude already allows us to avoid the incorporation of information bits; nevertheless, in order to obtain a variable which reflects as much as possible beliefs rather than information, we orthogonalize the measure with respect to a set of firms' balance sheet information. Finally, since this sentiment index has both positive and negative values, and in our regressions the index is made to interact with other variables that can also take on negative values, we use the rank of the index value, which constitutes our investor sentiment measure.

Measuring investor sentiment and stock mispricing is interesting per se, in that their existence and implications call for alternatives to the Efficient Market Hypothesis (Fama, 1970). Indeed, by now there exists a broad consensus in the literature that investor sentiment can generate fluctuations in firms' stock prices[6] and this argument bears even more crucial implications if it is proven that such non-fundamental price fluctuations influence firms' decisions, hence affecting the real economy, rather than simply constituting a "sideshow" (Morck et al., 1990) confined to financial markets. The consequences of stock mispricing are addressed by a large number of authors; the literature on the determinants of M&As, in particular, has tried to shed light on the relationship between stock market movements and acquisitions. In fact, M&A activity occurs in clusters, also known as merger waves, which appear to follow financial indexes. Indeed, authors have found evidence of stock market movements correlating with several characteristics of such form of firms' investments. For example, Rosen (2006) documents the existence of a stock market momentum, finding that stock market reaction to a merger announcement is better in times of hot financial markets. Furthermore, Shleifer and Vishny (2003) and Rhodes-Kropf et al. (2005) offer theoretical models showing that the bidder firms' overvaluation relative to the target firm drives stock-financed acquisitions. The role of firms' overvaluation is also studied by Dong et al. (2006) and Gugler et al. (2012), who provide support for a positive correlation between the overvaluation of a firm's stock and the firm's likelihood of pursuing M&As.

In this paper we investigate potential explanations for the relationship between investor sentiment, measured as briefly illustrated above, and M&As. More specifically, we study what is the impact of investor sentiment on the probability of firms announcing a merger or an acquisition; in other words, whether a positive/negative belief about a specific company carries, respectively, a higher/lower probability of the firm announcing one or more M&As. We focus on announced mergers rather than completed deals because we are interested in the intention of companies to acquire other firms, rather than in the

[5]We also conduct the analysis illustrated below by using a raw investor sentiment measure, and the results are similar in sign and significance.

[6]Cfr., among others, Shiller (2015); Baker and Wurgler (2007).

actual closing of a deal, which depends on a great number of additional factors. We find that, in different versions of the model, investor sentiment significantly (positively) affects the probability of firms announcing mergers or acquisitions. This implies that positive or negative attitudes towards the firm, reflected and/or amplified by the news, have an impact on the real activity of firms and, therefore, on the real economy. However, there might be different explanations for such a relationship, which we attempt to disentangle. First, let us assume that shareholders have biased expectations, unlike firms' managers, who have access to all the relevant information about their company and are rational. In this scenario, managers might be influenced by shareholders' biased expectations for various reasons. For example, the equity market timing hypothesis states that firms might exploit periods of overvaluation in order to issue equity at a more convenient price and exchange it for the real assets of other companies. Furthermore, the catering theory, which has not been studied in the M&A literature, suggests that firms' managers have incentives to cater to shareholders' expectations of the company's growth opportunities, even if those beliefs might be biased. Hence, in times of overoptimism, managers might pursue investment projects which are characterized by a negative net present value with the purpose of satisfying biased shareholders' expectations and maximizing the firm's stock price.

We investigate such potential factors and, according to our findings, both the equity market timing and the catering theories do not adequately explain the impact of sentiment on merger announcements. Indeed, we do not find evidence that managers rationally time their decisions based on shareholders' sentiment. There are various alternative hypotheses able to explain the positive relationship between investor sentiment and merger announcements. First, our measure of investor sentiment might capture relevant information about firms' growth opportunities rather than biased beliefs. In this case, the positive relationship would reflect the fact that higher investor sentiment implies the existence of growth opportunities that are exploited by firms acquiring other companies. Alternatively, the positive relationship between investor sentiment and M&A announcements might be explained by the overoptimism theory: positive investor sentiment, reflecting biased beliefs, is shared by investors and managers, who are willing to expand their business through M&As even though the firm's accurate evaluation would suggest otherwise. These hypotheses can be investigated by studying the short- and long-run stock market reaction to merger announcements (of completed deals) and their relationship with investor sentiment. In particular, the presence of a positive correlation between investor sentiment and short-run market reaction, which is reversed in the long-run, provides evidence for the overoptimism hypothesis, for it suggests that mergers announced in periods of high investor sentiment are evaluated better than others around announcement day, but that they perform worse in the long-run, when all the information has been incorporated and biases have been absorbed. This would imply that the higher probability of firms an-

nouncing more M&As in periods of high investor sentiment is driven by overoptimism and constitutes over investment which in the long-run destroys value. Moreover, in the present framework, it would also point to our investor sentiment measure being able to capture beliefs rather than information. Alternatively, if the relationship between investor sentiment and stock market reaction is positive in the short-run and is not reversed in the long-run, this would indicate investor sentiment capturing growth opportunities, that are well exploited by managers and correctly evaluated by the market. This finding would be in line with the neoclassical theory of mergers that, as exposed in the literature review, states that acquisitions are generally made when there are potential synergies, and the market is characterized by rational expectations and thus able to correctly evaluate a transaction. Another option, if the relationship between the short-run stock market reaction and investor sentiment is negative, is that rational investors evaluate investment choices made by overoptimistic managers negatively. Finally, where there is no significant relationship between investor sentiment and stock market reaction, one possibility could be that our measure captures growth opportunities that can either be well or badly exploited by managers, regardless of the level of investor sentiment.

Hence, to address these points, we restrict the sample to those M&As that were completed and study the impact of investor sentiment on the market evaluation of the merger announcement both in the short-run and long-run. We find that the impact of investor sentiment on the market reaction to merger announcements is actually reversed in the long-run, pointing to the presence of overoptimism and suggesting, overall, that biased expectations on the part of both shareholders and managers might partly explain the occurrence of acquisitions.

2 Literature review

The present paper is related to a number of different streams of literature. First, it is closely linked with studies on the drivers of M&As and merger waves which have shed light on various possible determinants. The neoclassical theory of mergers (cfr. Andrade and Stafford, 2004; Jovanovic and Rousseau, 2002), for example, stresses the role of economic shocks driving acquisitions which are pursued when there exist potential synergies from the transaction. According to this view, acquisitions generally bring positive results to the merging companies and shareholders are able to distinguish good deals from bad ones, for they are not subject to biased expectations. Other authors emphasize the conflicting interests between shareholders and managers and show the importance of managerial objectives in influencing M&A activity (cfr. Jensen, 1986). In particular, managers of firms with large free cash flows might engage in takeovers, rather than distribute resources to shareholders. This theory predicts that transactions driven by these motives might destroy, rather than create, value. Furthermore, the overvaluation of firms is studied by

Shleifer and Vishny (2003), who stress the practice of companies of issuing more equity when it is overvalued, exchanging it for the real assets of other firms, in order to protect shareholders from the expected stock market downturn. For those authors, the managers of target firms have a short time horizon and are thus willing to accept the overvalued shares in order to gain from the stock market boom. Similarly, Rhodes-Kropf et al. (2005) support the view that the overvaluation of stocks is one of the drivers of merger waves, but posits a different reasoning for the targets' side, stating that the managers of targets are not able to distinguish overoptimism from rational expectations of future synergies. With regards to the behavioral channel, research by the likes of Gugler et al. (2012) and Petmezas (2009) provides evidence for the role of overoptimism in generating merger waves.

Broadening the view to the effects of misvaluation or investor sentiment on firms' decisions in general, we gain other interesting insights. Stein (1996), for instance, introduces the catering theory concerning investment decisions, which puts forward that managers are rational and aim at satisfying shareholders' expectations, regardless of their potential bias. For example, a firm stock price being overvalued might imply that investors are overoptimistic about its growth opportunities and this might drive managers, attempting to maximize the share price, to cater to this positive investor sentiment by pursuing investment projects characterized by a negative net present value, which nevertheless is positively perceived by investors, and *vice versa*. Stein (1996) argues that managers' incentives to cater are stronger under some circumstances, such as when firms are harder to value and, as a consequence, might be characterized by a misvaluation which lasts longer. The time horizon of shareholders or managers will potentially also influence the catering incentive; in particular, a shorter time horizon implies a stronger focus on results that occur when the eventual mispricing has not vanished yet, bringing about a larger incentive to cater. This theory has been tested for certain corporate decisions, such as for the dividend policy (Baker and Wurgler, 2004) and for firms' investment (Polk and Sapienza, 2008). Moreover, the above-mentioned equity market timing hypothesis has also been studied outside the literature focusing specifically on M&As. The idea, again, is that deviations in stock prices influence a firms' equity value, which constitute a significant source of financing. On this point, Baker and Wurgler (2002) show that, if the company's stock is mispriced, rational managers of equity-dependent firms find it more attractive to issue equity or buy back undervalued equity, eventually affecting the level of investment. Baker et al. (2003) test this hypothesis directly and find evidence that stock market mispricing does indeed influence firms' investment through an equity issuance channel.

More generally, the study of investor sentiment links the present paper to the growing literature on heterogeneous expectations and biased beliefs, both in the real economy and in financial markets. Such works share the notion that individuals might not be

entirely rational, as supported by evidence from other disciplines, such as psychoanalysis, psychology, neuroscience and sociology. In these fields, it is particularly stressed that individuals, when taking decisions, integrate their cognitive abilities with their emotional state. Furthermore, whilst relying on rational expectations implies complex reasoning, it is shown that, in a context of uncertainty and complexity, acting upon simple behavioral rules might be more convenient (cfr., among others, in psychoanalysis and psychology: Simon (1990), Gigerenzer and Todd (1999), Tuckett (2012), Lerner et al. (2015); in neuroscience: Bechara et al. (2000); in sociology: Smelser (1998)). In economics, Shiller (2015) constitutes an early example of studies taking into account such ideas and this is followed by various papers formalizing heterogeneous expectations, such as LeBaron et al. (1997), Brock and Hommes (1997, 1998), De Grauwe (2011) and others, which have been reviewed by Franke and Westerhoff (2017). In terms of empirical support for the role of heterogeneous expectations, the focus has been devoted both to survey data and laboratory experiments with human subjects. Among the former group, there are, for example, Gennaioli et al. (2016) and Bordalo et al. (2020), which show the importance of employing expectations data in order to understand corporate investment, planned and actual; these data, in fact, help explain such figures more than traditional measures of investment determinants. Furthermore, the results of these studies suggest the rejection of the rational expectations benchmark and instead provide support for the extrapolative nature of expectations, consistent with the presence of overoptimism in good times and over pessimism in bad times. Research that provides laboratory evidence for heterogeneous expectations in macroeconomics is surveyed in Assenza et al. (2014).

Finally, the proxy of investor sentiment that we build relates the present paper to those economic studies applying sentiment analysis to text sources, which are growing in number and importance. One important issue addressed in this field concerns the measurement of sentiment and its impact on economic variables. Tetlock (2007) is a pioneering example: the author applies sentiment analysis to The Wall Street Journal's (WSJ's) "Abreast of the Market" column on US stock market returns and provides evidence that measures of media content serve as a proxy for investor sentiment or non-informational trading by rejecting the hypothesis that media content contains new information about fundamental asset values. Tetlock et al. (2008), instead, investigate the impact of negative words found in The Wall Street Journal and in the articles from the Dow Jones News Service about individual S&P 500 firms. Their results, in contrast to the prediction of the former study, suggest that linguistic media content captures otherwise hard-to-quantify aspects of firms' fundamentals, which investors quickly incorporate into stock prices. In particular, media pessimism in firm-specific news is able to forecast low firm earnings. A similar study is Garcia (2013), in which the author investigates the effect of sentiment – the fraction of positive and negative words in two columns of financial news from The New York Times – on asset prices from 1905 to 2005, showing that stock returns are predicted by news

content especially during recessions. Another interesting study is by Soo (2018), which aims at explaining the house price boom that occurred before the 2007 financial crisis. Soo's findings indicate that text content measures of local housing news has significant predictive power for future house prices, leading prices by nearly two years. Moreover, the author provides evidence that this result is not generated by news stories of unobserved fundamentals. Indeed, Tuckett et al. (2014) test what later became the Conviction Narrative Theory (Tuckett and Nikolic, 2017), by measuring shifts in the proportion of approach and avoidance words in news databases, and find that, during the period leading up to the 2017 financial crisis, there were unusual sentiment shifts, highlighting that the emergence of consensus over a narrative can be an important warning sign of impending financial system distress.

The present paper aims at contributing to these streams of literature, first by measuring the impact of investor sentiment on M&As, shedding light on the role of a number of potential factors that might explain the relationship, providing evidence for the overoptimism hypothesis. We accomplish this by also studying the impact of investor sentiment on market reaction to merger announcements. Importantly, we provide a measure of investor sentiment based on text analysis applied to a very large sample of firm-specific news stories supplied by the major news source Thomson Reuters.

3 Sentiment measure

We build our firm-level investor sentiment measure by applying text analysis to the database provided by Thomson Reuters[7], which stores all the major news agency's content from 1996. We consider only articles written in English on firms that are traded in at least one of the main US stock exchanges, namely the New York Stock Exchange, Nasdaq and NYSE American, and employ text analysis in order to match stories to those firms which are mentioned and discussed therein. Moreover, we only include articles that contain at least a few words from the dictionary developed by McDonald (2012), in order to avoid such ones that consist solely of tables or lists with company names and quantitative information. Therefore, similarly to Tetlock et al. (2008), we only select news articles that:

- mention the firm's name at least twice either in the headline or body of the article;
- mention the firm's ticker at least once either in the headline or body of the article; and
- contain at least three words that are either positive or negative.

[7] A more detailed description of this and other data sets can be found in the Appendix.

Furthermore, we only include news on those firm-year observations that appear in Compustat. Table B.1 shows the number of articles per year included in our final news sample.

We measure investor sentiment on the selected news employing a bag-of-words method. In particular, we count the number of positive and negative words, based on the dictionary developed by McDonald (2012). This list of words, including approximately 2,500 negative and 300 positive words, is a version of The General Inquirer's Harvard-IV-4 classification dictionary adapted for economic contexts by McDonald (2012), which finds that a great number of words are capable of expressing a very different attitude depending on the context in which they are used.

We obtain our investor sentiment measure in the following way. First, we count the number of positive and negative words which appear in all the news stories published about a certain firm during the last quarter of every fiscal year and we compute:

$$Count_{i,t} = \frac{pos_{i,t} - neg_{i,t}}{length_{i,t}}, \tag{1}$$

where i and t indicate firm and quarter, respectively. Further, $pos_{i,t}$ and $neg_{i,t}$ are the total number of positive and negative words in all news articles published in quarter t on firm i and $length_{i,t}$ is the total number of words in those articles. We also compute $Count_{i,t}$ at the monthly and yearly frequency and provide a slightly different version which first computes the variable $Count_{i,t}$ for each article and then takes the average over a certain period of time: regression results are qualitatively similar in all cases.

Figure C.1 illustrates the variable *Count*, measured at the monthly frequency and averaged across firms (indicated as Sentiment in the figure), and the monthly S&P index return obtained from CRSP, scaled by a factor of 100 for the purpose of comparison. We can see that the two move in a broadly similar way, except for the peaks before and after the 2007 financial crisis. Another significant period in the stock market history is that before 2000, characterized by the dot-com bubble; in the figure, the variable Sentiment seems relatively higher than the index return and both decline afterwards.

This measure of investor sentiment could capture both "a belief about future cash flow not based on facts at hand" and news that actually reflect growth opportunities. Whilst from a psychology point of view, such as that contained in the CNT, the distinction between rational and irrational elements contributing to opinion formation is somewhat problematic, for they are interdependent and hardly separable, we instead follow the line of thinking that such distinction is crucial for disentangling different economic theories such as the Efficient Market Hypothesis (EMH) from behavioral views of the functioning of financial markets. Therefore, our investor sentiment measure is orthogonalized with respect to certain firms' characteristics that proxy for future performance, as in Soo (2018). Table **??** shows the correlation between selected variables and we observe that the variable *Count* has a very low correlation with almost all other variables. Nevertheless,

we regress *Count* on a set of balance sheet information included in the table and take the residuals which constitute the orthogonalized investor sentiment. Finally, in order to study interaction effects among such investor sentiment and other variables, we build for every year a percentile rank of the orthogonal sentiment, which is the variable *Sent* that appears in our regressions.

4 Data

We build our own dataset by combining six existing data sets. In particular, data on M&A deals are obtained from Zephyr Bureau van Dijk and stock market data are collected from the CRSP data set, whilst balance sheet and income data are derived from Compustat. As mentioned above, news data are taken from Thomson Reuters and, finally, data on managers' compensation are provided by ExecuComp. We drop any mergers where we cannot obtain CRSP and Compustat data for the bidder. Whereas Compustat (including ExecuComp) and CRSP can be combined through the match table provided by CRSP, the other datasets utilize different firms' identifiers. Hence, we combine the datasets by employing ISIN and CUSIP codes and by matching firms' names through text analysis – we describe this process in more detail in the Appendix. Our analysis covers the years from 1997 to 2018.

Zephyr Bureau van Dijk provides a dataset which contains substantial information on M&As: we include those mergers or acquisitions where the acquiring company is US-listed. The great majority of observations are acquisitions, with only two deals in the sample being mergers – we use the two terms interchangeably. The dataset indicates the status of each deal, i.e. rumored, announced, completed or withdrawn. Whilst we exclude rumored M&As, we include those that have been completed as well as those that are announced and then withdrawn, for we are focused on the interest in acquiring another company, rather than in the actual completion of the deal. We eliminate those observations which are missing the announcement date or the acquired stake. We ignore outliers; any firm with a negative book value of equity or with a ratio of book value of equity to market value of equity over 10 is dropped. Our final sample of M&As contains 19,810 deals made by 2,437 companies included in Compustat, CRSP and in the final news dataset; table B.3 shows how deals are distributed over the years.

In order to pursue a yearly analysis, we compute the number of deals made by each company per fiscal year. The explanatory variable of our interest is investor sentiment in the last quarter of the previous fiscal year with respect to the acquisition announcement. The focus of our study is the relationship, if any, between investor sentiment and the expressed interest of a firm in acquiring (or merging with) another company. Therefore, we ensure that, between our investor sentiment measure and the acquisition announcement date, there is a gap of at least one month, meaning that, if a M&A deal has been announced

in the first month after the end of the firm's fiscal year, we attribute that deal to the previous fiscal year.

5 Investor sentiment and M&As

In this section we study the relationship between investor sentiment and M&A announcements by firms. The basic version of the equation that we estimate is the following:

$$Y_{i,t} = \beta_0 + \beta_1 Sent_{i,t-1} + \beta_2 CF_{i,t-1} + \beta_3 log(AT)_{i,t-1} + \beta_4 LEV_{i,t-1} + \eta_t + \mu_j + \varepsilon_{i,t}, \quad (2)$$

where $Y_{i,t}$ is the probability of firm i announcing an acquisition or a merger in time t. The dependent variable is binary and can only take the values 0 or 1; thus, we estimate the relationship with a Probit model. *Sent* is our ranked orthogonalized sentiment measure, expressed as a percentage. Moreover, we include control variables which, according to the literature, help explain the occurrence of M&As. We consider that firms with larger cash flows might be less financially constrained and thus pursue acquisitions more easily. Hence, we include $CF_{i,t-1}$, which is firm i's cash flow. Moreover, $logAT_{i,t-1}$ is the logarithm of total assets, which proxies for firm size: large firms may be more likely to acquire other companies than small ones. Furthermore, a higher leverage might financially constrain firms; thus, we include $LEV_{i,t-1}$. Finally, we include industry dummies, μ_j, obtained from the three-digit SIC codes from Compustat, year dummies η_t and an error term. We expect: $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 > 0$ and $\beta_4 < 0$.

Table 5.1 shows the marginal effects of the Probit model for different specifications. First of all, we find that a more positive sentiment is correlated with a higher probability of announcing an acquisition; this relationship is significant in all three models, the only difference being in the size of the effect, which is reduced by the inclusion of the industry and year dummies. In particular, in specification (1), an increase of one percentile in the sentiment ranking is associated with an increase of 4.2 percentage points in the probability of a firm making an acquisition, all other variables being at their average level. Moreover, less financially constrained and larger firms are more likely to announce mergers, while a higher leverage reduces such a probability. Adding time and industry fixed effects in model (2) reduces the marginal effects of investor sentiment, cash flow and leverage, while increasing the impact of the firm's size.

The literature investigating the determinants of mergers and acquisitions has studied the impact of overvaluation of firms by employing different proxies for mispricing and investor sentiment (cfr. Harford, 2005 and Gugler et al., 2012). These are, for instance, the market-to-book ratio, measuring the market and book value of equity, and the Tobin's Q, given by the ratio between the market and book value of the total assets. Both these measures aim at capturing how the market evaluation of a firm deviates from its

Table 5.1: Marginal Effects

	Dependent variable:		
	P(Y=1)		
	(1)	(2)	(3)
L.Sent	0.042***	0.035***	0.036***
	(0.006)	(0.008)	(0.008)
L.CF	0.022***	0.013***	0.026***
	(0.005)	(0.005)	(0.008)
L.logAT	0.033***	0.036***	0.037***
	(0.001)	(0.007)	(0.007)
L.LEV	−0.047***	−0.037***	−0.050***
	(0.006)	(0.009)	(0.012)
L.ME-BE			0.00004
			(0.00003)
L.Tobin's Q			−0.0001*
			(0.0001)
Year Dummies	No	Yes	Yes
Industry Dummies	No	Yes	Yes
Constant			
Observations	51,878	51,878	49,785
Log Likelihood	-21,475.640	-19,457.520	-18,845.390
Akaike Inf. Crit.	42,961.280	39,495.040	38,274.780

*p<0.1; **p<0.05; ***p<0.01. L.Sent is lagged investor sentiment. We obtain it with the following procedure: we compute equation (2) on news published in the last quarter of every fiscal year and we orthogonalize it; i.e. we regress it on a number of firms' variables and take the residuals. Finally, in every year, we rank these residuals by percentiles. L.CF is the beginning of year cash flow, given by income before extraordinary items plus depreciation and amortization, all divided by total assets. L.logAT is the log of beginning of year total assets. L.LEV is the beginning of year leverage, given by the ratio of total assets minus book equity and total assets. Book equity is given by total assets minus total liabilities plus deferred taxes and investment tax credit minus preferred stock plus convertible debt. If preferred stock is missing, we use the redemption value. L.ME-BE is the beginning of year market-to-book ratio of equity; the market value of equity is obtained from CRSP as the product of shares outstanding and share price, eventually summed over the different classes of shares. L.Tobin's Q is given by the ratio of total assets minus book value of equity plus market value of equity and total assets – all values are beginning of year. Industry dummies are built from the three-digit SIC codes by Compustat.

fundamental value; however, the use of such proxies is somewhat problematic, in that it is difficult to separate mispricing from the correct anticipation of future growth opportunities – Tobin's Q is, in fact, often used in order to proxy for the latter. Nevertheless, we include both of these measures in model (3) in order to study whether the investor sentiment coefficient is reduced in size and significance after their addition. Interestingly, the results of model (3) suggest that the market-to-book ratio is not significant and the estimate is close to zero, whereas Tobin's Q is significant but has a small negative marginal effect. Thus, it appears that, in our sample, the measures perform poorly and that they also do not have any impact on the sentiment coefficient, which is still positive and significant. Nevertheless, their inclusion improves the predictive power of the model, as shown by the log likelihood and the AIC values.

The above-mentioned results suggest that there is a positive relationship between investor sentiment and the firm's probability of announcing one or more acquisitions. This implies that more positive investor sentiment towards a specific company drives that company to pursue acquisitions, whilst a more negative attitude causes a firm to be less willing to consider M&As as a means of expansion. This analysis does not provide insights into why such a relationship exists, which is what we investigate in the next section.

5.1 What are the mechanisms at play?

As mentioned in the literature review, a number of theories have been developed on the mechanisms that exist behind the relationship between investor sentiment and M&As, such as the overvaluation hypothesis and the overoptimism on the part of either shareholders or managers. Moreover, with regard to the impact of mispricing on investment, Stein (1996) has introduced the catering theory. In what follows we explore these two potential explanations for the positive relationship between investor sentiment and the likelihood of a firm announcing a merger or an acquisition.

5.1.1 Overvaluation hypothesis

The overvaluation hypothesis, as mentioned, stresses that firms might exploit a positive mispricing of their stock in order to issue equity under more convenient conditions. Hence, we aim at taking into account the possibility that investor sentiment is positively correlated with acquisition announcements through the equity issuance channel. To do so, we include three proxies for equity issuance borrowed from Baker and Wurgler (2002), which should provide information on whether the effect of investor sentiment depends on equity issuance or not. In table 5.2, we estimate equation (2), with the addition of the ME-BE ratio and Tobin's Q; moreover, in model (1) we introduce EQISS.a, i.e. the ratio of the change in the book value of equity minus the change in retained earnings and total assets. The measure used in the second specification, EQISS.b, is similar, but the book

value of equity is computed as stakeholders' equity plus deferred taxes and investment tax credit minus preferred stock (Davis et al., 2000). Finally, model (3) considers a cash flow measure of equity issuance, given by the difference between the sale and the purchase of common and preferred stock. From table 5.2, we observe that in models (1) and (2) equity issuance is significant and their coefficient is positive, meaning that higher equity issuance is correlated with the probability of pursuing acquisitions. This implies that it is likely that part of the acquisitions of the sample are financed by equity – Zephyr provides information on the means of payment and financing, but there are too many missing data that prevent its inclusion in the regression. In model (3), instead, the effect of equity issuance is significant but slightly negative. Importantly, we find that the marginal effect of investor sentiment is not affected at all by the inclusion of equity issuance variables, meaning that the two effects are distinct and separate.

5.1.2 Catering Theory

The catering theory posits that managers, who are rational, have incentives to cater – i.e. to satisfy – shareholders' expectations which can be biased. This implies that, as a consequence of stock mispricing, managers can over/under invest, if expectations are subject to overoptimism/over pessimism respectively. The extent of the incentives to cater depend essentially on the duration of the mispricing which, in turn, depends on how easy it is to evaluate a company, and on the time horizon of the shareholders. Hence, the relationship between investor sentiment and over/under investment should vary across firms. In particular, with regard to the former dimension, firms that are harder to evaluate might be characterized by a mispricing which lasts longer, for it takes more time for the correct evaluation to be incorporated by shareholders. Thus, such firms should exhibit a stronger relationship between investor sentiment and the probability of the announcement of acquisitions.

We employ four proxies for hard-to-value firms which have been studied in the literature: we consider that firms with high asset intangibility, low dividends, low profitability and young companies constitute hard-to-value firms (cfr. Baker and Wurgler, 2006; Kumar, 2009). With respect to the time horizon dimension, the idea is that a shorter time horizon on the part of shareholders or managers implies that the time when the mispricing is absorbed – because of the incorporation of the correct information – is less relevant for shareholders and managers. The latter group, in fact, might either have direct incentives to maximize the stock price or might be uninterested in the long time horizon. Similarly to Gibbons and Murphy (1992) and Gao (2010), we employ two proxies for this dimension, both obtained from the ExecuComp data set: one is a dummy variable indicating whether the CEO is younger than 63 years old, implying that he or she is at least three years from retirement, and, the other is the ratio of vested options to the total managers' compensation based on the average for the top five executives at the firm. In fact, newly

Table 5.2: Marginal Effects

	Dependent variable:		
	deal.yes		
	(1)	(2)	(3)
L.Sent	0.035***	0.036***	0.038***
	(0.012)	(0.012)	(0.009)
L.CF	0.031***	0.030***	0.030***
	(0.012)	(0.011)	(0.011)
L.logAT	0.038***	0.038***	0.037***
	(0.012)	(0.012)	(0.007)
L.LEV	−0.056***	−0.056***	−0.051***
	(0.019)	(0.019)	(0.013)
L.ME-BE	0.00004	0.00004	0.00004
	(0.00004)	(0.00004)	(0.00004)
L.Tobin's Q	−0.0001*	−0.0001*	−0.0001*
	(0.0001)	(0.0001)	(0.0001)
EQISS.a	0.032***		
	(0.012)		
EQISS.b		0.029**	
		(0.012)	
EQISS.cashflow			−0.00001***
			(0.00000)
Constant			
Observations	48,709	48,794	44,630
Log Likelihood	-18,336.570	-18,380.270	-17,156.750
Akaike Inf. Crit.	37,259.140	37,346.540	34,895.510

*p<0.1; **p<0.05; ***p<0.01. L.Sent is lagged investor sentiment. We obtain it with the following procedure: we compute equation (2) on news published in the last quarter of every fiscal year and we orthogonalize it, i.e. we regress it on a number of firms' variables and take the residuals. Finally, in every year, we rank these residuals by percentiles. L.CF is the beginning of year cash flow, given by income before extraordinary items plus depreciation and amortization, all divided by total assets. L.logAT is the log of beginning of year total assets. L.LEV is the beginning of year leverage, given by the ratio of total assets minus book equity and total assets. Book equity is given by total assets minus total liabilities plus deferred taxes and investment tax credit minus preferred stock plus convertible debt. If preferred stock is missing, we use the redemption value. L.ME-BE is the beginning of year market-to-book ratio of equity; the market value of equity is obtained from CRSP as the product of shares outstanding and share price, eventually summed over the different classes of shares. L.Tobin's Q is given by the ratio of total assets minus book value of equity plus market value of equity and total assets – all values are beginning of year. EQISS.a is the ratio of the change in the book value of equity minus the change in retained earnings and total assets. EQISS.b is the same as EQISS.a, except that the book value of equity is computed as stakeholders' equity plus deferred taxes and investment tax credit minus preferred stock. If stockholders' equity is missing, we use common equity plus preferred stock; otherwise, we take the difference between total assets and total liabilities. If deferred taxes is missing, we substitute it with zero. EQISS.cashflow is measured as sale of common and preferred stock minus purchase of common and preferred stock. Industry dummies are built from the three-digit SIC codes by Compustat.

granted stocks and options have to become vested in order to be sold or exercised. Thus, managers with a considerable amount of vested stocks and options might be more concerned about the firm's near-term stock price than those with a smaller amount. In order to build this proxy, we use the total compensation variable (TDC1), which includes salary, bonus, restricted stock granted and the Black-Scholes value of stock-options granted. The value of restricted stock and options that become vested in year t reads

$$ValueVestingEquity_t = UnvestedEquity_{t-1} + EquityGrant_t - UnvestedEquity_t, \quad (3)$$

where $UnvestedEquity_t$ is the value of unvested stock and options in year t and $EquityGrant_t$ is the value of newly granted stock and options. $VestingEquity$ is then obtained as $ValueVestingEquity$ divided by TDC1. Finally, we compute TH2 as TH2 = 1 - VestingEquity; a higher TH2 value indicates a longer horizon.

In order to study the interaction effect, we include interaction terms between investor sentiment and the above-mentioned proxies of hard-to-value and short time horizon companies in the regression. Since in a Probit model an insignificant interaction term does not necessarily indicate an insignificant relationship (cfr. Ai and Norton, 2003), we also study such relationships graphically but we do not present the related figures as they all confirm the regression results.

Table 5.3 illustrates the results of the regressions that specifically test the interaction effect between investor sentiment and dividends and between investor sentiment and asset tangibility. In model (1), we include a dummy indicating whether the firm pays low dividends, i.e. dividends that are less than or equal to the median amount of dividends paid. In our sample, the median dividends paid is zero; therefore, low-dividend firms are those which do not distribute dividends at all. In specification (2), we include an interaction term of investor sentiment with the actual dividends distributed by the firm. Models (3) and (4) take into account the level of asset tangibility and its interaction with investor sentiment. First of all, we observe that in all specifications, investor sentiment remains significant and positive. Moreover, concerning models (1) and (2), the two variables indicating the firms' dividend policies are insignificant in explaining the probability of a firm announcing an acquisition. As for the interaction terms, they are not significant either.

Specifications (3) and (4) in table 5.3 include asset tangibility, which significantly affects the probability of acquiring a company. In particular, firms with low asset tangibility are more likely to announce a merger or an acquisition. The coefficients of interaction terms between investor sentiment and the two specifications of asset tangibility are insignificant.

The two other proxies that we employ in order to test whether hard-to-value firms are more affected by investor sentiment in their acquisition decisions are firm age and profitability. Table 5.4 presents the results of four different specifications which include the interaction terms. Models (1) and (2) take into account the effect of firm age, whilst

models (3) and (4) study firms' profitability. Model (1) includes a dummy indicating whether the firm is a young firm – i.e. younger than the median firm age. A young firm is less likely to pursue a merger or an acquisition; moreover, the interaction between investor sentiment and the dummy YoungFirm is non-significant. This result is confirmed by specification (2). Models (3) and (4) consider the profitability of firms; the former specification includes a dummy indicating whether the company is less profitable than the median firm, whereas the latter model includes the full distribution of profitability. Both models show that more profitable firms are more likely to pursue M&As and that the interaction between firms' age and investor sentiment and firms' profitability and investor sentiment is not significant.

Table 5.5 focuses on the role of time horizon. Model (1) includes a dummy, TH1, indicating whether the CEO of a company is younger than 63 years old. Model (2) includes a measure, TH2, of the options becoming vested over the total manager's compensation. TH1 does not have a significant impact on the probability of a firm making an acquisition; TH2, on the other hand, is positively associated with such a probability, implying that managers with a longer time horizon are more likely to acquire other companies. The two interaction terms are negative but non-significant, suggesting that, in our sample of M&A deals, investor sentiment and time horizon do not present interactions in influencing a firm's interest in acquiring other companies.

To sum up, our results suggest that investor sentiment is positively and significantly correlated with the probability of a firm announcing one or more acquisitions, which is confirmed across different specifications of the estimated model. Moreover, we find that equity issuance is positively correlated with such a probability. However, its inclusion in the regression does not affect the significance and size of investor sentiment impact, which, therefore, seems to exist independently from equity issuance. Furthermore, by employing proxies for hard-to-value and short-time horizon firms, we do not find evidence for the catering channel. Therefore, our results seem to provide an additional mechanism, beyond those just considered, that links investor sentiment to M&As. We explore this point in the next sections.

6 Effect of investor sentiment on the announcement return

One possible explanation for the positive relationship between investor sentiment and M&A activity, ignoring equity issuance and catering theories, is that a positive sentiment is an indicator of growth opportunities that are exploited by companies through mergers and acquisitions. In this case, investor sentiment would capture relevant information on firms' fundamentals. Alternatively, investor sentiment might reflect or amplify shareholders' and possibly managers' overoptimism, providing support for behavioral theories of

Table 5.3: Marginal Effects

	Dependent variable:			
	deal.yes			
	(1)	(2)	(3)	(4)
L.Sent	0.035***	0.036*	0.036***	0.034***
	(0.012)	(0.019)	(0.014)	(0.013)
LowDiv	−0.051			
	(0.053)			
Div		0.195		
		(0.121)		
lowAsTan			0.023**	
			(0.010)	
AssetTang				−0.169***
				(0.057)
L.CF	0.031***	0.029*	0.033***	0.036***
	(0.012)	(0.016)	(0.013)	(0.013)
L.logAT	0.038***	0.037*	0.038***	0.038***
	(0.012)	(0.019)	(0.012)	(0.012)
L.LEV	−0.056***	−0.050*	−0.054***	−0.054***
	(0.019)	(0.027)	(0.019)	(0.019)
L.ME-BE	0.00004	0.00001	0.00003	0.00004
	(0.00004)	(0.00004)	(0.00004)	(0.00004)
L.Tobin's Q	−0.0001*	0.008*	−0.0001*	−0.0001**
	(0.0001)	(0.004)	(0.0001)	(0.0001)
EQISS.a	0.032***	0.022*	0.032***	0.031***
	(0.012)	(0.013)	(0.012)	(0.012)
L.Sent:LowDiv	0.048			
	(0.132)			
L.Sent:Div		−0.255		
		(0.172)		
L.Sent:lowAsTan			−0.002	
			(0.010)	
L.Sent:AssetTang				0.008
				(0.023)
Constant				
Observations	48,422	47,921	48,615	48,615
Log Likelihood	-18,215.030	-17,975.680	-18,289.650	-18,194.130
Akaike Inf. Crit.	37,018.070	36,539.370	37,169.300	36,978.250

*p<0.1; **p<0.05; ***p<0.01. L.Sent is lagged investor sentiment. We obtain it with the following procedure: we compute equation (2) on news published in the last quarter of every fiscal year and we orthogonalize it; i.e. we regress it on a number of firms' variables and take the residuals. Finally, in every year, we rank these residuals by percentiles. L.CF is the beginning of year cash flow, given by income before extraordinary items plus depreciation and amortization, all divided by total assets. L.logAT is the log of beginning of year total assets. L.LEV is the beginning of year leverage, given by the ratio of total assets minus book equity and total assets. Book equity is given by total assets minus total liabilities plus deferred taxes and investment tax credit minus preferred stock plus convertible debt. If preferred stock is missing, we use the redemption value. L.ME-BE is the beginning of year market-to-book ratio of equity; the market value of equity is obtained from CRSP as the product of shares outstanding and share price, eventually summed over the different classes of shares. L.Tobin's Q is given by the ratio of total assets minus book value of equity plus market value of equity and total assets – all values are beginning of year. EQISS.a is the ratio of the change in the book value of equity minus the change in retained earnings and total assets. LowDiv is a dummy variable indicating whether the firm pays no dividends. Div is dividends and is computed as total annual dividend per share times shares outstanding divided by book value of equity. Low AssetTang is a dummy variable indicating whether the firm has less tangible assets than the median firm, measured by AssetTang. The latter is given by total property, plant and equipment over total assets. Industry dummies are built from the three-digit SIC codes by Compustat.

Table 5.4: Marginal Effects

	Dependent variable:			
	deal.yes			
	(1)	(2)	(3)	(4)
L.Sent	0.036***	0.037***	0.026***	0.031*
	(0.012)	(0.011)	(0.009)	(0.017)
YoungFirm	−0.028**			
	(0.013)			
FirmAge		0.0001***		
		(0.00003)		
LowProf			−0.055***	
			(0.012)	
Prof				0.026*
				(0.015)
L.CF	0.029***	0.029***	0.019**	0.022*
	(0.011)	(0.009)	(0.008)	(0.013)
L.logAT	0.037***	0.033***	0.037***	0.039**
	(0.012)	(0.006)	(0.007)	(0.020)
L.LEV	−0.057***	−0.063***	−0.073***	−0.062*
	(0.019)	(0.015)	(0.016)	(0.032)
L.ME-BE	0.00003	0.00004	0.00004	0.00001
	(0.00004)	(0.00003)	(0.00004)	(0.0001)
L.Tobin's Q	−0.0001*	−0.0001*	−0.0001	0.008*
	(0.0001)	(0.0001)	(0.0001)	(0.004)
EQISS.a	0.033***	0.032***	0.047***	0.044*
	(0.012)	(0.009)	(0.012)	(0.024)
L.Sent:YoungFirm	0.003			
	(0.019)			
L.Sent:FirmAge		0.00001		
		(0.00002)		
L.Sent:lowprof			0.008	
			(0.011)	
L.Sent:Prof				0.010
				(0.014)
Constant				
Observations	48,816	48,816	46,934	46,224
Log Likelihood	-18,363.340	-18,238.430	-17,821.350	-17,695.110
Akaike Inf. Crit.	37,316.690	37,066.860	36,230.700	35,976.230

*p<0.1; **p<0.05; ***p<0.01. L.Sent is lagged investor sentiment. We obtain it with the following procedure: we compute equation (2) on news published in the last quarter of every fiscal year and we orthogonalize it; i.e. we regress it on a number of firms' variables and take the residuals. Finally, in every year, we rank these residuals by percentiles. L.CF is the beginning of year cash flow, given by income before extraordinary items plus depreciation and amortization, all divided by total assets. L.logAT is the log of beginning of year total assets. L.LEV is the beginning of year leverage, given by the ratio of total assets minus book equity and total assets. Book equity is given by total assets minus total liabilities plus deferred taxes and investment tax credit minus preferred stock plus convertible debt. If preferred stock is missing, we use the redemption value. L.ME-BE is the beginning of year market-to-book ratio of equity; the market value of equity is obtained from CRSP as the product of shares outstanding and share price, eventually summed over the different classes of shares. L.Tobin's Q is given by the ratio of total assets minus book value of equity plus market value of equity and total assets – all values are beginning of year. EQISS.a is the ratio of the change in the book value of equity minus the change in retained earnings and total assets. YoungFirm is a dummy variable indicating whether the firm has an age lower than the median one. FirmAge is computed as the number of months in which the firm appears in CRSP. LowProf is a dummy variable indicating whether the firm has a profitability lower than the median one; Prof is profitability and is computed as the ratio of income before extraordinary items plus income taxes minus preferred dividends and book value of equity. Industry dummies are built from the three-digit SIC codes by Compustat.

Table 5.5: Marginal Effects

	Dependent variable:	
	deal.yes	
	(1)	(2)
L.Sent	0.055**	0.064***
	(0.023)	(0.022)
L.CF	0.146***	0.168***
	(0.041)	(0.047)
L.logAT	0.068***	0.068***
	(0.015)	(0.015)
L.LEV	−0.110***	−0.114***
	(0.029)	(0.030)
L.ME-BE	0.0001	0.0001
	(0.0001)	(0.0001)
L.Tobin's Q	0.006***	0.010***
	(0.002)	(0.003)
EQISS.a	0.160***	0.187***
	(0.041)	(0.048)
TH1	0.001	
	(0.014)	
TH2		0.019**
		(0.009)
L.Sent:TH1	−0.006	
	(0.023)	
L.Sent:TH2		−0.017
		(0.014)
Constant		
Observations	24,879	25,172
Log Likelihood	-11,847.460	-11,860.630
Akaike Inf. Crit.	24,244.910	24,271.270

*p<0.1; **p<0.05; ***p<0.01. L.Sent is lagged investor sentiment. We obtain it with the following procedure: we compute equation (2) on news published in the last quarter of every fiscal year and we orthogonalize it; i.e. we regress it on a number of firms' variables and take the residuals. Finally, in every year, we rank these residuals by percentiles. L.CF is the beginning of year cash flow, given by income before extraordinary items plus depreciation and amortization, all divided by total assets. L.logAT is the log of beginning of year total assets. L.LEV is the beginning of year leverage, given by the ratio of total assets minus book equity and total assets. Book equity is given by total assets minus total liabilities plus deferred taxes and investment tax credit minus preferred stock plus convertible debt. If preferred stock is missing, we use the redemption value. L.ME-BE is the beginning of year market-to-book ratio of equity; the market value of equity is obtained from CRSP as the product of shares outstanding and share price, eventually summed over the different classes of shares. L.Tobin's Q is given by the ratio of total assets minus book value of equity plus market value of equity and total assets – all values are beginning of year. EQISS.a is the ratio of the change in the book value of equity minus the change in retained earnings and total assets. TH1 is the first dummy for time horizon, equal to 1 if the firm's CEO is younger than 63 years old. TH2 is computed as 1 minus the value of vesting equity over the total managers' compensation (TDC1 from ExecuComp). Value of vesting equity is the amount of options that become vested and is computed as the difference between unvested equity of the previous period and current unvested equity plus equity grant. Industry dummies are built from the three-digit SIC codes by Compustat.

mergers. These two potential explanations can be disentangled by studying the short-run and long-run stock market reaction to merger announcements and how such reaction varies depending on investor sentiment. Indeed, different theories generate differing predictions as to how stock return varies over time as a consequence of an acquisition announcement. For example, a positive relationship between the short-run return around the announcement date and investor sentiment is consistent both with the neoclassical theory – which stresses the role of economic shocks as M&A determinants and states that acquisitions generally create value because they reflect the presence of potential synergies between the companies involved – and with the overoptimism theory – which highlights that, in periods of positive sentiment, mergers might be perceived as better deals than they really are. However, these theories take an alternative view on the long-run reaction to merger announcements. In particular, if the stock market reaction is more positive in periods characterized by higher investor sentiment because the latter indicates growth opportunities that are exploited by managers and correctly evaluated by rational investors, then there should be no long-run reversal of the impact of investor sentiment. That is, investor sentiment before the announcement should not have a negative effect on the long-run stock market reaction because all the information is incorporated by shareholders at the time of the announcement. Instead, if such a long-run drift does exist, it should point towards the overoptimism hypothesis, as it suggests that the value created by deals made in periods of optimistic investor sentiment is perceived as being higher than it really is, as it emerges only in the long-run.

In order to compute the short- and long-run return of stocks, we use stock prices from CRSP; furthermore, we only consider completed acquisitions, ignoring withdrawn deals.

6.1 Short-run returns

The short-run return is computed as the average abnormal return of the stock over a window of five days around the announcement – we also consider a window of seven days, which does not change the results. More specifically, we follow Fuller et al. (2002) and Rosen (2006), and measure the cumulative abnormal average return (CAAR) over the five days surrounding the merger announcement as the difference between the return for the bidder and the return on the value-weighted market index:

$$CAAR_{i,t} = \sum_{t-2}^{t+2} R_{i,t} - R_t^{index}, \tag{4}$$

where $R_{i,t}$ is the return on the firm's stock on date t relative to the announcement date and R_t^{index} is the return on the index for that date.

For our sample of 1,087 deals the average CAAR using the value-weighted benchmark is 1.27%. The main variable we are interested in is investor sentiment, as we aim at

investigating whether it has an impact on the stock market reaction. For this analysis we measure investor sentiment over a window of time starting four months before and ending one month before the announcement day; moreover, we consider the non-ranked orthogonalized investor sentiment expressed as a percentage, which we call $Sent2$. We include a few control variables that have been shown to influence the stock market reaction to acquisition announcements. In particular, we follow Rosen (2006) and add measures of merger and stock market momentum. With respect to the former, we take into account both the total number of mergers made in the year prior to a particular announcement, *n.mergers.total*, and the average five-day CAAR on merger announcements made in the same period, *CAAR.average*. With stock market momentum, we proxy this with *return.index* , i.e. the return on the value-weighted market index. Furthermore, bidder-specific merger activity might influence the short- and long-run reaction to acquisition announcements. Hence, we add the CAAR on the last merger by the bidding firm, provided that the announcement occurred in the prior three years, $L.CAAR$. Moreover, *n.mergers* is added to measure how active a firm is, measured as the number of acquisitions announced by the bidder in the prior three years. We also include $BHAR.average$ – where BHAR stands for buy and hold average return – which is firms' long-term stock return computed according to equation (5), and the bidder market-to-book equity ratio, in order to qualify the financial health of the bidding company. We control for firm size by including $logAT$, i.e. the log of total assets. Finally, we control for two deal-specific factors: *proport.size* indicates the ratio between the size of the bidder and the target, and the dummy $diversifying$ states whether the transaction involves firms from two different industries, defined as the three-digit SIC code from Compustat. In the sample, 46.5% of all mergers are diversifying.

Table 6.1 shows the results of the CAAR analysis. We find that investor sentiment has a positive and significant effect on the short-run announcement return. In particular, a one percentage point increase in the sentiment boosts the CAAR for a bidding firm by 0.099 percentage points. This implies that announcing a merger in periods with high firm-specific investor sentiment leads to better market reaction than doing so in times characterized by low sentiment. As argued above, this can be consistent both with the neoclassical theory of mergers and with the behavioral view, depending on the long-run reaction. With regards to the other variables, the results provide evidence for the presence of merger and stock market momentum; in fact, both the coefficients of $CAAR.average$ and *return.index* are positive and significant, whilst *n.mergers.total* is insignificant. Hence, during hot merger and stock markets, a deal is more likely to be positively perceived by financial markets. Similarly for bidder-specific merger momentum, the CAAR on the previous merger boosts the current CAAR by 0.085 percentage points, whereas the number of mergers completed by the same firm in the previous year is not significant. Firm-specific market conditions do not indicate the presence of momentum; the negative coefficient

Table 6.1: Results

	Dependent variable:
	CAAR
L.Sent2	0.099**
	(0.046)
CAAR.average	0.381***
	(0.136)
n.mergers.total	0.010
	(0.010)
return.index	0.009*
	(0.005)
L.CAAR	0.085**
	(0.039)
n.mergers	−0.0001
	(0.0004)
BHAR.average	−0.0005*
	(0.0003)
L.ME-BE	0.001
	(0.001)
L.logAT	−0.004***
	(0.001)
proport.size	−0.0001
	(0.001)
diversifying	−0.004
	(0.005)
Constant	0.036**
	(0.016)
Observations	1,087
R^2	0.017
Adjusted R^2	0.007
Residual Std. Error	0.063 (df = 1075)
F Statistic	2.395** (df = 11; 1075)

*p<0.1; **p<0.05; ***p<0.01. CAAR is defined in equation (4). The announcement window runs from two days prior to an announcement to two days after the announcement. L.Sent2 is lagged investor sentiment. We obtain it with the following procedure: we compute equation (2) on news published over a period running from four months before to one month before the merger announcement and we orthogonalize it; i.e. we regress it on a number of firms' variables and take the residuals. CAAR.average is the trailing 12-month average cumulative abnormal announcement return (CAAR), computed as the average CAAR for all sample mergers in the 12 months ending three days before an announcement. n.mergers.total is the number of sample mergers in the 12 months prior to an announcement. Return.index is the return on the value weighted CRSP index in the year ending three days before a merger announcement. L.CAAR is CAAR for the most recent merger, provided that the merger was announced in the three years prior to the current announcement. n.mergers is the number of acquisitions announced by the bidder in the three years prior to the announcement. BHAR.average is the return in the 12 months ending three days before an announcement. Bidder L.ME-BE is the beginning of year market-to-book equity ratio, measured at the end of the year prior to the merger announcement. L.logAT is the beginning of year log of total assets. The ratio of target-to-bidder size is the ratio of target equity to bidder equity. If information on the target is missing, we use the variable on deal value from Zephyr. Diversifying merger is a dummy indicating whether the target and the bidding firm are in different industries. Industry dummies are included in the regressions but not shown in the table.

of BHAR.average is consistent with Rosen (2006), where it is argued that one possible reason for such a relationship is hubris (Roll, 1986); i.e. managers of bidding firms that were recently successful might be induced to believe in their ability to create value in situations negatively judged by the market.

The amount of assets held by the firm is negatively correlated with the CAAR, which is consistent with earlier findings (cfr. Loderer and Martin (1997)). Furthermore, deal specific conditions do not have a significant effect on the short-run stock market reaction to acquisition announcements.

To sum up, the CAAR analysis offers the following insights: first and most importantly, investor sentiment has a positive impact on short-run market reaction to merger announcements; hence, we find evidence for investor sentiment momentum. Second, the results provide support for the presence of hot merger and stock market momentum.

6.2 Long-run returns

We turn to the long-run analysis, which can help us distinguish between the overoptimism hypothesis and the neoclassical theory of mergers. We employ the buy and hold average return (BHAR) measure of long-run performance after a merger announcement, which is similar to our short-run CAAR measure. We define the BHAR as the value of holding a long position in the stock of the bidding firm and a short position in a benchmark index, i.e. the CRSP value-weighted index, over the time horizon:

$$BHAR_{i,t} = \frac{\Pi_{t=1}^{T}(1 + R_{i,t})}{\Pi_{t=1}^{T}(1 + R_t^{index})} \tag{5}$$

The time window over which we measure the BHAR is the post-announcement period, as it starts three days after the announcement day and ends three years after that same announcement day. In our sample, the average BHAR is -3.51%. The results are similar to the time horizon that runs from two days prior to a merger announcement and has the same end date as the post-announcement period.

The BHAR regression results are provided in Table 6.2. The control variables are the same as those we use for the CAAR analysis. The coefficient on the investor sentiment is negative and significant, implying that an increase of one percentage point in the sentiment during the quarter before the acquisition announcement lowers the long-run return by 1.283 percentage points. This reversal of the relationship with respect to that in the short-run implies that acquisitions announced in periods of high investor sentiment perform worse, all else being equal, than those announced when beliefs are less optimistic, suggesting that investor sentiment reverses in the long-run, therefore providing support for the overoptimism hypothesis. Furthermore, this on the one hand indicates that investor sentiment reflects, at least partly, biased beliefs rather than information on firms' growth opportunities; on the other hand, it provides evidence that investors do not immediately

correctly evaluate the value of deals, for they are subject to investor sentiment.

Other coefficients that are revrsed with respect to the short-run analysis are that on the CAAR.average, which is of a larger magnitude than that in the CAAR regression, that on the value-weighted stock index over the twelve months prior to an announcement and that on the total number of mergers, *n.mergers.total*. Hence, acquisitions announced during a hot merger and stock market create less value than those announced during a cold market. With regards to firm-specific momentum variables, such has *n.mergers*, BHAR.average and L.ME-BE, these have negative and significant coefficients, but there is no strong evidence of reversal, as in the short-run analysis they were found to have a similar or non-significant impact.

7 Conclusion

In this paper we study the relationship between investor sentiment, measured by applying text analysis to news stories published by Thomson Reuters, on US-listed firms' decisions to announce M&A deals. We find that investor sentiment is positively correlated with the likelihood of firms announcing M&As. There are several possible explanations for such a relationship existing, one of them being the assumption that investors are not rational and that their biases cause stocks to be mispriced. Firms' managers, instead, are rational and time their decisions based on investor sentiment; this is what is predicted both by the overvaluation hypothesis and the catering theory. However, according to our findings, including proxies for these two mechanisms has almost no impact on the investor sentiment coefficient, suggesting that the latter has an independent effect. Therefore, we consider two alternative hypotheses: one is that investor sentiment actually captures future growth opportunities, rather than beliefs not based on facts at hand and the other is coherent with the overoptimism theory, which implies that managers as well as shareholders are not fully rational and that their beliefs are subject to investor sentiment. In order to distinguish these two theories, we explore the short-run and long-run stock market reaction to merger announcements, focusing in particular on the impact investor sentiment has on them. We find that investor sentiment is positively correlated with a better stock market reaction in the short-run, but that this relationship is reversed in the long-run, providing evidence for the overoptimism hypothesis, i.e. that managers are more inclined towards announcing M&As in times characterized by higher investor sentiment and that deals announced under these circumstances are better perceived by the stock market, even though, all else being equal, they perform worse in the long-run than those announced when investor sentiment is lower.

Table 6.2: Results

	Dependent variable:
	BHAR
L.Sent2	-1.283^{***}
	(0.457)
CAAR.average	-3.289^{***}
	(1.170)
n.mergers.total	-0.0003^{***}
	(0.0001)
return.index	-0.247^{**}
	(0.083)
L.CAAR	0.311
	(0.287)
n.mergers	-0.005^{*}
	(0.003)
BHAR.average	-0.016^{**}
	(0.009)
L.ME-BE	-0.031^{***}
	(0.007)
L.logAT	0.007
	(0.010)
proport.size	-0.005
	(0.007)
diversifying	0.033
	(0.033)
Constant	1.273^{***}
	(0.118)
Observations	1087
R^2	0.047
Adjusted R^2	0.037
Residual Std. Error	0.493 (df = 1075)
F Statistic	5.286^{***} (df = 11; 1075)

*p<0.1; **p<0.05; ***p<0.01. BHAR is defined in equation (5). The announcement window runs from three days after an announcement to three years after the announcement. CAAR is defined in equation (4). The announcement window runs from two days prior to an announcement to two days after the announcement. L.Sent2 is lagged investor sentiment. We obtain it with the following procedure: we compute equation (2) on news published over a period running from four months before to one month before the merger announcement and we orthogonalize it; i.e. we regress it on a number of firms' variables and take the residuals. CAAR.average is the trailing 12-month average cumulative abnormal announcement return (CAAR), computed as the average CAAR for all sample mergers in the 12 months ending three days before an announcement. n.mergers.total is the number of sample mergers in the 12 months prior to an announcement. Return.index is the return on the value-weighted CRSP index in the year ending three days before a merger announcement. L.CAAR is CAAR for the most recent merger, provided that the merger was announced in the three years prior to the current announcement. n.mergers is the number of acquisitions announced by the bidder in the three years prior to the announcement. BHAR.average is the return in the 12 months ending three days before an announcement. Bidder L.ME-BE is the beginning of year market-to-book equity ratio, measured at the end of the year prior to the merger announcement. L.logAT is the beginning of year log of total assets. The ratio of target-to-bidder size is the ratio of target equity to bidder equity. If information on the target is missing, we use the variable on deal value from Zephyr. Diversifying merger is a dummy indicating whether the target and the bidding firm are in different industries. Industry dummies are included in the regressions but not shown in the table.

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Appendices

Appendix A Data

In the Thomson Reuters data set, every observation is a "news story", composed of a large amount of information: besides the article's body and headline, we are able to obtain the time of publication, the language and the topic or subject, identified by Reuters Identification Codes (RICs). We select articles written in English about specific companies: their RICs contain a letter that provides information on the asset type, the company's ticker, followed by a letter indicating the stock exchange in which its stock is traded. For example, the company Apple is identified by R.AAPL.N, where R shows that it is a tradable asset, AAPL is the stock's ticker and N states that the stock is exchanged on the New York Stock Exchange. Moreover, a news story can be updated, corrected or modified in some way; this is indicated by the variable "takeSequence", for which we select only the last version of each story.

Compustat and ExecuComp's companies are matched with those covered by CRSP thanks to the matching table provided by the latter. In order to combine the above-mentioned data sets with Zephyr, we employ three methods: the conversion between the ISIN and CUSIP codes, matching companies' tickers and firms' names. In particular, the CUSIP, provided by Compustat, is entirely contained in the ISIN, obtained from Zephyr, which includes a prefix of two letters indicating the firm's country and a random digit at the end. Hence, we derive an expected CUSIP from the ISIN code and match the companies; for the remaining firms we employ the tickers. Both methods do not ensure exact matches; hence, we also check firms' names. Finally, we manually search for those companies for which we did not find match.

In order to match Thomson Reuters and Compustat companies, first, we single out those news stories referring to companies that are traded on at least one of the main US stock exchanges, namely the New York Stock Exchange, Nasdaq and NYSE American. Next, we combine firms from the two datasets through tickers. However, given that a ticker does not uniquely identify a stock, for it can be assigned to multiple companies over time, we extract firms' names from each news story and check whether they match with names provided by Compustat, ignoring certain words such as "Inc.", "Corp.", "The" and their variations. A further check is conducted when we require that firms' names appear in news stories at least a certain number of times, as mentioned in section 3.

Appendix B Tables

Table B.1: News stories distribution

	Median	Mean	Total number of news
1996	10.00	20.57	210982
1997	10.00	20.17	228207
1998	10.00	20.36	218422
1999	10.00	21.87	217535
2000	13.00	23.77	224644
2001	17.00	27.08	228358
2002	17.00	29.07	239260
2003	17.00	25.00	271122
2004	16.00	23.71	278469
2005	16.00	24.11	220562
2006	16.00	23.31	222871
2007	16.00	24.07	234577
2008	16.00	26.53	242791
2009	16.00	25.87	252206
2010	16.00	25.04	246222
2011	16.00	24.53	237693
2012	17.00	26.93	229766
2013	18.00	26.97	248707
2014	17.00	24.44	259016
2015	16.00	22.46	238905
2016	16.00	21.06	219086
2017	17.00	21.03	206015
2018	16.00	20.88	203494

Table B.3: M&As per year

Year	N. of deals	N. of bidders	Max. n. of deals done by one firm
1997	70	60	4
1998	155	112	8
1999	235	136	16
2000	904	419	19
2001	901	438	19
2002	801	422	15
2003	765	405	14
2004	912	463	19
2005	1043	496	19
2006	1156	569	16
2007	1162	562	25
2008	985	479	25
2009	611	377	23
2010	913	486	16
2011	1063	567	23
2012	1148	607	41
2013	1043	574	41
2014	1319	731	38
2015	1265	703	38
2016	1079	643	34
2017	1204	732	34
2018	1076	668	40

Table B.4: Descriptive Statistics for M&A determinants

	Median	Mean	Std. dev.
CF	0.23	0.36	1.09
AT	261.5	1967.7	7708.82
LEV	0.22	0.23	0.19
ME-BE	2.01	3.66	4.25
Tobin's Q	1.44	2.61	2.42
EQISS.a	0.23	14.21	73.12
Div	0.00	0.02	0.03
AssetTang	0.16	0.25	0.24
FirmAge (months)	130.0	197.7	204.48
Prof	0.07	0.01	0.06

CF is cash flow, given by income before extraordinary items plus depreciation and amortization, all divided by total assets. AT is total assets. LEV is leverage, given by the ratio of total assets minus book equity and total assets. ME-BE is the market-to-book equity ratio. Book equity is given by total assets minus total liabilities plus deferred taxes and investment tax credit minus preferred stock plus convertible debt. If preferred stock is missing, we use the redemption value. L.ME-BE is the beginning of year market-to-book ratio of equity; the market value of equity is obtained from CRSP as the product of shares outstanding and share price, eventually summed over the different classes of shares. Tobin's Q is given by the ratio of total assets minus book value of equity plus market value of equity and total assets. EQISS.a is the ratio of the change in the book value of equity minus the change in retained earnings and total assets. Div is dividends and is computed as total annual dividend per share times shares outstanding divided by book value of equity. AssetTang is given by total property, plant and equipment over total assets. FirmAge is computed as the number of months in which the firm appears in CRSP. Profitability is computed as the ratio of income before extraordinary items plus income taxes minus preferred dividends and book value of equity.

Table B.5: Descriptive Statistics for stock market reaction analysis

	Median	Mean	Std. dev
CAAR	2.14	1.27	1.02
BHAR	-4.24	-3.51	8.52
CAAR.average	2.57	1.93	1.62
n.mergers.total	155.0	126.6	76.90
return.index	19.83	14.94	13.17
L.CAAR	0.32	1.62	7.16
n.mergers	1.34	0.92	1.03
BHAR.average	-0.85	9.49	23.94
ME-BE	2.66	4.67	5.87
AT	656.82	2679.12	10545.3
Diversifying		46.51%	
Proport.size	0.25	0.375	0.36

CAAR is defined in equation (4). The announcement window runs from two days prior to an announcement to two days after the announcement. BHAR is defined in equation (5). The announcement window runs from three days after an announcement to three years after the announcement. L.Sent2 is lagged investor sentiment. We obtain it with the following procedure: we compute equation (2) on news published over a period running from four months before to one month before the merger announcement and we orthogonalize it; i.e. we regress it on a number of firms' variables and take the residuals. CAAR.average is the trailing 12-month average cumulative abnormal announcement return (CAAR), computed as the average CAAR for all sample mergers in the 12 months ending three days before an announcement. n.mergers.total is the number of sample mergers in the 12 months prior to an announcement. Return.index is the return on the value weighted CRSP index in the year ending three days before a merger announcement. L.CAAR is CAAR for the most recent merger, provided that the merger was announced in the three years prior to the current announcement. n.mergers is the number of acquisitions announced by the bidder in the three years prior to the announcement. BHAR.average is the return in the 12 months ending three days before an announcement. ME-BE is the beginning of year market-to-book equity ratio of the bidder, measured at the end of the year prior to the merger announcement. AT is total assets. Diversifying is a dummy indicating whether the target and the bidding firm are in different industries, obtained as the three-digit SIC code from Compustat. Proport.size is the ratio of target equity to bidder equity. If information on the target is missing, we use the variable on deal value from Zephyr.

Appendix C Figures

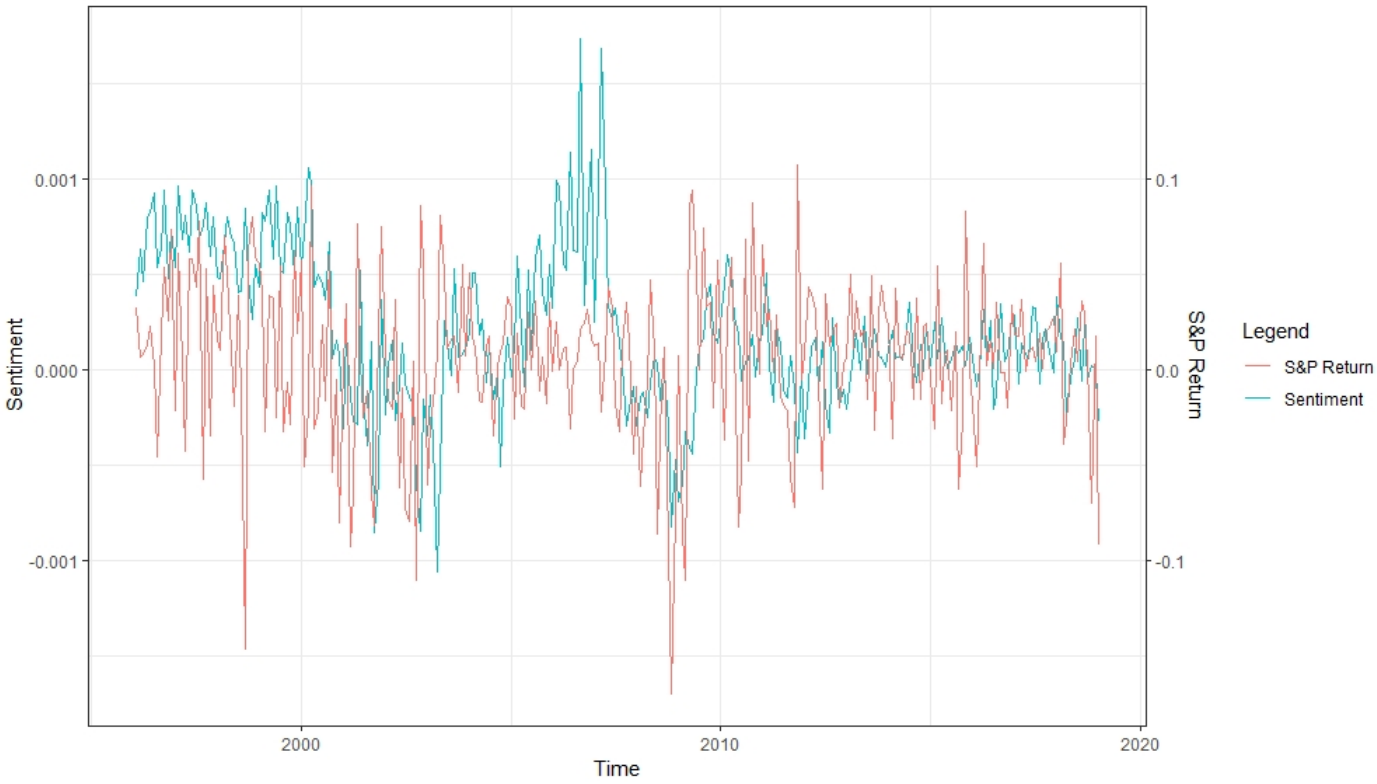

Figure C.1: Sentiment index and S&P index return