What does media tone premium tell about expected stock returns?

Sha Liu and Jingguang Han

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 positive-tone articles in the previous 6 months generate higher returns in the following months than firms with negative-tone articles. This media tone premium is not a disguised well-known risk factor, and is most pronounced among larger firms and firms with high media coverage. We argue that differences in media tone communicate information of fundamental risk. By constructing a media tone factor in the spirit of Fama and French (1993), we find that media tone does contain additional information that explains average stock returns over the widely-accepted risk factors, indicating that media tone premium is a proxy of common risk. In contrast, although the no-coverage premium is more pronounced than the tone premium, media coverage largely plays a non-informational role.

Key words: media tone; media coverage; negative words; asset pricing models; cross-section of stock returns

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1. Introduction

Mass media has been found to play a role in stock pricing or investor behaviors. Recent studies have focused on two aspects of media – media tone (e.g. Tetlock 2007; Tetlock et al., 2008), media coverage[1] (e.g. Chan, 2003; Vega, 2006; Fang and Peress, 2009; Engelberg and Parsons, 2011), or both (e.g. Hillert et al., 2014; Ahmad et al., 2016). The role of mass media on stock markets can be both informational and behavioral as some media content contains elements of news by and large, while some content is not genuine news but the follow-ups of news or commentaries (i.e. opinions). Meanwhile, media coverage can have an effect on investors' trading behaviors by affecting investors' attention on individual stocks (Barber and Odean, 2008; Fang and Peress, 2009). From corporate sides, there is evidence that some firms actively manage their media coverage and media tone during important corporate events (e.g. mergers and acquisitions) in order to influence their stock prices (Ahern and Sosyura, 2014).

Regarding media tone (sometimes termed as "sentiment"), researchers have been investigating whether it contains value-relevant information. Tetlock et al. (2008) find that *firm-specific* negative tone contains firms' fundamental information that is hard to be measured by traditional quantitative financial measures, and investors quickly react to such information. Using UK firm-specific data, Ferguson et al. (2015) also find that the market quickly reacts to the tone of the news stories and there is no significant evidence of reversals. On the other hand, two studies that investigate media tone for the *general market* (Tetlock; 2007; Garcia, 2013) lend more support to the non-informational interpretation of the role of media, as they find that the negative impact of negative tone on stock returns is reversed over the next few days. Ahmad et al. (2016) separately examine a large collection of all kinds of

[1] Number of articles about a particular firm in specified periods

media articles and newswires, and find that media content can sometimes contain news and sometimes contain sentiment (or noise), while newswires are indeed pure information.

The studies on media coverage generally confirm the non-informational or behavioral role of mass media in financial markets. Fang and Peress (2009) find that the return premium between no-coverage stocks and high-coverage stocks (i.e. no-coverage premium) are related to investor recognition and the breadth of information dissemination. Engelberg and Parsons (2011) find that the probability and magnitude of local trading are strongly related to the local patterns of media coverage. Hillert et al. (2014) confirm the overreaction-based story of the momentum effect by finding that media coverage can exacerbate investor biases, leading to stronger momentum for firms particularly covered by media. By comparing tone-based and coverage-based trading strategies on 20 large and liquid stocks that are free from investor recognition problems or information scarcity, Ahmad et al. (2016) conclude that the qualitative information conveyed in media articles plays a role in individual stock or portfolio returns, but media attention (proxied by media coverage) does not.

Given that the role of media on stock prices is complicated as it depends both on those who write the news (i.e. firms, journalists)[2] and on those who interpret the news (i.e. investors), this research tries to transcend the process of information dissemination and investigate whether media tone and media coverage explain average stock returns on the whole. Our sample consists of 53,856 newspaper articles about non-financial S&P 500 firms between January 2004 and December 2013. We calculate the fraction of negative words, based on Loughran and McDonald's (2011) finance dictionary, in the total number of words in a calendar month as the monthly negative tone scores. By sorting firms into two equally-weighted portfolios by the median of their average negative tone scores over the previous 6

[2] Dougal et al. (2012) argue that the "sentiment" of different journalists may cause persistent return predictability. Their results suggest that characteristics of financial journalists are likely to influence investor behaviours at least in the short run.

months, we find that firms with positive-tone newspaper articles earn higher returns in the following months than firms with negative-tone articles. The return difference between the positive and negative portfolios is a statistically significant 3.17% per year. This “media tone premium” 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 risk factor.

The ‘no-media-coverage premium’ found by Fang and Peress (2009) is most pronounced among small firms, which face more severe information problems and lower investor recognition. Large firms tend to be “information complete”, and are therefore not subject to the coverage effect. In contrast, we find that the “media tone premium” is most pronounced among larger firms. This suggests that tone plays a role among larger (and normally highly covered) firms, as it communicates additional information about firm fundamentals. On the contrary, tone effect is insignificant among smaller firms, which have much fewer newspaper articles or no coverage at all in our sample. It is not surprising that the tone effect is weak, as investors simply require a media coverage premium because of the information scarcity of these firms. Unsurprisingly, tone premium also exists among high-coverage stocks.

A monthly zero-cost trading strategy that longs positive-tone stocks and shorts negative-tone stocks with equal weights yields a significant return of 3.05% to 3.41% per year, after adjusting for the Fama-French (1993) three factors, the Carhart (1997) four factors, the Pastor-Stambaugh (2003) liquidity factor, or the Fama-French (2015) five factors. The abnormal returns are largely driven by negative-tone stocks. Another strategy that longs no-coverage stocks and shorts negative-tone stocks has even greater abnormal returns. It outperforms the benchmarks by 3.41% to 6.46% per year. Consistent with the findings of Fang and Peress (2009), high-coverage stocks do not produce significant alphas while no-coverage stocks do. Therefore, a media strategy that longs the no-coverage stocks and shorts negative-tone stocks generate greater alphas than a pure coverage strategy or a pure sentiment strategy. These findings are robust using the overlapping portfolio construction method of Jegadeesh and Titman (1993).

Different from previous literature that examine the effect of firm-specific media tone on stock returns (e.g. Tetlock et al.; 2008; Ferguson et al.; 2015), we also delve into the potential valuable information conveyed by the *differences* in tone scores of individual firms. This allows us to create a measure of media tone premium and test whether it is a latent common risk factor. The reason to consider media tone premium as a risk factor is that existing literature largely support that firm-specific media tone contains hard-to-quantify fundamental information (see Tetlock, 2008; Ferguson et al., 2015; Ahmad et al., 2016), and in the meantime we find that a few fundamental variables (e.g. size, Book-to-Market ratio) are determinants of media tone. Our hypothesis is that on average, the return differences between positive-tone stocks and negative-tone stocks tell the differences in firm fundamentals, hence the risk levels. We implement the standard asset pricing tests to examine whether the media tone premium help explain average stock returns over widely-accepted factors. Additionally, we compare the role of media tone with that of media coverage in this regard. Although the number of stocks in our sample may be small (due to the limitation in media coverage), compared with classic asset pricing test samples, these stocks constituent an important sample as they encompass a substantial proportion of the total US market capitalization. Meanwhile, the main purpose of this research is to increase our understanding of the role of media in terms of explaining expected stock returns, rather than to create and validate a new empirical model.

To examine the hypothesis above, we construct 6 value-weighted size/media tone portfolios, from which we construct a media tone factor in the spirit of Fama and French (1993), and implements the GRS tests (Gibbons et al., 1989) and Fama-MacBeth (1973) regressions on 6 sets of portfolios formed on different fundamentals or momentum to see if a model contains the media tone factor has better performance than the Fama-French (1993) three-factor, Carhart (1997) four-factor, or Fama-French (2015) five-factor models. Both the GRS tests and Fama-MacBeth regressions show that adding the media tone factor to the original models improve the p-values[3] and adjusted R square most of the time. The average absolute intercepts (i.e. pricing errors) in the GRS tests are also reduced in 61% of cases. Fama-MacBeth regressions show that the model contains Fama-French (2015) five factors and the media tone factor has the best performance for 5 out of 6 sets of testing portfolios. In some cases, the improvement brought by the tone factor is huge. For example, for the 25 portfolios formed on size and momentum, the model including Fama-French (2015) five factors plus the media tone factor has a p-value of 0.70, significantly higher than the p-value of the second best model, which is 0.26. Our findings suggest that media tone does contain additional value-relevant information that explains average stock returns.

Unlike tone, media coverage of firms should contain less fundamental information, because the number of articles itself does not explicitly communicate any value-relevant information. Moreover, “media coverage is not random, but rather the product of profit maximization by newspapers, television, magazines, etc.” (Engelberg and Parsons, 2011, p.67, cited Gentzkow and Shapiro, 2010). Therefore, there are good reasons to believe that media coverage contains less value-relevant information than media tone. To test this hypothesis, we also construct a media coverage factor in the same way that we construct the tone factor. Our

[3] For testing the null hypothesis that the intercepts of the portfolios being tested are jointly zero

findings show that the media coverage models indeed do not explain average stock returns as well as the media tone models.

If the media tone premium is a common risk factor that reflects the difference in fundamental risk between positive-tone (low-negativity) firms and negative-tone (high-negativity) firms, the differences between the average negative tone scores of the two groups of firms should have an impact on stock returns. We test this hypothesis as a robustness check for the media tone effect. Our results show that for our full sample and sub-samples, the differences between the monthly average high-negativity scores and low-negativity scores have a significant and negative impact on stock returns in the following months, after controlling for firm fundamentals. Interestingly, negative tone scores do not have any impact on future returns, suggesting that the information component of media tone has been quickly reflected in prices. However, the difference between positive tone and negative tone is a predictor of stock returns. The difference-in-tone-score series generated from our sample of S&P 500 stocks also predict returns of other samples of stocks (NASDAQ 100 firms, S&P 400 firms, and S&P 600 firms), suggesting that the differences between positive tone and negative tone can indeed reflect common risk – a further confirmation of our hypothesis that the media tone premium is a measure of risk premium.

The rest of this paper is organized as follows. In Section 2, we describe the sample stocks, text corpus, as well as the media tone scores. In Section 3, we examine the relation between media tone and the cross-section of stock returns by forming portfolios on tone and firm characteristics. Trading strategies are implemented to see if tone-related strategies can generate abnormal trading profits. In Section 4, we perform the GRS tests and Fama-MacBeth regressions to systematically test the role of media tone and media coverage in explaining average stock returns. Section 5 includes some additional tests as robustness analysis. Section 6 concludes.

2. Data Description

Our sample consists of all non-financial S&P 500 firms (as of July 2014) that were listed on the stock exchange between January 2004 and December 2013, amounting to 352 firms. These firms are all large firms, which are more likely to be covered by mass media. As we will illustrate in more detail later, we did not choose the universe of US stocks as the sample, which is different from many studies that examine the cross-section of stock returns, because beyond S&P 500 or even S&P 100 stocks, the newspaper coverage is rather low. 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 were collected from the *Nexis* database. Similar to 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)[4], because *Nexis* only has abstracts of WSJ, but has full articles of FT. In addition, according to the Global Capital Markets Survey 2011[5], FT also has wide readership in Americas, reaching 21% of the sample population. The articles about a particular firm are identified by the "Index Term", which is the company name in this case, 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

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

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.

Table 1 provides summary statistics for the number of articles and negative tone scores (explained below) of the sample firms. Panel (a) reports, for all countries 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. It can be seen 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 ten-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 large 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 shapely increased from 27% in 2004 to 46% in 2013. It may be that Internet sources have largely replaced newspaper coverage. From these statistics we can expect that the newspaper coverage for non-S&P 500 firms (smaller firms) will be minimal. This is the reason why choosing the universe of U.S stocks as the sample would not do much difference since our analysis relies on media tone scores extracted from newspaper articles.

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 negative tone 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 Loughran and McDonald, 2015). As there are many possible weighting schemes in the computational linguistics literature, "hopefully future research can provide a more objective basis for improved term weighting methods in business applications" (Loughran and McDonald, 2015: p23). 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 negative tone 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 companies. This further supports our choice of choosing the S&P 500 firms as the representative sample.

Table 2 examines the possible determinants of the monthly negative tone scores, using Fama-MacBeth (1973) two-step regression method. We consider past trading information (cumulative abnormal returns in the previous 6 months, share turnover by volume) as well as fundamental variables (market capitalization, Book-to-Market ratio, cash holdings and long-term debt at the end of the preceding year[6], current earnings per share) as the dependent variables. Standard errors are adjusted using the Newey-West (1987) procedure with one lag. We can see that higher cumulative abnormal returns in the previous 6 months are associated with lower negative tone scores (significant at the 1% level), and higher share turnover is associated with higher negative tone (1% level). Among selected fundamental variables, firm size (market capitalization), Book-to-Market ratio, and cash holdings at the end of the

[6] Both cash holdings and long-term debt are specified as the ratio against total assets

preceding year are all significantly associated with negative tone scores at the 1% level. Greater firm size and/or higher Book-to-Market ratio are related with higher negative tone scores, while greater cash holdings are associated with lower negative tone scores. Despite that there may be other variables that determine negative tone, these results lend support to the hypothesis that media tone is associated with fundamental information, and that the differences in media tone scores reflect differences in firms' fundamental aspects, which will be systematically tested in Section 4.

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. 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 positive (POS) and negative (NEG) portfolios based on the median of their average monthly negative tone scores over the previous 6 months. The portfolios are rebalanced every 6 months.

The first row (start with 'All stocks') of Panel (a) in Table 3 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 (POS: 0.72%, NEG: 0.46%). This is consistent with the no-coverage premium found by Fang and Peress (2009). The return difference between the NC and the NEG portfolios is 0.49% per month (6.04% per year), statistically significant at the 1% level. In contrast, Panel (b) of Table 3 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), which is smaller than the return difference between the NC and the NEG portfolios. The return difference between the POS and NEG portfolios is 0.26% per month (3.17% per year), significant at the 5% level, indicating that firms with positive newspaper articles in the prior 6 months earn higher returns in the following months than firms with negative articles. We call it the *media tone premium*. These results are robust using value-weighted portfolios[7].

Next, firms are double-sorted by firm characteristics and media tone. Firms are first sorted into terciles by one of the firm characteristics: size (market capitalization), Book-to-Market ratio, profitability (earnings per share)[8], past 6-month return, and price. All the financial data are collected from *Datastream*. Then each of the terciles is sorted into three media tone-based portfolios: NC, POS and NEG, based on their average monthly negative tone scores in the previous 6 months. Again, the portfolios are held for 6 months and are rebalanced at the end of the 6^{th} month. The equally weighted average monthly portfolio returns are calculated and reported in Panel (a1) to (a5) in Table 3. The focus of this paper is the media tone premium (i.e. the column titled 'POS - NEG' and 't-statistics for POS - NEG'). We can see that the double-sorts results generally support the single-sort results, except the medium size group (second row of Panel (a1)), for which the return difference between the POS and NEG portfolios is negative, but insignificant. Media tone premium exists in all other cases, and in many cases significant, indicating that it is not a disguised well-known risk premium. The tone effect only exists among the largest firms (discussed below), the most profitable firms, and the middle Book-to-Market ratio group. The return differences between the NC and NEG portfolios seem to be greater and statistically more significant than the tone premium.

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

Interestingly, the tone effect is only found within the largest firms, while Fang and Peress (2009) find that the no-media-coverage effect is more pronounced among small firms. Like Fang and Peress (2009), we also find that large firms are more likely to be covered by mass media. This means that for small firms, which usually face more severe information problems and lower investor recognition, media tone does not play a role in determining stock returns, as investors simply require higher return to compensate for "incomplete" information. However, for large firms, information from various sources tends to be more "complete". Media coverage does not make a significant difference in this case, but tone plays a role because it may communicate additional information about firm fundamentals. To further examine how the tone premium is related with news coverage, we sort firms with news coverage in the previous 6 months into the low-coverage group and the high-coverage group, using the median of the number of articles. In either coverage group, firms are sorted into the POS and NEG groups. Panel (c) in Table 3 shows that the tone premium exists in the high-coverage group (0.40%, T-stat: 2.30), but not in the low-coverage group. This result is consistent with the findings of small versus large firms, as media coverage is positively associated with firm size.

To examine the risk-adjusted return difference between the POS and NEG firms, we employ a zero-cost trading strategy that longs the POS portfolio and shorts the NEG portfolio (POS-NEG strategy). The formation of the two portfolios are based on the median of firms' average negative tone 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 (2015) five factors. Table 4 reports the coefficients and the corresponding t-statistics. Notice that the 'SMB2' factor in the table means the 'Small Minus Big' factor constructed for the

Fama-French five-factor model. It is constructed in different way than the original SMB factor in the three-factor model, and has different values. 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 media tone premium does not load very heavily on some of the risk factors. To separately examine the profitability of the long and short legs, we perform analysis similar to Fang and Peress (2009). The returns on the long and short legs are separately regressed on the aforementioned risk factors. We can see from Panel (b) and (c) of Table 4 that the abnormal returns of the POS-NEG strategy come from the negative-tone stocks. Alphas from the positive-tone position are positive, but insignificantly different from zero.

Another strategy that longs the NC portfolio and shorts the NEG portfolio (i.e. NC-NEG strategy) has also been examined. The same regressions are implemented on the returns of the strategy, and the intercepts (alphas) are reported in Panel (a) of Table 5. This strategy has even better performance than the POS-NEG strategy, outperforming benchmarks by 0.280% to 0.523% per month (3.41% to 6.46% per year), significant at the 5% or 1% level. In addition, to see whether the NC-NEG strategy is indifferent to the coverage-based strategy performed by Fang and Peress (2009), we also implement a strategy that longs the NC stocks and shorts the high-coverage stocks[9] (NC-HC strategy), and separately examine the long and short legs. Panel (b) to Panel (d) in Table 5 presents the results. The alphas for the long leg of each strategy (i.e. long no-coverage stocks) are generally statistically significant (Panel (c)). However, the NC-HC strategy generally yields smaller alphas than the NC-NEG 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 (e)), while the short leg of the NC-NEG

[9] 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

strategy (i.e. short negative-tone stocks) does produce alphas. The finding that the high-coverage stocks do not produce significant alphas is in line with the finding by Fang and Peress (2009). Therefore, the return premium between stocks with no media coverage and stocks with negative-tone articles, a form of media premium, is substantially greater than the no-coverage premium examined by Fang and Peress (2009). For robustness check, we employ the overlapping portfolio construction method used by Jegadeesh and Titman (1993) for all three strategies mentioned above (POS-NEG, NC-NEG, and NC-HC). We construct equally weighted portfolios every month according to companies' media coverage or tone in the previous 6 months. Portfolios are held with overlapping holding periods, and each portfolio is rebalanced to maintain equal weights every month and held for 6 months in total. The unreported results (average monthly returns) remain quantitatively and qualitatively similar.

4. Asset Pricing Tests

Using event studies, Tetlock et al. (2008) find that media content (including negative tone) contains firms' fundamental information that is hard to be quantified, and investors quickly incorporate such information into stock prices. Ahmad et al. (2016), who examine time-series of daily media tone for 20 firms, find that at the aggregate level, negative media tone leads to lower next-day returns, and this effect is not reversed over the subsequent days, suggesting that firm-specific media tone captures fundamental information of firm value. We have also found in Section 2 that a few fundamental variables, such as firm size, Book-to-Market ratio and cash holdings, are determinants of media tone. Consequently, we hypothesize that the return premium of positive-tone stocks over negative-tone stocks is a common risk factor. It reflects the differences in fundamental aspects between firms with positive news stories and firms with negative stories. To systematically test if media tone explains the cross-section of stock returns, this section constructs a media tone factor in the spirit of Fama and French (1993), and implements the GRS tests (Gibbons et al., 1989) and Fama-MacBeth (1973) regressions.

This paragraph details the steps to construct the media tone factor. In the first place, we construct 6 value-weighted portfolios formed on size and media tone, which are formed at the end of each June and December from 2004 to 2013, except the last December. The 6 portfolios are the intersections of 3 portfolios formed on size (market capitalization) and 2 portfolios formed on media tone (negative scores). The size breakpoints are the first tercile and the second tercile of the market capitalization of stocks at the end of each June and December. The terciles divide firms into Small, Medium, and Big size portfolios. The tone breakpoint is the median of the average monthly negative tone score in the previous 6 months at the end of each June and December. Firms with no news coverage in the previous 6 months are excluded from portfolio construction. Figure 1 shows the construction and numbering of portfolios. Portfolio 1 is the ‘Small Positive’ portfolio, portfolio 2 is ‘Small Negative’, portfolio 3 is ‘Medium Positive’, and so on. We construct a monthly media tone factor called ‘Positive Minus Negative’ (PMN) as follows:

PMN = 1/2 (Small Positive + Big Positive) – 1/2 (Small Negative + Big Negative)

or PMN = 1/2 (Portfolio 1 + Portfolio 5) – 1/2 (Portfolio 2 + Portfolio 6)

Panel (a) of Table 6 presents the correlation coefficients between the PMN factor and the Fama-French three factors, five factors, and the momentum factor. We see that the PMN factor is not highly correlated with any of the other factors, indicating that the media tone premium is not a replication of other risk premiums.

First-stage regression tests

After the PMN series is generated, GRS test is performed with selected 6 sets of portfolios: 25 (5 x 5) portfolios formed on size and Book-to-Market ratio (25 Size-B/M), 32 (2 x 4 x 4) portfolios formed on size, Book-to-Market, and operating profitability (32 Size-B/M-OP), 16 (2 x 2 x 2 x 2) portfolios formed on size, Book-to-Market, operating profitability and investment (16 Size-B/M-OP-Inv), 25 (5 x 5) portfolios formed on size and momentum (25 Size-MoM), 30 industry portfolios (30 Industry), and 10 portfolios formed on Earnings/Price (10 E/P). The monthly returns of these portfolios and the risk factor data are all downloaded from Kenneth R. French's data library. Descriptive statistics of the risk factors are presented in Panel (b) of Table 6. The market premium (Mkt-Rf) has the highest mean value, while the momentum factor (UMD) has the lowest mean. The statistics of the PMN factor are closest to those of the SMB factors. The models being tested are: 1) the Fama-French (1993) three-factor model (FF3); 2) the FF3 model plus the PMN factor (FF3+PMN); 3) the Carhart (1997) four-factor model (FF3+UMD); 4) the Carhart four-factor model plus the PMN factor (FF3+UMD+PMN); 5) the Fama-French (2015) five-factor model (FF5); and 6) the FF5 model plus the PMN factor (FF5+PMN). We intend to see if the PMN factor improves the original pricing models.

Table 7 reports the GRS statistics calculated using the Newey-West (1987) standard errors with one lag, the corresponding p-values, the average absolute intercepts (A $|\alpha|$), and the mean adjusted R^2. We see that during the sample period from 2004 to 2013, the null hypothesis that the intercepts of one set of portfolios are jointly zero are rejected in many cases. For example, the test easily rejects all models for the 25 Size-B/M portfolios. However, these models fare better for the 32 Size-B/M-OP portfolios (no intercept terms are significant at the 1% level) and 16 Size-B/M-OP-Inv portfolios (no intercept terms are significant at the

5% level), and the best for the 10 E/P portfolios (no intercept terms are significant at the 10% level). Overall, the GRS test says that these models do not well explain the expected returns of these portfolios. Nevertheless, we are more interested in the improvements in describing average returns brought by the PMN factor. In 9 out of 18 (50%) cases, adding the PMN factor to an original model (Fama-French three-factor, Carhart four-factor, or Fama-French five-factor model) improve the p-values. In 11 out of 18 (61%) cases, adding the PMN factor to an original model reduces the average absolute intercepts, which means smaller pricing errors and an improvement of the model. The mean adjusted R^2 generally increase when the PMN factor is added to the model. On the whole, there is strong evidence that the PMN factor help improve the description of average returns.

Second-stage Fama-MacBeth (1973) regressions

We now turn to the Fama-MacBeth (1973) cross-sectional regressions. Our results are based on the assumption of constant parameter estimates throughout the sample period. Table 8 presents the factor risk premiums (Gamma), the associated t-statistics (t-sh) calculated using the Shanken (1992) – corrected standard errors, the cross-sectional adjusted R^2, as well as the F statistics and p-values for testing the null hypothesis of jointly-zero alphas. The models being tested are the aforementioned six models as well. P-values show that these models generally well describe the expected returns of the 30 industry portfolios and the 10 E/P portfolios (no intercept terms are significant at the 10% level). For the 16 Size-B/M-OP-Inv portfolios and the 25 Size-MoM portfolios, the FF5 factor model and the FF5+PMN model pass the test at the 10% level, substantially outperforming the other models. For the 25 Size-B/M portfolios and the 32 Size-B/M-OP portfolios, the models generally fail. The PMN factor's contribution to the description of average portfolio returns is evident. If we look at 4 decimal places of the p-values, adding the PMN factor to the original models improve the p-values in 15 out of 18 cases (83%), and the improvement is considerable in many cases. For example, for the 25 Size-Mom portfolios, the p-value for the FF5+PMN model is 0.70, significantly higher than the p-value of the second best model (FF5), which is 0.26. The FF5+PMN model has the best performance for 5 out of 6 portfolios. The cross-sectional adjusted R^2 also increases in 15 out of 18 cases. If we look at the individual factor risk premiums (Gamma) and the associated t-statistics, almost none of the individual factors is significantly priced with these portfolios in this sample period. However, for this research, we are more interested in the improvement of models brought by the PMN factor.

Comparing the media tone factor and the media coverage factor

To compare the media tone effect with the media coverage effect, we follow the same method of constructing the PMN factor and construct a media coverage factor called 'No-coverage minus high-coverage' (NMH) factor, based on 6 value-weighted portfolios formed on size and media coverage (i.e. number of articles):

NMH[10] = 1/2 (Small No-coverage + Big No-coverage) – 1/2 (Small high-coverage + Big high-coverage)

The same GRS tests and Fama-MacBeth regressions are performed on the 6 sets of portfolios using the NMH factor, instead of the PMN factor, as an additional factor to the original models. Results are presented in the Appendix. For GRS tests, In 5 out of 18 (28%) cases, adding the NMH factor to an original model (Fama-French three-factor, Carhart four-factor, or Fama-French five-factor model) improve the p-values. In 8 out of 18 (44%) cases, adding the NMH factor to an original model reduces the average absolute intercepts, which means smaller pricing errors and an improvement of the model. Regarding Fama-MacBeth regressions, the inclusion of the NMH factor to the original models leads to obvious

[10] The correlation coefficient between the NMH factor and the PMN factor is 0.38

improvement of the p-value in only 3 out of 18 (17%) cases. We also compare the models with the PMN (tone) factor and models with the NMH (coverage) factor directly, and summarize the results in Table 9. The most evident result is that in 16 out of 18 (89%) cases, the tone models describe the average stock returns better than the coverage models, according to the Fama-MacBeth regressions. Overall, although the coverage factor is on average greater in magnitude than the tone factor, it does not convey as much value-relevant information as the tone factor. Together with the findings by Fang and Peress (2009), Engelberg and Parsons (2011), and Hillert et al. (2014) on media coverage, our results suggest that the role of media coverage is largely non-informational.

5. Additional Tests

If the media tone premium is a common risk factor that reflects the difference in fundamental risk between firms with positive-tone news and firms with negative-tone news, the differentials between the average value of high negative tone scores and the average value of low scores should have an enduring impact on stock returns. This section tests this hypothesis.

Every month, firms with news coverage are sorted into terciles by their negative tone scores from low to high. The monthly H – L (high negativity minus low negativity) score is calculated as the difference between the average score of the most negative group and the average score of the least negative group. We then examine whether the H – L scores in the previous 6 months have significant and permanent impact on stock returns, after controlling for returns in the previous month, the cumulative abnormal returns[11] in the previous 6 months, share turnover by volume, size, Book-to-Market ratio, cash holdings and long-term debt at the end of the preceding year, current profitability (earnings per share), number of articles in

[11] Against the Fama-French value-weighted market return

the previous month, and industry dummies (based on two-digit SIC codes). Table 10 reports the coefficients of these variables and the associated t-statistics computed using heteroscedasticity robust standard errors. We first examine the full sample of 352 firms, and separately examine the no-coverage, POS and NEG firms categorized in the trading strategy analysis in Section 3. The first column of Table 10 shows that for the full sample and the negative firms, all 6 lags of the H – L scores have significant impact on the monthly stock returns, controlling for the aforementioned fundamental and market variables. For no-coverage firms and positive firms, not all 6 lags of the H – L scores impact the stock returns. Nevertheless, the test of the sum of lag 1 to lag 6 coefficients (reported at the end of Table 10) shows that for all samples, the effect of the H – L scores is permanently priced after 6 months. Unreported results (available upon request) show that the lags of negative tone scores do not have significant impact on monthly firm returns, suggesting that the news component of media tone has been quickly reflected in prices, but the differences between positive tone and negative tone is a predictor of stock returns.

One may argue that our H – L scores are generated from S&P 500 firms, which are all large-cap firms and highly liquid. If the H –L scores convey information about common risk, do they also predict returns of other firms? To examine this, we also perform similar regressions on other samples: NASDAQ 100 firms, S&P 400 firms, and S&P 600 firms. NASDAQ 100 index comprises 100 largest non-financial companies listed on NASDAQ, S&P 400 firms are mid-cap US firms (we test the "pure growth" firms and "pure value" firms separately[12]), and S&P 600 index covers roughly the small-cap range of US stocks. We intend to see if H – L scores *derived from our sample* have impact on the returns of these stocks as well. Table 11 presents the results. Consistent with the findings of Table 10, H – L scores in the previous 1 to 6 months predict stock returns of this month aggregately. Except S&P 400 Pure Value

[12] The lists of "pure growth" and "pure value" firms are from Datastream

firms, the impact of H – L scores is permanently priced after 6 months. Therefore, we conclude that the difference in the media tone levels contains information about firms' fundamental risk, which supports our hypothesis that the media tone premium is a proxy of common risk.

6. Conclusions

We construct media tone measures from 53,856 newspaper articles about non-financial S&P 500 firms between January 2004 and December 2013. We find that firms with positive-tone articles in the previous 6 months generate higher returns in the following months than firms with negative-tone articles. The annualized return premium is significant at 3.17%. The media tone premium is not a disguised well-known risk factor as it exists within portfolios formed on various fundamental variables, past 6-month returns and current price. The tone effect is also found to exist among larger firms rather than smaller firms, and among high-coverage stocks rather than low-coverage stocks. This indicates that for stocks that tend to be "information complete", media tone communicates additional value-relevant information. For stocks that face more severe information problems, investors require higher returns because of the scarcity of information (Fang and Peress, 2009), rather than the exact tone of information.

A monthly zero-cost trading strategy that longs positive-tone stocks and shorts negative-tone stocks with equal weights generates risk-adjusted returns of 3.05% to 3.41% per year, depending on the benchmark model used. We systematically examine the role of media tone in stock pricing by constructing a media tone factor in the spirit of Fama and French (1993), and performing the GRS tests and Fama-MacBeth regressions. There is strong evidence that media tone does contain additional information that explains average stock returns over the

Fama-French (1993) three factors, Carhart (1997) four factors, or the most recent Fama-French (2015) five factors. We argue that media tone premium is a proxy of common risk. In contrast, our results suggest that the role of media coverage in stock markets is less informational than that of media tone.

We also find that negative tone does not have direct impact on future returns, indicating that the market is efficient with regards to media tone. However, the differentials between the average high negative-tone scores and the average low negative-tone scores (generated from on our sample) is a predictor of stock returns, not only for our S&P 500 samples stocks, but also for other samples of stocks with varied firm characteristics. This is a further confirmation that differences in tone communicate information of fundamental or macroeconomic risk; therefore the media tone premium should reflect common risk in the market. Overall, our results lend support to the argument that media tone communicates additional value-relevant information over widely-accepted risk factors, while media coverage largely plays a non-informational role.

References

Ahern, K. R., and D. Sosyura (2014) Who Writes the News? Corporate Press Releases during Merger Negotiations. *Journal of Finance*, 69, 241–291.

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.

Barber, B. M., and T., Odean (2008) All that glitters: The effect of attention and news on the buying behavior of individual and institutional investors. *Review of Financial Studies*, 21(2), 785-818.

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.

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

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

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.

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.

Fama, E. F., and J. MacBeth (1973) Risk, return and equilibrium: Empirical tests. *Journal of Political Economy*, 81, 607–636.

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.

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

Gentzkow, M., and J. Shapiro (2010) What drives media slant? Evidence from U.S. daily newspapers. *Econometrica*, 78, 35–71.

Gibbons, M., S. A. Ross, and J. Shanken (1989) A test of the efficiency of a given portfolio. *Econometrica*, 57, 1121–1152.

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

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.

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 (2015) Textual Analysis in Accounting and Finance: A Survey. Available at SSRN: http://ssrn.com/abstract=2504147

Newey, W. K., and K. D. West (1987) A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica*, 55, 703–708.

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

Shanken, J. (1992) On the estimation of beta-pricing models. *Review of Financial Studies*, 5, 1–33.

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.

Vega, C. (2006) Stock price reaction to public and private information. *Journal of Financial Economics*, 82, 103-133.

Figure 1: 6 Value-weighted Portfolios Formed on Size and Media Tone

6 value-weighted portfolios are formed at the end of each June and December from 2004 to 2013, except the last December. The 6 portfolios are the intersections of 3 portfolios formed on size (market capitalization) and 2 portfolios formed on media tone (negative tone scores). The size breakpoints are the first tercile and the second tercile of the market capitalization of stocks at the end of each June and December. The tone breakpoint is the median of firms' average monthly negative tone score in the previous 6 months at the end of each June and December. Firms with no news coverage in the previous 6 months are excluded from portfolio construction.

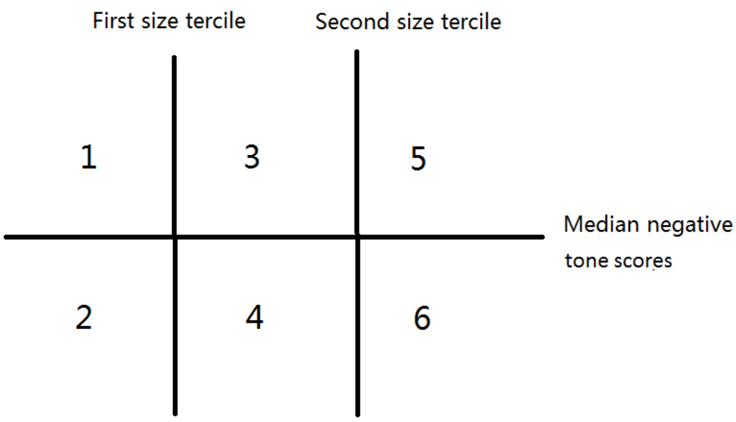

Table 1: Summary Statistics of Newspaper Coverage and Negative Tone Scores

This table presents summary statistics for the number of newspaper articles and negative tone 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 negative tone scores for all firms and S&P 100 firms only.

Panel (a): All firms

	Number of articles			Percentage of firms not covered in the media
	Mean	Median	S.D.	
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			Fraction of firms not covered in the media
	Mean	Median	S.D.	
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 negative tone 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: Determinants of Negative Tone Scores

This table examines the determinants of firms' monthly negative tone scores using Fama-MacBeth (1973) regression method. Independent variables include the cumulative abnormal returns (CAR) in the previous 6 months, share turnover by volume, size (market capitalization), Book-to-Market ratio, cash holdings and long-term debt (as the ratio against total assets) at the end of the preceding year, current profitability (earnings per share), and article count. T-statistics are computed using Newey-West (1987) procedure with one lag, and are marked in italic, bold, or bold and italic for significance level of 10%, 5%, and 1%, respectively.

Dependent variable: Negative Tone Scores	
CAR(-6,-1)	-0.006
	-6.77
Log(Share Turnover)	0.122
	3.78
Log(Market Capitalization)	0.115
	7.42
Log(Book-to-Market)	0.066
	3.07
Cash	-0.369
	-2.89
Long-term Debt	0.228
	1.89
Profitability	-0.180
	-1.06
Article Count	0.002
	1.42
Average R^2	0.1092

Table 3: 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 positive (POS) and negative (NEG) portfolios based on the median of their average monthly negative tone 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 positive- and negative-tone stocks and between no-coverage stocks and negative-tone 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 (a1) to (a5) presents the results of these portfolios. Panel (b) presents the returns of stocks with no, low, and high media coverage, and panel (c) reports the returns for portfolios double sorted by tone and coverage. T-statistics which are marked in bold (bold and italic) indicate significance at the 5% (1%) level.

Average Monthly Portfolio Return (Equally weighted)							
		Media Tone					
	NC	POS	NEG	POS - NEG	t-Statistics for POS - NEG	NC - NEG	t-Statistics for NC - NEG
Panel (a): Media Tone Only							
All stocks	0.95	0.72	0.46	0.26	**2.19**	0.49	***3.41***
Panel (a1): 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 (a2): 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 (a3): 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 (a4): 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 (a5): 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 3 (continued)

Panel (b): 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 (c): Double Sort by Media Coverage and Tone				
	Media Tone			t-Statistics for
	POS	NEG	POS - NEG	POS - NEG
Low coverage	0.64	0.58	0.07	0.36
High coverage	0.79	0.38	0.40	**2.30**

Table 4: Media Tone Strategy and Risk-adjusted Returns

This table presents the risk-adjusted returns (the intercept) of a zero-cost trading strategy that longs the positive-tone portfolio and shorts the negative-tone portfolio. The formation of the two portfolios are based on the median of firms' average negative tone 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.

Panel (a): Long positive-tone stocks, short negative-tone stocks

	Model 1: FF Three-Factor	Model 2: Carhart Four-Factor	Model 3: PS Liquidity	Model 4: FF Five-Factor
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 4 (continued)

		Panel (b): Alphas for positive-tone stocks		
Intercept	0.038	0.047	0.020	0.055
	0.36	0.45	0.20	0.49
		Panel (c): Alphas for High-Negativity Stocks		
Intercept	-0.241	-0.223	-0.260	-0.196
	-2.22	**-2.11**	**-2.53**	*-1.71*

Table 5: Additional Media-related Strategies and Risk-adjusted Returns

This table presents the risk-adjusted returns (the intercept) of additional media-related trading strategies. Panel (a) reports the results for a strategy that longs the no-coverage portfolio and shorts the negative-tone portfolio. Panel (b) examines a coverage strategy that longs the no-coverage portfolio and shorts the high-coverage portfolio. Panel (c) and (d) separately examine the abnormal returns of the long and short legs for the coverage strategy. 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 Negative-tone 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 6: Risk Factors Correlation Matrix and Summary Statistics

Panel (a) of this table presents the correlation coefficients between each pair of the monthly risk factors employed in the GRS tests and Fama-MacBeth regressions. Panel (b) reports the summary statistics (mean, standard deviations, min, and max) of these factors. The number of observations is 114.

Panel (a): Correlation matrix

	PMN	Mkt-rf	SMB	HML	MOM	SMB2	RMW	CMA
PMN	1.00							
Mkt-Rf	0.28	1.00						
SMB	0.36	0.47	1.00					
HML	-0.03	0.33	0.16	1.00				
UMD	-0.04	-0.34	-0.12	-0.34	1.00			
SMB2	0.35	0.50	0.99	0.28	-0.17	1.00		
RMW	-0.24	-0.58	-0.43	-0.18	0.26	-0.43	1.00	
CMA	-0.13	0.02	0.09	0.39	0.00	0.10	-0.12	1.00

Panel (b): Summary statisitcs

Variable	Mean	Std. Dev.	Min	Max
PMN	0.18	2.05	-4.09	4.99
Mkt-Rf	0.62	4.45	-17.23	11.35
SMB	0.20	2.22	-4.22	5.78
HML	0.14	2.39	-9.86	7.57
UMD	0.03	4.92	-34.72	12.53
SMB2	0.23	2.31	-4.76	6.73
RMW	0.27	1.50	-3.43	4.78
CMA	0.10	1.32	-3.16	3.43

Table 7: GRS Tests for Media Tone Models

The GRS test is performed with 6 sets of portfolios: 25 portfolios formed on size and Book-to-Market ratio (25 Size-B/M), 32 portfolios formed on size (32 Size-B/M-OP), Book-to-Market, and operating profitability, 16 portfolios formed on size, Book-to-Market, operating profitability and investment (16 Size-B/M-OP-Inv), 25 portfolios formed on size and momentum (25 Size-MoM), 30 industry portfolios (30 Industry), and 10 portfolios formed on Earnings/Price (10 E/P). This table reports the GRS statistics computed using the Newey-West (1987) standard errors with one lag, the corresponding p-values, the average absolute intercepts (A｜α｜), and the mean adjusted R^2. The models being tested are: 1) the Fama-French three-factor model (FF3); 2) the FF3 model plus the PMN factor (FF3+PMN); 3) the Carhart four-factor model (FF3+UMD); 4) the Carhart four-factor model plus the PMN factor (FF3+UMD+PMN); 5) the Fama-French five-factor model (FF5); and 6) the FF5 model plus the PMN factor (FF5+PMN).

	Test Portfolios							
Models	25 Size/BtM				32 Size/OP/Inv			
	GRS	p-val	A｜α｜	Mean Adjusted R^2	GRS	p-val	A｜α｜	Mean Adjusted R^2
FF3	2.19	0.00	0.1436	0.9392	1.67	0.03	0.1872	0.9005
FF3 + PMN	2.20	0.00	0.1387	0.9399	1.65	0.04	0.1882	0.9010
FF3+UMD	2.16	0.00	0.1397	0.9399	1.65	0.04	0.1798	0.9017
FF3+UMD+PMN	2.17	0.00	0.1348	0.9407	1.63	0.04	0.1813	0.9022
FF5	2.43	0.00	0.1461	0.9416	1.56	0.06	0.1492	0.9161
FF5+PMN	2.43	0.00	0.1386	0.9423	1.53	0.07	0.1464	0.9164
	16 Size/BtM/OP/Inv				25 Size/MoM			
	GRS	p-val	A｜α｜	Mean Adjusted R^2	GRS	p-val	A｜α｜	Mean Adjusted R^2
FF3	1.55	0.10	0.1378	0.9309	1.95	0.01	0.1992	0.8710
FF3 + PMN	1.54	0.10	0.1355	0.9312	1.97	0.01	0.1973	0.8708
FF3+UMD	1.62	0.08	0.1411	0.9311	1.95	0.01	0.2007	0.9417
FF3+UMD+PMN	1.60	0.08	0.1389	0.9314	1.97	0.01	0.2010	0.9422
FF5	1.39	0.16	0.1284	0.9486	1.96	0.01	0.1688	0.8747
FF5+PMN	1.36	0.18	0.1286	0.9490	1.96	0.01	0.1662	0.8745
	30 Industry				10 E/P			
	GRS	p-val	A｜α｜	Mean Adjusted R^2	GRS	p-val	A｜α｜	Mean Adjusted R^2
FF3	1.89	0.01	0.3168	0.6781	0.98	0.46	0.1103	0.8992
FF3 + PMN	2.42	0.00	0.3292	0.6860	0.96	0.49	0.1080	0.8999
FF3+UMD	1.86	0.02	0.3058	0.6922	1.00	0.45	0.1116	0.8999
FF3+UMD+PMN	2.41	0.00	0.3143	0.7004	0.97	0.48	0.1113	0.9006
FF5	1.99	0.01	0.3106	0.6901	1.33	0.23	0.1458	0.9069
FF5+PMN	2.56	0.00	0.3261	0.6968	1.30	0.24	0.1430	0.9076

Table 8: Fama-MacBeth Regressions for Media Tone Models

Fama-MacBeth (1973) regressions are performed with 6 sets of portfolios: 25 portfolios formed on size and Book-to-Market ratio (25 Size-B/M), 32 portfolios formed on size, Book-to-Market, and operating profitability (32 Size-B/M-OP), 16 portfolios formed on size, Book-to-Market, operating profitability and investment (16 Size-B/M-OP-Inv), 25 portfolios formed on size and momentum (25 Size-MoM), 30 industry portfolios (30 Industry), and 10 portfolios formed on Earnings/Price (10 E/P). This table presents the factor risk premiums (Gamma), the associated t-statistics (t-sh) calculated using the Shanken (1992) – corrected standard errors, the cross-sectional adjusted R^2, as well as the F statistics and p-values for testing the null hypothesis of jointly-zero alphas. The models being tested are: 1) the Fama-French three-factor model (FF3); 2) the FF3 model plus the PMN factor (FF3+PMN); 3) the Carhart four-factor model (FF3+UMD); 4) the Carhart four-factor model plus the PMN factor (FF3+UMD+PMN); 5) the Fama-French five-factor model (FF5); and 6) the FF5 model plus the PMN factor (FF5+PMN).

Panel (a): 25 Size/BtM

Models	FF3		FF3 + PMN		FF3+UMD		FF3+UMD+PMN		FF5		FF5+PMN	
Variables	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh
Mkt - rf	0.649	1.53	0.600	1.30	0.688	1.38	0.644	1.26	0.675	1.45	0.612	1.11
SMB	0.172	0.80	0.187	0.80	0.181	0.72	0.193	0.74				
HML	0.157	0.66	0.216	0.84	0.086	0.31	0.141	0.49	0.222	0.90	0.260	0.90
UMD					2.519	**2.34**	2.332	**2.08**				
SMB2									0.087	0.33	0.151	0.48
RMW									0.404	1.45	0.527	1.56
CMA									-0.205	-0.66	-0.339	-0.89
PMN			0.888	*1.78*			0.785	1.41			1.231	**1.99**
Cross-sectional adjusted R^2	0.7921		0.8034		0.7963		0.8084		0.8071		0.8203	
χ^2	51.40		41.70		32.45		29.96		41.20		27.95	
p-val	0.00		0.00		0.05		0.07		0.00		0.08	

Panel (b): 32 Size/OP/Inv

Models	FF3		FF3 + PMN		FF3+UMD		FF3+UMD+PMN		FF5		FF5+PMN	
Variables	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh
Mkt - rf	0.617	1.45	0.608	1.40	0.634	1.44	0.622	1.30	0.655	1.45	0.639	1.33
SMB	0.160	0.73	0.160	0.72	0.165	0.73	0.166	0.68				
HML	0.466	1.50	0.475	1.51	0.444	1.39	0.454	1.31	0.261	1.10	0.262	1.04
UMD					0.814	1.03	1.261	1.45				
SMB2									-0.021	-0.06	-0.110	-0.32
RMW									0.285	*1.81*	0.271	1.62
CMA									0.099	0.70	0.113	0.75
PMN			0.394	0.95			0.720	1.59			0.776	*1.67*
Cross-sectional adjusted R^2	0.7495		0.7559		0.7527		0.7583		0.7729		0.7782	
χ^2	65.80		63.39		58.12		49.13		49.46		43.33	
p-val	0.00		0.00		0.00		0.01		0.01		0.02	

Table 8 (continued)

Panel (c): 16 Size/BtM/OP/Inv

Models	FF3		FF3 + PMN		FF3+UMD		FF3+UMD+PMN		FF5		FF5+PMN	
Variables	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh
Mkt - rf	0.587	1.38	0.559	1.26	0.587	1.38	0.561	1.25	0.643	1.46	0.613	1.32
SMB	0.268	1.25	0.282	1.26	0.269	1.25	0.285	1.26				
HML	0.298	1.20	0.289	1.11	0.296	1.18	0.281	1.05	0.280	1.22	0.291	1.20
UMD					-0.227	-0.20	0.074	0.06				
SMB2									0.064	0.26	0.054	0.20
RMW									0.201	1.21	0.186	1.06
CMA									-0.039	-0.27	-0.057	-0.36
PMN			0.683	1.24			0.717	1.28			0.780	1.43
Cross-sectional adjusted R^2	0.7861		0.7897		0.7830		0.7866		0.8324		0.8352	
χ^2	26.69		23.86		26.49		23.40		15.14		12.34	
p-val	0.01		0.02		0.01		0.02		0.18		0.26	

Panel (d): 25 Size/MoM

Models	FF3		FF3 + PMN		FF3+UMD		FF3+UMD+PMN		FF5		FF5+PMN	
Variables	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh
Mkt - rf	0.582	1.33	0.614	1.38	0.606	1.41	0.627	1.45	0.726	1.47	0.712	1.31
SMB	0.412	*1.69*	0.399	1.61	0.336	1.46	0.334	1.44				
HML	-0.287	-0.40	-0.384	-0.50	0.302	0.51	0.170	0.30	0.325	1.22	0.319	1.09
UMD					0.073	0.15	0.088	0.18				
SMB2									0.207	0.27	0.510	0.62
RMW									0.382	1.31	0.194	0.60
CMA									0.428	1.40	0.746	**2.12**
PMN			-0.182	-0.35			-0.166	-0.33			0.789	1.06
Cross-sectional adjusted R^2	0.8094		0.8151		0.8251		0.8290		0.8341		0.8386	
χ^2	41.48		37.58		42.11		39.74		23.52		15.32	
p-val	0.01		0.01		0.00		0.01		0.26		0.70	

Table 8 (continued)

Panel (e): 30 Industry

Models	FF3		FF3 + PMN		FF3+UMD		FF3+UMD+PMN		FF5		FF5+PMN	
Variables	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh
Mkt - rf	0.742	*1.66*	0.782	*1.69*	0.742	*1.68*	0.783	*1.68*	0.730	1.42	0.735	1.44
SMB	-0.253	-0.77	0.098	0.25	-0.177	-0.47	0.246	0.75				
HML	-0.161	-0.40	-0.167	-0.40	-0.045	-0.14	0.020	0.06	-0.460	-1.14	-0.122	-0.31
UMD					0.109	0.11	0.298	0.30				
SMB2									-0.417	-1.10	-0.304	-0.80
RMW									0.593	*1.91*	0.479	1.55
CMA									-0.169	-0.48	-0.221	-0.64
PMN			-0.590	-1.10			-0.619	-1.21			-0.632	-1.43
Cross-sectional adjusted R^2	0.50		0.57		0.57		0.63		0.63		0.64	
χ^2	34.08		24.48		32.06		23.10		20.15		16.44	
p-val	0.16		0.55		0.19		0.57		0.74		0.87	

Panel (f): 10 E/P

Models	FF3		FF3 + PMN		FF3+UMD		FF3+UMD+PMN		FF5		FF5+PMN	
Variables	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh
Mkt - rf	0.657	1.49	0.655	1.48	0.655	-0.86	0.651	0.45	0.684	1.44	0.689	1.39
SMB	0.709	1.38	0.644	1.27	0.794	1.30	0.740	0.60				
HML	0.397	1.21	0.409	1.24	0.412	1.23	0.429	0.34	1.027	1.55	1.041	1.50
UMD					-0.865	-0.61	-0.974	1.48				
SMB2									0.629	1.39	0.733	1.49
RMW									-0.394	-0.90	-0.447	-0.95
CMA									0.410	1.01	0.486	1.10
PMN			0.494	1.01			0.540	0.54			0.633	1.11
Cross-sectional adjusted R^2	0.77		0.76		0.77		0.76		0.79		0.79	
χ^2	6.30		5.46		6.07		5.13		5.12		3.65	
p-val	0.50		0.49		0.42		0.40		0.40		0.46	

Table 9: Compare the Media Tone models with the Media Coverage Models

Panel (a) presents the percentage of cases in the GRS tests (Table 7) and Fama-MacBeth regressions (Table 8) that the models with a tone factor or models with a coverage factor are superior to the original models. Panel (b) presents the percentage of cases that the tone models are superior to the coverage models.

	GRS tests		Fama-MacBeth regressions
	P-value improved	Absolute pricing errors reduced	P-value improved
Panel (a): Compare with original models			
Tone models	50%	61%	83%
Coverage models	28%	44%	17%
Panel (b): Compare tone models with coverage models			
Tone models superior to coverage models	56%	56%	89%

Table 10: Difference in Negative Tone Scores and Stock Returns

This table examines whether the monthly H – L (high negativity minus low negativity) scores predict stock returns. Every month, firms with news coverage are sorted into terciles by their negative tone scores from low to high. The H – L score is the difference between the average score of the most negative group and the average score of the least negative group. Control variables are returns in the previous month, the cumulative abnormal returns (CAR) in the previous 6 months, share turnover by volume, size (market capitalization), Book-to-Market ratio, cash holdings and long-term debt (as the ratio against total assets) at the end of the preceding year, current profitability (earnings per share), number of articles in the previous month, and industry dummies (based on two-digit SIC codes). T-statistics are computed using heteroscedasticity robust standard errors, and are marked in italic, bold, or bold and italic for significance level of 10%, 5%, and 1%, respectively. We first examine the full sample, and separately examine the no-coverage, positive-tone and negative-tone stocks.

Dependent Variable: Monthly Stock Returns (in percentage)

	Full sample	No-coverage stocks	Positive-tone stocks	Negative-tone stocks
Lag 1(Return)	0.075	0.069	0.066	0.094
	9.09	***6.02***	***3.92***	***5.62***
CAR(-6,-1)	-0.018	-0.018	-0.009	-0.033
	-4.44	***-3.50***	-1.04	***-3.63***
Log(Share Turnover)	-1.097	-1.031	-1.214	-1.249
	-10.38	***-6.84***	***-5.35***	***-5.94***
Log(Market capitalization)	-0.764	-0.986	-0.600	-0.641
	-14.29	***-9.77***	***-5.48***	***-5.48***
Log(Book-to-Market)	1.103	1.168	1.226	1.133
	11.62	***7.48***	***6.79***	***6.79***
Cash	3.933	3.958	3.975	4.346
	8.28	***6.00***	***4.03***	***4.14***
Long-term Debt	1.974	2.909	2.452	0.243
	4.05	***4.16***	**2.38**	0.24
Profitability	3.056	4.002	3.252	1.773
	3.62	***3.25***	*1.72*	1.18
Lag 1(No. of Articles)	0.037		0.054	0.011
	3.78		***3.09***	0.80
Lag 1(H-L)	-0.566	-0.206	-0.607	-1.290
	-3.03	-0.75	*-1.71*	***-3.52***
Lag 2(H-L)	0.369	0.441	-0.146	0.717
	1.98	1.61	-0.40	**2.01**
Lag 3(H-L)	-1.965	-2.443	-1.416	-1.613
	-10.44	***-8.81***	***-3.91***	***-4.46***
Lag 4(H-L)	1.005	1.278	0.521	0.994
	5.64	***4.86***	1.53	***2.86***
Lag 5(H-L)	-1.453	-1.535	-1.269	-1.487
	-8.41	***-5.98***	***-3.84***	***-4.47***
Lag 6(H-L)	1.591	1.664	1.754	1.335
	8.96	***6.36***	***5.21***	***3.81***
Constant	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Observations	38,995	19,224	9,943	9,828
R^2	0.024	0.026	0.025	0.031
Sum of Lag 1(H-L) to Lag 6(H-L)	-1.019	-0.801	-1.163	-1.344
χ^2	13.60	3.72	4.62	6.47
p-val	0.00	0.05	0.03	0.01

Table 11: Difference in Negative Tone Scores and Stock Returns – Additional Samples

This table examines whether the monthly H – L scores generated from our sample of non-financial S&P 500 firms predict returns of other samples of stocks – NASDAQ100, S&P 400 Pure Growth, S&P 400 Pure Value, and S&P 600 stocks. Control variables are returns in the previous month, the cumulative abnormal returns (CAR) in the previous 6 months, share turnover by volume, size (market capitalization), Book-to-Market ratio, cash holdings and long-term debt (as the ratio against total assets) at the end of the preceding year, and current profitability (earnings per share). T-statistics are computed using heteroscedasticity robust standard errors, and are marked in italic, bold, or bold and italic for significance level of 10%, 5%, and 1%, respectively.

Dependent Variable: Monthly Stock Returns (in percentage)

	NASDAQ 100	S&P 400 Pure Growth	S&P 400 Pure Value	S&P 600
Lag 1(Return)	0.059	0.087	0.098	0.053
	3.84	***5.07***	***5.21***	***7.53***
CAR(-6,-1)	0.000	-0.031	-0.009	-0.022
	0.03	***-3.72***	-1.18	***-6.78***
Log(Share Turnover)	-0.455	-0.835	-0.145	-0.807
	-2.49	***-4.85***	-0.97	***-9.78***
Log(Market capitalization)	-0.797	-1.301	-1.238	-0.919
	-8.34	***-6.71***	***-5.78***	***-9.04***
Log(Book-to-Market)	0.847	0.822	1.953	1.262
	4.63	***3.96***	***7.01***	***10.67***
Cash	3.027	1.233	4.017	2.025
	5.01	1.39	***2.67***	***6.02***
Long-term Debt	1.745	0.507	1.949	1.190
	2.55	0.59	**2.04**	***3.13***
Profitability	2.478	4.088	6.463	4.831
	2.08	**2.44**	***3.07***	***6.26***
Lag 1(H-L)	-0.752	-0.774	-1.146	-1.088
	-1.74	-1.64	***-2.63***	***-5.08***
Lag 2(H-L)	0.206	0.168	1.534	0.405
	0.47	0.35	***3.56***	*1.88*
Lag 3(H-L)	-2.334	-2.870	-1.931	-1.956
	-5.46	***-6.18***	***-4.40***	***-9.24***
Lag 4(H-L)	0.394	-0.083	2.176	1.666
	0.93	-0.19	***5.38***	***8.32***
Lag 5(H-L)	-2.206	-1.621	-2.492	-2.619
	-5.60	***-3.74***	***-6.17***	***-13.08***
Lag 6(H-L)	1.484	0.557	1.682	1.286
	3.60	1.28	***4.03***	***6.37***
Constant	Yes	Yes	Yes	Yes
Industry Dummies	No	No	No	No
Observations	9,944	8,779	10,722	60,356
R square	0.021	0.026	0.031	0.021
Sum of Lag 1(H-L) to Lag 6(H-L)	-3.207	-4.622	-0.177	-2.307
χ^2	23.83	46.10	0.08	52.67
p-val	0.00	0.00	0.78	0.00

Appendix 1: GRS tests for the media coverage factor

The GRS test is performed with 6 sets of portfolios: 25 portfolios formed on size and Book-to-Market ratio (25 Size-B/M), 32 portfolios formed on size (32 Size-B/M-OP), Book-to-Market, and operating profitability, 16 portfolios formed on size, Book-to-Market, operating profitability and investment (16 Size-B/M-OP-Inv), 25 portfolios formed on size and momentum (25 Size-MoM), 30 industry portfolios (30 Industry), and 10 portfolios formed on Earnings/Price (10 E/P). This table reports the GRS statistics computed using the Newey-West (1987) standard errors with one lag, the corresponding p-values, the average absolute intercepts (A∣α∣), and the mean adjusted R^2. The models being tested are: 1) the Fama-French three-factor model (FF3); 2) the FF3 model plus the NMH factor (FF3+NMH); 3) the Carhart four-factor model (FF3+UMD); 4) the Carhart four-factor model plus the NMH factor (FF3+UMD+NMH); 5) the Fama-French five-factor model (FF5); and 6) the FF5 model plus the NMH factor (FF5+NMH).

	Test Portfolios							
Models	25 Size/BtM				32 Size/OP/Inv			
	GRS	p-val	A∣α∣	Mean Adjusted R^2	GRS	p-val	A∣α∣	Mean Adjusted R^2
FF3 + NMH	2.22	0.0036	0.1333	0.9453	1.77	0.0221	0.1950	0.9042
FF3+UMD+NMH	2.20	0.0040	0.1299	0.9462	1.77	0.0220	0.1874	0.9056
FF5+NMH	2.55	0.0008	0.1249	0.9480	1.62	0.0444	0.1457	0.9180
	16 Size/BtM/OP/Inv				25 Size/MoM			
	GRS	p-val	A∣α∣	Mean Adjusted R^2	GRS	p-val	A∣α∣	Mean Adjusted R^2
FF3 + NMH	1.74	0.0515	0.1353	0.9343	1.93	0.0137	0.2012	0.8778
FF3+UMD+NMH	1.80	0.0430	0.1372	0.9346	1.94	0.0136	0.2097	0.9489
FF5+NMH	1.60	0.0846	0.1213	0.9501	1.90	0.0160	0.1830	0.8818
	30 Industry				10 E/P			
	GRS	p-val	A∣α∣	Mean Adjusted R^2	GRS	p-val	A∣α∣	Mean Adjusted R^2
FF3 + NMH	1.96	0.0094	0.3319	0.7129	0.97	0.4722	0.1126	0.9033
FF3+UMD+NMH	1.93	0.0109	0.3213	0.7267	0.98	0.4662	0.1155	0.9041
FF5+NMH	2.32	0.0016	0.3362	0.7187	1.26	0.2662	0.1379	0.9090

Appendix 2: Fama-MacBeth regressions for the media coverage factor

Fama-MacBeth (1973) regressions are performed with 6 sets of portfolios: 25 portfolios formed on size and Book-to-Market ratio (25 Size-B/M), xf32 portfolios formed on size, Book-to-Market, and operating profitability (32 Size-B/M-OP), 16 portfolios formed on size, Book-to-Market, operating profitability and investment (16 Size-B/M-OP-Inv), 25 portfolios formed on size and momentum (25 Size-MoM), 30 industry portfolios (30 Industry), and 10 portfolios formed on Earnings/Price (10 E/P). This table presents the factor risk premiums (Gamma), the associated t-statistics (t-sh) calculated using the Shanken (1992) – corrected standard errors, the cross-sectional adjusted R^2, as well as the F statistics and p-values for testing the null hypothesis of jointly-zero alphas. The models being tested are: 1) the Fama-French three-factor model (FF3); 2) the FF3 model plus the NMH factor (FF3+NMH); 3) the Carhart four-factor model (FF3+UMD); 4) the Carhart four-factor model plus the NMH factor (FF3+UMD+NMH); 5) the Fama-French five-factor model (FF5); and 6) the FF5 model plus the NMH factor (FF5+NMH).

	25 Size/BtM						32 Size/OP/Inv					
Models	FF3 + NMH		FF3+UMD+NMH		FF5+NMH		FF3 + NMH		FF3+UMD+NMH		FF5+NMH	
Variables	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh
Mkt - rf	0.597	1.40	0.636	1.27	0.622	1.35	0.631	1.47	0.639	1.46	0.646	1.41
SMB	0.200	0.93	0.210	0.83			0.169	0.77	0.169	0.75		
HML	0.204	0.85	0.134	0.48	0.264	1.09	0.373	1.24	0.400	1.29	0.273	1.14
UMD			2.559	**2.34**					0.648	0.80		
SMB2					0.105	0.40					-0.049	-0.15
RMW					0.365	1.34					0.300	1.88
CMA					-0.106	-0.36					0.107	0.74
NMH	0.400	1.52	0.499	1.57	0.315	1.07	-0.207	-0.75	-0.040	-0.14	0.190	0.63
Cross-sectional adjusted R^2	0.8104		0.8157		0.8277		0.7547		0.7566		0.7750	
χ^2	50.37		31.73		41.70		64.70		59.06		47.86	
p-val	0.00		0.05		0.00		0.00		0.00		0.01	

Appendix 2 (Continued)

	16 Size/BtM/OP/Inv						25 Size/MoM					
Models	FF3 + NMH		FF3+UMD+NMH		FF5+NMH		FF3 + NMH		FF3+UMD+NMH		FF5+NMH	
Variables	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh
Mkt - rf	0.585	1.38	0.586	1.38	0.618	1.37	0.689	1.49	0.689	1.42	0.721	1.45
SMB	0.269	1.26	0.270	1.26			0.399	1.55	0.434	1.64		
HML	0.298	1.20	0.296	1.18	0.296	1.25	-0.585	-0.69	-0.893	-1.73	0.326	1.22
UMD			-0.204	-0.18					0.042	0.08		
SMB2					0.037	0.14					0.277	0.31
RMW					0.202	1.18					0.387	1.31
CMA					-0.007	-0.04					0.467	1.42
NMH	0.133	0.38	0.139	0.39	0.483	1.18	-0.255	-0.88	-0.262	-0.86	-0.248	-0.79
Cross-sectional adjusted R^2	0.8122		0.8111		0.8398		0.8393		0.8425		0.8591	
χ^2	26.08		25.85		13.28		32.81		29.32		22.87	
p-val	0.01		0.01		0.21		0.05		0.08		0.24	

	30 Industry						10 E/P					
Models	FF3 + NMH		FF3+UMD+NMH		FF5+NMH		FF3 + NMH		FF3+UMD+NMH		FF5+NMH	
Variables	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh	Gamma	T-sh
Mkt - rf	0.773	*1.75*	0.816	*1.84*	0.727	1.42	0.660	1.47	0.658	1.39	0.688	1.44
SMB	-0.220	-0.65	0.076	0.24			0.805	1.52	0.995	1.47		
HML	-0.234	-0.72	0.031	0.09	-0.463	-1.13	0.422	1.27	0.461	1.31	1.006	1.50
UMD			0.794	1.11					-1.221	-0.78		
SMB2					-0.412	-1.09					0.662	1.44
RMW					0.593	1.91					-0.458	-0.98
CMA					-0.146	-0.50					0.393	0.95
NMH	-0.011	-0.04	-0.077	-0.27	-0.172	-0.51	0.111	0.29	0.053	0.13	0.061	0.13
Cross-sectional adjusted R^2	0.64		0.66		0.67		0.79		0.79		0.79	
χ^2	33.74		30.95		19.78		6.09		5.49		5.08	
p-val	0.14		0.19		0.71		0.41		0.36		0.28	