Media-Based Merger Arbitrage

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Executive Summary

Merger arbitrage is one of the most profitable investment strategies available to investment practitioners. Although it is mostly used by institutional investors such as hedge funds, it is increasingly being made accessible to retail investors as well through ETFs and mutual funds. While merger arbitrage is one of the most profitable trading strategies, it is surprising that the determinants of merger arbitrage success have received little attention in previous studies. This paper fills this gap by investigating a key determinant of merger arbitrage success: the financial media, for example financial newspapers and financial newswires. The financial media is important because it reveals new information that can increase the profitability of the merger arbitrage investment strategy. Consistent with this argument, we find that risk-adjusted alphas increase by more than 12 percentage points when trading on the information content of the financial press.

Keywords: Financial media, merger arbitrage, hedge funds, market efficiency, mergers and acquisitions.

JEL Codes: G34, G14, G11

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Abstract

Using a large sample of merger announcements, this paper provides strong evidence that information in financial media is not fully incorporated in stock prices. Cross-sectional regressions show that a one standard deviation increase in the media-implied probability of deal completion results in an increase of 1.2% in the subsequent twelve-day return. Media content information released on the announcement day contains information, not captured by announcement day stock returns, which are found to be largely unrelated to the probability of deal completion. The results for media coverage are much weaker. A trading strategy based on media content increases annualized alphas by 12.5%, while the effect of media coverage on alphas is statistically insignificant. Finally, we find weak evidence in favor of a certification role of the media, with the top newswire and top newspapers contributing more information to the market.

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1 Introduction

A key purpose of the financial media is to provide novel information to financial markets (Engelberg and Parsons (2011)). This information is likely to be particularly relevant during times when a corporate event takes place, since this introduces extra uncertainty and informational asymmetries are likely to be high. During such times, the information provided by the financial media may therefore be particularly valuable.

A contrasting view is that the information contained in financial media is already reflected in financial markets, or that it may be manipulated, and thus may be irrelevant or even mislead financial market participants (Gurun and Butler (2012), Ahern and Sosyura (2013)). Although there is a growing literature dealing with related questions, it is still unclear whether media provide information not yet incorporated in securities prices and, if this is the case, what the implications are for stock returns, corporate valuations, and shareholder wealth (Tetlock (2007), Tetlock et al. (2008), Barber and Odean (2008)). Furthermore, if information flows from the media to financial markets, we would like to understand the specific channels through which such information transmission takes place.

We investigate these questions by considering public announcements of a planned corporate merger or acquisition. During this event, one firm, the *acquirer*, tries to take over another firm, the *target*. The distinguishing feature of this event is the uncertainty about whether the planned acquisition will complete or fail. This uncertainty is used by so-called merger arbitrageurs, who place risky stock market bets that the acquisition will complete. By their nature, these bets are highly sensitive to new information about the likelihood of deal completion. We use this sensitivity as an identification strategy to test whether the financial media provides fundamental information about the merger or whether it is a potentially manipulated sideshow.

To quantify media-based information, we use a novel empirical approach that allows us to *directly* calculate the media-implied likelihood of deal completion. This methodology allows us to extract the media-based information that is directly relevant to the merger arbitrage investment strategy. It thus provides further insights about the specific channels of information transmission to financial markets.

We find that information in financial media is not fully incorporated in stock prices, even after twelve trading days. Our cross-sectional regressions show that a one standard deviation increase in the media-implied probability of deal completion results in an increase of 1.2% in the subsequent twelve-day return, corresponding to a monthly increase of 2.2%. Furthermore, time series tests show that the twelve trading days after an announcement date yield annualized risk-adjusted alphas of 18.5% for deals with a high media-implied probability of deal completion, while the alpha drops to 6% for deals with a low media-implied probability of deal completion.

While we find strong evidence that media content affects merger arbitrage returns, the result for media coverage, i.e. the frequency, with which the media report an

announced merger, is much weaker. For example, our time series regressions show that a one standard deviation increase in media coverage yields an increased return of only 0.3% whereas the same change in lagged media content yields a monthly increase in returns of 0.8%. Also, a trading strategy based on media content increases annualized alphas by 12.5%, while the effect of media coverage on alphas is statistically insignificant. So, while media manipulation may occur by increasing media coverage (Ahern and Sosyura (2013)), this does not seem to be the case for media content.

Our results show that media information released on the announcement day contains information, not captured by announcement day stock returns. In fact, a regression of announcement returns on media variables show insignificant results. Thus, announcement returns seem to be unrelated to the probability of deal completion and may largely reflect other information such as an assessment of whether a completed deal would create or destroy value. Finally, we find weak evidence in favor of a certification role of the media, with the top newswire and top newspapers contributing more novel information to the market.

The remainder of the paper is organized as follows. Section 2 reviews the related literature. We then introduce the merger arbitrage investment strategy in Section 3 and explain how we quantify media information in Section 4. In the remaining sections we describe an analyze the data: Section 5 details our data and shows summary statistics, while Section 6 presents our regression results. Finally, Section 7 concludes this paper.

2 Related Literature

This research project is related to four strands of the literature. The first strand is on mergers and acquisitions (M&A). Manne (1965) and Jensen (1986) are two cornerstones of the current literature because they show how mergers can create value. Manne's basic proposition is that the control of a firm constitutes a valuable asset and that through the M&A process an active market for corporate control exists. Jensen (1986) recognizes that control of a corporation is frequently in the hands of management instead of being in the hands of the corporation's shareholders. This leads to agency costs when a company has large cash flows but few high-return investment projects. Jensen proposes debt as a potential solution to this agency problem and shows that takeovers play a crucial role in this debt creation. Building on this basic literature, Grossman and Hart (1980) investigate the so-called free-rider problem that occurs in tender offers during takeovers. In their model, no target shareholder tenders his shares because every target shareholder tries to free-ride on other shareholders. Bagnoli and Lipman (1988) show how to overcome this free-rider problem by making a subset of target shareholders pivotal. The basic idea is that some shareholders get to know that their tendering decision is essential for the takeover deal to complete. Finally, a large empirical literature deals with the question of whether mergers create or destroy value.

For example, Savor and Lu (2009) show that overvalued acquirer firms create value for their own shareholders by using acquirer stock instead of cash to pay for acquisitions.

The second strand of the literature is on merger arbitrage. The key difference to the M&A literature discussed above is that the arbitrage literature deals with stock trading strategies of *deal outsiders*, who try to profit from the events surrounding mergers. Larcker and Lys (1987) show that merger arbitrageurs obtain private information about the outcome of a takeover deal and use this information to earn substantial returns. Many other studies confirm that merger arbitrage strategies earn high excess returns, sometimes more than 100 percent annually (Dukes et al. (1992), Karolyi and Shannon (1999), and Jindra and Walkling (2004)). Potential explanations include market inefficiencies, limits to arbitrage (Baker and Savaşoglu (2002)), and trading costs and premia for providing liquidity during market downturns (Mitchell and Pulvino (2001) and Mitchell et al. (2007)). Cornelli and Li (2002) argue that merger arbitrageurs have an informational advantage relative to target shareholders because arbitrageurs, hiding among noise traders, know that they bought shares.

The third strand of the literature is on the role of the media in finance. A first step is to consider how stock market indices incorporate new information from the financial press, as investigated by Tetlock (2007). He shows that, consistent with models of noise traders, the content of a Wall Street Journal column predicts downward pressure on the stock market, followed by a price reversal. Another hypothesis is that the media can alleviate informational frictions in the stock market, even if the media does not supply genuine news. Fang and Peress (2009) investigate this hypothesis and find that stocks with no media coverage earn higher returns than stocks with high media coverage. However, when considering the media and trading in the stock market, it is crucial to distinguish between the impact of media reporting and the impact of the events being reported. Engelberg and Parsons (2011) address this question and find that local media coverage causes local trading activity. Ahern and Sosyura (2013) and Buehlmaier (2012) show that media content can be manipulated during corporate acquisitions. Dyck et al. (2008) consider corporate governance and find that media coverage leads to reversals of corporate governance violations.

There is a fourth strand of the literature that uses text-based information in areas unrelated to the financial media. For example, Hoberg and Phillips (2009) use text-based information from 10-K statements to develop a novel method of industry classification and apply it to product differentiation as well as mergers and acquisitions (Hoberg and Phillips (2011)). Das and Chen (2007) and Antweiler and Frank (2004) analyze the text of stock message boards on the internet.

3 Introducing Merger Arbitrage

When a company (the *acquirer*) tries to "swallow" another company (the *target*), a so-called *merger*, *acquisition*, or *takeover* occurs. For the purpose of this paper, we use the terms *merger*, *acquisition*, and *takeover* interchangeably, although depending on their definition there can be subtle differences between them. *Merger arbitrage* is an investment strategy that bets on the outcome of a merger, i.e. whether or not the acquirer ends up "swallowing" the target. An alternative name for merger arbitrage is *risk arbitrage*. This section briefly reviews this investment strategy and clarifies the terminology surrounding it.

3.1 Outlining the Anatomy of a Typical Corporate Acquisition

Although each corporate acquisition is different, a typical timeline can be described as follows. In the *pre-announcement phase*, the management and the boards of both the target and the acquirer are in private negotiations about the potential sale of the target to the acquirer and the conditions of this sale. This phase is often shrouded in secrecy, and even the employees of the target and the acquirer (with exception of the senior management) are not aware of the ongoing negotiations. The negotiations are usually facilitated by investment banks, who also have to treat any knowledge of the ongoing negotiations confidentially. The negotiations may break down at any point in time, or they may reach the next stage, at which point the deal is made public. The date when the deal is made public is called the *announcement date*. Its purpose is to inform regulators and the shareholders of the target and the acquirer that a deal is in the making. The goal of the subsequent *post-announcement phase* is to obtain approval from both regulators and shareholders to complete the planned merger. If it is possible to obtain approval, the deal is *completed* and the firms merge. Otherwise the deal status is said to be *withdrawn* and the two companies continue to exist as two separate entities. The *resolution date* is the date when the deal either completes or is withdrawn.

Although most deals fit into the timeline above, there are some deals where the pre-announcement phase is skipped and no negotiations take place prior to the announcement date. These deals are called *unsolicited* since there are no prior negotiations and the acquirer directly approaches the target's shareholders instead of the target's management or board. Most unsolicited deals end up being *hostile*, meaning that the target's management and board oppose the takeover. There are, however, also unsolicited deals that turn friendly, with the target's board and management supporting the planned acquisition.

In the simplest case, the method of payment is cash, meaning that the acquirer pays a given amount of money to target shareholders in exchange for each target share. A deal of this type is known as a *cash deal* or *all-cash deal*. Instead of using cash,

the acquirer may wish to issue new acquirer stock and use this newly-issued acquirer stock to pay for the acquisition. In this case, the target shareholders give up ownership of their target stocks (which are subsequently canceled) and in return receive newly-issued stock of the acquirer. A deal of this type is called *all-stock deal*. This type of deal, however, is not very frequent. More often one settles on a deal where target shareholders receive both cash and acquirer stock. A deal of this type is called *stock deal*, where it is important to note that many stock deals also have a cash component. In this sense, a stock deal means that some of the payment to target shareholders (but not necessarily the whole payment) consists of acquirer stock, with the remaining part usually consisting of cash.

3.2 Profiting from Merger Arbitrage

The distinction between cash deals and stock deals is important for merger arbitrageurs since it determines which investment strategy they use. The simplest case for the arbitrageur is the cash deal, in which he simply buys the target stock on the stock market immediately after the public announcement of the deal. If the deal completes, the arbitrageur makes a profit that consists of the difference between the (cash) bid price and the price of the target stock when he bought it. If the deal is withdrawn, the arbitrageur sells his target stock, usually at a loss. Given this investment strategy, which is only based on public information, the arbitrageur makes a profit if the deal completes, and he may make a loss if the deal is withdrawn. The key takeaway is that conditional on the success of the takeover bid (i.e. when the deal closes), the arbitrageur makes a riskless profit. As in the textbook definition of arbitrage, this profit is already known in advance. (Sometimes the bid price is even revised upwards after the announcement date, which further increases the arbitrageur's profit.) Of course, it is unknown on the announcement date whether the deal will complete, which introduces a risk element to the arbitrage strategy. This is the reason why this investment strategy is commonly called *risk arbitrage*, although this terminology is somewhat of a misnomer. Throughout this paper we use the term *merger arbitrage* since this term, while also not being strictly correct, tends to create less confusion than the term *risk arbitrage*.

In contrast to a cash deal, a stock deal makes the life of a merger arbitrageur slightly more complicated. In addition to buying the target stock on the stock market, he also needs to short-sell the acquirer's stock in order to lock in a risk-free profit conditional on deal completion. Consider for example an all-stock deal. In this deal, the negotiations between the target and the acquirer result in a so-called *exchange ratio* being specified. This exchange ratio, denoted by δ, defines how many acquirer stocks a target stockholder may obtain for each target stock he holds. For example, if the exchange ratio is $\delta = 2$, then each target stock will be converted into two newly-issued acquirer stocks in case the deal completes. For the arbitrageur to lock in a risk-free profit conditional on deal completion, he thus short-sells δ acquirer stocks for each target stock

he buys. If the deal completes, he exchanges each target stock into δ acquirer stocks and uses these acquirer stocks to cover his short position. Since δ reflects a premium over the target's stock price at the announcement date, the arbitrageur makes a riskless profit if the deal closes. Suppose for example that shortly after the announcement date, the target's stock price is \$90 and the acquirer's stock price is \$50. The arbitrageur buys one target stock and short sells $\delta = 2$ acquirer stocks, leaving him with a positive cash flow of $\$10 = 2 \cdot \$50 - \$90$. When the deal closes, his cash flow is zero, since he can cover his short position in the acquirer stock by exchanging the target stock. He thus makes a riskless profit of \$10 per long-short position conditional on deal completion. In contrast, if the deal is withdrawn, the arbitrageur often loses money since he has to unwind his long position in the target and his short position in the acquirer, often at a loss.

As mentioned earlier in this section, there are only relatively few *all*-stock deals. Many deals that have a stock component also have a cash component. The merger arbitrageur's investment strategy in these so-called stock deals (which may also contain a cash component) is treated in the existing empirical literature in the same way as in *all*-stock deals (Mitchell and Pulvino (2001)). That is, although less than 100% of the payment is made in stock, the literature considers an investment strategy that shorts δ acquirer stocks for each target stock bought. The reason for this simplification is mainly data availability, since Thomson Reuters SDC Platinum, the most commonly used database on M&A, only has a dummy variable that indicates whether there is some stock component; it does not contain a variable that encodes how large the stock component is. In this paper, we thus follow the existing literature in constructing merger arbitrage returns for stock deals, with one minor extension. Often the exchange ratio is not available, even when the deal is marked as a stock deal. To approximate the exchange ratio in these cases, we use the average of the collar target ratios, in case they are available (Adolph and Pettit (2007)).

Building upon these merger arbitrage investment strategies, we calculate so-called *long-short* merger arbitrage returns as follows by distinguishing between stock deals and cash deals. For stock deals with known exchange ratio δ, the long-short return is given by the target's return minus δ times the acquirer's return. In stock deals, if the acquirer's return is missing or if the exchange ratio is missing, the long-short return is also assigned a missing value. For cash deals, the long-short return is given by the target's return, and is thus a long-"short" return only in a degenerate sense. Following this recipe, we can calculate long-short merger arbitrage returns for all deals, where it is important to keep in mind that for the cash deals this "long-short" investment strategy is degenerate. With the exchange ratio δ being set to zero for cash deals, we can write the long-short strategy returns shorthand as:

$$r_{Tar} - \delta r_{Acq},$$

where r_{Tar}, r_{Acq} denote the target stock return and the acquirer stock return, respec-

tively. In addition to this long-short merger arbitrage strategy, we also consider a simplified investment strategy that always invests in the target stock, independent of whether the acquisition is a cash deal or a stock deal.

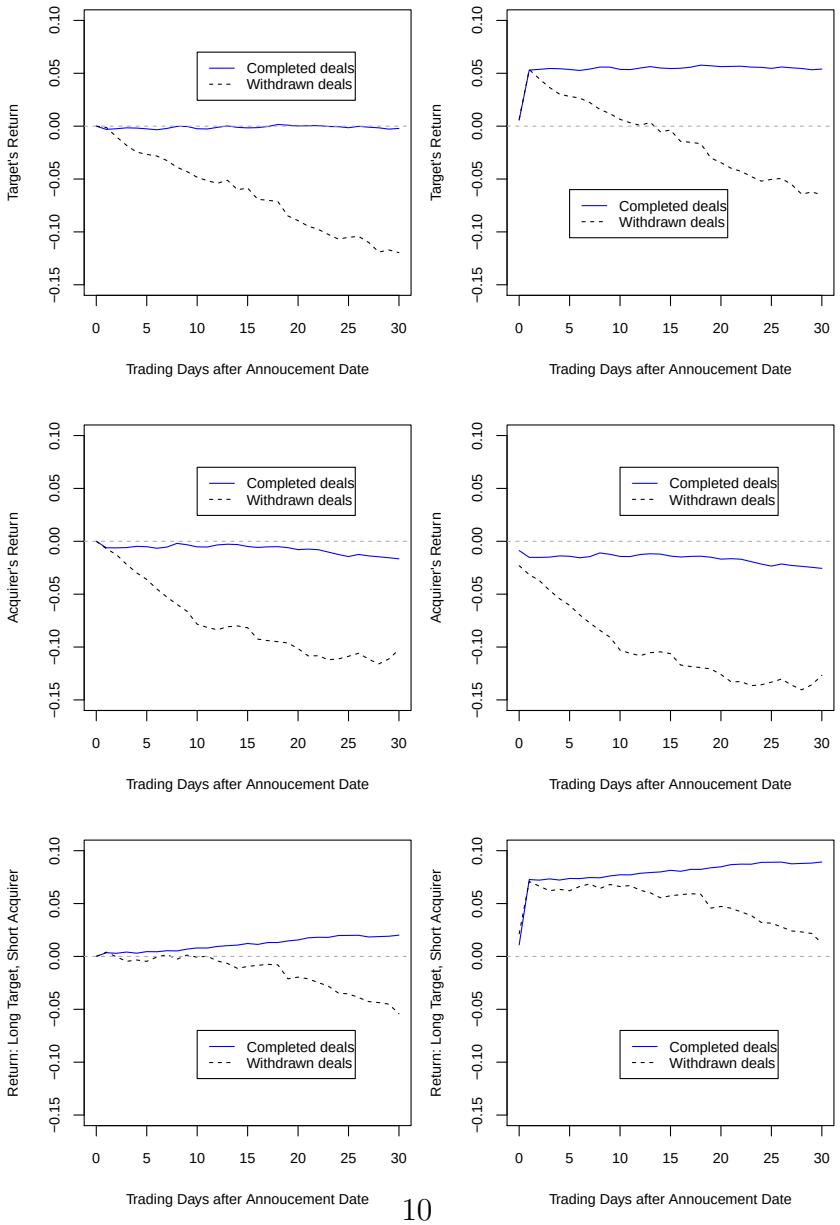
To ensure that there is no look-ahead bias in our sample, we follow the common practice in the literature to open merger arbitrage trading positions on the first trading day *after* the deal's announcement day. This is motivated by two considerations. First, some deals are announced after the markets close, which makes it impossible to trade on this information on the same day. Second, even if a deal is announced during trading hours, our databases dot not contain the exact announcement time of the day, and furthermore it is difficult to gauge how long it would take hedge funds to open their trading positions after the announcement. To be conservative and to follow the prior literature, we thus open trading positions only *after* the announcement day, calculating this day's return based on the opening stock price and closing stock price of that day. The left-hand side of Figure 1 shows these merger arbitrage returns for the target, the acquirer, and the long-short merger arbitrage strategy. The solid lines represent completed deals, while the dashed lines represent withdrawn deals. The right-hand side of Figure 1 shows the same returns, with the difference that these returns include the announcement day. The right-hand side returns thus do not correspond to a tradable investment strategy based only on public information.

Considering the left-hand column in Figure 1, we see that profiting from merger arbitrage is difficult if the announcement day is omitted. For completed deals, the target's cumulative stock return (shown in the top row) is close to zero without much variation. The target stock return for withdrawn deals becomes increasingly negative as time progresses. For the acquirer (shown in the middle row) a similar picture emerges, with the difference that even completed deals have slightly negative returns. In contrast, the long-short merger arbitrage strategy (shown in the bottom row) makes money if the deal completes, and loses money if the deal is withdrawn.

Figure 1 vividly illustrates that it makes a fundamental difference for the merger arbitrageur whether he invests in a deal that will be completed or in a deal that will be withdrawn. While deal completion/withdrawal becomes known with certainty only at the very end of a deal, Figure 1 shows that prices incorporate this information gradually. For merger arbitrageurs, it is thus essential to stay ahead of the curve by trying to obtain new information about the likelihood of deal completion. Since the financial media processes and disseminates merger-related information, we describe in the next section how this information can be quantified to be useful for the merger arbitrageur.

Figure 1: Arbitrage Returns for Completed Deals and Withdrawn Deals

This figure shows the cumulative event-time returns of the target's stock (row one), the acquirer's stock (row two), and the long-short strategy (row three). The long-short strategy consists of shorting the acquirer stock and going long the target stock in stock deals where an exchange ratio exists, and going long the target in cash deals. The returns in the left column of figures show the merger arbitrage returns. These returns start on the first trading day *after* the announcement day. For comparison, the returns in the right column of figures show hypothetical merger arbitrage returns that could be obtained if, hypothetically, the merger arbitrageur could capture the announcement day returns as well.



4 Constructing the Media Measures

Since our focus is on a subset of the financial media, namely the financial press, the key question is how to quantify a given press article. In this paper we employ two distinct media measures. The first is called *media coverage* and simply counts the number of press articles for a given day and a given acquisition deal. Since for our econometric analysis, especially the time series tests, the media coverage *surprises* are important, we also calculate an adjusted version of media coverage, adjusted by its exponentially-weighted moving average (EWMA). In particular, we obtain EWMA by defining a lambda-value of 0.88, and then multiplying lambda with the previous EWMA-coverage plus (1-lambda) times the current media coverage. The EWMA-adjusted *coverage surprise* is defined to be the difference between media coverage and its EWMA average.

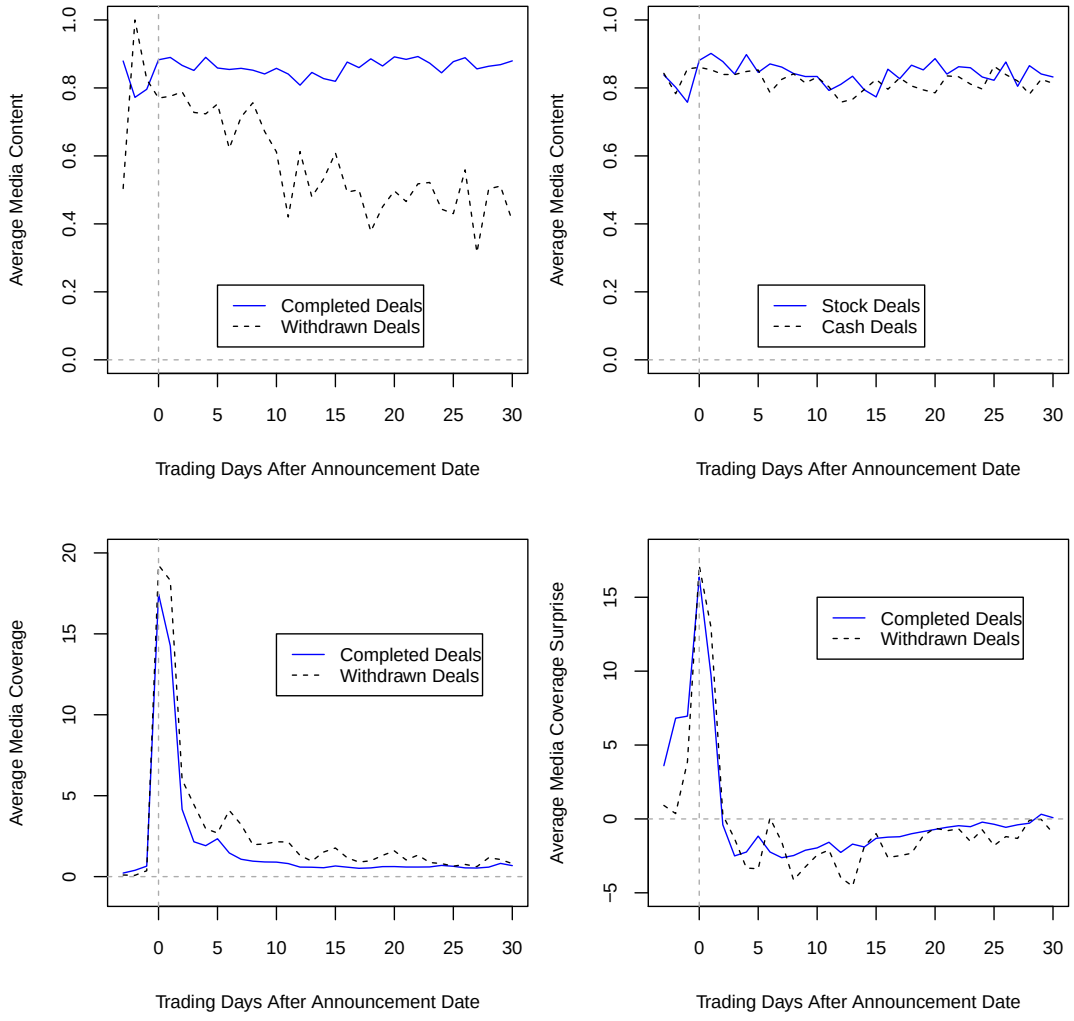
We call the second media measure *media content* since it analyzes the words used in a given press article, and also the article's length. The media content measure, for every press article, consists of a number between zero and one. The interpretation of this number is as follows: the larger this number (i.e. the closer to one), the larger the media-implied probability of deal completion. Our media content measure thus reflects the "opinion" of the financial press about the likelihood of deal completion. This is the relevant information for merger arbitrageurs, as we have seen in Section 3.2 in general and in particular in Figure 1. Changes of the media content measure over time can already be interpreted as content surprises, so we refrain from calculating an EWMA-adjusted media content measure.

Figure 2 shows time series plots for both media content and media coverage. From left to right, top to bottom, the first plot shows that the media content measure indeed is able to capture what it is supposed to capture: the media-implied probability of deal completion vs. deal withdrawal. More importantly, it shows that even on the announcement day (date 0), the solid line is above the dashed line, meaning that already on the announcement day, the media can distinguish between deals that will later complete and deals that will later be withdrawn. The second plot shows that media content does not differ meaningfully for cash deals and stock deals. This plot is included since Section 3.2 discusses how the merger arbitrageur uses different investment strategies, depending on whether he invests in a cash deal or stock deal. The third and fourth plot show that most press articles appear on or shortly after the announcement day. After the announcement day, media activity levels off, where withdrawn deals receive slightly more press coverage than completed deals. Although coverage is slightly higher for withdrawn deals, the fourth plot in particular shows that withdrawn deals exhibit more time series variation in media coverage than completed deals.

The construction of the media content measure can be explained by way of analogy with a regression, before we formally describe our model of media content. On the left-hand side, we have a dummy variable that is one if the deal completes and zero if the deal is withdrawn. On the right-hand side of this "regression," we have independent

Figure 2: Media Measures: Time Series Plots

This figure shows time series plots of media content (top row) and media coverage (bottom row). The announcement day corresponds to date zero on the plots. From left to right, top to bottom, the first plot shows media content split up by completed deals and withdrawn deals. The second plot shows media content split up by stock deals and cash deals. The third plot shows raw media coverage, while the fourth plot shows EWMA-adjusted media coverage.



variables that correspond to the frequencies of words in the press article. This way we have a model where we have on the left-hand side the dependent variable that is relevant for merger arbitrageurs (i.e. deal completion/withdrawal) and on the right-hand side we have the press article, or, to be precise, a representation thereof. For this model to be estimated, we need to ensure that there is no look-ahead bias.

To avoid any look-ahead bias during estimation, we partition our data in several subintervals that correspond to one quarter of a year. Using these quarters, we then estimate the model separately for each quarter and use the estimated model to predict the next quarter out-of-sample. For example, we use a random sample from quarter four to estimate the model, and then use this model to predict quarter five. By *prediction* we mean that we input each press article that appears in quarter five on the right-hand side of the model and use the estimated model to predict its left-hand side variable. This variable is the out-of-sample *media-implied probability of deal completion* for each press article. While we refer to this measure as *media content*, it is important to keep in mind that we are referring to a very special type of media content, namely the media content that is relevant for merger arbitrageurs. In case several press articles appear on a given day for a given deal, we aggregate the media-implied probabilities by taking averages to arrive at our media content measure. Since probabilities are between zero and one, our aggregated measure also has this property and thus is easy to interpret: the higher the value of the media measure (i.e. the closer to one), the higher the media-implied probability of deal completion.

To operationalize the media content measure discussed above, we use a standard model from the computational linguistics literature and statistical learning literature called *naïve Bayes model* (Hornik et al. (2008)). While this model is the oldest algorithm used to classify text, it continues to be among the most successful algorithms for text classification, despite, or maybe because of, its simplicity. Although the recent finance literature has proposed other measures to deal with text, such as counting how words fit into various psychological categories, these analyses do not fit into the regression-like framework discussed above and thus cannot extract the media-implied probability of deal completion the way we do.

While the use of the naïve Bayes model in finance is not new (Antweiler and Frank (2004), Das and Chen (2007)), we propose a novel way to *apply* it by estimating and predicting the outcome of a corporate event, i.e. deal completion or deal withdrawal. Instead of estimating the model on realizations of corporate events, previous studies used humans to read and classify a number of text documents whose classifications were then used to estimate the model. While this approach certainly has merit in some applications, we circumvent the subjectivity associated with this approach by getting rid of the human element. Instead, given our research question, we can directly use the variable of interest, deal completion, to estimate the naïve Bayes model.

Before estimating this model, we preprocess the press articles (Feinerer et al. (2008)). In particular, we remove stop words such as "as" and "the," convert all words to low-

ercase, and use stemming to erase word suffixes and retrieve their radicals. We then remove words that occur only very infrequently in each press article. After these steps, we are left with a set of words whose frequencies we can calculate for every press article. For example, let us calculate the word frequencies for a simplified version of the previous sentence:

> We are left with words whose frequencies we can calculate.

The frequency of the word "we" is 2, while the frequency of all other words is 1. Repeating this procedure for every press article, we obtain a representation of each article given by its word frequencies. This representation can be used as independent variables on the right-hand side in our regression-like approach, as discussed above.

Press articles are released on all days of the week, not only on trading days. To align media information to stock returns, we proceed as follows. During trading days, e.g. on Wednesdays, we assign all the press articles released on Wednesday to the contemporaneous media measures, and all press articles released on Tuesday to the lagged media measures. On trading days after weekends or holidays, e.g. on Mondays, we use for the contemporaneous media measures the information starting after the previous trading day up until the current trading day, i.e. Saturday, Sunday, and Monday. For lagged measures we use media information from the previous trading day, i.e. Friday.

5 Data and Summary Statistics

Our merger-related data is from Thomson Reuters SDC Platinum. We apply the following screens to merger data, which include disclosed value mergers & acquisitions, tender offers, and exchange offers. The deal's announcement date is in the eleven years between January 1, 1999 and December 31, 2009, which ensures that we include both the dot-com bubble and the financial crisis of 2007–2008. Furthermore, almost all deals that were announced in this time period are either completed or withdrawn at the time of this writing, which means that we are not biasing our sample by excluding long-running deals in a non-random way. Both the target and the acquirer have to be public companies to ensure that stock market data are available. We remove all non-US companies to avoid cross-border mergers, since national interests instead of economic forces often dominate the discussion in those deals. We also exclude challenged deals (i.e. deals with several bidders) since media content can be fundamentally different during bidding wars. Industries that are relatively strongly regulated are also excluded, i.e. energy and power, financials, and government and agencies. Deals where the acquirer CUSIP and target CUSIP are identical are removed to avoid contaminating the sample with self-tenders or recapitalizations. We only keep deals where the deal status is completed or withdrawn, where the acquirer owns more than 50% of the target shares after a merger, and where the acquirer purchases at least 20% of the outstanding shares.

Table 1: Summary Statistics of Nominal Variables
The variable *Deal Status* indicates whether the acquirer merged with the target. *Stock Deal* indicates whether the acquirer paid for the merger using its own stock or cash only. If *Stock Deal* is *yes*, at least 50% of the merger consideration offered is in the form of acquirer equity. The variable *Unsolicited* denotes whether the acquirer made an offer without prior negotiation with the target.

Variable	Levels	Observations	%
Deal Status	withdrawn	112	10.1
	completed	995	89.9
Stock Deal	no	529	47.8
	yes	578	52.2
Unsolicited	no	1037	93.7
	yes	70	6.3

Of the deals that survive these screens, we keep the largest 1200 deals as measured by deal value (i.e. the value of the target).

After having created our sample containing the mergers, we add data from the financial press from Dow Jones Factiva, stock market data from the Center for Research in Security Prices (CRSP), and accounting data from Compustat. A key challenge is to match our merger data from SDC with data from Factiva. To ensure the highest possible data quality, we manually construct text strings that can be used as search terms in Factiva. We do this separately for the target and acquirer, leaving us with 2400 manually constructed search terms. We then recombine those search terms by requiring that both the search term for the target and the acquirer occur in the first 100 words of a press article. Downloading articles that appear later than the seven days preceding a deal's announcement date and before a deal's resolution date leaves us with a sample of 130,589 press articles from Factiva. After merging all databases we are left with 1107 mergers.

To be able to separately investigate the information content of newspapers containing the largest number of articles, we define a group called *top newspapers* that contains the union of the top four newspapers and the top four domestic newspapers. This set is given by The Wall Street Journal (2,873 articles), The New York Times (1,621 articles), Financial Times (1,613 articles), The Globe and Mail (956 articles), The Washington Post (757 articles), and eWeek (743 articles). For comparison, we also consider the newswires. Since the top newswire, Dow Jones News Service (15,298 articles), already contributes more articles than the top newspapers combined, we only focus on Dow Jones News Service when analyzing top newswires.

Table 1 shows summary statistics for nominal variables. It documents that approximately 90% of all mergers complete in the sense that the acquirer merges with

the target. This number is highly relevant for merger arbitrageurs, since merger arbitrage is a bet where the arbitrageur wins if the deal completes. Unconditionally, the merger arbitrageur thus expects to win. However, in the few cases in which he loses this bet, his losses can be substantial. Another important deal characteristic is whether the acquirer pays for the deal using his own stock or using cash. If he uses cash, the merger arbitrageur only needs to buy the target stock in order to lock in a profit in case the merger closes. On the other hand, in case the arbitrageur pays for the deal by issuing more of his own stock, the merger arbitrageur shorts the acquirer stock in addition to buying the target stock. This strategy allows the arbitrageur to lock in a profit in case the merger closes. Table 1 shows that roughly half of the deals in our sample have a stock component. Finally, since nowadays many firms use anti-takeover devices, Table 1 shows that almost 95% of all deals are solicited in the sense that prior negotiations between the acquirer and target took place before the public announcement of the deal. This is also a reason why almost 90% of all deals in our sample are completed, since target resistance is unlikely after successful negotiations prior to the public announcement.

Table 2 provides an overview of our media measures, stock returns, firm characteristics and remaining deal characteristics not already presented in Table 1. The media measures are calculated on the day before the first trading day after the announcement day. (Except for weekends and holidays, this day is the announcement day.) Consistent with the fact that most deals complete, the media content is 0.87 on average, showing that the media correctly reflects the 90% likelihood of deal completion. The media coverage surprise is positive on average, reflecting the fact that the news coverage is abnormally high around the public announcement of a new deal. Merger arbitrage returns range from minus one percent to plus one percent in a twelve day window that starts after the announcement date. Merger arbitrageurs who short the acquirer in stock deals in addition to buying the target make on average one percent, while arbitrageurs who only buy the target lose one percent on average. Consistent with the free cash flow hypothesis, targets hold more cash relative to total assets than acquirers and have higher book to market ratios (Jensen (1986)). Targets are also smaller than acquirers, consistent with the notion that in most cases the larger firm takes over the smaller firm. The stock market reaction to the public announcement of the deal is on average positive for the target and negative for the acquirer, with the target stock gaining one percent and the acquirer stock losing one percent. A deal takes on average 115 days until it either completes or gets withdrawn. However, the distribution of the deal duration is skewed, with the median being only 92 days, corresponding to roughly three months. Acquirers usually pay a premium over the target's share price. Acquirers hope to convince the target's board and the target's shareholders to approve the deal by paying more than the market price of the target. This is reflected on average by a premium of 33%. One reason for the acquirer's willingness to pay a premium is the fact that an acquisition of the target does not only give him ownership, but also control of

Table 2: Summary Statistics of Cardinal Variables

The variable $Content_{DA}$ denotes the media content on the day before the first trading day after the announcement day. (Except for weekends and holidays, this day is the announcement day, which motivates the usage of the subscript DA.) $Coverage_{DA}$ is media coverage surprise. Section 4 details the construction of these media measures. The number δ denotes the deal's exchange ratio, and r_{Tar}, r_{Acq}, r_{Mkt}, and r_f are the target's return, the acquirer's return, the stock market's return, and the return on the risk-free rate starting on the first trading day after the announcement day until twelve days afterwards. These returns capture the returns to merger arbitrageurs. Following the literature, the announcement date is excluded since merger arbitrageurs often cannot open their stock trading positions on the announcement day. The remaining variables are firm characteristics such as cash to total assets, book to market, and size ($ millions), followed by announcement day returns, the deal's duration in days, and the premium paid by the acquirer. All returns are log-returns, and the premium is also expressed using logarithms.

Variable	Min	P_{25}	Mean	Median	P_{75}	Max	Std. Dev.
Content_{DA}	0.00	0.83	0.87	0.99	1.00	1.00	0.21
Coverage_{DA}	-0.42	4.86	17.73	9.68	19.08	649.56	34.51
r_{Tar}	-0.97	-0.02	-0.01	0.00	0.02	0.75	0.12
$r_{\text{Tar}} - r_f$	-0.97	-0.02	-0.01	0.00	0.02	0.75	0.12
$r_{\text{Tar}} - r_{\text{Mkt}}$	-0.98	-0.04	-0.01	0.00	0.04	0.69	0.12
$r_{\text{Tar}} - \delta r_{\text{Acq}}$	-0.97	0.00	0.01	0.00	0.02	0.70	0.09
Tar. Cash/Total Assets	0.00	0.04	0.28	0.20	0.47	0.99	0.26
Acq. Cash/Total Assets	0.00	0.04	0.21	0.13	0.32	0.93	0.22
Tar. B/M	0.00	0.22	0.52	0.42	0.69	5.52	0.45
Acq. B/M	0.01	0.17	0.40	0.31	0.54	3.28	0.34
Tar. Size	2965.04	126593.50	1666167.28	376215.75	1125051.18	106213318.06	5895458.97
Acq. Size	23700.25	886775.22	23736267.96	3292817.12	16451593.36	531153308.38	54332026.58
$r_{DA,Tar}$	-1.02	-0.02	0.01	0.00	0.03	0.55	0.08
$r_{DA,Acq}$	-0.40	-0.03	-0.01	0.00	0.02	0.31	0.06
Deal Duration	0.00	65.50	114.81	92.00	138.00	1063.00	82.03
Premium	-1.93	0.17	0.33	0.32	0.49	1.30	0.28

the target. The premium is thus often also referred as the *control premium*.

Table 3 shows summary statistics broken down by the years in which the deal's announcement has been made. It shows the golden years of M&A in the late 1990s leading up to the year 2000 until the burst of the dot-com bubble. Almost 20% of the deals in our sample were announced in 1999 alone. The AOL Time Warner deal, one of the most significant mergers in recent history, took place during these golden years, being valued at US$164 billion. The more recent peak of merger activity in 2007 is still by far eclipsed by the merger activity in 1999 and 2000. Consistent with overvaluation theories, the lowest percentage of cash deals occurs in 2000 at the peak of the dot-com bubble. In this year, only 31% of acquirers paid exclusively in cash for their acquisitions. This means that overvalued acquirers used their *own* stock to pay for acquisitions, as has been the case in the AOL Time Warner deal. In more recent years, the percentage of cash deals has increased, peaking at almost 80% in the crisis year of 2007. This profound increase in cash deals might be due to the fact that target shareholders got burnt in the dot-com bubble and now follow a "cash is king" philosophy to avoid being paid in overvalued stock.

Table 3 also shows that media coverage of M&A activity has seen a substantial increase over the years. This effect is not due to a longer deal duration, since the average deal duration fluctuates only slightly around its mean of 115 days. In 1999, each deal was mentioned on average in 46 press articles, while in 2009 each deal was mentioned in 171 press articles. This is an increase in media coverage of almost 300% in ten years. While this increase might be explained by increased media attention, it might also be due to less data availability in earlier years in the Factiva data base. Media content, on the other hand, exhibits a seasonal patter. In 1999, the year with the most announced deals, media content peaked at 0.89 and subsequently dropped to 0.76 in 2002, when merger activity was most depressed. Media content then again peaked at 0.95 in 2005 and 0.90 in 2007 before the financial crisis started, and dropped sharply to 0.74 in the following year. Since media content reflects the media-implied probability of deal completion, this seasonal pattern shows that media content reflects the ups and downs of the M&A market quite well. It is thus a first confirmation that media content picks up important information about mergers and acquisitions.

Table 4 investigates media content and media coverage during the timeline of a typical M&A deal. Panel A shows the media measures in the week before the public announcement of the deal. Here it is important to keep in mind that for a press article to be included in our sample, it has to mention both the acquirer name and the target name in the first 100 words of the article. Surprisingly, the table shows that although no public announcement about the deal has been made, on average seven articles are published every day mentioning the target and the acquirer. Two articles per day are even published in the top newspapers. While one explanation is that there might already be some rumors in the press about the impending merger, a simpler explanation is that both the acquirer and the target do business in related areas or industries. Even

Table 3: Summary Statistics Year by Year

This table breaks down merger data and media data according to years. The column *percentage of cash deals* refers to deals where the merger consideration did not contain a stock component, meaning that target shareholders only got paid in cash. Media coverage and media content is measured starting from the deal's announcement date until the resolution date, when the deal is either completed or withdrawn. The media measures as well as market values in this table are averaged across all deals that were announced in a given year. More details about the construction of the media measures are available in Section 4.

Year	Number of Mergers	Percentage of Cash Deals	Average Deal Duration	Target Market Value ($ Billions)	Acquirer Market Value ($ Billions)	Coverage During Deal	Content During Deal
1999	212	36%	117 (96)	1.3 (3.6)	29.7 (63.3)	45.8 (66.0)	0.89 (0.14)
2000	188	31%	111 (71)	2.2 (8.7)	27.6 (76.1)	67.4 (297.1)	0.86 (0.21)
2001	110	28%	113 (57)	1.1 (2.6)	21.1 (44.1)	64.2 (98.6)	0.85 (0.15)
2002	72	47%	122 (120)	1.2 (6.0)	12.4 (33.6)	95.6 (237.5)	0.76 (0.23)
2003	83	48%	113 (79)	0.8 (1.8)	15.8 (42.2)	107.3 (305.1)	0.86 (0.18)
2004	74	47%	127 (80)	2.2 (7.6)	10.7 (22.1)	97.4 (175.2)	0.86 (0.20)
2005	85	56%	111 (63)	2.1 (6.0)	27.8 (48.8)	137.8 (275.1)	0.95 (0.08)
2006	81	73%	112 (64)	2.2 (7.4)	23.8 (38.7)	123.9 (370.2)	0.85 (0.16)
2007	91	79%	111 (81)	1.3 (1.6)	24.6 (51.8)	109.7 (250.6)	0.90 (0.13)
2008	64	75%	105 (94)	1.8 (5.2)	23.8 (53.4)	149.7 (507.9)	0.74 (0.27)
2009	47	57%	130 (87)	3.1 (9.5)	31.0 (45.8)	171.3 (270.0)	0.75 (0.20)
Complete Sample	1107	48%	115 (82)	1.7 (5.9)	23.7 (54.3)	92.0 (262.9)	0.86 (0.19)

Table 4: Summary Statistics of Media Content and Media Coverage
This table splits up the timeline of a merger into three periods: the pre-announcement period (Panel A), the announcement date (Panel B), and the post-announcement period (Panel C). The pre-announcement period starts seven days before the announcement date, while the post-announcement period ends on the deal's resolution date, when the deal either completes or is withdrawn. In all panels, media content and media coverage is further divided into all news sources, the top newspapers, and the top newswire. The top newspapers consist of The Wall Street Journal, The New York Times, Financial Times, The Globe and Mail, The Washington Post, and eWeek. The top newswire is Dow Jones News Service. We only focus on a single newswire for comparison since it alone produces more articles than the top newspapers combined. More details about the construction of the media measures are available in Section 4.

			Percentile			
	Mean	Std. Dev.	25th	50th	75th	Obs.
Panel A: Media Information Before Announcement Date						
Number of articles per deal-day	6.55	12.17	1	2	6	265
Number of top newspaper articles per deal-day	2.48	2.14	1	2	3	67
Number of top newswire articles per deal-day	2.75	2.71	1	1	4	71
Average media content per deal-day	0.823	0.319	0.83	1.00	1.00	265
Average media content in top newspapers per deal-day	0.720	0.427	0.28	1.00	1.00	67
Average media content in top newswire per deal-day	0.773	0.364	0.64	1.00	1.00	71
Panel B: Media Information During Announcement Date						
Number of articles per deal-day	19.42	31.15	6	11	21	958
Number of top newspaper articles per deal-day	2.29	2.08	1	1	3	159
Number of top newswire articles per deal-day	3.86	5.47	1	2	4	898
Average media content per deal-day	0.873	0.210	0.83	0.99	1.00	958
Average media content in top newspapers per deal-day	0.859	0.310	1.00	1.00	1.00	159
Average media content in top newswire per deal-day	0.890	0.250	0.98	1.00	1.00	898
Panel C: Media Information After Announcement Date						
Number of articles per deal-day	4.17	9.33	1	2	4	25426
Number of top newspaper articles per deal-day	2.01	2.19	1	1	2	3807
Number of top newswire articles per deal-day	1.50	1.47	1	1	1	7211
Average media content per deal-day	0.821	0.330	0.82	1.00	1.00	25426
Average media content in top newspapers per deal-day	0.757	0.393	0.51	1.00	1.00	3807
Average media content in top newswire per deal-day	0.812	0.357	0.92	1.00	1.00	7211

if there is a "latent" rumor about a potential merger, it is certainly not "hot," since on the announcement date, media coverage jumps to 19 articles per day, an increase of over 170%. Likewise, media content increases to 0.87 on the announcement date from 0.82 in the preceding week. More importantly, the standard deviation decreases to 0.21 from 0.32 in the preceding week. This implies that media content becomes more precise on the announcement date relative to the preceding week, consistent with more information being released on the announcement date. Media activity after the announcement date becomes less intensive again, with 4 articles per day being released on average. However, it is important to keep in mind that the post-announcement period lasts for 115 days on average (see Table 2), and a low number of articles *per day* does not mean that less information comes out. On the contrary, the total number of press articles in the post-announcement period far exceeds the number of press articles on the announcement day. So while the information intensity is highest on the announcement day, the total amount of press articles is highest in the post-announcement period. Of course, more press articles does not automatically equate to more information. Following this line of thought, we also see an increase in the standard deviation of media content to 0.33 after the announcement date, indicating that post-announcement, there is more disagreement in the media. Another point to note is that Dow Jones News Service, the top newswire, consistently has a larger media content measure than the top newspapers, while having a consistently lower standard deviation of media content. This means that on average, Dow Jones News Service has a higher media-implied probability that the deal completes, while having less disagreement than the top newspapers.

6 Merger Arbitrage and the Financial Media

We begin this section by examining the cross-sectional correlations on each deal's announcement day in Table 5. There are several reasons for examining the announcement day. One reason is that media coverage has a distinct spike around this date because many new press articles are released, showing that information intensity is particularly high during this day, as shown in Figure 2. Furthermore, Figure 2 shows that media content can already differentiate on this early day whether a deal will close or will be withdrawn, thus further underlining the importance of this day.

Table 5 provides information regarding the correlation between our two media measures on the announcement day, as well as the relation to the announcement day stock returns. The announcement day returns of the target and the acquirer are relevant since they are traditional measures used to reflect the stock market's evaluation of the information released during the merger's announcement.

The first two regressions in Table 5 show that media coverage and media content are negatively related, implying that the more press articles are released, the smaller is the media-implied probability of deal completion. The table shows that this effect is not

Table 5: Media Determinants and Announcement Day Return Determinants

The first two regressions have media content and EWMA-adjusted media coverage as the dependent variables. Both media measures only use articles that appear on the day before the first trading day after the announcement. (Except for weekends and holidays, this day is given by the announcement day.) The last two columns have the announcement days of the target and the acquirer as their dependent variables. The regression coefficients ">0" or "<0" denote positive or negative numbers that are too small to print, given the number of digits after the decimal mark. The symbols *, **, and *** indicate significance at 10%, 5%, and 1%, respectively, based on robust standard errors.

Dependent Variable:	Content_{DA}	Coverage_{DA}	$r_{DA,Tar}$	$r_{DA,Acq}$
Intercept	0.933***	-123.777***	0.020	-0.054**
	(12.025)	(-6.524)	(0.563)	(-2.243)
Content_{DA}		-16.114**	0.007	-0.003
		(-2.283)	(0.402)	(-0.319)
Coverage_{DA}	-0.001***		<0	>0
	(-2.962)		(-0.927)	(0.085)
log(Tar. Cash/Total Assets)	-0.003	-0.116	-0.002	-0.002
	(-0.656)	(-0.243)	(-1.112)	(-1.334)
log(Acq. Cash/Total Assets)	0.009	2.409***	>0	-0.001
	(1.378)	(2.842)	(0.082)	(-0.348)
log(Tar. B/M)	-0.012	2.204**	-0.002	-0.001
	(-1.603)	(2.238)	(-0.688)	(-0.793)
log(Acq. B/M)	-0.019*	1.224	0.003	0.003
	(-1.777)	(1.235)	(0.917)	(1.158)
log(Tar. Size)	-0.009	10.874***	-0.003	-0.001
	(-1.255)	(7.947)	(-1.593)	(-0.338)
log(Acq. Size)	0.004	1.438**	0.001	0.004***
	(0.821)	(2.282)	(0.455)	(3.127)
$r_{DA,Tar}$	0.056	-9.202		0.232***
	(0.400)	(-0.890)		(4.677)
$r_{DA,Acq}$	-0.046	1.057	0.390***	
	(-0.319)	(0.085)	(6.823)	
Unsolicited=Yes	-0.196***	7.330	0.030**	-0.004
	(-5.338)	(0.804)	(2.175)	(-0.581)
Stock Deal=Yes	0.008	2.795	0.007	-0.019***
	(0.534)	(1.294)	(1.374)	(-5.478)
Premium	-0.010	-0.444	0.025***	-0.004
	(-0.447)	(-0.232)	(2.759)	(-0.644)
R^2	0.108	0.281	0.119	0.155
Observations	910	910	910	910

caused by a size effect, since the regressions control for various company characteristics including size and deal characteristics. Except for the acquirer's book to market ratio, media content is unrelated to firm characteristics of the acquirer and the target, showing that media content contains novel information that is not available elsewhere. Since unsolicited deals are often withdrawn, the negative correlation of the unsolicited dummy with media content is consistent with media content implying a high probability of deal withdrawal in those cases.

Media coverage, on the other hand, correlates positively with target size, acquirer size, and the acquirer's cash on hand. The first two correlations are consistent with the notion that larger deals generate more media attention, while the third correlation with acquirer's cash (but, interestingly, not target's cash) may be interpreted as weak evidence consistent with the acquirer trying manipulate media coverage in his favor, e.g. by hiring PR firms to spin the news (Ohl et al. (1995), Ahern and Sosyura (2013), Buehlmaier (2012)). Interestingly, in case the acquirer indeed tries to spin the news, he is not very successful in spinning the media-implied probability of deal completion, since acquirer cash is insignificant in the first regression. This does, however, not mean that the acquirer is unsuccessful spinning media content in general, since our media measure only picks up the part of the media content that is relevant for deal completion (and not necessarily other parts).

Table 5 shows that while the announcement day returns of the target and the acquirer are positively related to each other in regressions in the last two columns, they are unrelated to both media coverage and media content in all four regressions. This result shows that if our media measures contain novel information, this information is not reflected in the stock market's assessment of the merger announcement. Furthermore, these results show that the announcement day returns reflect information unrelated to deal completion, for example the assessment of whether a merger creates or destroys value.

6.1 Cross-Sectional Merger Arbitrage Results

In Table 6 we present cross-sectional evidence relating merger arbitrage returns to media content and EWMA-adjusted media coverage. The regressions in this table are predictive in the sense that all realizations of the dependent variables happen after the realizations of the independent variables. The media content and media coverage variables in these regressions are constructed using data from the day before the first trading day after the announcement day. In most cases, except for weekends and holidays, this day is given by the announcement day. The dependent variables are cumulative stock returns that start on the first trading after the announcement day and end twelve days afterwards (Baker and Savaşoglu (2002)). We consider target stock returns, excess target stock returns (over the risk-free interest rate and over the stock market's return) and returns from the long-short investment strategy. Cross-sectionally, we find that

Table 6: Predicting Returns Cross-Sectionally

This table shows predictive regressions of merger arbitrage returns on media content, EWMA-adjusted media coverage, and control variables. The media measures are constructed using data from the day before the first trading day after the announcement day. (Except for weekends and holidays, this day is the announcement day.) The dependent variables are cumulative returns that start on the first trading day after the announcement day and end twelve days afterwards. The regressions in this table are predictive in the sense that the realizations of the dependent variables (the merger arbitrage returns) occur after the realizations of the independent variables. The regression coefficients ">0" or "<0" denote positive or negative numbers that are too small to print, given the number of digits after the decimal mark. The symbols *, **, and *** indicate significance at 10%, 5%, and 1%, respectively, based on robust standard errors.

Dependent Variable:	r_{Tar}	$r_{\text{Tar}} - r_f$	$r_{\text{Tar}} - r_{\text{Mkt}}$	$r_{\text{Tar}} - \delta r_{\text{Acq}}$
Intercept	-0.088	-0.088	-0.064	0.066
	(-1.512)	(-1.514)	(-1.257)	(0.938)
Content_{DA}	$0.056^{\star\star\star}$	$0.056^{\star\star\star}$	$0.045^{\star\star}$	-0.009
	(2.857)	(2.838)	(2.492)	(-0.335)
Coverage_{DA}	>0	>0	>0	$<0^{\star\star}$
	(0.524)	(0.578)	(0.885)	(-2.165)
log(Tar. Cash/Total Assets)	$-0.006^{\star\star}$	$-0.006^{\star\star}$	$-0.006^{\star\star}$	<0
	(-2.492)	(-2.460)	(-2.282)	(-0.141)
log(Acq. Cash/Total Assets)	<0	<0	-0.001	0.002
	(-0.030)	(-0.007)	(-0.527)	(1.079)
log(Tar. B/M)	0.001	0.001	0.002	>0
	(0.242)	(0.242)	(0.434)	(0.130)
log(Acq. B/M)	0.002	0.002	-0.001	-0.003
	(0.261)	(0.303)	(-0.180)	(-0.569)
log(Tar. Size)	-0.001	-0.001	-0.001	-0.002
	(-0.160)	(-0.178)	(-0.301)	(-0.585)
log(Acq. Size)	0.002	0.002	0.001	-0.001
	(0.888)	(0.892)	(0.549)	(-0.357)
$r_{DA,Tar}$	-0.070	-0.071	-0.049	0.022
	(-0.639)	(-0.644)	(-0.479)	(0.240)
$r_{DA,Acq}$	$0.228^{\star}$	$0.229^{\star}$	$0.205^{\star}$	-0.057
	(1.913)	(1.922)	(1.810)	(-0.595)
Unsolicited=Yes	$0.022^{\star}$	$0.023^{\star}$	0.013	0.002
	(1.813)	(1.837)	(1.196)	(0.163)
Stock Deal=Yes	-0.010	-0.010	$-0.011^{\star}$	$0.018^{\star}$
	(-1.391)	(-1.396)	(-1.682)	(1.706)
Premium	0.017	0.017	0.011	-0.009
	(0.800)	(0.796)	(0.554)	(-0.503)
R^2	0.036	0.036	0.033	0.034
Observations	910	910	910	624

the media content measure strongly predicts target returns over the following twelve days, while media coverage strongly predicts the long-short investment strategy. In particular, a one standard deviation increase in the media-implied probability of deal completion yields an increase in the target stock return of 1.2% over the subsequent twelve days. Assuming 22 trading days per month, this corresponds to a monthly return that is 2.2% larger, an economically as well as statistically meaningful number. Similarly, a one standard deviation decrease in EWMA-adjusted media coverage yields a long-short return that is 1.3% larger over the subsequent twelve days, corresponding to 2.3% on a monthly basis. Of course it is important to keep in mind that these are event-date returns and it is not possible to earn them on a continuous basis. On the other hand, we have approximately eight announced deals per month in our sample, which shows that these merger events take place frequently enough to also make the reported increase in event-time returns economically relevant.

Table 7 repeats the analysis from the previous Table 6, with the difference that media data is restricted to be from top news sources. For the top newswire Dow Jones News Service in columns one and two, the coefficients of media content and media coverage increase in absolute value compared to Table 6, where *all* news sources were used. Likewise, the goodness of fit of the regressions increase, as measured by R^2. These results show that much of the media-implied probability of deal completion is driven by the top newswire alone. On the other hand, restricting attention to the top newspapers in columns three and four do not yield significant media coefficients. This might be due to the fact that the top newspapers only publish relatively few press articles, which implies that the number of cross-sectional observations drops to less than 200 in Table 7 from over 900 in Table 6. Despite the small number of observations, the goodness of fit of the newspaper regressions are highest among all cross-sectional merger arbitrage return regressions, with R^2's of up to 11.5%. While the evidence for the top newspapers is not as clear-cut as the evidence for the top newswire, we cannot rule out that the top newspapers contribute novel information that is relevant to merger arbitrageurs.

6.2 Time Series Tests of Media-Based Merger Arbitrage

This section shows time series tests. We begin with Table 8, where we regress time series of merger arbitrage returns on time series of media measures while controlling for movements of the overall stock market. In case only one deal is open at any given date, we use the returns and media measures from that deal. If several deals are open at any given date, we take averages across all open deals. For example, on Tuesday there is only one deal ongoing, so we use the return and the media measures from that deal on Tuesday. If on Wednesday another deal is announced, we now have two deals open, and thus take averages of returns and media measures across those two deals on Wednesday. Using this strategy, we invest on average in 30 deals on any given trading day using the long-only investment strategy (i.e. only investing in the target) and in 19 deals on

Table 7: Top News Sources

This table runs the same predictive regressions as in Table 6, with the difference that only top news sources are used for the construction of the media measures. The top newswire is Dow Jones News Service (columns one and two), while the top newspapers (columns three and four) consist of The Wall Street Journal, The New York Times, Financial Times, The Globe and Mail, The Washington Post, and eWeek. We only focus on a single newswire for comparison since it alone produces more articles than the top newspapers combined. The regression coefficients ">0" or "<0" denote positive or negative numbers that are too small to print, given the number of digits after the decimal mark. The symbols *, **, and *** indicate significance at 10%, 5%, and 1%, respectively, based on robust standard errors.

	Dow Jones	Dow Jones	Top Newspapers	Top Newspapers
Dependent Variable:	$r_{\text{Tar}} - r_f$	$r_{\text{Tar}} - \delta r_{\text{Acq}}$	$r_{\text{Tar}} - r_f$	$r_{\text{Tar}} - \delta r_{\text{Acq}}$
Intercept	-0.101*	0.037	-0.046	0.140**
	(-1.723)	(0.626)	(-0.403)	(2.184)
Content$_{DA}$	0.069***	0.012	0.028	0.004
	(3.896)	(0.649)	(1.447)	(0.234)
Coverage$_{DA}$	0.001	-0.003*	0.001	0.001
	(0.672)	(-1.773)	(0.788)	(0.200)
log(Tar. Cash/Total Assets)	-0.006**	<0	-0.008*	-0.002
	(-2.502)	(-0.190)	(-1.660)	(-0.608)
log(Acq. Cash/Total Assets)	0.001	0.003	-0.003	0.001
	(0.253)	(1.267)	(-0.696)	(0.365)
log(Tar. B/M)	0.001	0.001	-0.004	-0.006
	(0.291)	(0.348)	(-0.623)	(-1.107)
log(Acq. B/M)	0.003	-0.004	0.001	<0
	(0.409)	(-0.567)	(0.036)	(-0.019)
log(Tar. Size)	-0.001	-0.001	-0.005	-0.011***
	(-0.251)	(-0.223)	(-0.707)	(-2.808)
log(Acq. Size)	0.003	-0.001	0.005	0.001
	(1.007)	(-0.550)	(0.820)	(0.314)
$r_{DA,Tar}$	-0.066	0.009	-0.267	-0.063
	(-0.622)	(0.093)	(-0.955)	(-0.475)
$r_{DA,Acq}$	0.193	-0.090	0.728**	-0.004
	(1.532)	(-0.877)	(2.174)	(-0.033)
Unsolicited=Yes	0.031**	0.011	0.006	0.011
	(2.238)	(0.868)	(0.248)	(0.512)
Stock Deal=Yes	-0.009	0.019*	-0.023	0.007
	(-1.207)	(1.790)	(-1.455)	(0.572)
Premium	0.015	-0.012	-0.043	-0.043
	(0.680)	(-0.656)	(-0.761)	(-1.345)
R^2	0.040	0.043	0.115	0.086
Observations	853	584	195	129

Table 8: Time Series Tests

This table shows time series regressions of merger arbitrage returns on media measures. The media measures consist of lagged and contemporaneous media content as well as lagged and contemporaneous EWMA-adjusted media coverage. In case more than one deal is open at any given date, the returns and the media measures are averaged across all open deals on this date.

Dependent Variable:	$r_{\text{Tar}} - r_{\text{f}}$	$r_{\text{Tar}} - r_{\text{f}}$	$r_{\text{Tar}} - \delta r_{\text{Acq}}$	$r_{\text{Tar}} - \delta r_{\text{Acq}}$
Intercept	-0.002***	-0.003***	-0.002**	-0.003***
	(-2.912)	(-3.314)	(-2.396)	(-2.669)
$r_{\text{Mkt}} - r_{\text{f}}$	0.734***	0.736***	0.241***	0.242***
	(68.522)	(68.577)	(21.262)	(21.241)
Content		0.002		0.001
		(1.332)		(1.077)
Coverage		<0		<0
		(-0.853)		(-0.471)
Content Lagged	0.003***	0.002**	0.003***	0.002*
	(2.939)	(2.042)	(2.696)	(1.872)
Coverage Lagged	>0	>0	>0**	>0**
	(0.248)	(0.698)	(2.282)	(2.132)
R^2	0.627	0.628	0.144	0.144
Observations	2822	2810	2817	2808

Table 9: Time Series Tests: Top News Sources

This table shows the same regressions as in Table 8, with the difference that only top news sources are used for the construction of the media measures.

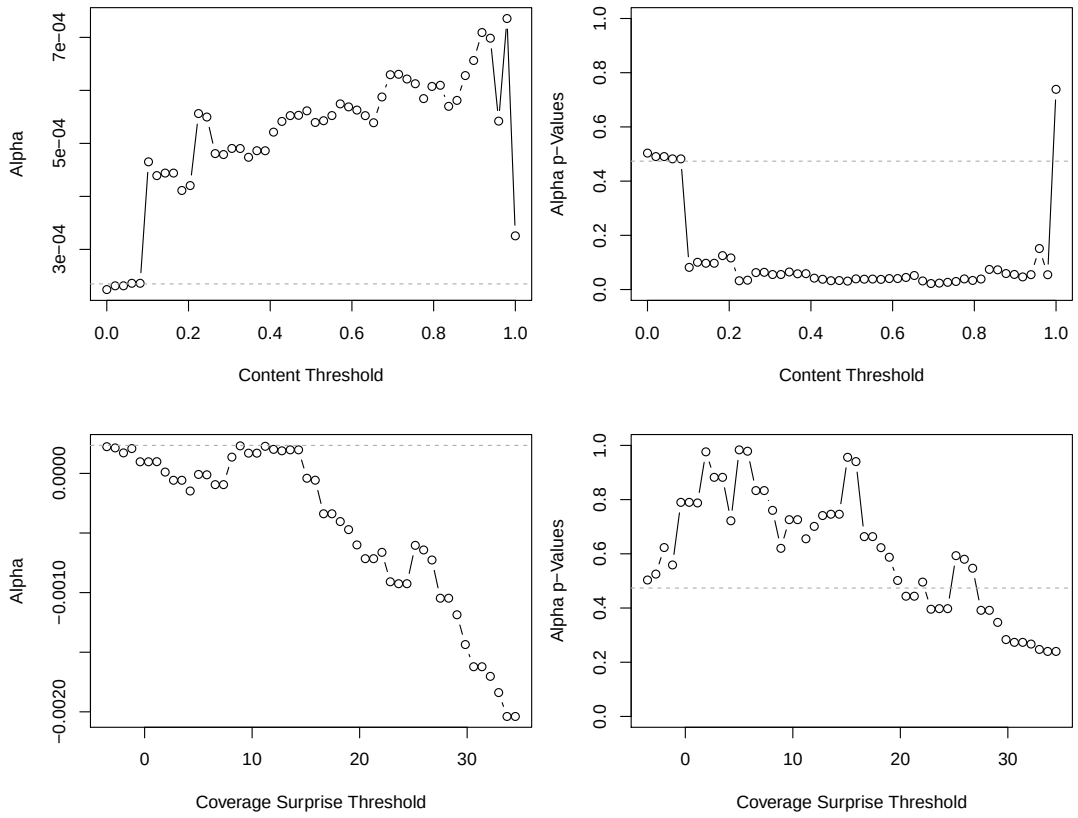
	Dow Jones	Dow Jones	Top Newspapers	Top Newspapers
Dependent Variable:	$r_{\text{Tar}} - r_{\text{f}}$	$r_{\text{Tar}} - \delta r_{\text{Acq}}$	$r_{\text{Tar}} - r_{\text{f}}$	$r_{\text{Tar}} - \delta r_{\text{Acq}}$
Intercept	-0.001*	-0.001	<0	<0
	(-1.788)	(-1.157)	(-0.681)	(-0.541)
$r_{\text{Mkt}} - r_{\text{f}}$	0.741***	0.228***	0.778***	0.213***
	(60.492)	(17.961)	(47.497)	(12.341)
Content	>0	0.001*	>0	0.001
	(0.511)	(1.941)	(0.193)	(0.969)
Coverage	<0	<0*	<0	>0
	(-1.484)	(-1.719)	(-0.436)	(1.296)
Content Lagged	0.001*	>0	>0	>0
	(1.701)	(0.053)	(0.690)	(0.625)
Coverage Lagged	>0	>0	<0	<0
	(0.289)	(1.272)	(-0.131)	(-0.955)
R^2	0.608	0.122	0.583	0.088
Observations	2373	2373	1624	1624

average using the long-short investment strategy. The number of deals is lower for the long-short investment strategy because of missing exchange ratios or missing acquirer returns in stock deals. Table 8 shows positive and significant coefficients for the lagged media content measure for all time series regressions. For example, for the long-short merger arbitrage investment strategy, an increase of one standard deviation in the lagged media content yields an increase in return of 0.04%, corresponding to 0.8% per month. Like in the cross-sectional regressions, this is a economically and statistically significant number. The time series variation for the EWMA-adjusted media coverage is different compared to its cross sectional variation. While media coverage has a significantly negative sign in the cross-sectional regressions, its lagged values have a significantly positive sign in the time series regressions involving the long-short merger arbitrage returns. The economic magnitude of this effect is smaller than for lagged media coverage: a one standard deviation increase in lagged media coverage increases the long-short return by 0.01%, corresponding to 0.3% per month.

Table 9 repeats the regressions from Table 8 using only top news sources. The time series evidence for top news sources is mixed, with lagged content having a significantly positive effect on future target excess returns, while lagged media coverage and lagged media content are insignificant for the remaining regressions.

To consider time series variation from another angle, we investigate next the alpha

Figure 3: Time Series Alphas and p-Values



generated by a simple media-based investment strategy. This investment strategy is based on the media information available on the announcement day only, and based on this information a decision is made whether to invest in the deal. This investment strategy is simple on purpose. Its goal is not to obtain the highest possible return, but to investigate the relation between the media and merger arbitrage by actually trading on the financial media. We next describe this investment strategy in detail.

On the announcement day of each deal,[1] we calculate the media content measure and invest in the deal if media content is above a given threshold level. We repeat this procedure for every deal and thus identify a set of deals in which we invest in. For those deals, we calculate a time series of returns the same way we did for the previous time series regressions. Since this exercise has a cross-sectional dimension in addition to its time series dimension, we use the same time series length as in Section 6.1, where we have discussed cross-sectional tests. That is, we start with the first return after the announcement day and include the subsequent twelve trading days. Using the long-short merger arbitrage returns, we calculate the alphas and their p-values by regressing merger arbitrage returns on the stock market return and the Fama/French factors (Fama and French (1993)). This procedure gives us for every content threshold level an alpha coefficient and its p-value. We also repeat the same procedure with EWMA-adjusted media coverage instead of media content.

The upper part of Figure 3 shows the alpha coefficient (left plot) as well as its p-values (right plot). The dotted horizontal lines correspond to alphas and p-values when we include all deals for comparison, even those deals with no press articles on the announcement day. We find that, except for the largest threshold level were by construction only few observations are available, alpha is an increasing function of the media content threshold level. Furthermore, except for the smallest and largest threshold levels, the alphas are all statistically significant. More importantly, by conditioning on media-based information, it is possible to almost always outperform the investment strategy that *always* invests in a deal, independent of media content. This result is visualized by the alphas being above the dotted horizontal line. The annualized risk-adjusted alpha is 18.5% when investing in deals that have a media content measure of 0.98 or more, compared with an annualized alpha of 6% when investing in all deals. Keep in mind that, consistent with most deals succeeding, the media content measure is skewed, and that a threshold of 0.98 still means that we invest in more than 50% of the deals. So this result is not driven by outliers, since otherwise it would also be difficult to obtain consistently low p-values. Of course, the usual caveats apply for annualizing alphas, in particular there might be some days during each year when there are no deals to invest in, meaning that it may not be possible to earn this alpha on every trading day. Nonetheless, the increase in annualized alpha to 18.5% from 6% is profound. Furthermore, it is possible to achieve this increase in alpha by investing in

[1]To be precise, we use the day before the first trading day after the announcement day. Except for weekends and holidays, this day is the announcement day.

less deals, which also means lower trading costs.

The same cannot be said about media coverage. Conditioning on media coverage yields lower alphas than could be obtained by simply investing in all deals, as can be seen by the fact that the alphas are below the dotted horizontal line. Furthermore, the alphas are not statistically significant.

6.3 Dealing with Unobserved Heterogeneity

To complete our analysis of media-based merger arbitrage, we also run fixed effects panel data regressions. This allows us to control for unobserved heterogeneity that is constant over time, for example potential variables that do not vary over time but were omitted in the cross-sectional tests in Section 6.1. In order to avoid losing too many observations, we interpolate media content in the following way: in case no article was published for a particular deal on a particular date (meaning that the media content measure cannot be calculated), we use the media content measure from the preceding date.

We find the following results. Lagged media content is positive and significant for the long-short merger arbitrage investment strategy and insignificant for the target's excess returns as well as for the top news sources. Lagged media coverage is significantly negative for both the long-short investment strategy and the target's excess returns, while being insignificant for the top news sources.

When comparing these results with the cross-sectional results from Section 6.1 and the time series results from Section 6.2, it is important to keep in mind that we are investigating different sources of variation in the media measures. In the cross-sectional tests, we consider media information released around the announcement date. In the time series tests, we use media information from the whole duration of the deal (Tables 8 and 9) and from the time around the announcement date (Figure 3). In the panel data results from Table 10, we use media information from the whole duration of the deal, while extracting information from both the time-series variation as well as the cross-sectional variation of the media measures. For all regression types, the significant coefficients of the media measures have signs that are consistent with each other, with one exception: lagged media coverage has a negative sign in the cross-sectional regressions and panel data regressions, while it has a positive sign in the time series regressions in Table 8. Furthermore, in Figure 3, alpha is a decreasing function of the coverage threshold, indicating a negative relation between media coverage and alpha.

There are several potential explanations for this change in sign of the media coverage coefficients. First, as discussed previously, the negative coefficient comes from tests that capture cross-sectional variation. The interpretation is that an arbitrageur, when choosing between several deals, should invest in those deals that have low media coverage. The positive coefficient in the time series regression in Table 8 means that an arbitrageur, who was already invested in a number of deals yesterday, should stay

Table 10: Fixed Effects Panel Data Regressions

	All	All	Top Newspapers	Top Newspapers	Dow Jones	Dow Jones
Dependent Variable:	$r_{\text{Tar}} - r_{\text{f}}$	$r_{\text{Tar}} - \delta r_{\text{Acq}}$	$r_{\text{Tar}} - r_{\text{f}}$	$r_{\text{Tar}} - \delta r_{\text{Acq}}$	$r_{\text{Tar}} - r_{\text{f}}$	$r_{\text{Tar}} - \delta r_{\text{Acq}}$
$r_{\text{Mkt}} - r_{\text{f}}$	0.839^{***}	0.228^{***}	0.884^{***}	0.208^{***}	0.838^{***}	0.229^{***}
	(83.758)	(18.408)	(84.126)	(16.143)	(83.737)	(18.532)
Content	<0	-0.002	-0.003	>0	<0	$0.003^{\star}$
	(-0.232)	(-1.537)	(-1.344)	(0.055)	(-0.291)	(1.803)
Content Lagged	0.001	0.003^{**}	0.002	<0	0.002	-0.002
	(0.812)	(2.255)	(1.193)	(-0.032)	(1.273)	(-1.230)
Coverage	$>0^{***}$	0.001^{***}	<0	>0	>0	0.001^{***}
	(9.315)	(13.957)	(-0.309)	(0.689)	(1.145)	(2.937)
Coverage Lagged	$<0^{***}$	$<0^{**}$	<0	<0	<0	<0
	(-3.401)	(-2.327)	(-0.761)	(-0.191)	(-0.676)	(-0.635)
R^2	0.077	0.010	0.096	0.006	0.077	0.007
Observations	86748	55277	67505	42070	84853	53954

invested today if media coverage was high yesterday. These different interpretations do not necessarily contradict each other.

Second, more interestingly, this result could be a variation of Simpson's paradox. One famous example of this paradox occurred in the 1970s at the University of California, Berkeley involving a potential bias against women in admissions to graduate schools. The paradox was that, although individual departments had a small bias *in favor* of women, the total admission figures showed a bias *against* women. An investigation was conducted (Bickel et al. (1975)) and found that the reason for this paradox was that men tended to apply to less competitive departments that have high rates of admissions (e.g. engineering and chemistry) while women tended to apply to departments with low rates of admissions (e.g. the English department). So, although most *individual* departments had a bias in favor of women, the *total* success rate of men was higher because men applied to departments with higher rates of admissions. The same logic can be applied to the results in this paper. Keep in mind that in the cross-sectional regressions and the panel data regressions, the unit of observation is the *individual* deal, while in the time series regressions in Table 8 the unit of observation is the *total* number of open deals on a given trading day. On average, we invest at any given trading day in 30 deals or 19 deals (depending on the merger arbitrage strategy), so the total deals we invest in at any given point in time is relatively large. What the cross-sectional and panel data regressions tell us is that for each *individual* deal, high media coverage is followed by a low merger arbitrage return. However, if in *total*, high media coverage is obtained for those deals that will have higher merger arbitrage returns, we will have exactly the same result as in the time series regression shown in Table 8, namely that higher media coverage in total is positively related to the aggregate time series returns. The seemingly contradictory results about media coverage can thus be resolved as a variant of Simpson's paradox.

7 Conclusion

This paper analyzes the role of media in the provision of information to financial markets, using a large sample of merger announcements. We calculate two alternative measures of media information. The first measure focuses on media coverage and simply counts the number of press articles for a given day and a given acquisition deal. More specifically, we use the coverage *surprises* by adjusting media coverage by its exponentially-weighted moving average.

The second measure is related to *media content*. Here we use a novel empirical approach that allows us to *directly* calculate the media-implied likelihood of deal completion. It analyzes the words used in a given press article, and also the article's length. The media content measure, for every press article, consists of a number between zero and one, which can be interpreted as the media-implied likelihood of deal completion.

This methodology allows us to extract the media-based information that is directly relevant to the merger arbitrage investment strategy. It thus provides further insights about the specific channels of information transmission to financial markets.

We find strong evidence of a stock market underreaction to media content. Information in financial media is not fully incorporated in stock prices, even after twelve trading days. Our cross-sectional regressions show that a one standard deviation increase in the media-implied probability of deal completion results in an increase of 1.2% in the subsequent twelve-day return. Time series tests show that the twelve trading days after an announcement date yield annualized risk-adjusted alphas of 18.5% for deals with a high media-implied probability of deal completion, while the alpha drops to 6% for deals with a low media-implied probability of deal completion.

While we find strong evidence that media content affects merger arbitrage returns, the result for media coverage is much weaker. For example, our time series regressions show that a one standard deviation increase in media coverage yields an increased return of only 0.3% whereas the same change in lagged media content yields a monthly increase in returns of 0.8%. Also, a trading strategy based on media content increases annualized alphas by 12.5%, while the effect of media coverage on alphas is statistically insignificant. So, while media manipulation may occur by increasing media coverage (Ahern and Sosyura (2013)), this does not seem to be the case for media content.

Our results show that media information released on the announcement day contains information, not captured by announcement day stock returns. In fact, a regression of announcement returns on media variables show insignificant results. Thus, announcement returns seem to be unrelated to the probability of deal completion and may largely reflect other information such as an assessment of whether a completed deal would create or destroy value. Finally, we find weak evidence in favor of a certification role of the media, with the top newswire and top newspapers contributing more novel information to the market.

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