MKT MEDIASTATS

Global Markets

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In Practice

Media Coverage and the Cross-Section of Stock Returns

Abstract

When purchasing stocks, investors face a number of challenges. To begin with, the investment opportunity set is vast, with thousands of common stocks to choose from. Additionally, cognitive limits and time constraints can limit the amount of information one can digest. Humans are generally not able to assess hundreds—much less thousands—of alternatives, while processing often seemingly contradicting information from a variety of sources. Doing so is even more difficult when the alternatives differ on multiple dimensions.

Investors manage the problem of choosing among thousands of possible stock purchases by limiting their search to stocks that have recently caught their attention. In this study, we measure attention by looking at several attributes of media coverage. More specifically, we focus on four observable measures that are likely to increase investor awareness of their opportunity set: the conditional tone of media coverage, the unusual news volume, the level of disagreement among outlets, as well as the degree of factual content with which companies are discussed in news.

We find a significant premium on stocks with positive media coverage, varied opinions and less numerical coverage. On average, stocks featured positively in the media outperform stocks with negative coverage by 2.7% per annum. Furthermore, stocks with a high dispersion in opinion outperform consensus stocks by 3% per annum, on average, consistent with the traditional risk-return trade-off. We also demonstrate that stocks with softer media coverage outperform those with harder media coverage by 4.8% per annum, on average. These figures are not only statistically significant, but also economically large.

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Contents

Introduction	p. 3
The Media-Based Stock-Level Suite of Indicators	p. 3
HCR: Theoretical Foundations and Intuition	p. 5
Media Coverage and Stock Prices	p. 6
Media Coverage and Stock Selection	p. 9
Conclusions	p. 11
References	p. 11

Information Classification: General

Our *In Practice* series provides practitioners with concrete insights into how they can incorporate State Street MediaStats indicators and tools into their investment process. In this issue, we introduce a framework for incorporating media coverage in assessing the outlook for US stocks.

1. Introduction

When purchasing stocks, investors face a number of challenges. To begin with, the investment opportunity set is vast, with thousands of common stocks to choose from. Additionally, cognitive limits and time constraints can limit the amount of information one can digest. Humans are generally not able to assess hundreds—much less thousands—of alternatives, while processing often seemingly contradicting information from a variety of sources. Doing so is even more difficult when the alternatives differ on multiple dimensions.

According to Barber and Odean (2008), investors manage the problem of choosing among thousands of possible stock purchases by limiting their search to stocks that have recently caught their attention. In this study, we measure attention by looking at several attributes of media coverage. More specifically, we focus on four observable measures that are likely to increase investor awareness of their opportunity set: the conditional tone of media coverage, the unusual news volume, the level of disagreement among outlets, as well as the degree of factual content with which companies are discussed in news. Our research suggests that all of these measures impact investor behavior and asset prices.

2. The Media-Based Stock-Level Suite of Indicators

Through our partnership with MKT MediaStats, State Street leverages natural language processing to provide differentiated insights on media coverage and its impact on asset prices. The methodology employed in constructing our media indicators is based on an extensive body of academic research by MKT MediaStats' founding partners, Professor Emeritus Ken Froot of Harvard Business School, Gideon Ozik, PhD, and Professor Ronnie Sadka of Boston College.

News articles are gathered daily through various channels from over 100,000 thousand sources for a universe of roughly 3,000 US companies. The source set is diverse and includes publications classified into General, Local General, Local Business, News Services, Industry, International, Business or Investing, Corporate Communications (PR), and other categories.

However, not all news sources are created equally. To comb through the media chatter, our indicators correct for a variety of consistent biases discovered through years of academic research. For a deep dive in the merits of bias correction, please view our white paper here.

The State Street MediaStats indicators include:

- **Sentiment**, or the conditional tone of media coverage of a company.
- **Intensity**, or the abnormal frequency of media coverage of a company.
- **Disagreement**, or the tone dispersion of media coverage of a company.

- **Hard Content Ratio (HCR)**, or the degree of factual media coverage of a company.

Indicators are available with a number of periodicities, including 1-day, 7-days, 14-days, 21-days and 28-days. The longer-periodicity indicators are constructed daily using a rolling exponential moving average (e.g., the 28-day indicators use a 28-calendar-day rolling exponential moving average). Moreover, each indicator is standardized daily in the cross-section of firms to produce firm-level z-scores, with the exception of the HCR indicator which is expressed as a percentage weight between 0 and 100%.

Figure 1: State Street MediaStats Indicators

	Intensity	Sentiment	Disagreement	Hard Content Ratio (HCR)
Insight	*The abnormal frequency of media coverage of a company*	*The conditional tone of media coverage of a company*	*The tone dispersion of media coverage of a company*	*The degree of factual coverage of a company*
Intuition	Lesser-covered companies are under-invested in (underpriced) while overly-covered companies are over-priced	A company's media sentiment is correlated with market return	Large and Mid Caps: **Risk-return tradeoff** – investments in high disagreement firms are riskier and earn higher expected returns than safer assets Small Caps: **Short-sale constraint** – the optimists alone set the tone for high-disagreement companies which are over-priced as a result	Large and Mid Caps: **Market Efficiency** – investors digest numerical content faster than news content nuanced with varied opinion Small Caps: **Discovery Premium** – small companies are generally less followed (under-invested); news articles with high HCR attract market participants' interest driving stock prices up

Source: State Street Global Markets®, MKT MediaStats. Data for illustrative purposes only.

Key advantages of the State Street MediaStats indicators include:

- **Differentiated Investment Insights**. Our research suggests that trends in media coverage correlate with forward returns, which may be useful for investment decisions.
- **Breadth of Coverage**. We scan 120,000 media articles daily – and this number continues to grow. Our information spans many distinct, reputable sources of media.
- **Noise Reduction**. Our proprietary technology provides a calibrated bias reduction. Our signals are pre-processed and ready for integration into the investment process.
- **Longer Alpha Decay Horizon.** The media indicators suggest signals are effective over longer investment horizons.

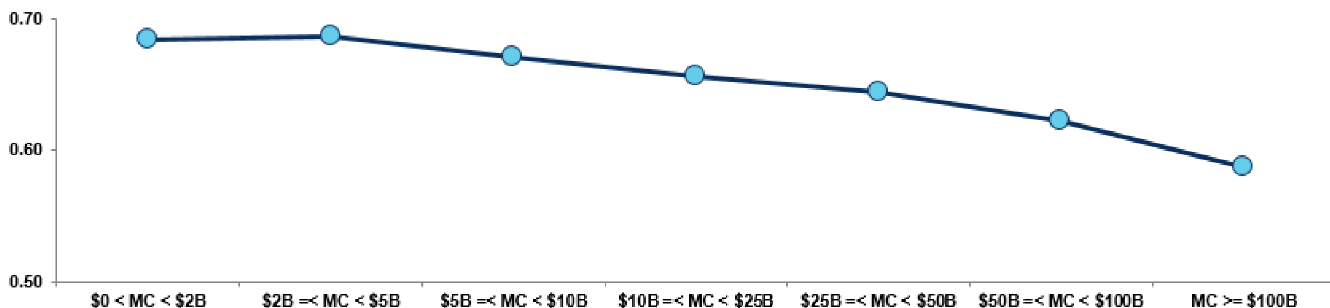
- **Comprehensive Data Archive.** Our database dates back to 2011[1] providing ample history for signal backtesting.
- **Timeliness**. The media indicators are delivered daily, with a one-day lag.
- **Comparability**. The media indicators use a consistent statistical methodology through time and across securities.
- **Academic Rigor.** Our data scientists and researchers have decades of experience in developing quantitative signals.

3. HCR: Theoretical Foundations and Intuition

Our latest addition to the stock-level media suite of indicators, the HCR, was released in December 2019. It considers the proportion of numerical (aka "hard") content in the media coverage of a particular asset. Each news article presents a continuum between *soft* and *hard* information, and a crisp dichotomy is challenging to define. While hard information is almost always quantitative, soft information is not. Associated with commentary, as well as individual opinions and interpretations, it requires more resources to process (readers' time, brain-power, and attention). Moreover, in contrast to the ease with which hard information can be summarized and disseminated, soft information is not as easily shared.

In Figure 2 below, we present the average HCR by market cap band. Of note is the near monotonic relationship between size and HCR. Indeed, while small caps tend to be covered in media with more factual content, large caps enjoy *softer* coverage, nuanced with more varied opinions and interpretations.

Figure 2: Average HCR by Market Cap (MC) band



Source: State Street Global Markets®, MKT MediaStats, DataStream (May 2011 – Dec 2019).

[1] History dates back to 2011 for Large 500 US Companies, 2013 for global country equity indices, and 2015 for ~3,000 Broad US Market Companies.

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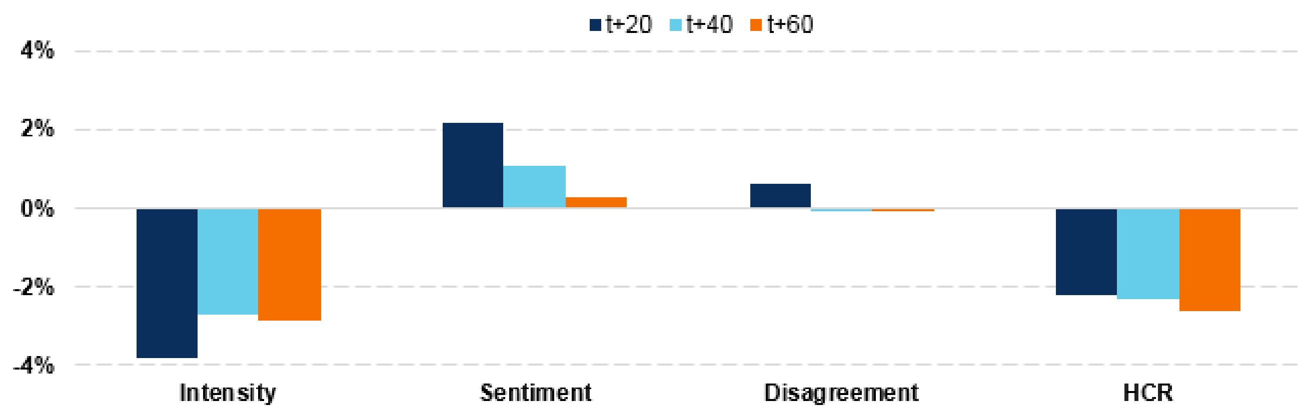
Our examination of whether asset prices respond to information in news coverage is focused on separately measuring the degree of soft versus hard information in firm-specific news coverage and—more importantly—examining which type of news is most strongly associated with future asset performance. We find evidence that large and mid-cap stocks with a high degree of *hard* coverage tend to underperform as information incompleteness is alleviated faster, resulting in a reduction of expected risk and return premium. In contrast, news articles with a high proportion of hard content contribute to the discovery premium for smaller companies that are generally not as frequently under the microscope of market participants. Attracting investor interest in turn tends to drive small-cap stock prices up in the aggregate.

4. Media Coverage and Stock Prices

In this section, we examine the relationship between each of the State Street MediaStats stock-level indicators and future stock returns. For the purposes of this analysis, each day we rank all stocks in our coverage by their 28-day indicator value and allocate them into ten equal groups—or deciles—incorporating the latest indicator measures. One-day publication lag is included to avoid any look-ahead biases. We then calculate the cumulative returns from t_0 to t+60 for each stock, where t_0 is the indicator publication date. Lastly, we calculate average cumulative returns for all stocks, in each decile, over the entire forward period, up to 60 trading days following indicator publication dates. The spread, which represents the cumulative returns of the top decile minus the cumulative returns of the bottom decile (e.g., high - low), is shown in Figure 3 for each indicator.

Figure 3: Cumulative Annualized Decile Spread (Top Decile – Bottom Decile)



Source: State Street Global Markets®, MKT MediaStats, DataStream (May 2011 – Dec 2019).

From this event time study, the following relationships emerge:

1) High intensity of media coverage is associated with lower forward stock returns. These findings are consistent with the theoretical work of Merton (1987). In his model, some investors are not aware of the opportunity of investing in certain assets (these are the neglected assets)—and therefore will not include them in their optimal

portfolios. In equilibrium, the neglected assets are under-invested, thereby resulting in a low expected return for better-known assets relative to less-known assets. Using media coverage intensity of a company to proxy for how well investors are familiar with it, we find evidence consistent with predictions. As the amount of firm-specific news increases, the incompleteness of information about a given stock is alleviated. Given that the extent of information incompleteness is positively correlated with risk, the resultant lower risk causes the stock price to decline—that is, high-intensity companies tend to underperform in the short term.

2) High sentiment tends to lead positive stock returns. The impact peaks at one month out following positive media coverage, although the relationship persists over the subsequent three months. This phenomenon is consistent with existent theories. For example, Barber and Odean (2008) argue that, due to limited information processing power, investors do not pay sufficient attention to publicly available information when it is initially released via the media, resulting in investor *underreaction*. Over time, however, investors gradually pay greater attention to such information and subsequently trade on it, thereby impacting stock prices.

3) High disagreement impacts positively stock returns over the subsequent one month. This measure is motivated by the traditional risk-return tradeoff in the literature. It asserts that stocks for which there is a high disagreement about fundamental value are riskier, and, therefore, investors would demand high expected premium to hold them in their portfolios.

4) High degree of factual coverage is associated with the faster assimilation of content, resulting in stock underperformance over the subsequent three months. These findings are also consistent with the *limited attention* theory. Indeed, several papers, including Hirshleifer and Teoh (2003) and Peng and Xiong (2006), stress the idea of limited attention, whereby cognitively-overloaded investors pay attention to only a subset of publicly-available information. Arguably, numerical detail is faster to process than more nuanced news coverage with subjective commentary. As the amount of factual coverage on a given firm increases, the incompleteness of information about its stock is alleviated. Building further upon the positive correlation between information incompleteness and risk, the resultant lower risk is expected to exert downward pressure on the company's stock price—that is, high-HCR companies tend to underperform in the short term.

Next, we investigate the presence of any dichotomies in indicator behavior conditioned on size. Each day, we rank stocks in our coverage by their 28-day indicator value and allocate them into three equal groups—or terciles—incorporating the latest media measures. Again, one-day publication lag is included to avoid any look-ahead biases. We then break down the coverage universe by market cap into three buckets: i) small caps with market cap less than $2 billion; ii) mid-caps with market cap between $2 billion and $10 billion, and iii) large caps with market cap above $10 billion. The cumulative returns from t_0 to t+20 are then calculated for each stock, where t_0 is the indicator publication date. Lastly, we calculate the cumulative return spread (high tercile minus low tercile), in each market cap bucket, over the forward 20-day period, following indicator publications. Results are shown in Figure 4 below.

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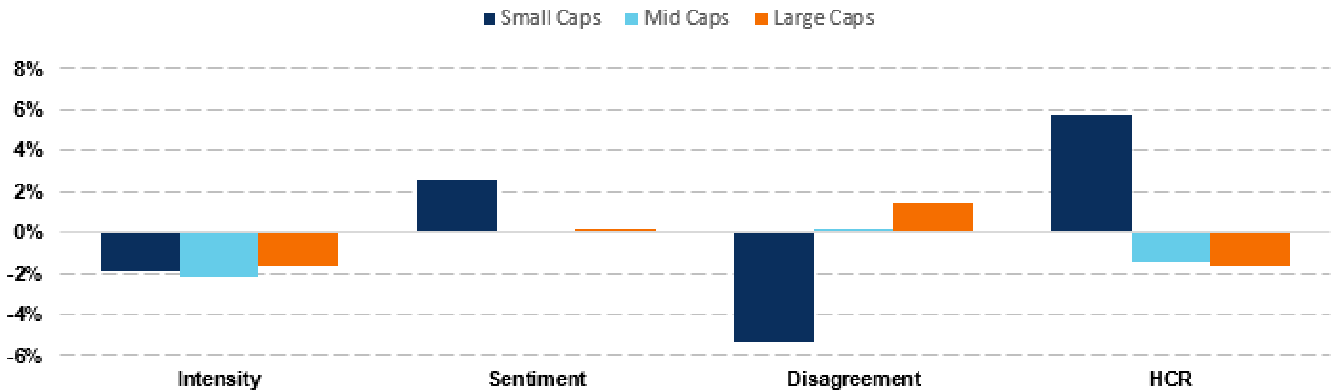
Figure 4: Cumulative Annualized Tercile Spread (Top Tercile – Bottom Tercile) by Size



Source: State Street Global Markets®, MKT MediaStats, DataStream (May 2011 – Dec 2019).

The breakdown of indicator spreads by size provides additional insights. More specifically, we observe a dichotomy of stock behavior with respect to disagreement and HCR. While high disagreement leads positive returns of large caps, consistent with the traditional risk-return trade-off, high disagreement leads to future underperformance of smaller companies. *Short-sale constraints* in the small cap space result in slower incorporation of negative views and current asset prices may reflect the views of optimist investors only. The short-sell constraints, in turn, result in those securities to be overpriced and underperform going forward.

In the case of HCR, on the other hand, we observe the *discovery premium* of small caps in play. Small companies are generally less followed and under-invested; news articles with high HCR attract market participants' interest, thereby driving stock prices up.

Lastly, we present average cross-sectional indicator correlations in Figure 5. At the margin, sentiment is negatively correlated with intensity and disagreement, consistent with prior intuition. Indeed, bad news is more likely to attract a casual reader's eye than good news. It is a secret journalists have known for years: bad news receives more attention than good news. It is not surprising, therefore, that high-intensity coverage is associated with lower media sentiment. The negative correlation between intensity and disagreement is also noteworthy, albeit it is fairly modest at -5%.

The largest correlations observed are between HCR and disagreement at -16% which makes intuitive sense: companies with a high degree of factual coverage tend to be associated with lower levels of disagreement as information incompleteness is alleviated. Overall, pair correlations are small enough to suggest that the media indicators provide orthogonal information.

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Figure 5: Media Indicator Cross-Sectional Correlations

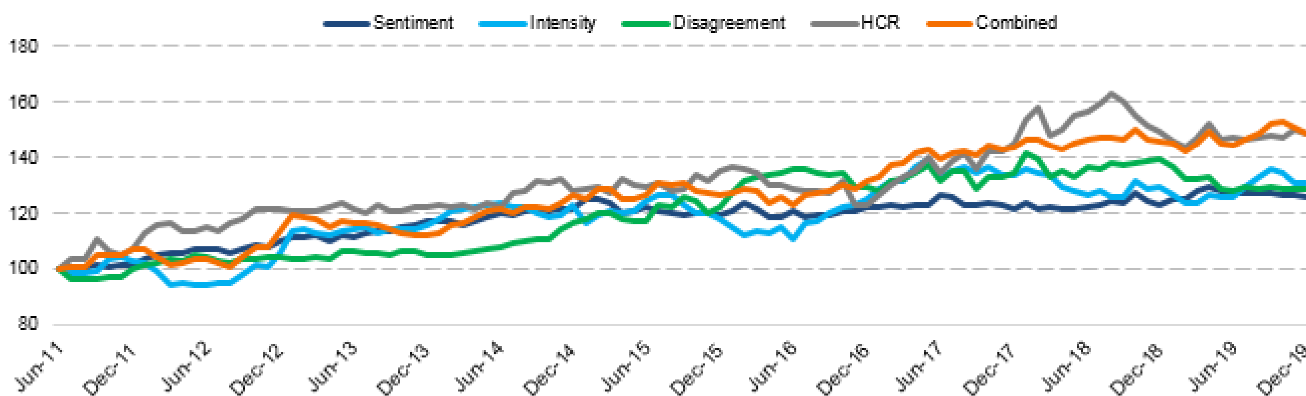
	Sentiment	Intensity	Disagreement	HCR
Sentiment	100%			
Intensity	-1%	100%		
Disagreement	-1%	-5%	100%	
HCR	0%	0%	-16%	100%

Source: State Street Global Markets®, MKT MediaStats, DataStream (May 2011 – Dec 2019).

5. Media Coverage and Stock Selection

In this section, we explore a practitioner implementation of media coverage for US stocks. Based on each indicator, we sort US stocks in our coverage into ten equal groups—or deciles—each day. The combined model is constructed as the simple addition of [*Sentiment* + *Disagreement – Intensity – HCR]*. We go long the top decile of stocks (bottom decile in the case of intensity and HCR) and short the bottom decile (top decile in the case of intensity and HCR), weighting each position by the company's market capitalization. We hold each position for 20 days, following the methodology of Jegadeesh and Titman (1993). Cumulative returns and performance statistics are shown in Figures 6 and 7, respectively.

Figure 6: Leveraging Media Coverage in Stock Selection



Source: State Street Global Markets®, MKT MediaStats, DataStream (May 2011 – Dec 2019).

Figure 7: Performance Statistics

Statistics	Sentiment	Intensity	Disagreement	HCR	Combined
Return (Ann)	2.7%	3.2%	3.0%	4.8%	4.8%
t-stat	2.1	1.3	1.5	1.8	2.3
Volatility (Ann)	3.9%	7.5%	6.3%	8.3%	6.2%
Sharpe Ratio	0.7	0.4	0.5	0.6	0.8
Max Drawdown	5.6%	12.2%	9.3%	11.6%	6.3%
Hit Rate	58%	57%	61%	58%	56%

Source: State Street Global Markets®, MKT MediaStats, DataStream (May 2011 – Dec 2019).

We note that media is indeed associated with future stock returns. These results are economically large and statistically significant for sentiment, disagreement and HCR. For example, a value-weighted portfolio of high-sentiment stocks outperforms a value-weighted portfolio of low-sentiment stocks by 2.7% annualized. Additionally, a value-weighted portfolio of high-disagreement stocks outperforms a value-weighted portfolio of low-disagreement stocks by 3.0% annualized. Constructing portfolios by the degree of factual coverage delivers even stronger returns, with low-HCR portfolios outperforming high-HCR portfolios by 4.8%.

Although media signals can be helpful in stock selection strategies, we find that the information content derived from all four media measures can be aggregated to generate the strongest results. Our combined signal generates statistically significant returns, with an annualized return spread of 4.8%, a Sharpe ratio of 0.8 and a more limited drawdown of 6.3%.

Lastly, we regress the strategy returns of our combined model on standard Fama-French factors and find a statistically significant alpha of 0.4% that remains after risk adjustment to common market exposures (Figure 8).

Figure 8: Fama-French Factor Regression

	Alpha	Market-RF	SMB	HML	Momentum
Coefficient	0.4%	3.7%	-6.1%	0.6%	-0.3%
T-stat	2.1	0.6	-0.7	0.1	0.0

Source: State Street Global Markets®, MKT MediaStats, DataStream, Ken French's website, https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html (May 2011 – Dec 2019). SMB: small minus big; HML: high minus low. Monthly returns used.

6. Conclusions

Digital media serves as an important outlet for disseminating information to both the general public and the investment community. This study empirically examines the relationship between media coverage, its attributes and the cross-section of stock returns in the US broad equity market. We find a significant premium on stocks with positive media coverage, varied opinions and less numerical coverage. On average, stocks featured positively in the media outperform stocks with negative coverage by 2.7% per annum. Furthermore, stocks with a high dispersion in opinion outperform consensus stocks by 3% per annum, on average, consistent with the traditional risk-return trade-off. We also demonstrate that stocks with *softer* media coverage, nuanced by a greater proportion of commentary rather than numerical content, outperform those with *harder* media coverage by 4.8% per annum, on average. These figures are not only statistically significant, but also economically large.

Finally, our results suggest that the media effects are robust to a number of well-known return anomalies, and are distinct from broadly studied patterns such as size, value, and momentum. Indeed, the media can provide orthogonal information and generate alpha that could not be explained by standard market exposures. These findings can be useful for investors in the portfolio management process.

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