Media Tone Effect and Return Drift following Ambiguous News

Sha Liu[a], Jingguang Han[b]

[a] Corresponding author. Michael Smurfit Graduate Business School, University College Dublin. Blackrock, Dublin 4, Ireland. Phone: +353-1-7164318. Email:sha.liu@ucd.ie

[b] Accenture Technology Labs, 7 Hanover Quay, Dublin 4, Ireland. Email: jingguang.han@accenture.com

Abstract

We construct media tone measures from 53,856 newspaper articles about non-financial S&P 500 firms between 2004 and 2013, and find that firms with low-negative-tone articles in the previous months generate higher returns in the following months than firms with high-negative-tone articles. This media tone effect is primarily driven by abnormal returns of high-negative stocks. There is persistent return drift for high-negative stocks following ambiguous public information. Market frictions, slow information diffusion, and investor biases are possible explanations of underreaction in the short term, but in the medium to long term, the media may help correct mispricing based on private signals.

Key words: media coverage and tone, news and information, ambiguous news, return drift, market efficiency

JEL classifications: G11, G12, G14, G40

1. Introduction

Most recent literature on the role of conventional media in stock pricing have focused on two aspects – media coverage (e.g. Chan, 2003; Fang and Peress, 2009; Engelberg and Parsons, 2011), media tone (e.g. Tetlock 2007; Tetlock et al., 2008; Garcia, 2013), or both (e.g. Hillert et al., 2014; Ahmad et al., 2016). Media coverage is often measured as the number of news stories about a firm over a certain period, and media tone is the degree of positivity or negativity in texts, proxied by a measure of tone generated via computational linguistics analysis. The central question in the literature is whether media plays an informational role and improves market efficiency, or whether it influences investor psychology and leads to mispricing. So far the evidence is mixed. On the good side, media coverage broadens information dissemination and expedites incorporation of information into prices (Fang and Peress, 2009; Peress, 2014); firm-specific negative tone contains additional fundamental information over traditional quantitative financial measures (Tetlock et al., 2008; Ferguson et al., 2015). On the other hand, there is evidence that media coverage or content causes temporary price deviations by affecting investor sentiment (Tetlock, 2007; Gurun et al., 2011; Garcia, 2013; Dougal et al., 2012). After all, 'business and investment writers keep us interested by telling a good story' (Nofsinger, 2016, p.101). Some media content contains truly noteworthy news, while more content is not genuine news but the follow-ups of news, value-irrelevant news, or commentaries (i.e. opinions).

The existing research in media tone, either at the market level of firm level, have focused on very short horizons, usually a few days (e.g. Tetlock, 2007; Tetlock et al., 2008, Ahmad et al., 2016). Few studies have examined medium to long horizons. Up till now, it is not yet clear how media tone affect stock returns in the long run. Besides, while the literature mostly investigates aggregate

or firm-level returns, little is known about the relationship between media tone and cross-sectional returns. This research intends to fill these gaps.

The first important finding of this research is the 'media tone effect' – firms with low-negative-tone stories over a period earn higher returns in the following months than firms with high-negative-tone stories. We collect 53,856 articles about non-financial S&P 500 firms between January 2004 and December 2013 from four newspapers that are widely circulated in the US and have great international impact: *New York Times*, *Washington Post*, and *USA Today*, and *Financial Times*. We find that the return difference between the low-negative and high-negative tone portfolios is 3.17% per year, and statistically significant. This effect also exists within portfolios sorted by size, Book-to-Market ratio, profitability, past 6-month return, or current price, indicating that it is not a disguised widely-known return anomaly. We also find that no-media-coverage stocks yield higher returns than either low-negative or high-negative stocks, consistent with the no-coverage premium found by Fang and Peress (2009). A zero-cost media-based investment strategy that goes long on no-coverage stocks and short on high-negative stocks generates greater profits than a pure tone-based or coverage-based strategy, yielding an annual risk-adjusted return of around 5% to 6%.

The second finding is that the tone effect is primarily driven by the negative abnormal returns (also termed as 'risk-adjusted returns' or 'alphas' throughout the paper) of high-negative stocks. High-negative stocks produce the biggest abnormal returns with a 6-month formation period and a 6-month or 9-month holding period, and such returns gradually become insignificant after 12 months. The biggest alpha is 3.38% per year. The cumulative abnormal return for high-negative stocks is close to -4.0% after 24 months. There is no evidence of long-term reversal, however, suggesting that the market underreacts to negative information embedded in high-negative stories. Although

previous studies that examine the informational role of firm-specific media tone (e.g. Tetlock et al., 2008; Ahmad et al., 2016) find that investors quickly incorporate new fundamental information embedded in negative tone into stock prices, usually within 1 or 2 trading days, and there is no reversal afterwards, we do find that some information is not incorporated into prices until 12 to 18 months later. In contrast, low-negative stocks produce negative but insignificant monthly alphas, suggesting that low-negative stories do not contain new information, especially positive information. The results are robust when another tone measure that takes into account both positive and negative words is employed. The finding that stocks in the media, regardless of the tone, tend to have negative return drift is in line with the finding by Ahmad et al. (2016) that media articles are more likely to be negative than positive. We also find that stories about larger firms tend to be more negative than those about smaller firms.

Why do investors underreact to negative information? Using institutional ownership as a proxy for short-selling constraints, we find that the return drift of high-negative stocks is concentrated among those with low institutional ownership, indicating that short-selling constraints can at least be part of the answer. If institutional ownership is considered to be a proxy for the speed of information dissemination, the results are also consistent with the gradual-information-diffusion model of Hong and Stein (1999). In addition, we find that the market's underreaction to high-negative tone is concentrated among high-coverage stocks, confirming the slow-information-flow story, as the magnitude of underreaction should be positively associated with the amount of information released over a period[1]. In addition, firms that are more likely to be covered by the media tend to be those facing poor information environment (e.g. high individual ownership, low analyst

---

[1] Note that high coverage with high-negative tone potentially conveys more new information, as we have excluded any articles that are highly similar to a previously published article.

coverage) (Fang and Peress, 2009). Alternatively, the fact that underreaction to negative information is more severe with high-coverage stocks may be consistent with the notion that investors' attention to a specific piece of information is selective if the amount of information available is huge (Hirshleifer et al., 2011), slowing the incorporation of information into prices.

Our finding that there is return drift following *ambiguous* news contributes to the literature that document short-term return continuation pattern in various settings. It is well known that stock returns tend to exhibit unconditional positive serial correlations in the next 3 to 12 months (Jegadeesh and Titman, 1993). In addition, return drift has been found following specific public news events or information release, including earnings announcements (Foster et al., 1984; Chan et al., 1996), stock issues (Loughran and Ritter, 1995), revisions in analysts' earnings forecast (Chan et al., 1996), and analysts' buy and sell recommendations (Womack, 1996). The common feature of the 'post event' studies is that they all examine specific events that give the market relatively clear and straightforward signals about firms' fundamentals. Our finding of return-drift following negative stories is novel in that we examine media stories – many of which are about sales and purchases, investments, executive changes, new agreements – that may convey *ambiguous* signals about a firm to investors, or investors would have different interpretations on them. If we exclude all articles about a firm in any month when the firm makes an earnings announcement, we still find return drift for high-negative stocks, confirming that media articles do contain value-relevant information that is slowly reflected in prices over conventional *unambiguous* financial measures, and such information is in negative form. The market's *asymmetric* reaction to low-negative and high-negative stories is similar to the finding by Busse and Green (2002) on positive and negative real-time CNBC reports and Womack (1996) on analysts' buy and sell recommendations.

We have also examined the tone effect conditioned on price momentum, and find that it exists only among past winners. No-coverage winners have strong positive return drift even after 12 months, but the abnormal returns of winners with high-negative contemporaneous news stories disappear after about 3 months, suggesting that high-negative tone plays an informational role that speeds up the price discovery process. Low-negative stocks experience short-term positive return continuation that is reversed after 9 months. The reversal is not odd since we find that low-negative or relatively positive tone does not contain value-relevant information, and that media stories tend to be more negative than positive (Ahmad et al., 2016). In contrast, we find that past losers with media coverage have strong negative return drift of similar magnitude for both low-negative and high-negative stocks. We believe that the evidence support some assumptions of Daniel et al. (1998) (hereafter, DHS). Investors tend to underreact to public signals and overreact to private signals. Positive or negative price momentum is driven by overreaction to private information, which may be corrected by information embedded in public media content over medium to long term, if the media content indeed contains new fundamental information.

Chan (2003) also studies firms with and without public news and finds that there is strong return drift after bad news, especially losers with news. However, our research is different in several ways. First, his definition of 'bad news' is not identical to negative media articles. Chan does not quantify the tone of articles, but use market performance to define a 'bad news' event, which is the month when firm-specific news occurs and the return of the stock in that month is at the bottom part of the sample stocks. This means that market reaction determines whether news stories are genuine 'new information', and whether such events are good or bad. In other words, the return drift following 'bad news' in Chan's work is not identical to the return drift following high-negative media stories in our research. We do not let the market to define genuine news because

our focus is what role *media tone* plays in stock pricing. Second, Chan collects news headlines from newspapers, periodicals and newswires, while we focus on major newspapers. Media articles (e.g. newspaper articles) may play a role that is very different to that of newswire stories in asset pricing. Many firms with headlines in the newswires are neglected by conventional media outlets (Fang and Peress, 2009). Ahmad et al. (2016) find that the tone of newswire articles contains pure information that is immediately reflected in prices, with little overreaction or underreaction, but other sources (newspapers, magazines, etc.) cause big overreaction that is quickly corrected fully or partially. We believe it is important to distinguish between media articles and pure news (newswire stories).

The rest of the article is organized as follows. In Section 2, we describe the sample stocks, text corpus, content analysis method, as well as media tone scores. In Section 3, we examine the relationship between media tone and cross-sectional stock returns by forming portfolios on tone and firm characteristics. Trading strategies with different formation and holding periods are implemented to see if media-based strategies can generate abnormal trading profits. In Section 4, we examine the tone effect with medium to long horizon, investigate the underlying causes of the tone effect and how the tone effect is related to price momentum. Section 5 summarizes and concludes.

2. Data Description

Our sample consists of all non-financial S&P 500 firms (as of July 2014) that were listed on stock exchanges between January 2004 and December 2013, amounting to 352 firms. All of them are large firms in the market, and are more likely to be covered by traditional mass media. We do not

choose a bigger sample, because beyond S&P 500 or even S&P 100 stocks, newspaper coverage is rather low (evidence shown in Table 1), making it very difficult to study the impact of media tone. Besides, 'firms in the S&P 500 index encompass roughly three-quarters of the total U.S. market capitalization, and appear in the news sufficiently often to make the analysis interesting' (Tetlock et al., 2008: p.1441).

The media articles are collected from the *Nexis* database. Like Fang and Peress (2009), we focus on the most widely circulated newspapers in the US: *New York Times*, *Washington Post*, and *USA Today*. We also include *Financial Times* (*FT*), instead of the *Wall Street Journal* (*WSJ*)[2], because *Nexis* does not have full articles of *WSJ*. We believe that *FT* is a choice as good as *WSJ*. According to the Global Capital Markets Survey 2011[3], a survey of the world's most senior corporate and financial decision makers, *FT* reaches 33% of the sample population, higher than the circulation of *WSJ*. While *WSJ* does have higher circulation than *FT* in the US, the S&P 500 firms we study have investors from all around the world, where *FT* may have a higher circulation than *WSJ*.

Firm-specific articles are identified by the 'Index Term', which is the firm name, and we choose 'strong references only' to ensure high relevance of an article to the firm. We choose the 'group duplicates – high similarity' option to exclude any articles that are highly similar to a previously published article. We also exclude non-business news, but include websites of these newspapers. The 'group duplicates – high similarity' option ensures that the same articles published both in the newspapers and on their websites will not be picked up twice.

---

[2] Fang and Peress (2009) incorporated the Wall Street Journal
[3] http://www.gcmsurvey.com/Media.html

As discussed in the Introduction, we must distinguish between media articles and specific news events. Chan (2003) summarizes that studies that examine stock returns after specific news events have traditionally focused on corporate actions such as dividend payout, and scheduled news releases such as earnings announcements. However, like what Chan (2003) has found in his sample, most articles in our sample are *not* about scheduled releases or signaling events. Instead, they are about executive changes, sales and purchases, investments, new agreements, lawsuits, etc. Unlike specific news events, these stories tend to be more ambiguous or noisy. For example, while positive earnings surprise is considered as 'good news' by the market almost for sure, it would be more difficult to tell how a new CEO, a new investment project, or a new agreement will change the valuation of the firm. In other words, it requires some private or subsequent information for market participants to arrive at a rough number of value.

We focus on negative words, because the principle component analysis conducted by Tetlock (2007) based on the *WSJ* 'Abreast of the Market' column shows that negative words are one of the most important categories in the 77 categories from the Harvard psychosocial dictionary. We do consider positive words in some of our robustness analysis later. Table 1 provides summary statistics for the number of articles and negative tone (*NT*) scores (explained in the next paragraph) of the sample firms. Panel A reports, for all firms in the sample, the mean, median, and standard deviation of the number of articles per year, and the average statistics for the 10-year period. Panel B reports the statistics for the S&P 100 stocks in the sample. Statistics show that newspaper coverage is much higher for S&P 100 firms. The average number of articles per year for all S&P 500 firms ranges from 11 to 21, while the number ranges from 40 to 72 for S&P 100 firms. Throughout the 10-year period, 10% of the sample firms are not covered by the four major newspapers at all, while there is at least one article about each individual S&P 100 firms. This is

consistent with the finding of Fang and Peress (2009) that the overall newspaper coverage is surprisingly low, and larger firms are much more likely to be covered. It is also interesting to note that the fraction of firms not covered in the four newspapers has sharply increased from 27% in 2004 to 46% in 2013. It may be that internet sources, including social media, have largely replaced newspaper coverage. Nevertheless, the role of conventional media remains important, as the circulation of major newspapers is still high, including both print and digital editions. In addition, messages on the web and social media platforms tend to be more noisy than traditional media articles – they are likely to serve a different role compared with newspapers. Based on the statistics above, we conjecture that the newspaper coverage for non-S&P 500 firms (smaller firms) will be rather low.

~ Table 1 about here ~

We implement the most popular 'bag of words' approach in the textual-analysis-in-finance literature, and employ the simple proportional weighting scheme. It assumes that the sequence of words in a sentence and a document is unimportant, so the monthly *NT* score is calculated as the fraction of negative words in the total number of words in a calendar month, and the identification of negative words is based on the finance dictionary created by Loughran and McDonald (2011). Some studies have adopted more complicated weighting schemes for different words in a document (e.g. Brown and Tucker; 2011; Jegadeesh and Wu, 2013), but most papers have not considered modification of the algorithm (see survey papers: Kearney and Liu, 2014; Loughran and McDonald, 2016). In their research on textual methods, Loughran and McDonald conclude that:

> Term weighting has the potential to increase the power of textual methods, but, lacking theoretical motivation or independent verification, provides the researcher with potentially too many degrees of freedom in selecting an empirical specification. Hopefully, future

research will provide a structured analysis that provides an objective basis for specifying a particular weighting scheme in textual applications. (Loughran and McDonald, 2016: p1223).

For this reason, we still adopt the classic 'bag of words' approach with simple proportional weighting. Panel C of Table 1 reports the mean, median and standard deviation of the *NT* scores. The magnitudes of these scores are in line with the literature (e.g. Ahmad et al., 2016; Ferguson et al., 2015), which cover fewer or more firms, further supporting the choice of S&P 500 firms as the representative sample.

3. Portfolio Analysis and Trading Strategies

This section examines the relation between media tone and the cross-section of stock returns by constructing portfolios and implementing trading strategies.

3.1 Single sort and raw returns

At the beginning of January (except the first January in the sample) and July of year *t,* firms with no newspaper article in the previous 6 months are grouped into the no-coverage (NC) portfolio. Firms with news stories are sorted into the low-negative (LN) and high-negative (HN) portfolios based on the median of their average monthly *NT* scores over the previous 6 months. The portfolios are rebalanced every 6 months.

Panel A of Table 2 presents the equal-weighted average monthly returns of the three portfolios. The average return of the NC portfolio is 0.95% per month, which is much higher than the other two portfolios (LN: 0.72%, HN: 0.46%). It is consistent with the no-coverage premium – stocks with no media coverage earn higher returns than stocks with high media coverage (Fang and

Peress, 2009). The return difference between the NC and the HN portfolios is 0.49% per month (6.04% per year), significant at the 1% level. For comparison, Panel D of Table 2 presents the equal-weighted average monthly returns of stocks with no, low, and high media coverage (i.e. No. of articles). The return difference between the NC and high-coverage portfolios is 0.38% per month (4.66% per year), smaller than the return difference between the NC and the HN portfolios. The return difference between the LN and HN portfolios is 0.26% per month (3.17% per year), significant at the 5% level, indicating that firms with low-negative-tone newspaper articles in the prior 6 months earn higher returns in the following months than firms with high-negative-tone articles. We call this the *media tone effect*. These results are robust using value-weighted portfolios[4].

~ Table 2 about here ~

3.2 Double sorts and raw returns

Next, firms are double-sorted by firm characteristics and media tone. Firms are sorted into terciles by one of the firm characteristics: size (market capitalization), Book-to-Market ratio, profitability (earnings per share)[5], past 6-month return, and price. Within each tercile, firms are assigned to NC, LN, or HN portfolios, using classification/breakpoints determined in the single sort. Again, the portfolios are held for 6 months and are rebalanced at the end of the 6th month. The equally weighted average monthly portfolio returns are calculated and reported in Panel B1 to B5 in Table 2. We discuss the tone effect (LN-HN) first. The double-sort results generally support the single-sort results, since within each characteristic group, the return difference between the LN and HN portfolios is positive, except the medium size group (second row of Panel B1), for which the return

---

[4] Results available upon request
[5] Based on the value of market capitalization, Book-to-Market ratio, and earnings per share at the end of every 6 months

difference between LN and HN is negative, but insignificantly different from zero. In each panel from B1 to B5, there is one characteristic group within which the tone effect is significant at the 10% level or above, indicating that it is not a disguised well-known anomaly. The tone effect only exists among the largest firms, the most profitable firms, and the middle Book-to-Market ratio group. Many documented return anomalies exist among small stocks, as anomalies could be driven by bid-ask bounce issue of small stock returns. Our finding that the tone effect is more pronounced among larger firms is not at odds. While the anomaly studies usually examine a large sample of stocks (e.g. all NYSE/AMEX stocks), our sample is confined to non-financial S&P 500 firms. There are no real small firms in our sample which face significant liquidity issues, although we use 'small firms' in this article to refer to the firms that are relatively small in our sample.

Table 2 also shows that there are positive return differences between NC and HN portfolios, and they are generally greater than the differences between LN and HN portfolios, except in Panel B1. This is in line with the finding of Fang and Peress (2009) that firms with no media coverage earn higher returns than firms with high coverage. Nonetheless, it seems to be unusual that none of the return differences between NC and HN stocks within each size group (0.23%, 0.14%, and 0.04%) is greater than the single-sort result (0.49%). To explain this, we first examine the number of stocks in each sub-portfolio throughout the 10-year sample period. Recall that the portfolios are reconstituted every 6 months. Figure 1 presents the details. It is very clear from the figure that the 'small (size 1) & NC' group has most stocks consistently throughout the sample period. It means that the smallest firms are least covered by mass media. About 70 to 90 small firms have zero coverage in the previous 6 months[6]. Small firms that do get coverage have about the same chance to fall into LN or HN classifications. In contrast, only about 20 to 30 large firms have no coverage

---

[6] Note that firms are sorted into terciles by size, so roughly 117 firms fall within each tercile.

in the previous 6 months. Large firms with newspaper coverage are much more likely to fall into HN classification – About 50 to 60 firms fall in to 'large (size 3) & HN', whilst 20 to 45 fall into 'large (size 3) & LN'. The equal-weighted average monthly returns of all the sub-portfolios are presented in Table A1 in the Appendix. Although within each size group, the return differences between NC and HN stocks are insignificantly different from zero, the single-sort result (NC – HN) is bigger and statistically significant (0.49%, T-stat = 3.41), because 'small & NC' stocks (average monthly returns: 1.32%) has the biggest proportion among NC firms, and 'large & HN' stocks (average monthly returns: 0.26%) has the biggest proportion among HN firms. The finding that large firms tend to have more negative news is consistent with Ahmad et al. (2016), who investigate media tone for giant firms only, and conclude that 'news is bad news'. Our additional finding is that media tone is asymmetric for larger and smaller firms. Stories about larger firms tend to be more negative.

3.3 Risk-adjusted returns and robustness checks

To examine the risk-adjusted return differences between the LN and HN firms, we employ a zero-investment trading strategy that goes long on the LN portfolio and short on the HN portfolio (LN-HN strategy). Both the long and short positions are equally weighted, and are held for 6 months. The monthly returns on the long-short strategy are then regressed on the Fama-French (1993) three factors, the Carhart (1997) four factors, the Carhart four factors plus the Pastor-Stambaugh (2003) liquidity factor, or the Fama-French (2015) five factors. Table 3 reports the coefficients and the corresponding t-statistics. Results show that the profitability of the long-short strategy cannot be fully explained by the commonly-known risk factors, because all intercepts (alphas) are positive and statistically significant at the 5% level. The strategy outperforms the benchmarks by 0.251% to 0.280% per month (3.05% to 3.41% per year). The monthly returns on the long-short strategy

do not load very heavily on some risk factors, such as momentum and liquidity. In the next step, returns on the long and short legs are separately regressed on the aforementioned risk factors. Panel B and C of Table 3 show that abnormal returns of the LN-HN strategy come from the high-negative stocks. Alphas from the low-negative position are positive, but insignificantly different from zero.

~ Table 3 about here ~

The risk-adjusted return differences between NC and HN firms has also been examined. The intercepts (alphas) are reported in Panel A of Table 4. This strategy has even better performance than the LN-HN strategy, outperforming benchmarks by 0.280% to 0.523% per month (3.41% to 6.46% per year), significant at the 5% level or better. Some may wonder if the NC-HN strategy is indifferent to the coverage-based strategy performed by Fang and Peress (2009). To test it, we replicate their strategy that buys the NC stocks and sells the high-coverage stocks[7] (NC-HC strategy), and separately examine the long and short legs. Panel B to Panel D in Table 4 presents the results. The alphas for the long leg of each strategy (i.e. long NC stocks) are generally statistically significant (Panel C). However, the NC-HC strategy generally yields smaller alphas than the NC-HN strategy (Panel B and A), because the short leg of the NC-HC strategy (i.e. short high-coverage stocks) does not produce significant alphas (Panel D), while the short leg of the NC-HN strategy (i.e. short high-negative stocks) does. The finding that high-coverage stocks do not produce significant alphas is consistent with Fang and Peress (2009). In conclusion, high-negative stocks are not disguised high-coverage stocks.

~ Table 4 about here ~

---

[7] The news coverage of a firm is proxied by the number of articles for a firm. The high-coverage firms are those with more articles than the median

To examine media-based trading strategies in greater detail and check the robustness of our results, we employ the calendar-time overlapping portfolio approach of Jegadeesh and Titman (1993) for three strategies (LN-HN, NC-HN, and NC-HC) with different formation periods (J = 1, 3, or 6 months) and holding periods (K =1, 3, 6, 9, or 12 months). Each strategy is denoted as a J-month/K-month strategy. In every month t, a strategy selects stocks (LN, HN, NC, or HC) based on their media coverage and tone information in the past J months and holds them for K months. All portfolio returns are equally weighted. The strategies include a series of long-short portfolios with overlapping holding periods, so 1/K of the portfolios is effectively rebalanced every month (see details of this method in Jegadeesh and Titman, 1993). Table 5 reports the mean returns and risk-adjusted returns of the pure tone strategy (i.e. LN-HN). Some combinations of formation period and holding period (e.g. the 3-month/6-month and the 6-month/3-month strategies) have better performance than others, yielding statistically significant annualized alphas of around 2.5% to 3.3%. This is much smaller than alphas of the coverage-tone combined strategy (i.e. NC-HN) presented in Table 6, which are around 5% to 6% and all highly significant. The pure coverage strategy (i.e. NC-HC) produces slightly smaller alphas than the coverage-tone combined strategy (results available upon request), indicating that no-coverage stocks are the main driver of the alphas in all cases, while high-negative-tone stocks produce alphas in many cases.

~ Table 5 and Table 6 about here ~

4. Disentangling the Media Tone Effect

This section explores the longer-term (more than 1 year) effect of media tone, the underlying causes of the tone effect, and its interaction with price momentum.

4.1 Medium to long horizon

From Table 3, we have briefly seen that high-negative stocks are the drivers of the risk-adjusted returns of the strategy that goes long on low-negative stocks and short on high-negative stocks. In this section, we vary the formation period and holding period and separately check the long and short legs to have a better understanding of the tone effect in the longer term, as well as its underlying causes. We specifically examine the pure tone strategy (overlapping portfolio) adopted in the previous section. We separately examine risk-adjusted returns of low-negative and high-negative stocks, and extend the holding period to 18 and 24 months. Formation periods are still 1 month, 3 months, and 6 months, respectively. For brevity, we only report returns adjusted by the Fama-French (1993) three factors, as results based on other benchmarks are qualitatively similar. Panel A1 to A3 of Table 7 show that low-negative stocks produce insignificant negative abnormal returns in all cases. High-negative stocks consistently generate negative alphas, regardless of the formation period, but 3-month and 6-month formation periods produce greater and more statistically significant alphas. These abnormal returns are the biggest with a holding period of 6 or 9 months, and they gradually disappear after holding for 12 months. The biggest abnormal return (produced by F=6/H=3) in absolute term is -0.286% per month (-3.38% per year). The cumulative abnormal return for high-negative stocks is close to -4.0% after 24 months. Alphas of the long-short portfolio are generally significant with 3, 6, or 9 month holding periods.

Clearly, the positive return premium between low-negative and high-negative stocks is essentially driven by the medium-term negative return drift of high-negative stocks. With longer formation period, the drift is more evident. Although abnormal returns gradually disappear after 12 to 18 months, there is no evidence of reversal, since the magnitude of cumulative abnormal returns for high-negative stocks keeps increasing even 36 or 48 months after formation (unreported). It seems

that the information component of negative media tone is gradually impounded into prices. Similar medium-term return drift has been documented following specific news events or public information release, including earnings announcement (Foster et al., 1984; Chan et al., 1996), revisions in analysts' earnings forecast (Chan et al., 1996), and analysts' buy and sell recommendations (Womack, 1996), suggesting that investors underreact. In these studies, the news items are specific, and there is usually no ambiguity as to whether the information is positive or negative, because it is generally in quantitative form or presented via straightforward measures. Our results are based on media articles, which convey qualitative or 'soft' information that may be ambiguous, and investors' interpretation is subjective.

~ Table 7 about here ~

Our results suggest that the market's response is *asymmetric* for high-negative and low-negative stories. We find that low-negative stocks do not generate significant alphas, suggesting that low-negative stories do not contain *new* information, especially positive information, since alphas tend to be negative on average. At first glance this seems to be contradicted with the finding by Ahmad et al. (2016), who examine daily negative tone for 20 large firms, and discover that negative alphas for high-negative stocks and positive alphas for low-negative stocks on the first day following news stories are of similar magnitude and both significant. However, holding period returns for their low-negative portfolio drop to zero from the second day and remain at the same level afterwards, suggesting that low-negative tone only causes temporary price distortions. Meanwhile, high-negative tone leads to permanent price change within 1 to 2 days. In comparison, we do find that some information embedded in high-negative stories is not fully incorporated until at least 12 to 18 months later. Some may argue that we should consider positive words, too. We perform a robustness check by replacing the monthly *NT* scores with a relative negative tone (*RNT*) measure

(the difference between negative word count and positive word count, divided by the total number of words), and replicate the analysis in Panel A1 to A3 of Table 7. Results remain quantitatively and qualitatively similar[8]. Apparently, while low *NT* or *RNT* may suggest positive tone, it does not suggest new positive information. The asymmetric market response to high-negative and low-negative stories is similar in spirit to studies of public news in other settings. For example, Busse and Green (2002) examine real-time market response following reports during the Morning Call and Midday Call segments on CNBC, and find that the response of positive reports is less dramatic, while negative reports elicit a large and more gradual response. Womack (1996) finds that market reaction to added-to-sell recommendations by analysts is of greater magnitude than that to added-to-buy recommendations. Firms experience negative abnormal performance following added-to-sell recommendations for six months.

Our finding that low-negative stories do not contain new information is not contradicted with the finding by Tetlock et al. (2008) that S&P 500 firms' valuations are affected by positive (low-negative) news. Their news sample consists of both newspaper and newswires articles. As explained earlier, we should distinguish between newspaper stories and newswires. Newswires disseminate pure news (Ahmad et al., 2016), which is not necessarily covered by the media (Fang and Peress, 2009). Positive newswire stories should contain positive new information. In contrast, it is reasonable to conjecture that newspaper articles may disseminate objective fundamental information, contain 'sentiment' that can distort investor behavior (Dougal et al., 2012; Garcia, 2013), or they are purely noise. Regarding the abnormal return drift of high-negative stocks, the market's underreaction to negative information should come mostly from news about firms' fundamentals. How about other stories? Do they also contain information that is slowly

---

[8] Results available upon request

incorporated into prices? To examine this, we remove from the text sample all articles about a firm in any month when the firm makes an earnings announcement, and replicate the analysis in Panel A1 to A3 of Table 7. Our specific assumption is that news stories about firms' fundamentals is more likely to be concentrated in a few days around earnings release, although most articles in our sample are *not* about scheduled releases, and we remove all articles in that month to ensure robustness. The dates of earnings announcements are obtained from Compustat. For brevity, we only report results for 6-month formation period (Panel B of Table 7). We see that high-negative tone stocks still experience negative abnormal return drift. Comparing with the results based on full text sample (Panel A3), the magnitude of alphas is smaller overall, and cumulative abnormal return after 24 months drops to around 3.6%. It seems that the market's underreaction to negative news does come significantly from news about fundamentals. In the meantime, other stories also contain information that is not immediately reflected in prices, but the magnitude of underreaction is smaller.

4.2 Explaining the return drift of high-negative stocks

Why does the market underreact to negative news stories? The return drift suggests profitable opportunity that is not arbitraged away. The first explanation is that short-selling constraints cause delay in market reaction. With high short-selling constraints, prices tend to reflect the view of optimists, as pessimists are forced to stay on the sidelines, hence negative information is not fully incorporated into prices. We consider institutional ownership (IO) of a stock, defined as the number of shares held by all institutions as a fraction of the total common shares outstanding, as a proxy for short-selling restrictions, since institutions are a major source of lending (Asquith et al., 2005; Akbas, 2016). Therefore, lower IO indicates higher short-selling constraints, and the market's underreaction should be concentrated among stocks with lower IO. To test this, we focus

on the high-negative stocks, since low-negative stocks do not show return drift pattern. Among high-negative stocks, we assign firms into equally-weighted low-IO or high-IO portfolio, based on the median of their IO at the end of the formation period. IO data are obtained from Thomson Reuters' 13f and mutual fund databases. We still employ the overlapping portfolio approach (Jegadeesh and Titman, 1993). The monthly returns of the low-IO portfolio and high-IO portfolio are then regressed on the Fama-French (1993) three factors. Panel A of Table 8 reports the results for 6-month formation period with holding period ranging from 1 month to 24 months[9]. It is very clear that the return continuation pattern of high-negative stocks is indeed concentrated among low-IO stocks. Negative alphas for low-IO are of much bigger magnitude than that of the full high-negative group (-0.262% to -0.454% versus -0.196% to -0.286%). In addition, they are highly significant at the 1% level in all cases. Among them, the abnormal return for 1-month holding period is the biggest in absolute term at -0.454% per month (-5.31% per year). Abnormal returns become smaller in magnitude as holding period increases, but they are incomplete even after 24 months. The cumulative abnormal return is around -6.3% after 24 months. In contrast, high-IO stocks do not produce significant alphas. In conclusion, the evidence supports the hypothesis that the market's underreaction to information in negative stories is at least partly due to short-selling constraints. Apparently, while Engelberg et al. (2012) find that short sellers have superior ability to process publicly available information, there is still a substantial amount of information that is not immediately traded by the market.

Another explanation is that information diffuses slowly among investors. While the gradual-information-flow model of Hong and Stein (1999) emphasizes that investors observe different

---

[9] In Table 8, we only report returns adjusted by the Fama-French (1993) three factors for 6-month formation period. Results for other formation periods (1 month, 3 months) and other benchmark models (e.g. Carhart (1997) four factors, the Carhart four factors plus the Pastor-Stambaugh (2003) liquidity factor, or the Fama-French (2015) five factors) produce similar indication. These results are available upon request.

pieces of *private* information at different points in time, causing underreaction, it may also apply to public information reaction, as investors need to aggregate additional private signals following public news to form a judgment about value (Hong and Stein, 1999). Fang and Peress (2009) conjecture that high individual ownership (low IO) characterizes stocks with poor information dissemination. From this perspective, our results that underreaction is concentrated among low-IO stocks are consistent with the gradual-information-flow model (Hong and Stein, 1999). However, our finding that the market's response is asymmetric for high-negative and low-negative stories is not a direct confirmation of the 'bad news travels slowly' idea in Hong et al. (2000), as low-negative stories are not synonymous to good news.

~ Table 8 about here ~

We find that the tone effect is stronger for the high-coverage portfolio in the double sorts section (Panel D, Table 2). Why is coverage (number of articles) relevant to underreaction? We have a closer look by specifically examine high-negative stocks, which have more evident return drift. Among them, we form equally-weighted low-coverage and high-coverage portfolios with overlapping construction, based on the median of firms' total number of articles during the formation period. We then separately examine the abnormal returns of the low-coverage and high-coverage portfolios against the Fama-French (1993) three-factor model. Results reported in Panel B of Table 8 confirm that abnormal return drift of high-negative stocks is concentrated among high-coverage stocks. The absolute value of high-coverage stocks' monthly abnormal return is the biggest with 1-month holding period at -0.495% per month (-5.78% per year). The cumulative abnormal return is around -5.6% after 24 months. In contrast, low-coverage stocks also experience some negative abnormal return drift, but none of the monthly alphas is significant. These findings are consistent with Chan (2003), who finds little evidence that underreaction is mitigated if there

is more news for a firm. The findings also explain why the tone effect is concentrated among larger instead of smaller firms in our sample (Panel B1, Table 2), as firm size is positively correlated with media coverage. The fact that the market underreacts to negative public information when there are more news stories seems to confirm the hypothesis that private information diffuses slowly among investors (Hong and Stein, 1999), because the magnitude of underreaction should be positively associated with the amount of public information, as it takes more time for investors to process all available public news following aggregating their private signals. One may think that higher media coverage suggests higher speed of information flow, because media has been argued to play a positive role in information dissemination (Fang and Peress, 2009; Peress, 2014). However, while newspaper coverage helps increase public awareness and draw individual investors' attention, high-coverage firms generally do not enjoy quicker information diffusion. In fact, Fang and Peress (2009) find that firms face more severe information problem (e.g. firms with high individual ownership, low analyst coverage) are more likely to be covered in the media. They argue that the media seems to cater to information needs of individuals, instead of institutional investors. Therefore, high media coverage tends to be a proxy of poor information.

An alternative interpretation for the finding that underreaction is concentrated among high-coverage stocks is the limited investor attention hypothesis (Hirshleifer et al., 2009). Investors' attention to a specific piece of information is selective if the amount of information available is huge (Hirshleifer et al., 2011). This causes slow processing of new information when there are more stories during the formation period, as investors may simply ignore some value-relevant stories – especially because most stories are not about scheduled news events that highly attract investors' attention.

4.3 Tone effect and price momentum

What is the relationship between media tone and price momentum? We have briefly seen in Section 3.2 (Panel A4, Table 2) that the tone effect does not disappear if price momentum is considered. Hillert et al. (2014) find higher momentum profits among firms for which the article tone matches the formation period performance, and argue that media exacerbates investor biases (DHS overconfidence and self-attribution model) that lead to more pronounced overreaction and stronger later reversal. We would like to examine the opposite – the tone effect conditioned on past performance. Every month, we assign firms into equally-weighted 'winner' or 'loser' portfolio based on their past 6-month raw returns. Meanwhile, firms with media coverage in the past 6 months are classified as low-negative and high-negative stocks based on the median of their average monthly *NT* scores in this period. We still adopt the overlapping portfolio approach of Jegadeesh and Titman (1993), and separately examine the low-negative, high-negative, and no-coverage portfolios for winner and loser stocks with various holding periods, from 1 month to 24 months. Table 9 reports the risk-adjusted monthly returns of the sub-portfolios against the Fama-French (1993) three factors. Panel A presents winner results, and Panel B presents loser results. Comparing the two panels, we find that the tone effect (positive return differential between low-negative and high-negative stocks) exists only among winner stocks, with 3-month, 6-month, and 9-month holding periods. In contrast, whether the tone is good or bad does not make a difference for past *losers* at least in the medium term, as they all experience strong abnormal return drift of similar magnitude for at least 24 months. Low-negative winner stocks have slight positive abnormal return drift until holding for 9 months, followed by a gradual reversal (see CARs column), while high-negative winners reverse shortly after formation. Among firms with media coverage, return drift is much more evident for losers than winners, regardless of the tone. This is close to

Chan (2003)'s finding that news losers have drift, but news winners do not[10], although we do find mild return drift for low-negative winners. Meanwhile, we find that no-coverage winners have persistent return continuation for more than 12 months, while no-coverage losers have no drift, but a reversal shortly after formation. In contrast to Chan (2003)'s finding that both no-news winners and no-news losers reverse shortly after formation, we do not find reversal for no-coverage winners. Panel C of Table 9 shows that momentum profits (winner alphas minus loser alphas) with 6-month holding period between coverage stocks and no-coverage stocks are almost indifferent (0.763% vs. 0.754%). Momentum profits for low-negative stocks (0.853%) are greater than high-negative stocks (0.655%).

~ Table 9 about here ~

Our results seem to partly fit the core idea of the DHS model that investors overreact to private information and underreact to public information. For winner stocks with newspaper coverage during the formation period, low-negative tone causes positive short-term price deviation (due to self-attribution bias, as tone matches performance) that is reversed after 9 months[11]; high-negative tone contains new information that is gradually impounded into prices (underreaction), hence positive abnormal returns of high-negative past winners disappear after about 3 months. For winner stocks with no media coverage, there is persistent positive return drift. This may suggest overreaction to private signals in absence of public information[12]. The no-coverage risk premium (Fang and Peress, 2009) could also play a role here. It can take a substantial period of time for arbitragers or informed investors to remove significant positive abnormal returns because short-

---

[10] His definition of 'news' is not identical to newspaper coverage

[11] It is evidenced in Table 7 that low-negative tone does not contain positive new information

[12] We find that firms that are not covered in the previous 6 months (formation period) continue to have no or low coverage in future periods

selling is either not allowed or expensive. For loser stocks with newspaper coverage during the formation period, persistent negative return drift may also suggest overreaction to private information and any private signals generated following pubic stories. While high-negative stories should contain more value-relevant information than low-negative stories, based on our previous analysis, the fact that there is no difference between low-negative and high-negative losers may indicate that investors underweight public information. For no-coverage losers, arbitragers or informed investors can correct negative abnormal returns (overreaction of private signals in absence of public information) in relatively short period (3 months) since there is little constraint on buying. The no-coverage premium for losers is mainly driven by stocks with contemporaneous news coverage, not the no-coverage stocks. This is a novel finding related to the no-coverage premium. Our results seem to suggest an overreaction-based interpretation for momentum, but we are limited by the relatively short sample period to test the long-term patterns. The evidence supports that media tone speeds up the price discovery process, but only for past winners. There is no solid evidence confirming the finding of Hillert et al. (2014) that media exacerbates investor biases.

5. Summaries and Conclusions

We construct media tone measures from 53,856 newspaper articles about non-financial S&P 500 firms between 2004 and 2013, and find that stocks with low-negative-tone newspaper stories over a period earn higher returns (3.17% annualized) in the following months than stocks with high-negative-tone stories. The tone effect is not a disguised well-known return anomaly. While smaller firms are much less covered by major newspapers than larger firms, stories about larger firms tend

to be more negative, and the tone effect is more pronounced with larger firms. We also find that stocks with no coverage earn abnormal returns, and a zero-cost media-based investment strategy that goes long on no-coverage stocks and short on high-negative stocks generates greater profits than a pure tone-based or coverage-based strategy, yielding an annual risk-adjusted return of around 5% to 6%.

Media tone effect is primarily driven by the negative abnormal returns of the high-negative stocks. It is a novel finding that there is return drift following ambiguous public information (media articles), in contrast to the short-term return continuation following unambiguous and scheduled news events. The abnormal returns of the high-negative stocks disappear after about 12 to 18 months, but the return drift does not reverse in the long term. While the literature find that media negative tone contains value-relevant information that is immediately reflected in prices, our findings suggest that it also contains information that is not immediately traded away. Underreaction is more pronounced with stocks with low institutional ownership and higher media coverage. We conclude that short-selling constraints, gradual diffusion of information (Hong and Stein, 1999), and investor biases may collectively explain the market's underreaction to media information. While Fang and Peress (2009) conclude that mass media helps disseminate information to a broad audience, our findings reveal that value-relevant information from media is in *negative*, rather than positive form, and the market processes such information with a substantial delay. The informational role of media is asymmetric and limited in a way that it seems to convey negative new information only. Regarding the short-term price momentum, negative media tone expedites the correction of abnormal returns, but only for past winners. Overall, the evidence supports that the media's informational role is hampered by market frictions and bounded

rationality in the short term, but in the medium to long term, public information disseminated by the media may help correct mispricing based on private signals.

References

Akbas, F. (2016) The calm before the storm. *Journal of Finance*, 71, 225–266.

Ahmad, K., J. Han, E. Hutson, C. Kearney, and S. Liu (2016) Media-expressed negative tone and firm-level stock returns. *Journal of Corporate Finance*, 37, 152-172.

Asquith, P., P. Pathak, and J. Ritter (2005) Short interest, institutional ownership, and stock returns. *Journal of Financial Economics*, 2005 (78), 243–76.

Brown, S., and J. W. Tucker (2011) Large-sample evidence on firms' year-over-year MD&A modifications. *Journal of Accounting Research*, 49, 309-346.

Busse, J.A. and T.C. Green (2002) Market efficiency in real time. *Journal of Financial Economics*, 65, 415-437.

Carhart, M. M. (1997) On persistence in mutual fund performance. *Journal of Finance*, 52, 57-82.

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

Chan, L., N. Jegadeesh, and J. Lakonishok (1996) Momentum strategies. *Journal of Finance*, 51, 1681–713.

Daniel, K., D. Hirshleifer, and A. Subrahmanyam (1998) Investor psychology and security market under- and overreactions. *Journal of Finance*, 53, 1839–85.

Dougal C., J. Engelberg, D. Gacia, and C. A. Parsons (2012) Journalists and the stock market. *Review of Financial Studies*, 25, 639-679.

Engelberg, J. E. and C. A. Parsons (2011) The causal impact of media in financial markets. *Journal of Finance,* 66, 67–97.

Engelberg J. E., A.V. Reed, and M.C. Ringgenberg (2012) How are shorts informed? Short sellers, news, and information processing. *Journal of Financial Economics*, 105, 260-278.

Fama, E. F. and K. French (1993) Common risk factors in the returns on bonds and stocks. *Journal of Financial Economics*, 33, 3-56.

Fama, E. F. and K. French (2015) A five-factor asset pricing model. *Journal of Financial Economics*, 116, 1-22.

Fang, L. and J. Peress (2009) Media coverage and the cross-section of stock returns. *Journal of Finance,* 64, 2023–2052.

Ferguson, N., D. Philip, H. Lam, and J. Guo (2015) Media content and stock returns: The predictive power of press. *Multinational Finance Journal*, 19, 1-31.

Foster, G., C. Olsen, and T. Shevlin (1984) Earnings releases, anomalies, and the behavior of security returns. *The Accounting Review*, 59, 574–603.

Garcia, D. (2013) Sentiment during recessions. *Journal of Finance*, 68, 1267–1300.

Gurun, U. G., and A. W. Butler. (2011) Don't believe the hype: Local media slant, local advertising, and firm value. *Journal of Finance*, 67, 561–98.

Hillert, A., H. Jacobs, and S. Müller (2014) Media makes momentum. *Review of Financial Studies*, 27, 3647-3501.

Hirshleifer, D., S. Lim, and S. H. Teoh (2009) Driven to distraction: Extraneous events and underreaction to earnings news. *Journal of Finance*, 64, 2289–325.

Hirshleifer, D., S. Lim, and S. H. Teoh (2011) Limited investor attention and stock market misreactions to accounting information. *Review of Asset Pricing Studies*, 1 (1), 35-73.

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

Hong, H., T. Lim, and J. Stein (2000) Bad news travels slowly: Size, analyst coverage and the profitability of momentum strategies. *Journal of Finance*, 55, 265–295.

Jegadeesh, N. and S. Titman (1993) Returns to buying winners and selling losers: Implications for stock market efficiency. *Journal of Finance*, 48, 65–91.

Jegadeesh, N. and A.D. Wu (2013) Word power: A new approach for content analysis. *Journal of Financial Economics*, 110(3), 712-729.

Kearney, C. and S. Liu (2014) Textual sentiment in finance: a survey of methods and models. *International Review of Financial Analysis*, 33, 171–185.

Loughran, T. and J. Ritter (1995) The new issues puzzle. *Journal of Finance*, 50, 23–52.

Loughran, T. and B. McDonald (2011) When is a liability not a liability? Textual analysis, dictionaries, and 10-Ks. *Journal of Finance*, 66, 35-65.

Loughran, T. and B. McDonald (2016) Textual analysis in accounting and finance: A survey. *Journal of Accounting Research*, 54, 1187–1230.

Nofsinger, J. (2016) *The Psychology of Investing, 5th Edition*. New York: Routledge.

Pastor, L. and R. F. Stambaugh (2003) Liquidity risk and expected stock returns. *Journal of Political Economy*, 111, 642–685.

Peress, J. (2014) The media and the diffusion of information in financial markets: Evidence from newspaper strikes. *Journal of Finance*, 69, 2007–2043.

Tetlock, P. C. (2007) Giving content to investor sentiment: The role of media in the stock market. *Journal of Finance,* 62, 1139-1168.

Tetlock, P. C., M. Saar-Tsechansky, and S. Macskassy (2008) More than words: Quantifying language to measure firms' fundamentals. *Journal of Finance, 63, 1437-1467.*

Womack, K.L. (1996) Do brokerage analysts' recommendations have investment value? *Journal of Finance*, 51, 137–168.

Figure 1: Firm size, media coverage, and tone
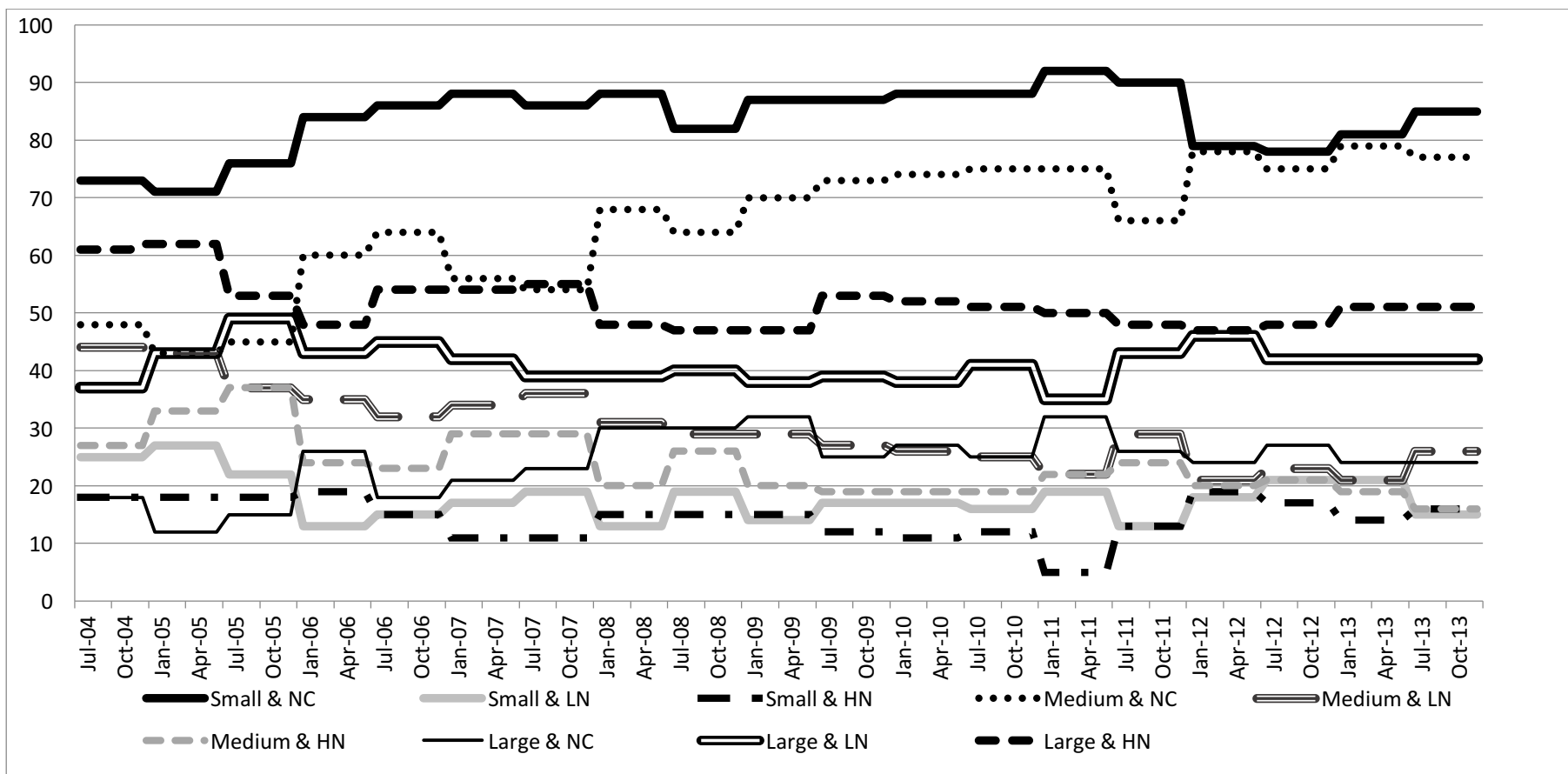
Table 1: Summary Statistics of Newspaper Coverage and *NT* scores

This table presents summary statistics for the number of newspaper articles and *NT* scores of the sample firms from 2004 to 2013. Panel A shows the statistics (mean, median, and standard deviation) for all firms in our sample – 352 non-financial S&P 500 firms. Panel B presents the same statistics for S&P 100 firms only. Panel C presents the mean, median, and standard deviation of the monthly *NT* scores for all firms and S&P 100 firms only.

	Panel A: All firms			
	Number of articles			Percentage of firms not
	Mean	Median	S.D.	covered in the media
2004	21	3	60	27%
2005	20	2	57	32%
2006	18	2	50	39%
2007	15	1	43	40%
2008	14	1	51	45%
2009	12	1	36	46%
2010	11	1	42	47%
2011	14	1	53	42%
2012	15	1	59	42%
2013	13	1	54	46%
All years	15	1	51	10%

	Panel B: S&P 100 firms			
	Number of articles			Percentage of firms not
	Mean	Median	S.D.	covered in the media
2004	72	28	109	4%
2005	67	29	100	9%
2006	60	25	90	6%
2007	51	22	77	5%
2008	45	19	83	9%
2009	40	15	66	6%
2010	40	14	83	10%
2011	47	15	101	8%
2012	49	17	114	6%
2013	44	13	106	5%
All years	51	19	94	0%

	Panel C:Monthly *NT* score		
	Mean	Median	S.D.
All firms	1.73	1.54	1.16
S&P 100 firms	1.81	1.64	1.04

Table 2: Media Tone and Stock Returns

Every month, firms with no newspaper article are grouped into the no-coverage (NC) portfolio. Firms with news articles are sorted into the low-negative-tone (LN) and high-negative-tone (HN) portfolios based on the median of their average monthly negative tone (*NT*) scores over the previous 6 months. The portfolios are rebalanced every 6 months. Panel A presents the equal-weighted average monthly returns of the three portfolios and the t-statistics for the return differences between LN and HN stocks and between NC stocks and HN stocks. Firms are also double sorted by one of the firm characteristics (size, Book-to-Market ratio, profitability, past 6-month return, and price) and media tone. Panel B1 to B5 presents the results of these portfolios. Panel C presents the returns of stocks with no, low, and high media coverage, and panel D reports the returns for portfolios double sorted by tone and coverage. T-statistics are marked in italic, bold, or bold and italic for significance level of 10%, 5%, and 1%, respectively.

	Average Monthly Portfolio Return (Equally weighted)						
	Media Tone				t-Statistics for		t-Statistics for
	NC	LN	HN	LN - HN	LN - HN	NC - HN	NC - HN
Panel A: Media Tone Only							
All stocks	0.95	0.72	0.46	0.26	**2.19**	0.49	***3.41***
Panel B1: By Size							
1	1.39	1.32	1.16	0.16	0.47	0.23	0.63
2	0.63	0.45	0.49	-0.03	-0.16	0.14	0.61
3	0.29	0.62	0.26	0.37	***2.73***	0.04	0.16
Panel B2: By Book-to-Market							
1	0.82	0.47	0.29	0.18	0.92	0.53	***2.75***
2	0.96	0.80	0.31	0.49	**2.57**	0.65	***3.31***
3	1.07	0.92	0.72	0.19	1.05	0.36	*1.82*
Panel B3: By Profitability							
1	0.79	0.63	0.41	0.22	1.09	0.38	*1.68*
2	0.99	0.70	0.64	0.06	0.35	0.35	*1.72*
3	1.07	0.89	0.35	0.55	***2.63***	0.72	***3.57***
Panel B4: By Past 6-Month Return							
1	1.02	0.68	0.41	0.27	1.49	0.61	***2.75***
2	0.83	0.83	0.69	0.14	0.91	0.14	1.04
3	1.01	0.70	0.30	0.39	*1.95*	0.71	***3.44***
Panel B5: By Price							
1	1.59	1.15	0.95	0.19	0.91	0.64	***2.84***
2	0.82	0.73	0.32	0.41	**2.37**	0.50	***2.87***
3	0.42	0.37	0.11	0.26	1.47	0.31	1.54

Table 2 (continued)

		Panel C: Media Coverage Sort					
		Media Coverage			t-Statistics for		t-Statistics for
	No	Low coverage	High coverage	Low - High	Low - High	No - High	No - High
All stocks	0.95	0.62	0.57	0.05	0.46	0.38	*2.77*

	Panel D: Double Sort by Media Coverage and Tone			
	Media Tone			
	LN	HN	LN - HN	t-Statistics for LN - HN
Low coverage	0.64	0.58	0.07	0.36
High coverage	0.79	0.38	0.40	**2.30**

Table 3: Media Tone Strategy and Risk-adjusted Returns

This table presents the risk-adjusted returns (alphas) of a zero-investment trading strategy that goes long on the low-negative portfolio and short on the high-negative portfolio. The formation of the two portfolios are based on the median of firms' average *NT* scores in the previous 6 months. Both the long and short positions are equally weighted, and are held for 6 months. The monthly returns on the long-short strategy are then regressed on the Fama-French (1993) three factors, the Carhart (1997) four factors, the Carhart four factors plus the Pastor-Stambaugh (2003) liquidity factor, or the Fama-French (2014) five factors. T-statistics are reported beneath the coefficients, and are marked in italic, bold, or bold and italic for significance level of 10%, 5%, and 1%, respectively.

	Model 1: FF Three-Factor	Model 2: Carhart Four-Factor	Model 3: PS Liquidity	Model 4: FF Five-Factor
Panel A: Long low-negative stocks, short high-negative stocks				
Intercept	0.279	0.271	0.280	0.251
	2.46	**2.38**	**2.45**	**2.08**
Mkt - Rf	-0.064	-0.055	-0.053	-0.057
	-2.15	*-1.77*	*-1.69*	-1.64
SMB	0.191	0.188	0.192	
	3.33	*3.27*	*3.32*	
HML	-0.111	-0.095	-0.107	-0.133
	-2.22	*-1.83*	*-1.97*	**-2.40**
UMD		0.031	0.034	
		1.23	1.32	
LIQ			-0.021	
			-0.73	
SMB2				0.207
				3.54
RMW				0.068
				0.72
CMA				-0.008
				-0.09
Observations	114	114	114	114
Adjusted R square	0.119	0.123	0.119	0.115

Table 3 (continued)

	Panel B: Alphas for low-negative- stocks			
Intercept	0.038	0.047	0.020	0.055
	0.36	0.45	0.20	0.49
	Panel C: Alphas for high-negative stocks			
Intercept	-0.241	-0.223	-0.260	-0.196
	-2.22	**-2.11**	**-2.53**	*-1.71*

Table 4: Additional Media-based Strategies and Risk-adjusted Returns

This table presents the risk-adjusted returns (alphas) of additional media-related trading strategies. Panel A reports the results for a strategy that goes long on the no-coverage portfolio and short on the high-negative-tone portfolio. Panel B examines a coverage strategy that buys the no-coverage portfolio and sells the high-coverage portfolio. Panel C and D separately examine the abnormal returns of the long and short legs for the coverage strategy. The formation period for these portfolios is 6 months. T-statistics are marked in italic, bold, or bold and italic for significance level of 10%, 5%, and 1%, respectively.

	Model 1: FF Three-Factor	Model 2: Carhart Four-Factor	Model 3: PS Liquidity	Model 4: FF Five-Factor
	Panel A: Long no-coverage stocks, short high-negative stocks			
Intercept	0.511	0.486	0.280	0.523
	3.70	*3.64*	**2.45**	*3.61*
	Panel B: Long no-coverage stocks, short high-coverage stocks			
Intercept	0.377	0.353	0.280	0.428
	2.78	*2.69*	**2.39**	*3.05*
	Panel C: Alphas for no-coverage stocks			
Intercept	0.270	0.263	0.177	0.327
	2.06	**2.00**	1.60	**2.46**
	Panel D: Alphas for high-coverage stocks			
Intercept	-0.107	-0.089	-0.104	-0.101
	-1.24	-1.08	-1.25	-1.10

Table 5: Risk-adjusted Returns of Pure Tone Strategies

This table presents the risk-adjusted returns (alphas) of a zero-investment trading strategy that goes long on the low-negative portfolio and short on the high-negative portfolio. We employ the overlapping portfolio approach of Jegadeesh and Titman (1993) with different formation periods (J = 1, 3, or 6 months) and holding periods (K =1, 3, 6, 9, or 12 months). The monthly returns on the long-short strategy are then regressed on the Fama-French (1993) three factors, the Carhart (1997) four factors, the Carhart four factors plus the Pastor-Stambaugh (2003) liquidity factor, or the Fama-French (2014) five factors. Alphas are marked with *, **, or *** for significance level of 10%, 5%, and 1%, respectively.

Holding Period	Time-Series Mean	FF Three-Factor	Carhart Four-Factor	PS Liquidity	FF Five-Factor
		Formation Period = 1 Month			
1 month	0.038	0.006	-0.014	-0.032	-0.008
3 months	0.135	0.123	0.101	0.098	0.188
6 months	0.156*	0.155*	0.140*	0.136*	0.198**
9 months	0.155**	0.153**	0.144**	0.143**	0.145**
12 months	0.142*	0.138**	0.132**	0.132*	0.140*
		Formation Period = 3 Months			
1 month	0.160	0.164	0.138	0.128	0.285*
3 months	0.176	0.184*	0.161	0.161	0.269**
6 months	0.201**	0.220**	0.198**	0.205**	0.248**
9 months	0.188**	0.196***	0.182**	0.184**	0.196**
12 months	0.123	0.130*	0.118*	0.121*	0.141*
		Formation Period = 6 Months			
1 month	0.178	0.191	0.188	0.165	0.202
3 months	0.222**	0.236**	0.225**	0.231**	0.240**
6 months	0.192**	0.204**	0.197**	0.214**	0.201*
9 months	0.129	0.134	0.131	0.144	0.140
12 months	0.091	0.098	0.091	0.088	0.080

Table 6: Risk-adjusted Returns of Coverage-Tone Combined Strategies

This table presents the risk-adjusted returns (alphas) of a zero-investment trading strategy that longs the no-coverage portfolio and shorts the high-negative portfolio. We employ the overlapping portfolio approach of Jegadeesh and Titman (1993) with different formation periods (J = 1, 3, or 6 months) and holding periods (K =1, 3, 6, 9, or 12 months). The monthly returns on the long-short strategy are then regressed on the Fama-French (1993) three factors, the Carhart (1997) four factors, the Carhart four factors plus the Pastor-Stambaugh (2003) liquidity factor, or the Fama-French (2014) five factors. Alphas are marked with *, **, or *** for significance level of 10%, 5%, and 1%, respectively.

Holding Period	Time-Series Mean	FF Three-Factor	Carhart Four-Factor	PS Liquidity	FF Five-Factor
Formation Period = 1 Month					
1 month	0.401***	0.375***	0.354***	0.271**	0.437***
3 months	0.403***	0.389***	0.364***	0.298***	0.472***
6 months	0.392***	0.383***	0.358***	0.297***	0.442***
9 months	0.360***	0.350***	0.330***	0.271***	0.384***
12 months	0.368***	0.358***	0.338***	0.282***	0.396***
Formation Period = 3 Months					
1 month	0.452***	0.452***	0.424***	0.359***	0.549***
3 months	0.434***	0.437***	0.406***	0.347***	0.509***
6 months	0.434***	0.442***	0.412***	0.361***	0.478***
9 months	0.425***	0.427***	0.402***	0.352***	0.447***
12 months	0.400***	0.402***	0.378***	0.328***	0.432***
Formation Period = 6 Months					
1 month	0.448***	0.466***	0.435***	0.372***	0.508***
3 months	0.473***	0.487***	0.455***	0.399***	0.497***
6 months	0.445***	0.456***	0.426***	0.374***	0.446***
9 months	0.422***	0.426***	0.399***	0.346***	0.422***
12 months	0.398***	0.403***	0.378***	0.323***	0.405***

Table 7: Risk-adjusted Returns of Pure Tone Strategy with Extended Holding Period

This table presents the risk-adjusted returns (alphas) of a zero-investment trading strategy that buys the low-negative portfolio and sells the high-negative portfolio, including both the long and short legs. We employ the overlapping portfolio approach of Jegadeesh and Titman (1993) with different formation periods (J = 1, 3, or 6 months) and holding periods (K =1, 3, 6, 9, 12, 18, or 24 months). The monthly returns on the long-short strategy are then regressed on the Fama-French (1993) three factors. Alphas are marked with *, **, or *** for significance level of 10%, 5%, and 1%, respectively. The last column presents the cumulative abnormal returns (CARs) of the high-negative stocks, calculated as the average monthly alphas times the holding period (months). Panel A1 to A3 show full-sample results; Panel B results are based on the text sample that excludes all articles about a firm in any month when the firm makes an earnings announcement.

Holding period (months)	low-negative stocks	High-negative stocks	long low-negative, short high-negative stocks	High-negative stocks CARs
Panel A1: Formation period = 1 month				
1	-0.146	-0.152	0.006	-0.152
3	-0.052	-0.175*	0.123	-0.525
6	-0.018	-0.173*	0.155*	-1.039
9	0.006	-0.147*	0.153**	-1.323
12	-0.012	-0.150*	0.138**	-1.802
18	-0.033	-0.134*	0.101	-2.420
24	-0.051	-0.127	0.076	-3.041
Panel A2: Formation period = 3 months				
1	-0.063	-0.227**	0.164	-0.227
3	-0.036	-0.220**	0.184*	-0.661
6	-0.010	-0.229**	0.220**	-1.376
9	-0.018	-0.214**	0.196***	-1.924
12	-0.054	-0.184*	0.130*	-2.205
18	-0.072	-0.072*	0.090	-1.303
24	-0.080	-0.130	0.051	-3.125
Panel A3: Formation period = 6 months				
1	-0.068	-0.268**	0.191	-0.268
3	-0.052	-0.286**	0.236**	-0.857
6	-0.055	-0.261**	0.204**	-1.568
9	-0.090	-0.226**	0.134	-2.032
12	-0.105	-0.203*	0.098	-2.439
18	-0.119	-0.196*	0.077	-3.529
24	-0.113	-0.166	0.053	-3.978
Panel B: Exclude stories around earnings announcements (Formation period = 6 months)				
1	-0.104	-0.273**	0.169	-0.273
3	-0.066	-0.261**	0.196*	-0.784
6	-0.047	-0.250**	0.203*	-1.499
9	-0.085	-0.221*	0.136	-1.991
12	-0.088	-0.210*	0.122	-2.522
18	-0.111	-0.187	0.076	-3.372
24	-0.125	-0.151	0.026	-3.634

Table 8: Interaction of High-Negative Tone with Institutional Ownership and Coverage

Panel A presents the risk-adjusted returns (alphas) for high-negative stocks with low and high institutional ownership (IO), respectively. Among high-negative stocks, we assign firms into equally-weighted low-IO or high-IO portfolio, based on the median of their total IO as the fraction of shares outstanding at the end of the formation period. We employ the overlapping portfolio approach of Jegadeesh and Titman (1993) with 6-month formation period and various holding periods (K =1, 3, 6, 9, 12, 18, or 24 months). The monthly returns of the low-IO and high-IO portfolios are regressed on the Fama-French (1993) three factors, and are marked with *, **, or *** for significance level of 10%, 5%, and 1%, respectively. The last two columns present the cumulative abnormal returns (CARs), calculated as the average monthly alphas times the holding period (months). Panel B presents the results for high-negative stocks with low and high coverage (number of articles), respectively.

Panel A: Negative tone and institutional ownership				
Holding period (Months)	Low-IO stocks	High-IO stocks	CARs for Low-IO stocks	CARs for High-IO stocks
1	-0.454***	-0.222	-0.454	-0.222
3	-0.406***	-0.140	-1.219	-0.421
6	-0.370***	-0.132	-2.222	-0.793
9	-0.309***	-0.150	-2.779	-1.351
12	-0.272***	-0.159	-3.268	-1.910
18	-0.284***	-0.113	-5.120	-2.037
24	-0.262***	-0.063	-6.298	-1.517
Panel B: Negative tone and coverage				
Holding period (Months)	Low-coverage stocks	High-coverage stocks	CARs for low-coverage stocks	CARs for high-coverage stocks
1	-0.199	-0.495***	-0.199	-0.495
3	-0.194	-0.406***	-0.583	-1.219
6	-0.228	-0.348***	-1.366	-2.088
9	-0.217	-0.284***	-1.954	-2.557
12	-0.181	-0.260**	-2.173	-3.124
18	-0.160	-0.248**	-2.877	-4.471
24	-0.114	-0.235**	-2.729	-5.632

Table 9: Media Tone and Price Momentum

This table presents the risk-adjusted returns (alphas) and cumulative abnormal returns (CARs) for low-negative stocks, high-negative stocks, and no-coverage stocks for past winners (Panel A) and losers (Panel B). Every month, we assign firms into equally-weighted 'winner' or 'loser' portfolio based on their past 6-month raw returns. Meanwhile, firms with media coverage in the past 6 months are classified as low-negative and high-negative stocks based on the median of their average monthly negative tone (*NT*) scores in this period. We employ the overlapping portfolio approach of Jegadeesh and Titman (1993) with various holding periods (K =1, 3, 6, 9, 12, 18, or 24 months). The monthly returns on the low-negative, high-negative and no-coverage portfolios are then regressed on the Fama-French (1993) three factors. Alphas are marked with *, **, or *** for significance level of 10%, 5%, and 1%, respectively. CARs are calculated as the average monthly alphas times the holding period (months). Panel C presents the momentum profits (winner alphas minus loser alphas) for low-negative stocks, high-negative stocks, coverage stocks, and no-coverage stocks, respectively, with 6-month holding period.

	Panel A: Winners						
	low-negative stocks		High-negative stocks		long low-negative, short high-negative stocks	No-coverage stocks	
Holding period (months)	Risk-adjusted returns	CARs	Risk-adjusted returns	CARs		Risk-adjusted returns	CARs
1	2.095***	2.095	1.959***	1.959	0.136	2.343***	2.343
3	0.722***	2.165	0.445***	1.334	0.277**	0.947***	2.840
6	0.370***	2.222	0.100	0.597	0.271***	0.551***	3.305
9	0.247	2.227	0.039	0.353	0.208**	0.425**	3.821
12	0.161	1.937	0.033	0.390	0.129	0.387**	4.641
18	0.088	1.587	-0.021	-0.380	0.109	0.348	6.256
24	0.077	1.845	-0.008	-0.181	0.084	0.340	8.161
	Panel B: Losers						
	low-negative stocks		High-negative stocks		long low-negative, short high-negative stocks	No-coverage stocks	
Holding period (months)	Risk-adjusted returns	CARs	Risk-adjusted returns	CARs		Risk-adjusted returns	CARs
1	-2.338***	-2.338	-2.085***	-2.085	-0.253	-2.153***	-2.153
3	-0.847***	-2.541	-0.880***	-2.639	0.033	-0.625***	-1.876
6	-0.483***	-2.896	-0.556***	-3.335	0.073	-0.204	-1.222
9	-0.436**	-3.921	-0.438**	-3.945	0.003	-0.051	-0.461
12	-0.380**	-4.563	-0.383**	-4.595	0.003	-0.019	-0.224
18	-0.329**	-5.924	-0.321**	-5.770	-0.009	0.034	0.604
24	-0.302**	-7.255	-0.277**	-6.657	-0.025	0.007	0.179
	Panel C: Momentum returns (long winners, short losers)						
Holding period (months)	low-negative stocks		High-negative stocks		Coverage stocks	No-coverage stocks	
6	0.853		0.655		0.763	0.754	

Appendix

Table A1

Every month, firms with no newspaper article are grouped into the no-coverage (NC) portfolio. Firms with news articles are sorted into the low-negative-tone (LN) and high-negative-tone (HN) portfolios based on the median of their average monthly negative tone (*NT*) scores over the previous 6 months. The portfolios are rebalanced every 6 months. Firms are also sorted by size. This table presents the equally-weighted monthly raw returns of each sub-portfolio. T-statistics are in the brackets.

	NC	LN	HN
Small (Size 1)	1.39 (2.82)	1.32 (2.29)	1.16 (1.69)
Medium (Size 2)	0.63 (1.34)	0.45 (0.87)	0.49 (0.92)
Large (Size 3)	0.29 (0.64)	0.62 (1.55)	0.26 (0.60)