# What's trending? Stock-level investor sentiment and returns.

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**Abstract**

We propose a new and direct measure of investor sentiment using the opinions expressed on social media platforms about individual stocks (BSVM sentiment). In a sample of 4000 stocks from 2015 to 2016, we find that the sentiment measure is related to but not fully captured by firms' fundamentals. It appears to be persistent in the short run and systematic. An increase in investor sentiment leads to higher concurrent stock return and a subsequent price reversal within the year. The effect of sentiment on stock return is stronger in hard-to-value stocks such as small and young stocks.

## Introduction

One of the important lessons that the sharp rises and falls of stock prices (e.g. dot.com bubble in the 1990s, financial crisis in the 2008) taught us is that the investors can become overly optimistic or pessimistic. The sentiment dominating the market can drive the asset prices away from the fundamental values, and the unsentimental investors may fail to correct the mispricing. Needless to say, investor sentiment plays a vital role in shaping asset prices. Theoretical work by authors such as Delong, Shleifer, Summers, and Waldman (1990) have used investor sentiment to explain stylized facts in finance such as excess volatility, closed-end fund discount, and equity premium.

However, to empirically test the implications of investor sentiment, we face the challenge of measuring investors' elusive opinions and perceptions. An exogenous shocks to investor sentiment may lead to a chain of events, beginning with some market participants forming a belief and subsequently translating to observable patterns of securities trades. The demand pressure combined with limits to arbitrage causes mispricing, which may then trigger responses by informed insiders. Previous literature has tried to track the traces of sentiment in every part of the chain. Proxies of sentiment include (ordered from origins in investor psychology to responses by insiders) sports outcomes, investor survey, consumer confidence index, trading volume, retail investor trading, mutual fund flows, closed-end fund premium, dividend premium, option implied volatility, IPO first day return, equity issuance, and insider trading[1]. In a highly influential paper, Baker and Wurgler (2006) use the principal component of six of the aforementioned proxies to capture the major episodes of investor sentiment. However, all of these are indirect measures subject to confounding influences. Additionally, they only capture the market-wide and ignore cross-sectional variations of sentiment.

In this paper, we propose a novel and direct measure of investor sentiment to individual stocks: the sentiment of tweets regarding individual stocks on social media. Since 2012[2], Bloomberg integrates Twitter, StockTwits and other social media outlets and uses a proprietary algorithm to identify whether the tweets related to individual stocks are positive or negative. These tweets are then aggregated to determine the overall sentiment to individual stocks on a daily basis (hereafter

[1]See e.g. Lee, Shleifer, and Thaler(1991), Cehn, Kan, and Miller (1993), Neal (1998), Brown and Cliff (2004, 2005), Baker and Wurgler (2006, 2007), Edmans, Garcia, and Norli(2007), Frazzini and Lamont (2008), Ben-Rephael, Kandel, and Wohl(2009), Chung, Hung, and Yeh (2010), Antoniou, Doukas, and Subrahmanyam (2011), Baker, Wurgler, and Yuan (2011), Yu and Yuan (2011), Baker, Wurgler, and Yuan (2012)

2 The available data begins in 2015.

referred to as "BSVM sentiment"). We argue that this sentiment measure has a number of advantages over the previous measures. First, the sentiment extracted from social media is the directly expressed opinion of investors, which is unlikely to be confounded by other factors. Second, we can trace the investors' sentiment at individual stock level and examine the cross-section of investor sentiment and its relation to asset prices. Third, Twitter is one of the most popular social media around the world, with 330 million active users[3]. Opinions extracted from Twitter and other platforms are likely to be representative of investors' aggregate view at a given moment. We obtained the daily measure for 3,955 firms over the period of January 2015 to December 2016 and aggregated it to monthly average.

We begin our analysis by examining the determinants of the sentiment measure. We find that the BSVM sentiment measure is positively related to the sentiment of press release and news media. Also, when firms announce positive earnings surprises or have high past stock returns, sentiment tend to increase. Investor sentiment tends to be more optimistic about large firms and growth firms. Overall, our results suggest that investor sentiment is partly driven by firms' fundamental information, but a large portion of it remain unjustified by firm information.

Existing findings suggest that sentiment, one of the driving forces of retail investors trading activities, seems to be persistent and systematic. Barber, Odean, and Zhu (2009) find that the order imbalances of retail investors usually persist over several weeks and Kumar and Lee (2006) show that the trades of individual investors are systematically correlated. Therefore, as a second step, we examine whether the BSVM investor sentiment measure exhibits such properties that one would expect from a good sentiment measure. We construct a monthly contingency table of sentiment decile portfolio assignments and find evidence of persistence in the individual sentiment values, in particular for the optimistic opinions. We also document some comovement between the individual sentiment and the industry and market average and find that the aggregate market sentiment is autocorrelated. Overall we conclude that the BSVM investor sentiment measure is relatively persistent.

Having validated the sentiment measure, as our third step we test its predictive power on stock returns. The expectation is that in times of irrational investor optimism, stocks become overvalued and should subsequently experience negative returns, while negative sentiment would drive

[3] Twitter earnings report for the 3rd quarter of 2017.

undervaluation and subsequent positive returns. To test the hypothesis, we sort stocks into deciles in each month and examine the abnormal returns in the concurrent month and the following 12 months. We find that higher investor sentiment is associated with higher concurrent return and lower subsequent returns from month 7 to 12. The result suggests that indeed, higher sentiment causes temporary overvaluation which subsequently reverses as the fundamentals are revealed. To control for other risk factors that may affect stock prices, we also run a Fama-Macbeth regression by including commonly used controls. The results are qualitatively similar.

Baker and Wurgler (2006) argue that hard-to-value stocks are more sensitive to speculative demand and more costly and risky to arbitrage. So we should expect investor sentiment to have a stronger effect on hard-to-value stocks such as young firms and small firms. As the fourth step, we follow Baker and Wurgler (2006) and compare the cross-section of predictability of investor sentiment on the returns. Indeed, we find that the predictability of sentiment is stronger on small and young firms than on big and old firms.

One may argue that the BSVM sentiment proxy reflects economic fundamentals to some extent and the concurrent relationship between BSVM sentiment proxy and return simply reflects investors' rational reaction to fundamental news. We have two responses to this skeptical view. One, the long-term reversal that we document is not a natural implication of the view. Rather, it suggests that the positive relationship between the BSVM sentiment proxy and return is at least partly driven by investors' unjustified sentiment. Two, we remove the influences of fundamentals, at least partially, by regressing the BSVM sentiment proxy on a set of fundamental indicators-sentiment in official news media, stock price, firm size, and book-to-market. The predicted value is then defined as Fundamental Sentiment, and the residuals as Pure Sentiment. We find that although both measures are positively related to concurrent stock returns, the magnitude is much larger for Pure Sentiment. In addition, there does not seem to be any reversal for the Fundamental measure, while in the Pure Sentiment, we find the reversal as early as the $5^{th}$ month in the future.

The paper contributes to the growing literature on the importance of sentiment in the asset pricing, by adding an important stock-level dimension. Our primary contribution is proposing a new direct stock-level measure of sentiment which shows valid and expected characteristics. Second, we test the theoretical predictions regarding the impact of sentiment on the cross-section of concurrent

and future stock returns. Finally, since our findings are based on stock-level data and a measure that's available to investors, we effectively present an implementable trading strategy.

The rest of the paper is organized as follows. Section 1 describes the data used for this research, Section 2 examines the characteristic of the investor sentiment measure, Section 3 presents analysis of the relationship between sentiment and abnormal returns, and Section 4 concludes.

## 1. Data and sample

We use the Bloomberg Social Velocity Monitor as a direct measure of investor sentiment. It is a measure of the opinion about publicly-traded companies expressed on the social media. Bloomberg integrates Twitter, StockTwits and other social media outlets. Following a proprietary Bloomberg algorithm that determines whether the language of the post is positive, negative or neutral, sentiment score is assigned daily, ranging from -1 (negative sentiment) to +1 (positive sentiment). The strength of the sentiment measure results from ranking of coverage sentiment of all mentioned firms in a given moment. The algorithm is designed to target sentiment signals related to business and finance information (and not, for example, discussion of company's product or marketing campaign). According to Bloomberg representatives, the sentiment analysis is driven by supervised machine learning methods[4] such as support vector machines, decision trees, and regressive models. We download BSVM daily measure for 3,955 firms[5] over the period of January 2015 to December 2016 and compute its monthly average.

To measure sentiment about individual firms in official media news and firm's own press release, we use the RavenPack News Analytics data. RavenPack aggregates news form the worlds' leading publishers, web aggregators, and newswire and use a proprietary algorithm to analyze the tone of each piece of news. For our purpose, we include only news reports from the credible sources that

[4] Supervised learning is a type of machine learning in which models are built from "training data." Here, training data is social media documents categorized by humans as positive, negative or neutral, which gives basis to a statistical model for each class of document. This model then serves to categorize in real time new documents with the use of probability estimates for class membership and various thresholds.

[5] The fully merged dataset includes 3,264 separate firms.

have relevance scores of higher than 75[6] and calculate the average sentiment of the news about individual firms as monthly sentiment measure.

Daily and monthly stock data comes from the Center for Research on Security Prices (CRSP), company accounting data is from Compustat and analyst forecasts are from I/B/E/S. Observations include common stocks (CRSP codes 10 and 11) listed on NYSE, AMEX and NASDAQ. Only stocks with price higher than $5 and lower than $1000 are included to mitigate market microstructure issues.

We include a number of stock characteristics that can potentially impact monthly returns: book-to-market ratio (lnbm), momentum (mom), idiosyncratic stock volatility (ivol), beta (beta), illiquidity measure (illiq), size – logarithm of market value (lnme), earnings surprise, analyst earnings forecast dispersion (disp), stocks co-skewness (coskew), extreme positive stock return (max), and abnormal dollar volume (voldu). Detailed descriptions of variable construction are available in Online Appendix A1.

Table 1 presents summary statistics and the correlation table. We notice that the sentiment measure is on average positive, consistent with observation that investors tend to be optimistic. The sentiment is most strongly positively correlated with size (more optimistic about large firms), abnormal dollar volume (increase in trading when sentiment is high) and most negatively with book-to-market (more optimistic about growth firms).

## 2. Characteristics of stock-level sentiment

We begin our analysis by examining the determinants of the sentiment measure, as defined by the Bloomberg Social Velocity Monitor. We are interested how much of the social-media investor hype about the stock is related to the fundamental information about the firm, firm's own communications and opinions formulated by the news outlets. News sentiment can be argued to be a more objective and information-based measure than the elusive investor sentiment and along

[6] In Ravenpack News Analytics, each news is assigned a score between 0-100 to indicate how strongly related the entity is to the underlying news story with higher values indicating greater relevance. Values above 75 are considered significantly relevant. The data provider also assign a score for news providers to indicate their influence and trustworthiness. The score ranges from 1 to 10 where rank 1 is the highest. News providers with score smaller or equal to three are considered credible.

with the fundamental information can help us identify the irrational portion of the stock sentiment measure.

Table 2 presents an OLS regression with time fixed effects and heteroscedasticity consistent standard errors of the monthly BSVM investor sentiment on various concurrent variables measuring fundamental information about the company and it's updated, stock reaction and news sentiment measures. The use of time fixed effects allows us to control for the market-wide sentiment, and focus on the stock-level sentiment impact. In the first column we can see that the BSVM investor sentiment is positively related to the sentiment of the news outlets (Average Event Sentiment). Second and third column show that both the media and newspapers-based sentiment (column 2) and press-release sentiment (column 3) hold a positive relation to the overall market sentiment for a given stock. Interestingly, in column 4 we see that investors agree with and follow news sentiment, but are skeptical about the opinion produced by the firm itself (negative coefficient for press-release sentiment).

In column 5 and 6 we find that the new fundamental information arrival (earnings announcement) is positively related to the market sentiment. We observe that the sentiment goes up when the firms announce positive earnings surprises or have high past returns. In columns 7 and 8 we introduce the fundamental variables, such as end-of-month price, size and book-to-market ratio. We find that the fundamental information about the firm has a significant relation to the market sentiment, while the news sentiment maintains its significance. In particular, investors are more optimistic about large and growth firms. We conclude that the BSVM sentiment measure picks up both the fundamental information and the sentiment of press and media. However, the R2 of 8.6% shows that a large portion of the sentiment remains unexplained and can be argued to be irrational, emotional "feeling" about the company.

We use the specification from the column 8 to perform a decomposition of the BSVM sentiment measure. The predicted values from the regression will serve us as the "fundamental-based" sentiment and the residuals will proxy for the "true, irrational" sentiment in the later part of analysis.

To further understand the sentiment measure, we examine its persistence by constructing a contingency graph. Each month we sort stocks based on their sentiment measure into 10 deciles. Figure 1 shows bars for initial decile assignment and subsequent, month later, representing

*Pr(portfolio assignment in time t=1|portfolio assignment in time t=0*). We can see that there is certain consistency in sentiment measure over time. High positive sentiment stocks (decile 10) are more likely to remain in that group (32% probability). Similarly, high negative sentiment stocks (decile 1) have a 23% chance of remaining in their decile. On the other hand, it is apparent that there is still turnover in portfolio assignment, with 70-80% stocks changing their subsequent sentiment ranks. In the middle portfolios persistence of assignment seems weaker. Finally, 7% of past extreme negative sentiment stocks become extreme positive and vice versa. Please note that exceptionally high persistence of portfolio 3 is due to the fact that both 3 and 4 contain zero breakpoints (neutral sentiment) and simply by construction, all zero observations are assigned to portfolio 3.

To sum up, while we observe that the sentiment measure may persist over time, especially for optimistic sentiment, it seems that there is also significant of variation and changes in sentiment over time. As additional test of persistence, we construct an average monthly sentiment measure for the whole market and examine its autocorrelation properties. We find that it follows an autoregressive model of order 1 ($y_{(t)}=0.018+0.53\ y_{(t-1)}+\ u_{(t)}$), again pointing to certain autocorrelation of the sentiment.

We are also interested how much does the stock-level sentiment co-move with the overall sentiment of the industry or the whole market. To this end, we compute, in addition to the aggregate market sentiment, the industry-specific sentiment, using the Fama-French 48 industry classification[7]. Table 3 presents the correlation coefficients between these measures. We see that the individual stock sentiment has a 29% correlation with the industry sentiment measure and 20% with the market as a whole. This shows that the optimism or pessimism about given stock is indeed related to the overall feeling about the market and even more so to the feeling about the industry. However, there is still a large portion that is idiosyncratic, pointing to the importance of examining the cross-sectional differences in stock sentiment.

[7] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_48_ind_port.html

## 3. Return consequences of sentiment

We now turn our focus towards the dynamic relationship between the stock level investor sentiment and returns. We are interested in the idiosyncratic sentiment price impact

Each month we sort stocks into deciles according to the monthly average sentiment and examine the average portfolio Fama French 3 factor returns in the concurrent month and up to 12 months in the future. Table 4 Panel A summarizes characteristics of each decile and Panels B and C presents the average returns for each decile, with equal and value-weighted returns respectively. In Panel A we can see that firms in the extreme deciles (with very high positive or very high negative sentiment) tend to be larger, with higher market share. Eight of our ten deciles have a positive average sentiment score, pointing that the investors tend to be optimistic. It seems that the negative sentiment stocks are mostly value firms, while positive sentiment firms tend to be growth entities.

Panel B shows that firms with very pessimistic sentiment experience negative concurrent returns, while firms with the most optimistic sentiment have very positive returns in the same month. The difference between the highest and lowest decile equals 9.00 and is strongly significant. The result for value-weighted return (Panel C) is also strongly significant but lower in magnitude, suggesting that the smaller firms are more likely to have returns reactive to sentiment. In the six months following the sentiment measurement there seems to be a return continuation, until in the $7^{th}$ month the reversal begins (there is some reversal in month 3 in the value-weighted portfolio). We interpret the 6 month delay in the price correction as a sign of market's inefficiency that can be partially related to sentiment's relative persistence.

We verify the findings of the above portfolio univariate analysis by including a number of additional known return determinants in a multivariate, stock-level Fama-MacBeth (1973) regression analysis with Newey-West standard errors (for discussion of return determinants, see Bali, Peng, Shen and Tang, 2014). Our goal is to see if a the relation between sentiment and returns is robust to inclusion of stock size, book-to-market and beta (Fama and French, 1992 and 1993), illiquidity level, price momentum (Jegadeesh and Titman, 1993), stocks co-skewness (Harvey and Siddique, 2000), idiosyncratic volatility (Ang et al., 2006), extreme positive stock return, analysts' earnings forecast dispersion (Diether, Malloy and Scherbina, 2002) and abnormal dollar volume.

Table 5 presents the results of regressing excess return in different months on stock characteristics and BSVM sentiment measure. We find that the strong concurrent positive relationship between sentiment and return even with the inclusion of a large variety of return determinants, with highly significant coefficient of 26.762. We could interpret this coefficient that in the extreme case, if the sentiment for a given stock changes from 0 (neutral) to 1(extremely optimistic), stock return would jump by 27%. We see that the earnings surprise variable coefficient is highly significant and large in value, but our sentiment measure maintains its strong impact nevertheless. Consistently with our univariate results, we find that the reversal begins after 6 months, again pointing to the slow market's realization of the sentiment-driven stock misvaluation.

### *3.1. Limits to arbitrage and sentiment*

We next want to explore which stocks' returns in particular are mostly affected by sentiment. Baker and Wurgler (2007) argue that hard-to-value and difficult to arbitrage stocks, such a smaller, younger, volatile firms with low or no profitability are more likely to be subject to sentiment swings. They are less transparent and their valuation is uncertain, thus opinions and biases may play a bigger role in investor's transaction decisions, when more solid sources of information are not available. We address this theoretical prediction by dividing our sample into top 50% biggest and bottom 50% smallest firms, based on their end of year market value. Table 6 summarizes the differences between the high and low sentiment monthly decile portfolios. We notice that indeed, small firms have a 11.64% equally weighted contemporaneous return differential between high and low sentiment deciles as compared to 6.76% in the large firms sample. The difference for value-weighted returns is even more striking, with more than double the same-month return differential for small firms.

We also assign firms the young and old subsamples, based on their age defined as the number of years since the firm's first appearance on CRSP. It seems that younger firms tend to have a slightly stronger contemporaneous relationship with stock returns, however the difference is not big.

*3.2 Fundamental and rational sides of sentiment*

The sentiment of investors expressed as an opinion in social media is likely multidimensional and combines the true fundamental information about the firm with the "pure" sentiment, defined by Baker and Wurgler (2007) as "a belief about future cash flows and investment risks that is not justified by the facts at hand". To increase the precision of our analysis, we decompose the BSVM sentiment measure into the fundamental and pure sentiment part. We use the regression in Table 2, Column 8, of the BSVM sentiment measure on Ravenpack Average Event Sentiment of the news, firm's price, size and book-to-market ratio. The predicted values from this regression become our Fundamental Sentiment measure of opinion based on firm information. Residuals from this regression are a measure of the Pure Sentiment, irrational and unrelated to facts. We then repeat our portfolio sorts analysis, this time sorting stocks monthly according to each portion of the sentiment measure separately and observing concurrent and future Fama-French 3 factor returns. Table 7 presents the results.

In Panel A we observe that there is a large dispersion in the sentiment across deciles. Also, interestingly, large firms tend to dominate negative Pure Sentiment deciles. In contrast, Panel C shows that large firms tend to cluster in the most optimistic Fundamental Sentiment decile.

In Panel B we see a very strong concurrent 8.5% return differential between high and low Pure Sentiment deciles, again stronger for equally weighted returns. Panel D shows almost 10 times smaller return differential between extreme Fundamental Sentiment deciles (still significant though). Consistently with the presumed source of these sentiment measures, there does not seem to be any reversal for the Fundamental measure, while in the Pure Sentiment we find the reversal as early as the $5^{th}$ month in the future. Only the Pure Sentiment should warrant a reversal, as it does not represent any real information.

We conclude that the stock-level sentiment as measured by the Bloomberg algorithm sourcing from Twitter and other social media, encompasses both the information-based and purely irrational portions. Investors immediately react to both which is pointed by the lower returns of pessimistically perceived stocks and high returns of the optimistically seen ones. The Pure Sentiment's effect on prices persists for around 6 months until investors start correcting the prices.

*3.3 Robustness checks*

Due to data limitations, our dataset covers a period of two years, 2015 and 2016. Unfortunately, for 2016, we do not have the long-term returns, so the sample size decreases monthly. To ensure representativeness of our results, we repeat the portfolio sort analysis from Table 4 with sample limited to year 2015 only. The results are very similar to the ones using full two years. Moreover, we replace the Fama-French 3 factor returns with the raw returns and summarize results for the full sample as well as small and large firms' subsamples. Table 9 shows that the conclusions remain unchanged.

## 4. Conclusion

Motivated by the theoretically-based and observed importance of sentiment in shaping the asset prices, we explore this topic in an empirical setting. The existing literature often relied on indirect proxies of sentiment and focused it from the aggregate market perspective. We fill this gap by proposing a new direct measure of stock-level investor sentiment based on Bloomberg SVM social media-based indicator. We show that the sentiment is related to company fundamentals, but also maintains a large irrational portion. We document sentiment's short run persistence and show that the idiosyncratic sentiment commoves with the market. We address the theoretical predictions and show a strong concurrent relationship between sentiment and abnormal returns and price reversal in the second part of the subsequent year, as investors update their information. We show the impact of sentiment being stronger in more speculative and harder to value stocks.

We would be interested to examine deeper the relationship between the individual and market sentiment and see if there is any seasonality in either. We are also interested in learning about sentiment volatility and its impact on asset prices. Overall, this area of research still has a lot of unexplored phenomena that, with the growing availability of relevant data, offers many opportunities for future explorations.

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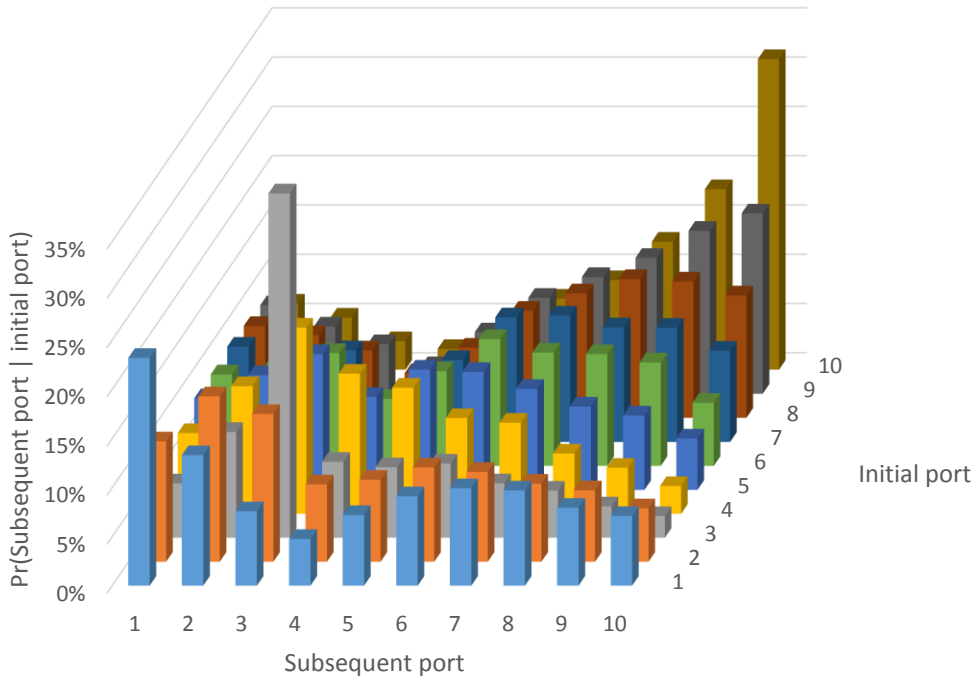
**Figure 1 Sentiment Persistence**

This is a contingency graph of initial and subsequent assignment to the monthly BSVM sentiment deciles. Each month we assign stocks into one of ten portfolios based in its aggregate monthly BSVM sentiment score. The initial assignments are then paired with subsequent assignments. The bars represent the conditional probability of being in a subsequent portfolio given the initial portfolio assignment.



## Table 1 Summary Statistics and correlation matrix

The table presents characteristics of monthly variables used in the analysis as well as the correlation matrix. BSVM sentiment is the monthly aggregated sentiment measure based on the Bloomberg social velocity measure, excess return is stock return less the risk-free rate in percentage points, beta is market Beta, size is natural logarithm of firm's market value, lnbm is natural logarithm of stock's book-to-market ratio, mom is 11-month momentum, coskew is stock's monthly co-skewness, ivol is idiosyncratic volatility, max is the stock's extreme positive return, disp is analyst forecast dispersion, earn. surprise is the measure of unexpected earnings, illiq is Amihud illiquidity factor and voldu is the abnormal dollar volume.

| Variable | Obs | Mean | Std. Dev. |
|---|---|---|---|
| **BSVM sentiment** | 64,302 | 0.020 | 0.044 |
| **excess return** | 64,301 | 1.303 | 13.800 |
| **beta** | 60,228 | 1.226 | 0.962 |
| **size** | 64,302 | 7.158 | 1.814 |
| **lnbm** | 61,924 | -0.857 | 0.891 |
| **mom** | 64,302 | 6.188 | 38.904 |
| **coskew** | 60,228 | -0.003 | 0.128 |
| **ivol** | 64,302 | 1.724 | 1.678 |
| **max** | 64,302 | 4.932 | 7.071 |
| **disp** | 64,302 | 0.130 | 1.707 |
| **earn. surprise** | 64,302 | 0.000 | 0.009 |
| **illiq** | 64,302 | 0.889 | 20.176 |
| **voldu** | 64,302 | 0.238 | 1.614 |

**Table 1 continued**

| | BSVM sent | ex. ret | beta | size | lnbm | mom | coskew | ivol | max | disp | ear. sur. | illiq | voldu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BSVM sentiment** | 1.000 | | | | | | | | | | | | |
| **excess return** | 0.132 | 1.000 | | | | | | | | | | | |
| **beta** | 0.000 | -0.005 | 1.000 | | | | | | | | | | |
| **size** | 0.182 | -0.010 | -0.015 | 1.000 | | | | | | | | | |
| **lnbm** | -0.104 | 0.021 | -0.048 | -0.306 | 1.000 | | | | | | | | |
| **mom** | 0.133 | -0.067 | -0.159 | 0.067 | -0.012 | 1.000 | | | | | | | |
| **coskew** | 0.024 | -0.001 | -0.371 | 0.061 | 0.027 | 0.035 | 1.000 | | | | | | |
| **ivol** | -0.029 | 0.323 | 0.143 | -0.242 | -0.024 | -0.114 | -0.045 | 1.000 | | | | | |
| **max** | 0.033 | 0.524 | 0.116 | -0.135 | -0.018 | -0.099 | -0.035 | 0.893 | 1.000 | | | | |
| **disp** | 0.003 | 0.002 | 0.042 | -0.005 | -0.020 | -0.046 | -0.002 | 0.033 | 0.022 | 1.000 | | | |
| **earn. surprise** | 0.030 | 0.029 | -0.004 | 0.013 | -0.002 | 0.017 | -0.002 | -0.007 | 0.010 | -0.007 | 1.000 | | |
| **illiq** | -0.019 | 0.015 | -0.021 | -0.083 | 0.038 | -0.005 | -0.006 | 0.055 | 0.036 | -0.005 | -0.001 | 1.000 | |
| **voldu** | 0.112 | 0.259 | -0.059 | 0.021 | 0.011 | 0.228 | 0.005 | 0.208 | 0.217 | -0.017 | 0.019 | -0.014 | 1.000 |

## Table 2 Determinants of the Investor Sentiment

The table presents the results of the stock-level OLS regression of BSVM investor sentiment on a variety of determinants; the media sentiment measures (Ravenpack news sentiment AES, pure news sentiment and press-release related sentiment) and well as stock characteristics (size measured as natural logarithm of market value, trading volume, end of month price, book-to-market ratio, lagged end of month return, earnings surprise, and earnings announcement day). The regression includes fixed effects and heteroscedasticity consistent standard errors. * p<0.1; ** p<0.05; *** p<0.01.

| | **Dependent variable: BSVM investor sentiment** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
| Ravenpack news sentiment (AES) | 0.00018*** | | | | 0.00017*** | 0.00017*** | 0.00019*** | 0.00020*** |
| | (11.41) | | | | (10.38) | (10.58) | (11.55) | (12.49) |
| Ravenpack sentiment-news | | 0.00018*** | | 0.00037*** | | | | |
| | | (11.25) | | (18.12) | | | | |
| Ravenpack sentiment-press release | | | 0.00013*** | -0.00017*** | | | | |
| | | | (9.41) | (-10.52) | | | | |
| Earnings announcement day | | | | | 0.00535*** | | | |
| | | | | | (6.14) | | | |
| Earnings surprise | | | | | | 0.152*** | 0.138** | |
| | | | | | | (3.05) | (2.74) | |
| Lag(return) | | | | | 0.00026*** | 0.00026*** | 0.00026*** | |
| | | | | | (4.74) | (4.68) | (-5.09) | |
| Trading volume | | | | | 0.00000 | 0.00000 | -0.00000*** | |
| | | | | | (1.53) | (1.65) | (-10.90) | |
| Price | | | | | | | 0.00001 | 0.00003*** |
| | | | | | | | (1.64) | (4.53) |
| Size | | | | | | | 0.00524*** | 0.00384*** |
| | | | | | | | (13.87) | (11.80) |
| B/M | | | | | | | -0.00173*** | -0.00210*** |
| | | | | | | | (-3.44) | (-4.14) |
| _cons | 0.00748*** | 0.00748*** | 0.0122*** | 0.00826*** | 0.00655*** | 0.00846*** | -0.0310*** | -0.0244*** |
| | (6.83) | (6.68) | (12.79) | (7.48) | (5.71) | (7.73) | (-9.22) | (-8.02) |
| Time fixed effect | YES | YES | YES | YES | YES | YES | YES | YES |
| N | 63,378 | 62,979 | 54,642 | 54,627 | 59,446 | 59,446 | 57,383 | 61,023 |
| R-sq | 0.05 | 0.05 | 0.045 | 0.054 | 0.057 | 0.055 | 0.097 | 0.086 |

## Table 3 Comovement of individual sentiment with industry and market

The table presents the correlation between the stock-level monthly BSVM investor sentiment measure and the average market sentiment as well as the average industry-specific sentiment, using the Fama-French 48 industry classification.

| | **stock sentiment** | **industry sentiment** | **market sentiment** |
|---|---|---|---|
| stock sentiment | 1 | | |
| industry sentiment | 0.2888*** | 1 | |
| market sentiment | 0.2047*** | 0.7088*** | 1 |

## Table 4 Monthly 3 factor Fama-French returns in portfolios based on the stock-level sentiment measure

Each month we sort stocks into 10 decile portfolios based on their BSVM investor sentiment level. The table in Panel A reports the average values of the stock characteristics, such as size in million, book to market ratio and market share. Panel B reports the equal average values (and Panel C value-weighted average values) of the monthly 3 factor Fama French returns, starting from the return concurrent to sentiment measure, until the return 12 months in the future. The last row reports the difference in returns between high (positive opinion) and low (negative opinion) sentiment portfolios. T statistics are reported in parentheses.

### Panel A Portfolio summary statistics

| Opinion decile | Opinion | Firm size (M) | Book/market | Market share |
|---|---|---|---|---|
| 1 | -0.04 | 10520.54 | 0.59 | 0.10 |
| 2 | -0.01 | 8765.81 | 0.60 | 0.11 |
| 3 | 0.00 | 5903.95 | 0.64 | 0.10 |
| 4 | 0.01 | 5575.08 | 0.62 | 0.09 |
| 5 | 0.02 | 6183.12 | 0.57 | 0.09 |
| 6 | 0.03 | 7430.98 | 0.54 | 0.09 |
| 7 | 0.04 | 8539.84 | 0.51 | 0.10 |
| 8 | 0.05 | 8601.65 | 0.49 | 0.10 |
| 9 | 0.07 | 10145.90 | 0.46 | 0.11 |
| 10 | 0.12 | 10864.09 | 0.43 | 0.11 |

**Panel B Equal-weighted monthly stock 3 factor Fama-French returns in sentiment portfolios**

| Opinion decile | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -4.92 | -0.78 | -1.03 | -2.06 | -1.19 | -0.25 | 0.57 | 1.23 | 1.01 | 0.50 | 0.79 | 1.93 | 3.53 |
| | (-17.29) | (-1.11) | (-1.63) | (-2.73) | (-0.76) | (-0.14) | (0.64) | (1.32) | (0.82) | (0.35) | (0.74) | (3.11) | (5.37) |
| 2 | -2.20 | -0.69 | -1.20 | -1.57 | -0.40 | 0.02 | 1.12 | 0.82 | 1.10 | 0.88 | 0.20 | 0.89 | 2.20 |
| | (-5.01) | (-1.00) | (-1.14) | (-2.79) | (-0.49) | (0.01) | (1.46) | (1.12) | (1.15) | (0.62) | (0.20) | (1.74) | (4.03) |
| 3 | -0.51 | -0.05 | -0.42 | -1.27 | -0.89 | -0.25 | 1.26 | 1.10 | 0.38 | 0.20 | 0.90 | 1.69 | 2.33 |
| | (-4.63) | (-0.09) | (-0.63) | (-2.49) | (-1.19) | (-0.19) | (1.82) | (1.75) | (0.41) | (0.13) | (0.88) | (3.88) | (4.29) |
| 4 | 0.74 | -0.33 | -0.29 | -1.15 | -1.01 | -0.97 | 0.74 | 1.09 | 0.64 | 0.44 | 0.44 | 2.65 | 2.45 |
| | (3.91) | (-0.60) | (-0.50) | (-1.85) | (-0.94) | (-0.88) | (1.22) | (1.53) | (0.61) | (0.28) | (0.41) | (6.14) | (3.85) |
| 5 | 1.27 | -0.45 | -0.83 | -1.33 | -1.20 | -0.59 | 0.70 | 1.18 | 0.57 | 0.61 | 0.75 | 1.77 | 2.67 |
| | (4.72) | (-0.66) | (-0.99) | (-2.13) | (-1.28) | (-0.48) | (1.14) | (1.67) | (0.57) | (0.45) | (0.65) | (3.42) | (4.82) |
| 6 | 1.58 | -0.61 | -0.48 | -1.68 | -0.98 | -1.14 | 0.85 | 1.12 | 0.67 | 0.82 | 0.33 | 1.98 | 2.07 |
| | (9.91) | (-0.90) | (-0.53) | (-2.22) | (-0.78) | (-0.88) | (1.64) | (1.63) | (0.62) | (0.51) | (0.32) | (3.73) | (3.09) |
| 7 | 1.54 | -0.32 | -0.75 | -1.45 | -1.30 | -0.40 | 1.00 | 1.18 | 0.38 | 0.61 | 0.69 | 1.67 | 2.31 |
| | (18.07) | (-0.63) | (-0.73) | (-2.18) | (-1.60) | (-0.28) | (1.15) | (1.52) | (0.44) | (0.43) | (0.56) | (3.33) | (3.65) |
| 8 | 2.40 | -0.27 | -1.19 | -1.28 | -0.96 | -0.68 | 0.74 | 0.41 | 0.45 | 0.73 | 0.84 | 2.03 | 2.35 |
| | (26.47) | (-0.51) | (-1.68) | (-1.86) | (-1.13) | (-0.56) | (1.11) | (0.51) | (0.42) | (0.49) | (0.77) | (3.48) | (3.78) |
| 9 | 2.64 | -0.85 | -0.75 | -1.62 | -0.76 | -0.65 | 0.73 | 0.48 | 0.23 | 0.68 | 0.70 | 1.63 | 2.03 |
| | (13.23) | (-1.05) | (-1.06) | (-2.28) | (-0.81) | (-0.45) | (0.95) | (0.60) | (0.21) | (0.42) | (0.65) | (2.74) | (3.60) |
| 10 | 4.08 | -0.50 | -0.56 | -1.29 | -0.85 | -0.73 | 0.47 | 0.67 | 0.46 | 0.38 | 0.03 | 1.59 | 2.19 |
| | (11.94) | (-0.61) | (-0.80) | (-1.97) | (-0.88) | (-0.57) | (0.72) | (0.99) | (0.39) | (0.24) | (0.03) | (1.96) | (3.14) |
| DIF(10-1) | 9.00 | 0.28 | 0.47 | 0.77 | 0.34 | -0.48 | -0.11 | -0.56 | -0.55 | -0.13 | -0.76 | -0.33 | -1.34 |
| | (59.26) | (0.58) | (1.30) | (1.48) | (0.53) | (-0.86) | (-0.22) | (-1.39) | (-2.66) | (-0.47) | (-5.44) | (-0.86) | (-3.77) |

**Panel C Value-weighted monthly stock 3 factor Fama-French returns in sentiment portfolios**

| Opinion decile | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -2.46 | -0.25 | -0.95 | -1.72 | -0.73 | 0.35 | 0.77 | 1.42 | 1.59 | 1.07 | 1.08 | 1.02 | 2.07 |
| | (-8.16) | (-0.48) | (-1.74) | (-3.73) | (-0.57) | (0.27) | (1.19) | (2.51) | (3.36) | (1.25) | (1.60) | (2.11) | (6.62) |
| 2 | -0.50 | 0.76 | 0.04 | -1.11 | 0.35 | 0.65 | 1.45 | 1.27 | 0.47 | 0.82 | -0.26 | 1.91 | 0.95 |
| | (-2.81) | (1.83) | (0.08) | (-2.24) | (0.38) | (0.66) | (2.45) | (2.65) | (0.74) | (0.95) | (-0.55) | (3.23) | (2.22) |
| 3 | -0.06 | 1.10 | 0.04 | -0.91 | -0.24 | -0.16 | 1.60 | 1.76 | 0.46 | 0.73 | 0.96 | 1.44 | 2.02 |
| | (-0.13) | (2.23) | (0.09) | (-1.80) | (-0.43) | (-0.21) | (2.32) | (3.91) | (0.83) | (0.79) | (1.18) | (5.38) | (6.68) |
| 4 | 1.04 | 0.09 | 0.16 | -0.66 | -0.21 | -0.99 | 0.50 | 1.17 | 1.10 | 1.54 | 0.62 | 2.30 | 1.26 |
| | (6.23) | (0.15) | (0.26) | (-1.37) | (-0.17) | (-1.66) | (0.80) | (1.59) | (1.15) | (1.39) | (0.76) | (6.34) | (2.01) |
| 5 | 0.70 | -0.10 | -0.26 | -1.04 | -0.33 | -0.33 | 2.06 | 1.19 | 0.55 | 0.75 | 0.73 | 1.02 | 1.23 |
| | (5.35) | (-0.18) | (-0.40) | (-1.88) | (-0.53) | (-0.45) | (4.32) | (2.20) | (0.72) | (0.78) | (1.18) | (1.92) | (3.17) |
| 6 | 0.64 | -0.05 | 0.54 | -1.18 | -0.47 | -0.54 | 0.51 | 0.77 | 0.62 | 0.38 | 0.17 | 1.08 | 1.39 |
| | (2.32) | (-0.09) | (1.09) | (-1.97) | (-0.47) | (-0.58) | (1.05) | (1.21) | (0.98) | (0.34) | (0.18) | (2.13) | (2.93) |
| 7 | -0.02 | -0.15 | -0.24 | -0.72 | -0.63 | 0.13 | 0.78 | 0.99 | 0.36 | 0.28 | 0.14 | 1.48 | 1.51 |
| | (-0.20) | (-0.27) | (-0.30) | (-1.17) | (-0.75) | (0.11) | (1.38) | (1.84) | (0.51) | (0.22) | (0.17) | (3.54) | (2.50) |
| 8 | 0.82 | 0.41 | -0.62 | -1.00 | -0.46 | -0.48 | 0.82 | 0.51 | 0.99 | 0.16 | 0.09 | 0.89 | 1.79 |
| | (6.75) | (0.90) | (-1.09) | (-2.01) | (-0.66) | (-0.45) | (1.56) | (0.84) | (1.11) | (0.16) | (0.11) | (1.05) | (3.40) |
| 9 | 1.68 | -0.03 | -0.08 | -0.90 | -0.34 | -0.28 | 0.86 | 0.72 | 0.51 | 0.69 | 0.51 | 1.49 | 1.15 |
| | (17.27) | (-0.08) | (-0.20) | (-1.59) | (-0.35) | (-0.28) | (1.53) | (0.91) | (0.86) | (0.57) | (0.76) | (2.65) | (1.47) |
| 10 | 2.24 | 0.00 | -0.44 | -1.31 | -0.39 | -0.53 | 0.81 | 0.84 | 0.18 | 0.45 | 0.08 | 1.25 | 1.39 |
| | (14.94) | (-0.01) | (-0.84) | (-2.45) | (-0.46) | (-0.55) | (1.79) | (1.21) | (0.16) | (0.39) | (0.13) | (1.80) | (2.10) |
| DIF(10-1) | 4.70 | 0.24 | 0.52 | 0.41 | 0.34 | -0.88 | 0.04 | -0.58 | -1.42 | -0.62 | -1.00 | 0.23 | -0.69 |
| | (23.81) | (0.72) | (2.02) | (1.75) | (0.67) | (-2.18) | (0.09) | (-2.74) | (-1.56) | (-1.70) | (-4.64) | (0.58) | (-1.30) |

## Table 5 Cross-sectional regressions of excess raw returns on sentiment and controls

The table presents the results of a stock-level Fama and MacBeth (1973) type regression of the concurrent and future excess returns (j=0-12) on the BSVM investor sentiment and controls Exreti,$t$+j=$\alpha t$+j+$\beta t$+j BSVM sentiment$i,t$+j+$\gamma t$+j$Xi,t$+j+$\varepsilon i,t$+j Stock characteristics: beta is market Beta, size is natural logarithm of firm's market value, lnbm is natural logarithm of stock's book-to-market ratio, mom is 11-month momentum, coskew is stock's monthly co-skewness, ivol is idiosyncratic volatility, max is the stock's extreme positive return, disp is analyst forecast dispersion, earn. surprise is the measure of unexpected earnings, illiq is Amihud illiquidity factor and voldu is the abnormal dollar volume. T statistics are based on Newey-West standard errors, 2 lags. * $p$<0.1; ** $p$<0.05; *** $p$<0.01.

| | **exret0** | **exret1** | **exret2** | **exret3** | **exret4** | **exret5** | **exret6** |
|---|---|---|---|---|---|---|---|
| BSVM sentiment | 26.762*** | -0.839 | -1.777 | -2.125 | 1.034 | -0.918 | 0.951 |
| | [7.711] | [-0.610] | [-1.426] | [-1.336] | [0.590] | [-0.446] | [0.576] |
| beta | -0.617 | -0.095 | -0.151 | -0.215 | -0.222 | -0.167 | -0.025 |
| | [-1.357] | [-0.306] | [-0.493] | [-0.674] | [-0.724] | [-0.594] | [-0.076] |
| size | -0.291*** | -0.131 | -0.169* | -0.105 | -0.150 | -0.180 | -0.153 |
| | [-3.688] | [-1.579] | [-2.012] | [-1.141] | [-1.508] | [-1.676] | [-1.565] |
| lnbm | 0.210 | 0.170 | 0.170 | 0.235 | 0.237 | 0.214 | 0.363 |
| | [1.236] | [0.685] | [0.682] | [0.853] | [0.809] | [0.710] | [1.285] |
| mom | -0.025*** | -0.008 | -0.005 | -0.007 | -0.003 | -0.007 | -0.006 |
| | [-3.357] | [-1.040] | [-0.820] | [-1.283] | [-0.557] | [-1.302] | [-1.103] |
| coskew | 1.304 | 0.543 | 0.103 | -0.310 | 0.240 | -0.399 | 0.229 |
| | [0.685] | [0.402] | [0.083] | [-0.241] | [0.170] | [-0.281] | [0.154] |
| ivol | -5.746*** | -0.299 | -0.530 | -0.411 | -0.450 | -0.669** | -0.636 |
| | [-19.955] | [-1.004] | [-1.699] | [-1.331] | [-1.307] | [-2.386] | [-1.624] |
| max | 2.190*** | -0.015 | 0.028 | 0.025 | 0.026 | 0.067 | 0.040 |
| | [21.298] | [-0.325] | [0.551] | [0.469] | [0.485] | [1.633] | [0.615] |
| disp | -0.035 | -0.220 | 0.013 | -0.071 | 0.176 | 0.155 | -0.123 |
| | [-0.425] | [-1.489] | [0.069] | [-0.369] | [0.582] | [0.589] | [-1.102] |
| earn. surprise | 97.998*** | 17.859 | 33.807 | -6.776 | -47.318 | 6.359 | 18.734 |
| | [3.715] | [0.954] | [1.351] | [-0.237] | [-1.545] | [0.221] | [0.507] |
| illiq | 0.009 | -0.002 | 0.007 | 0.012 | 0.033 | 0.004 | 0.000 |
| | [1.274] | [-0.269] | [1.301] | [1.497] | [1.228] | [0.382] | [0.073] |
| voldu | 1.196*** | 0.106 | 0.082 | 0.133* | 0.071 | 0.101 | 0.083 |
| | [9.530] | [1.288] | [1.435] | [2.083] | [0.828] | [1.337] | [1.435] |
| _cons | 2.713** | 2.655** | 2.963*** | 2.489** | 2.848** | 3.194** | 3.104** |
| | [2.326] | [2.673] | [2.980] | [2.187] | [2.490] | [2.628] | [2.706] |
| N | 58536 | 56008 | 53328 | 50694 | 48043 | 45440 | 42851 |
| R-sq | 0.522 | 0.066 | 0.067 | 0.065 | 0.065 | 0.067 | 0.065 |

**Table 5 continued**

| | **exret7** | **exret8** | **exret9** | **exret10** | **exret11** | **exret12** |
|---|---|---|---|---|---|---|
| BSVM sentiment | -3.414** | -3.314*** | -1.506 | -0.479 | 1.226 | -2.460 |
| | [-2.097] | [-2.689] | [-1.102] | [-0.196] | [0.435] | [-1.078] |
| beta | -0.023 | -0.064 | -0.006 | 0.125 | 0.108 | 0.341 |
| | [-0.080] | [-0.200] | [-0.017] | [0.338] | [0.292] | [1.107] |
| size | -0.139 | -0.145 | -0.075 | -0.186 | -0.147 | -0.090 |
| | [-1.119] | [-1.215] | [-0.516] | [-1.325] | [-1.050] | [-0.559] |
| lnbm | 0.453 | 0.380 | 0.382 | 0.368 | 0.390 | 0.647 |
| | [1.621] | [1.305] | [1.196] | [1.111] | [1.116] | [1.663] |
| mom | -0.004 | -0.006 | -0.007 | -0.006 | -0.008 | -0.006 |
| | [-0.906] | [-1.466] | [-1.483] | [-0.976] | [-1.155] | [-0.778] |
| coskew | -0.475 | -0.576 | 0.188 | 0.765 | 0.744 | 2.836** |
| | [-0.326] | [-0.421] | [0.106] | [0.460] | [0.443] | [2.342] |
| ivol | -0.575* | -0.579* | -0.042 | -0.571* | -0.212 | 0.038 |
| | [-2.042] | [-1.834] | [-0.137] | [-2.140] | [-0.649] | [0.144] |
| max | 0.063 | 0.078 | 0.007 | 0.101*** | -0.051 | -0.076* |
| | [1.205] | [1.275] | [0.148] | [4.542] | [-1.306] | [-1.865] |
| disp | 0.265* | -0.013 | -0.284* | -0.270 | -0.220 | -0.005 |
| | [2.007] | [-0.062] | [-1.930] | [-1.139] | [-1.407] | [-0.036] |
| earn. surprise | 3.591 | -6.280 | -1.138 | 11.203 | -13.373 | -38.962** |
| | [0.135] | [-0.335] | [-0.047] | [0.271] | [-0.430] | [-2.469] |
| illiq | 0.013 | -0.006 | -0.009* | 0.006 | 0.016 | -0.015 |
| | [1.276] | [-0.763] | [-1.943] | [0.577] | [0.873] | [-1.292] |
| voldu | 0.050 | 0.082 | 0.023 | 0.027 | 0.091 | 0.016 |
| | [0.815] | [1.074] | [0.368] | [0.417] | [1.273] | [0.288] |
| _cons | 3.126** | 3.489** | 2.898 | 3.605** | 3.352* | 3.233 |
| | [2.165] | [2.425] | [1.754] | [2.223] | [1.905] | [1.693] |
| N | 40286 | 37766 | 35257 | 32777 | 30378 | 27981 |
| R-sq | 0.057 | 0.060 | 0.053 | 0.056 | 0.058 | 0.055 |

## Table 6 Sentiment –return relationship and limits to arbitrage

Each month we sort stocks into 10 decile portfolios based on their BSVM investor sentiment level. The table reports the difference in returns between high (positive opinion) and low (negative opinion) sentiment portfolios measured as either equal-weighted or value-weighted 3 factor Fama French returns for different subsamples. Stocks are divided into the large and small firm category based on their logarithm of market value at a given time, where top 50% is assigned as large and bottom 50% as small. Similarly, stocks are divided into young and old category, based on their age, computed as the number of years since the firm's first appearance on CRSP.

| **Sample** | **Diff Dec10-Dec 1** | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Large firms | Equal weighted | 6.76 | -0.21 | -0.12 | -0.30 | 0.30 | -0.32 | -0.02 | -0.88 | -0.81 | -0.81 | -1.27 | -0.10 | -0.26 |
| | | (26.99) | (-0.76) | (-0.18) | (-0.64) | (0.70) | (-0.71) | (-0.04) | (-3.11) | (-1.79) | (-1.55) | (-7.33) | (-0.47) | (-0.57) |
| | Value weighted | 4.58 | -0.31 | -0.28 | -0.20 | 0.22 | 0.05 | -0.58 | -0.87 | -1.50 | -0.86 | -1.38 | 0.19 | -0.38 |
| | | (18.76) | (-1.45) | (-0.66) | (-0.55) | (0.57) | (0.11) | (-0.96) | (-4.36) | (-2.88) | (-1.87) | (-6.14) | (0.38) | (-0.52) |
| Small firms | Equal weighted | 11.64 | -0.63 | -0.46 | -0.22 | 0.34 | -0.19 | 0.01 | -0.88 | -0.54 | 0.24 | -0.59 | -0.86 | -1.87 |
| | | (22.93) | (-1.38) | (-0.70) | (-0.38) | (0.55) | (-0.39) | (0.05) | (-3.08) | (-2.53) | (0.70) | (-2.43) | (-4.16) | (-7.18) |
| | Value weighted | 10.35 | -0.72 | -0.37 | -0.09 | 0.57 | -0.53 | -0.27 | -1.25 | -0.60 | 0.23 | -0.69 | -0.74 | -1.74 |
| | | (24.62) | (-1.69) | (-0.51) | (-0.14) | (1.14) | (-1.05) | (-0.57) | (-6.56) | (-2.49) | (0.60) | (-2.30) | (-3.10) | (-2.67) |
| Old firms | Equal weighted | 9.06 | -0.31 | -0.06 | -0.31 | 0.25 | -0.12 | -0.02 | -0.68 | -0.76 | -0.72 | -0.74 | -0.31 | -1.20 |
| | | (20.00) | (-0.86) | (-0.10) | (-0.78) | (0.46) | (-0.23) | (-0.04) | (-2.13) | (-2.37) | (-3.07) | (-1.76) | (-0.42) | (-3.51) |
| | Value weighted | 4.48 | -0.11 | -0.25 | -0.42 | 0.32 | -0.08 | -0.50 | -0.67 | -1.71 | -0.84 | -1.08 | 0.06 | -0.56 |
| | | (11.14) | (-0.44) | (-0.56) | (-2.28) | (0.71) | (-0.25) | (-0.73) | (-2.93) | (-3.64) | (-2.49) | (-2.53) | (0.12) | (-1.54) |
| Young firms | Equal weighted | 10.12 | -0.40 | 0.32 | 0.07 | 0.07 | -0.08 | 0.09 | -0.84 | -0.76 | -0.79 | -0.15 | 0.47 | -0.89 |
| | | (21.92) | (-0.76) | (0.43) | (0.15) | (0.12) | (-0.13) | (0.10) | (-3.53) | (-2.58) | (-4.08) | (-0.29) | (0.61) | (-1.88) |
| | Value weighted | 5.35 | -0.97 | 0.03 | 0.04 | 0.05 | 0.69 | -0.45 | -0.57 | -1.09 | -1.10 | -1.06 | 1.13 | 0.02 |
| | | (9.93) | (-1.82) | (0.05) | (0.06) | (0.10) | (0.97) | (-0.71) | (-1.27) | (-1.84) | (-2.02) | (-1.97) | (1.54) | (0.04) |

## Table 7 Decomposition of sentiment into Pure Sentiment and Fundamental Sentiment

We decompose the BSVM investor sentiment measure into the fundamental and pure sentiment part. We use the regression in Table 2, Column 8, of the BSVM sentiment measure on Ravenpack Average Event Sentiment of the news, firm's price, size and book-to-market ratio. The predicted values from this regression become our Fundamental Sentiment measure and residuals from this regression are a measure of the Pure Sentiment. Then each month we sort stocks into 10 decile portfolios based on their Pure Sentiment (Panel A and B) and Fundamental Sentiment (Panel C and D). The tables in Panel A and C report the average values of the stock characteristics, such as size in million, book to market ratio and market share. Panels B and D report the equal average and value-weighted average values of the monthly 3 factor Fama French returns, starting from the return concurrent to sentiment measure, until the return 12 months in the future. The last row reports the difference in returns between high (positive opinion) and low (negative opinion) sentiment portfolios. T statistics are reported in parentheses.

### Panel A Portfolio summary statistics for Pure Sentiment

| Opinion decile | Opinion | Firm size (M) | Book/market | Market share |
|---|---|---|---|---|
| 1 | -0.07 | 26062.82 | 0.53 | 0.22 |
| 2 | -0.04 | 10075.60 | 0.57 | 0.16 |
| 3 | -0.03 | 8871.35 | 0.52 | 0.10 |
| 4 | -0.02 | 4578.96 | 0.59 | 0.07 |
| 5 | -0.01 | 4326.95 | 0.62 | 0.07 |
| 6 | 0.00 | 4935.30 | 0.61 | 0.07 |
| 7 | 0.01 | 5484.96 | 0.58 | 0.07 |
| 8 | 0.02 | 6256.60 | 0.54 | 0.07 |
| 9 | 0.04 | 7287.77 | 0.49 | 0.08 |
| 10 | 0.09 | 8310.13 | 0.47 | 0.09 |

## Panel B Monthly stock 3 factor Fama-French returns in Pure Sentiment portfolios

**Equal weighted portfolio 3 factor Fama-French stock return**

| Sentiment decile | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -4.30 | -0.32 | -0.94 | -1.88 | -0.77 | -0.25 | 0.62 | 1.20 | 0.97 | 0.67 | 0.91 | 2.14 | 3.10 |
| | (-11.88) | (-0.46) | (-1.68) | (-2.79) | (-0.50) | (-0.16) | (0.89) | (1.44) | (0.90) | (0.50) | (0.89) | (2.95) | (5.01) |
| 2 | -0.78 | -0.44 | -0.69 | -1.29 | -0.84 | -0.64 | 0.73 | 0.65 | 0.29 | 0.26 | 0.54 | 1.74 | 2.65 |
| | (-7.42) | (-0.62) | (-0.77) | (-2.13) | (-1.01) | (-0.47) | (1.02) | (0.78) | (0.24) | (0.15) | (0.43) | (3.26) | (4.08) |
| 3 | -1.27 | -0.94 | -0.54 | -1.20 | -0.68 | -0.25 | 1.13 | 1.38 | 0.97 | 0.82 | 0.49 | 1.19 | 2.35 |
| | (-6.48) | (-1.54) | (-0.68) | (-1.96) | (-0.77) | (-0.19) | (1.59) | (1.99) | (1.02) | (0.57) | (0.47) | (3.01) | (3.86) |
| 4 | 0.16 | -0.02 | -0.46 | -1.49 | -1.10 | -0.57 | 1.06 | 0.88 | 0.85 | 0.78 | 0.49 | 1.70 | 2.00 |
| | (0.50) | (-0.03) | (-0.63) | (-2.69) | (-1.48) | (-0.45) | (1.27) | (1.38) | (1.03) | (0.60) | (0.46) | (4.23) | (3.65) |
| 5 | 0.50 | -0.46 | -0.63 | -1.32 | -0.70 | -0.47 | 0.56 | 0.88 | 0.56 | 0.76 | 0.72 | 1.92 | 2.24 |
| | (1.50) | (-0.75) | (-0.81) | (-2.43) | (-0.69) | (-0.45) | (0.88) | (1.33) | (0.58) | (0.60) | (0.77) | (4.78) | (3.50) |
| 6 | 0.82 | -0.19 | -0.92 | -1.52 | -1.18 | -0.55 | 0.85 | 1.19 | 0.79 | 0.56 | 0.28 | 2.03 | 2.31 |
| | (6.19) | (-0.37) | (-1.20) | (-2.30) | (-1.27) | (-0.43) | (1.52) | (1.71) | (0.74) | (0.38) | (0.31) | (3.85) | (3.93) |
| 7 | 1.57 | -0.39 | -0.68 | -1.64 | -1.16 | -0.88 | 0.87 | 1.08 | 0.25 | 0.62 | 0.61 | 1.74 | 2.47 |
| | (15.82) | (-0.65) | (-0.88) | (-2.32) | (-1.28) | (-0.74) | (1.63) | (1.70) | (0.28) | (0.42) | (0.51) | (3.68) | (3.82) |
| 8 | 2.32 | -0.40 | -0.67 | -1.12 | -1.07 | -0.64 | 0.63 | 0.96 | 0.74 | 0.45 | 0.85 | 2.01 | 2.46 |
| | (22.66) | (-0.80) | (-0.73) | (-1.69) | (-1.04) | (-0.46) | (0.68) | (1.18) | (0.70) | (0.31) | (0.75) | (3.43) | (4.51) |
| 9 | 2.65 | -0.83 | -1.22 | -1.87 | -0.79 | -0.62 | 1.00 | 0.72 | 0.21 | 0.49 | 0.92 | 1.90 | 2.12 |
| | (10.36) | (-1.12) | (-1.83) | (-2.91) | (-0.77) | (-0.41) | (1.64) | (0.86) | (0.20) | (0.30) | (0.86) | (3.15) | (3.54) |
| 10 | 4.19 | -0.75 | -0.65 | -1.37 | -0.78 | -0.77 | 0.62 | 0.53 | 0.36 | 0.59 | 0.22 | 1.55 | 2.48 |
| | (10.50) | (-0.93) | (-0.98) | (-2.02) | (-0.82) | (-0.54) | (0.94) | (0.76) | (0.29) | (0.38) | (0.21) | (1.93) | (3.43) |
| DIF(10-1) | 8.50 | -0.44 | 0.29 | 0.51 | -0.02 | -0.51 | 0.01 | -0.67 | -0.61 | -0.07 | -0.69 | -0.60 | -0.62 |
| | (88.80) | (-0.99) | (0.76) | (0.96) | (-0.03) | (-2.45) | (0.04) | (-2.41) | (-2.10) | (-0.22) | (-4.47) | (-2.39) | (-2.86) |

## Panel B continued

**Value weighted portfolio 3 factor Fama-French stock return**

| Sentiment decile | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -0.65 | 0.67 | -0.17 | -1.19 | -0.07 | 0.30 | 1.28 | 1.41 | 1.25 | 0.94 | 0.53 | 1.43 | 1.22 |
| | (-4.96) | (1.40) | (-0.30) | (-2.54) | (-0.07) | (0.38) | (2.14) | (2.80) | (1.80) | (1.17) | (0.87) | (3.74) | (3.89) |
| 2 | 0.61 | 0.73 | 0.16 | -0.70 | -0.09 | 0.09 | 0.98 | 1.41 | 0.16 | 1.07 | 0.59 | 1.69 | 1.45 |
| | (3.88) | (1.59) | (0.30) | (-1.31) | (-0.11) | (0.09) | (1.79) | (2.24) | (0.35) | (1.06) | (0.76) | (4.22) | (3.75) |
| 3 | 0.15 | -0.42 | 0.17 | -0.90 | -0.57 | -0.36 | 0.91 | 1.50 | 0.97 | 0.35 | 0.30 | 1.01 | 1.31 |
| | (1.91) | (-0.69) | (0.33) | (-1.82) | (-0.59) | (-0.43) | (1.87) | (2.54) | (1.05) | (0.39) | (0.47) | (3.12) | (3.66) |
| 4 | -0.08 | 0.12 | 0.07 | -1.11 | -0.87 | -0.94 | 0.96 | 0.73 | 0.33 | 0.46 | -0.16 | 0.98 | 1.28 |
| | (-0.66) | (0.31) | (0.13) | (-1.95) | (-1.08) | (-1.20) | (1.76) | (1.28) | (0.64) | (0.41) | (-0.16) | (1.50) | (2.72) |
| 5 | -0.24 | -0.55 | 0.11 | -1.05 | 0.03 | -0.20 | 1.01 | 1.03 | 0.49 | 0.25 | 0.45 | 1.55 | 1.84 |
| | (-1.04) | (-0.96) | (0.18) | (-1.56) | (0.03) | (-0.23) | (1.33) | (2.10) | (0.79) | (0.16) | (0.59) | (4.38) | (3.34) |
| 6 | 0.05 | -0.03 | -0.68 | -1.29 | -1.27 | 0.06 | 0.58 | 0.57 | 0.57 | 0.64 | 0.21 | 1.03 | 1.39 |
| | (0.28) | (-0.06) | (-0.85) | (-2.58) | (-1.52) | (0.04) | (0.91) | (0.84) | (0.68) | (0.78) | (0.25) | (1.49) | (3.54) |
| 7 | 0.64 | 0.07 | -0.51 | -0.86 | -0.34 | -0.58 | 1.08 | 1.17 | 0.67 | 0.47 | -0.05 | 1.66 | 1.46 |
| | (7.28) | (0.18) | (-1.10) | (-1.69) | (-0.48) | (-0.60) | (2.32) | (2.12) | (0.92) | (0.43) | (-0.07) | (2.67) | (3.06) |
| 8 | 1.21 | -0.09 | -0.28 | -1.08 | -0.43 | -0.16 | 0.72 | 0.84 | 0.96 | 0.27 | -0.01 | 1.68 | 1.67 |
| | (13.06) | (-0.18) | (-0.54) | (-2.02) | (-0.48) | (-0.14) | (1.21) | (0.92) | (1.47) | (0.22) | (-0.01) | (3.37) | (2.10) |
| 9 | 1.75 | 0.20 | -0.45 | -1.21 | -0.37 | -0.51 | 0.97 | 0.71 | 0.11 | 0.63 | 1.15 | 1.51 | 1.30 |
| | (10.63) | (0.40) | (-1.34) | (-2.30) | (-0.36) | (-0.42) | (1.72) | (1.01) | (0.12) | (0.52) | (2.03) | (2.85) | (1.72) |
| 10 | 2.41 | -0.22 | -0.41 | -1.24 | -0.44 | -0.37 | 0.72 | 0.78 | 0.42 | 0.59 | -0.07 | 1.20 | 1.63 |
| | (20.94) | (-0.36) | (-0.61) | (-2.06) | (-0.51) | (-0.39) | (1.52) | (1.22) | (0.38) | (0.48) | (-0.10) | (1.50) | (2.42) |
| DIF(10-1) | 3.07 | -0.89 | -0.25 | -0.05 | -0.37 | -0.66 | -0.56 | -0.63 | -0.83 | -0.35 | -0.60 | -0.23 | 0.41 |
| | (15.40) | (-2.73) | (-0.62) | (-0.18) | (-1.30) | (-2.38) | (-2.91) | (-2.11) | (-1.82) | (-0.75) | (-1.96) | (-0.44) | (0.86) |

**Panel C Portfolio summary statistics for Fundamental Sentiment**

| Opinion decile | Opinion | Firm size (M) | Book/market | Market share |
|---|---|---|---|---|
| 1 | 0.01 | 333.98 | 0.84 | 0.01 |
| 2 | 0.02 | 1643.37 | 0.68 | 0.04 |
| 3 | 0.02 | 1149.03 | 0.57 | 0.02 |
| 4 | 0.03 | 1806.38 | 0.53 | 0.02 |
| 5 | 0.03 | 2784.56 | 0.47 | 0.03 |
| 6 | 0.03 | 4198.52 | 0.44 | 0.04 |
| 7 | 0.03 | 6555.27 | 0.40 | 0.06 |
| 8 | 0.03 | 9816.75 | 0.36 | 0.08 |
| 9 | 0.04 | 18468.20 | 0.35 | 0.14 |
| 10 | 0.04 | 73021.91 | 0.29 | 0.56 |

## Panel D Monthly stock 3 factor Fama-French returns in Fundamental Sentiment portfolios

**Equal weighted portfolio 3 factor Fama-French stock return**

| Fundamental decile | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -0.15 | -1.16 | -1.29 | -1.95 | -1.32 | -0.77 | 1.00 | 0.88 | 0.63 | 0.34 | 0.95 | 1.86 | 2.91 |
| | (-0.58) | (-1.75) | (-1.74) | (-3.51) | (-1.19) | (-0.52) | (1.19) | (1.11) | (0.53) | (0.21) | (0.77) | (4.55) | (4.16) |
| 2 | 0.95 | -0.46 | -0.51 | -1.36 | -0.84 | -0.66 | 0.60 | 0.91 | 0.69 | 0.33 | 0.51 | 1.94 | 2.88 |
| | (4.59) | (-0.69) | (-0.60) | (-2.38) | (-0.96) | (-0.46) | (0.96) | (1.25) | (0.65) | (0.20) | (0.36) | (4.12) | (4.18) |
| 3 | 0.80 | -0.35 | -0.26 | -1.57 | -1.28 | -0.55 | 0.67 | 1.07 | 0.62 | 0.61 | 0.65 | 2.09 | 2.72 |
| | (11.07) | (-0.62) | (-0.30) | (-2.54) | (-1.34) | (-0.40) | (0.88) | (1.35) | (0.49) | (0.39) | (0.57) | (3.03) | (4.13) |
| 4 | 1.21 | -0.36 | -0.26 | -1.49 | -0.79 | -0.29 | 0.93 | 1.27 | 0.54 | 0.92 | 0.61 | 1.99 | 2.74 |
| | (15.34) | (-0.65) | (-0.37) | (-2.18) | (-0.91) | (-0.20) | (1.41) | (1.65) | (0.49) | (0.70) | (0.57) | (3.32) | (3.90) |
| 5 | 0.50 | -0.67 | -0.91 | -1.15 | -0.54 | -0.37 | 1.19 | 0.90 | 0.54 | 0.99 | 0.64 | 1.89 | 2.19 |
| | (3.10) | (-0.96) | (-1.05) | (-1.55) | (-0.50) | (-0.31) | (1.78) | (1.26) | (0.59) | (0.68) | (0.61) | (4.16) | (3.38) |
| 6 | 0.37 | -0.46 | -1.04 | -1.40 | -1.03 | -0.93 | 0.40 | 0.75 | 0.55 | 0.69 | 0.61 | 1.64 | 2.24 |
| | (2.43) | (-0.57) | (-1.23) | (-2.19) | (-1.00) | (-0.78) | (0.69) | (1.27) | (0.64) | (0.52) | (0.72) | (2.78) | (4.02) |
| 7 | 0.57 | -0.21 | -0.84 | -1.30 | -0.86 | -0.24 | 0.58 | 0.62 | 0.36 | 0.92 | 0.52 | 1.65 | 1.99 |
| | (3.32) | (-0.37) | (-1.19) | (-2.05) | (-1.00) | (-0.18) | (0.76) | (0.81) | (0.39) | (0.71) | (0.62) | (3.41) | (4.63) |
| 8 | 0.68 | -0.20 | -1.22 | -1.23 | -0.61 | -0.55 | 0.90 | 0.90 | 0.78 | 1.11 | 0.47 | 1.74 | 1.41 |
| | (13.69) | (-0.33) | (-1.53) | (-1.85) | (-0.57) | (-0.48) | (0.96) | (1.14) | (0.90) | (0.80) | (0.60) | (3.16) | (3.12) |
| 9 | 0.71 | -0.09 | -0.56 | -1.43 | -0.95 | -0.52 | 0.97 | 0.78 | 0.52 | 0.44 | 0.33 | 1.19 | 1.46 |
| | (12.04) | (-0.17) | (-1.02) | (-2.07) | (-1.13) | (-0.48) | (1.65) | (1.16) | (0.53) | (0.35) | (0.41) | (2.82) | (4.30) |
| 10 | 0.71 | 0.45 | 0.02 | -0.76 | -0.22 | -0.42 | 0.91 | 1.10 | 0.79 | 0.54 | 0.09 | 1.08 | 0.98 |
| | (5.71) | (0.95) | (0.05) | (-1.29) | (-0.31) | (-0.58) | (1.80) | (1.93) | (1.22) | (0.51) | (0.13) | (2.43) | (1.99) |
| DIF(10-1) | 0.87 | 1.61 | 1.32 | 1.19 | 1.09 | 0.35 | -0.09 | 0.22 | 0.15 | 0.19 | -0.86 | -0.78 | -1.93 |
| | (2.62) | (4.31) | (2.92) | (2.74) | (2.32) | (0.39) | (-0.13) | (0.67) | (0.24) | (0.29) | (-1.34) | (-2.39) | (-2.85) |

## Panel D continued

**Value weighted portfolio 3 factor Fama-French stock return**

| Fundamental decile | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -0.37 | -1.53 | -1.88 | -2.62 | -1.82 | -1.08 | 1.33 | 1.14 | 0.38 | 0.58 | 0.84 | 2.15 | 3.30 |
| | (-1.02) | (-1.87) | (-1.96) | (-3.31) | (-1.14) | (-0.53) | (1.20) | (1.06) | (0.24) | (0.27) | (0.52) | (4.51) | (4.04) |
| 2 | 0.53 | -0.13 | 0.04 | -1.27 | -0.41 | -0.09 | 1.07 | 1.41 | 0.68 | 0.50 | 0.41 | 1.58 | 1.64 |
| | (3.17) | (-0.18) | (0.06) | (-2.33) | (-0.36) | (-0.07) | (1.73) | (2.15) | (0.80) | (0.41) | (0.45) | (2.33) | (2.35) |
| 3 | 0.50 | -0.70 | -0.57 | -2.18 | -1.25 | -0.52 | 1.04 | 1.56 | 0.56 | 0.23 | 0.50 | 2.09 | 2.81 |
| | (2.19) | (-0.97) | (-0.66) | (-3.17) | (-1.09) | (-0.32) | (1.16) | (1.72) | (0.40) | (0.15) | (0.48) | (2.11) | (3.59) |
| 4 | 0.44 | -0.86 | -0.40 | -1.26 | -0.70 | 0.05 | 1.05 | 0.94 | 0.51 | 0.75 | 0.62 | 1.85 | 2.16 |
| | (1.25) | (-1.32) | (-0.77) | (-1.73) | (-0.61) | (0.03) | (1.37) | (0.97) | (0.50) | (0.63) | (0.58) | (2.13) | (2.99) |
| 5 | -0.04 | -1.03 | -1.37 | -1.54 | -0.58 | 0.08 | 1.52 | 0.76 | 0.61 | 0.72 | 1.15 | 2.14 | 2.31 |
| | (-0.21) | (-1.42) | (-1.46) | (-2.61) | (-0.43) | (0.06) | (2.50) | (1.04) | (0.66) | (0.51) | (1.18) | (4.27) | (3.37) |
| 6 | 0.16 | -0.56 | -1.05 | -1.82 | -0.78 | -0.55 | 1.01 | 1.01 | 0.31 | 0.41 | 0.56 | 1.99 | 2.89 |
| | (1.57) | (-0.81) | (-1.63) | (-3.55) | (-0.61) | (-0.37) | (1.35) | (2.03) | (0.35) | (0.31) | (0.62) | (2.41) | (3.45) |
| 7 | -0.19 | -0.65 | -0.63 | -1.28 | -0.51 | -0.12 | 0.32 | 1.17 | 0.69 | 0.93 | 0.71 | 1.61 | 2.30 |
| | (-0.81) | (-1.01) | (-1.06) | (-2.49) | (-0.54) | (-0.10) | (0.57) | (1.64) | (0.88) | (0.84) | (1.00) | (3.45) | (6.01) |
| 8 | 0.16 | -0.22 | -1.13 | -1.90 | -0.43 | -0.21 | 1.22 | 0.87 | 0.64 | 1.21 | 0.53 | 1.86 | 1.67 |
| | (2.76) | (-0.38) | (-1.71) | (-3.36) | (-0.36) | (-0.19) | (1.50) | (1.12) | (0.79) | (0.98) | (0.65) | (3.29) | (3.52) |
| 9 | 0.25 | -0.10 | -0.33 | -1.10 | -0.54 | -0.14 | 1.04 | 0.94 | 0.35 | 0.38 | 0.54 | 1.48 | 1.59 |
| | (2.69) | (-0.21) | (-0.62) | (-2.04) | (-0.61) | (-0.13) | (2.14) | (1.53) | (0.39) | (0.34) | (0.74) | (3.62) | (4.67) |
| 10 | 0.64 | 0.70 | 0.21 | -0.69 | -0.09 | -0.12 | 0.98 | 1.18 | 0.75 | 0.74 | 0.19 | 1.13 | 1.05 |
| | (4.82) | (1.59) | (0.42) | (-1.36) | (-0.12) | (-0.17) | (1.86) | (2.29) | (1.31) | (0.82) | (0.32) | (2.87) | (2.97) |
| DIF(10-1) | 1.02 | 2.23 | 2.09 | 1.93 | 1.72 | 0.96 | -0.35 | 0.04 | 0.37 | 0.16 | -0.66 | -1.02 | -2.25 |
| | (2.11) | (3.84) | (2.70) | (2.95) | (1.91) | (0.65) | (-0.34) | (0.06) | (0.34) | (0.12) | (-0.61) | (-3.41) | (-3.28) |

## Table 8 Robustness. Monthly 3 factor Fama French returns in portfolios based on the stock-level sentiment measure in 2015 subsample

Each month we sort stocks into 10 decile portfolios based on their BSVM investor sentiment level, using the observations between 01.2015 and 12.2015 to ensure equal number of observations for all future returns. The table in Panel A reports the average values of the stock characteristics, such as size in million, book to market ratio and market share. Panel B reports the equal average values and value-weighted average values of the monthly 3 factor Fama French returns, starting from the return concurrent to sentiment measure, until the return 12 months in the future. The last row reports the difference in returns between high (positive opinion) and low (negative opinion) sentiment portfolios. T statistics are reported in parentheses.

### Panel A Portfolio summary statistics

| Sentiment decile | Opinion | Firm size (Million) | Book/market | Market share |
|---|---|---|---|---|
| 1 | -0.04 | 10520.54 | 0.59 | 0.10 |
| 2 | -0.01 | 8765.81 | 0.60 | 0.11 |
| 3 | 0.00 | 5903.95 | 0.64 | 0.10 |
| 4 | 0.01 | 5575.08 | 0.62 | 0.09 |
| 5 | 0.02 | 6183.12 | 0.57 | 0.09 |
| 6 | 0.03 | 7430.98 | 0.54 | 0.09 |
| 7 | 0.04 | 8539.84 | 0.51 | 0.10 |
| 8 | 0.05 | 8601.65 | 0.49 | 0.10 |
| 9 | 0.07 | 10145.90 | 0.46 | 0.11 |
| 10 | 0.12 | 10864.09 | 0.43 | 0.11 |

## Panel B Monthly stock 3 factor Fama-French returns in sentiment portfolios

**Equal weighted portfolio 3 factor Fama-French stock return**

| Sentiment decile | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -4.92 | -0.78 | -1.03 | -2.06 | -1.19 | -0.25 | 0.57 | 1.23 | 1.01 | 0.50 | 0.79 | 1.93 | 3.53 |
| | (-17.29) | (-1.11) | (-1.63) | (-2.73) | (-0.76) | (-0.14) | (0.64) | (1.32) | (0.82) | (0.35) | (0.74) | (3.11) | (5.37) |
| 2 | -2.20 | -0.69 | -1.20 | -1.57 | -0.40 | 0.02 | 1.12 | 0.82 | 1.10 | 0.88 | 0.20 | 0.89 | 2.20 |
| | (-5.01) | (-1.00) | (-1.14) | (-2.79) | (-0.49) | (0.01) | (1.46) | (1.12) | (1.15) | (0.62) | (0.20) | (1.74) | (4.03) |
| 3 | -0.51 | -0.05 | -0.42 | -1.27 | -0.89 | -0.25 | 1.26 | 1.10 | 0.38 | 0.20 | 0.90 | 1.69 | 2.33 |
| | (-4.63) | (-0.09) | (-0.63) | (-2.49) | (-1.19) | (-0.19) | (1.82) | (1.75) | (0.41) | (0.13) | (0.88) | (3.88) | (4.29) |
| 4 | 0.74 | -0.33 | -0.29 | -1.15 | -1.01 | -0.97 | 0.74 | 1.09 | 0.64 | 0.44 | 0.44 | 2.65 | 2.45 |
| | (3.91) | (-0.60) | (-0.50) | (-1.85) | (-0.94) | (-0.88) | (1.22) | (1.53) | (0.61) | (0.28) | (0.41) | (6.14) | (3.85) |
| 5 | 1.27 | -0.45 | -0.83 | -1.33 | -1.20 | -0.59 | 0.70 | 1.18 | 0.57 | 0.61 | 0.75 | 1.77 | 2.67 |
| | (4.72) | (-0.66) | (-0.99) | (-2.13) | (-1.28) | (-0.48) | (1.14) | (1.67) | (0.57) | (0.45) | (0.65) | (3.42) | (4.82) |
| 6 | 1.58 | -0.61 | -0.48 | -1.68 | -0.98 | -1.14 | 0.85 | 1.12 | 0.67 | 0.82 | 0.33 | 1.98 | 2.07 |
| | (9.91) | (-0.90) | (-0.53) | (-2.22) | (-0.78) | (-0.88) | (1.64) | (1.63) | (0.62) | (0.51) | (0.32) | (3.73) | (3.09) |
| 7 | 1.54 | -0.32 | -0.75 | -1.45 | -1.30 | -0.40 | 1.00 | 1.18 | 0.38 | 0.61 | 0.69 | 1.67 | 2.31 |
| | (18.07) | (-0.63) | (-0.73) | (-2.18) | (-1.60) | (-0.28) | (1.15) | (1.52) | (0.44) | (0.43) | (0.56) | (3.33) | (3.65) |
| 8 | 2.40 | -0.27 | -1.19 | -1.28 | -0.96 | -0.68 | 0.74 | 0.41 | 0.45 | 0.73 | 0.84 | 2.03 | 2.35 |
| | (26.47) | (-0.51) | (-1.68) | (-1.86) | (-1.13) | (-0.56) | (1.11) | (0.51) | (0.42) | (0.49) | (0.77) | (3.48) | (3.78) |
| 9 | 2.64 | -0.85 | -0.75 | -1.62 | -0.76 | -0.65 | 0.73 | 0.48 | 0.23 | 0.68 | 0.70 | 1.63 | 2.03 |
| | (13.23) | (-1.05) | (-1.06) | (-2.28) | (-0.81) | (-0.45) | (0.95) | (0.60) | (0.21) | (0.42) | (0.65) | (2.74) | (3.60) |
| 10 | 4.08 | -0.50 | -0.56 | -1.29 | -0.85 | -0.73 | 0.47 | 0.67 | 0.46 | 0.38 | 0.03 | 1.59 | 2.19 |
| | (11.94) | (-0.61) | (-0.80) | (-1.97) | (-0.88) | (-0.57) | (0.72) | (0.99) | (0.39) | (0.24) | (0.03) | (1.96) | (3.14) |
| DIF(10-1) | 9.00 | 0.28 | 0.47 | 0.77 | 0.34 | -0.48 | -0.11 | -0.56 | -0.55 | -0.13 | -0.76 | -0.33 | -1.34 |
| | (59.26) | (0.58) | (1.30) | (1.48) | (0.53) | (-0.86) | (-0.22) | (-1.39) | (-2.66) | (-0.47) | (-5.44) | (-0.86) | (-3.77) |

## Panel B continued

**Value weighted portfolio 3 factor Fama-French stock return**

| Sentiment decile | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -2.46 | -0.25 | -0.95 | -1.72 | -0.73 | 0.35 | 0.77 | 1.42 | 1.59 | 1.07 | 1.08 | 1.02 | 2.07 |
| | (-8.16) | (-0.48) | (-1.74) | (-3.73) | (-0.57) | (0.27) | (1.19) | (2.51) | (3.36) | (1.25) | (1.60) | (2.11) | (6.62) |
| 2 | -0.50 | 0.76 | 0.04 | -1.11 | 0.35 | 0.65 | 1.45 | 1.27 | 0.47 | 0.82 | -0.26 | 1.91 | 0.95 |
| | (-2.81) | (1.83) | (0.08) | (-2.24) | (0.38) | (0.66) | (2.45) | (2.65) | (0.74) | (0.95) | (-0.55) | (3.23) | (2.22) |
| 3 | -0.06 | 1.10 | 0.04 | -0.91 | -0.24 | -0.16 | 1.60 | 1.76 | 0.46 | 0.73 | 0.96 | 1.44 | 2.02 |
| | (-0.13) | (2.23) | (0.09) | (-1.80) | (-0.43) | (-0.21) | (2.32) | (3.91) | (0.83) | (0.79) | (1.18) | (5.38) | (6.68) |
| 4 | 1.04 | 0.09 | 0.16 | -0.66 | -0.21 | -0.99 | 0.50 | 1.17 | 1.10 | 1.54 | 0.62 | 2.30 | 1.26 |
| | (6.23) | (0.15) | (0.26) | (-1.37) | (-0.17) | (-1.66) | (0.80) | (1.59) | (1.15) | (1.39) | (0.76) | (6.34) | (2.01) |
| 5 | 0.70 | -0.10 | -0.26 | -1.04 | -0.33 | -0.33 | 2.06 | 1.19 | 0.55 | 0.75 | 0.73 | 1.02 | 1.23 |
| | (5.35) | (-0.18) | (-0.40) | (-1.88) | (-0.53) | (-0.45) | (4.32) | (2.20) | (0.72) | (0.78) | (1.18) | (1.92) | (3.17) |
| 6 | 0.64 | -0.05 | 0.54 | -1.18 | -0.47 | -0.54 | 0.51 | 0.77 | 0.62 | 0.38 | 0.17 | 1.08 | 1.39 |
| | (2.32) | (-0.09) | (1.09) | (-1.97) | (-0.47) | (-0.58) | (1.05) | (1.21) | (0.98) | (0.34) | (0.18) | (2.13) | (2.93) |
| 7 | -0.02 | -0.15 | -0.24 | -0.72 | -0.63 | 0.13 | 0.78 | 0.99 | 0.36 | 0.28 | 0.14 | 1.48 | 1.51 |
| | (-0.20) | (-0.27) | (-0.30) | (-1.17) | (-0.75) | (0.11) | (1.38) | (1.84) | (0.51) | (0.22) | (0.17) | (3.54) | (2.50) |
| 8 | 0.82 | 0.41 | -0.62 | -1.00 | -0.46 | -0.48 | 0.82 | 0.51 | 0.99 | 0.16 | 0.09 | 0.89 | 1.79 |
| | (6.75) | (0.90) | (-1.09) | (-2.01) | (-0.66) | (-0.45) | (1.56) | (0.84) | (1.11) | (0.16) | (0.11) | (1.05) | (3.40) |
| 9 | 1.68 | -0.03 | -0.08 | -0.90 | -0.34 | -0.28 | 0.86 | 0.72 | 0.51 | 0.69 | 0.51 | 1.49 | 1.15 |
| | (17.27) | (-0.08) | (-0.20) | (-1.59) | (-0.35) | (-0.28) | (1.53) | (0.91) | (0.86) | (0.57) | (0.76) | (2.65) | (1.47) |
| 10 | 2.24 | 0.00 | -0.44 | -1.31 | -0.39 | -0.53 | 0.81 | 0.84 | 0.18 | 0.45 | 0.08 | 1.25 | 1.39 |
| | (14.94) | (-0.01) | (-0.84) | (-2.45) | (-0.46) | (-0.55) | (1.79) | (1.21) | (0.16) | (0.39) | (0.13) | (1.80) | (2.10) |
| DIF(10-1) | 4.70 | 0.24 | 0.52 | 0.41 | 0.34 | -0.88 | 0.04 | -0.58 | -1.42 | -0.62 | -1.00 | 0.23 | -0.69 |
| | (23.81) | (0.72) | (2.02) | (1.75) | (0.67) | (-2.18) | (0.09) | (-2.74) | (-1.56) | (-1.70) | (-4.64) | (0.58) | (-1.30) |

## Table 9 Robustness. Monthly raw returns in portfolios based on the stock-level sentiment measure

This table replicates analysis from Table 4 by replacing 3 factor Fama French returns with the raw returns. Each months we sort stocks into 10 decile portfolios based on their BSVM investor sentiment level. The table in Panel A reports the average values of the stock characteristics, such as size in million, book to market ratio and market share. Panel B reports the equal average values and value-weighted average values of the monthly raw returns, starting from the return concurrent to sentiment measure, until the return 12 months in the future. The last row reports the difference in returns between high (positive opinion) and low (negative opinion) sentiment portfolios. Panel C reports the difference in returns between high (positive opinion) and low (negative opinion) sentiment portfolios measured as either equal-weighted or value-weighted raw returns for small firm and large firm subsamples. Stocks are divided into each category based on their logarithm of market value at a given time, where top 50% is assigned as large and bottom 50% as small. T statistics are reported in parentheses.

### Panel A Portfolio summary statistics

| Opinion decile | Opinion | Firm size (Million) | Book/market | Market share |
|---|---|---|---|---|
| 1 | -0.05 | 10960.33 | 0.60 | 0.11 |
| 2 | -0.01 | 9177.57 | 0.61 | 0.11 |
| 3 | 0.00 | 5618.18 | 0.66 | 0.10 |
| 4 | 0.00 | 7011.78 | 0.64 | 0.07 |
| 5 | 0.01 | 6854.19 | 0.58 | 0.09 |
| 6 | 0.02 | 7298.04 | 0.56 | 0.09 |
| 7 | 0.03 | 8005.71 | 0.54 | 0.09 |
| 8 | 0.04 | 9228.06 | 0.53 | 0.10 |
| 9 | 0.06 | 10735.34 | 0.49 | 0.11 |
| 10 | 0.12 | 11434.59 | 0.48 | 0.11 |

## Panel B Monthly stock raw returns in sentiment portfolios

**Equal weighted portfolio stock raw return**

| Opinion decile | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -4.00 | 1.13 | 0.61 | 0.77 | 0.57 | 0.67 | 0.45 | 1.04 | 1.71 | 1.99 | 1.58 | 1.51 | 2.73 |
| | (-3.98) | (1.13) | (0.51) | (0.72) | (0.46) | (0.54) | (0.32) | (0.88) | (1.53) | (2.74) | (1.38) | (1.09) | (3.29) |
| 2 | -1.44 | 0.91 | 0.64 | 0.72 | 0.94 | 0.89 | 1.14 | 1.07 | 1.62 | 2.08 | 1.14 | 0.53 | 1.74 |
| | (-1.48) | (1.07) | (0.60) | (0.84) | (1.05) | (0.84) | (0.98) | (0.93) | (1.85) | (2.37) | (1.00) | (0.42) | (1.94) |
| 3 | 0.20 | 1.19 | 1.09 | 0.89 | 0.88 | 1.15 | 1.23 | 1.24 | 1.05 | 1.47 | 1.67 | 1.48 | 1.86 |
| | (0.22) | (1.56) | (1.29) | (1.01) | (0.91) | (1.05) | (1.20) | (1.24) | (1.11) | (1.57) | (1.62) | (1.16) | (2.03) |
| 4 | 1.22 | 1.07 | 0.90 | 1.08 | 0.59 | 0.76 | 0.77 | 1.33 | 1.59 | 1.66 | 1.47 | 2.11 | 2.00 |
| | (1.49) | (1.22) | (1.12) | (1.01) | (0.62) | (0.67) | (0.70) | (1.32) | (1.54) | (1.77) | (1.37) | (2.07) | (2.47) |
| 5 | 1.60 | 0.99 | 0.74 | 0.89 | 0.67 | 0.75 | 0.77 | 1.14 | 1.39 | 1.89 | 1.52 | 1.49 | 2.27 |
| | (2.12) | (1.13) | (0.82) | (1.02) | (0.70) | (0.73) | (0.68) | (1.11) | (1.49) | (2.17) | (1.48) | (1.30) | (2.41) |
| 6 | 2.00 | 0.79 | 0.89 | 0.37 | 0.92 | 0.43 | 0.90 | 1.07 | 1.41 | 1.65 | 1.37 | 1.62 | 1.67 |
| | (2.50) | (0.89) | (1.08) | (0.37) | (0.89) | (0.41) | (0.91) | (1.03) | (1.55) | (1.99) | (1.32) | (1.46) | (1.92) |
| 7 | 2.31 | 0.98 | 0.55 | 0.74 | 0.69 | 0.77 | 0.84 | 1.07 | 1.13 | 1.70 | 1.61 | 1.19 | 1.87 |
| | (2.71) | (1.15) | (0.66) | (0.72) | (0.68) | (0.75) | (0.76) | (0.97) | (1.35) | (2.08) | (1.58) | (1.04) | (2.19) |
| 8 | 2.95 | 0.86 | 0.33 | 0.62 | 0.68 | 0.64 | 0.56 | 0.54 | 1.29 | 1.78 | 1.54 | 1.47 | 1.82 |
| | (3.99) | (1.06) | (0.36) | (0.70) | (0.81) | (0.68) | (0.53) | (0.46) | (1.37) | (2.31) | (1.52) | (1.49) | (2.16) |
| 9 | 3.79 | 0.61 | 0.25 | 0.39 | 0.83 | 0.66 | 0.52 | 0.25 | 0.81 | 1.71 | 1.49 | 0.97 | 1.70 |
| | (4.18) | (0.64) | (0.35) | (0.43) | (0.99) | (0.64) | (0.50) | (0.23) | (0.88) | (2.18) | (1.75) | (0.90) | (2.38) |
| 10 | 5.07 | 0.82 | 0.55 | 0.46 | 0.83 | 0.55 | 0.43 | 0.35 | 0.95 | 1.27 | 0.84 | 1.20 | 1.53 |
| | (5.48) | (0.92) | (0.74) | (0.52) | (0.91) | (0.61) | (0.48) | (0.37) | (1.06) | (1.72) | (0.99) | (1.49) | (2.33) |
| DIF(10-1) | 9.06 | -0.31 | -0.06 | -0.31 | 0.25 | -0.12 | -0.02 | -0.68 | -0.76 | -0.72 | -0.74 | -0.31 | -1.20 |
| | (20.00) | (-0.86) | (-0.10) | (-0.78) | (0.46) | (-0.23) | (-0.04) | (-2.13) | (-2.37) | (-3.07) | (-1.76) | (-0.42) | (-3.51) |

**Value weighted portfolio stock raw return**

| Opinion decile | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -1.40 | 0.75 | 0.48 | 0.65 | 0.49 | 0.51 | 0.72 | 0.85 | 2.11 | 1.91 | 1.62 | 0.87 | 1.73 |
| | (-1.76) | (1.09) | (0.57) | (0.93) | (0.54) | (0.71) | (0.77) | (1.10) | (4.01) | (3.72) | (2.12) | (1.15) | (2.94) |
| 2 | -0.38 | 1.23 | 0.74 | 0.48 | 0.80 | 0.89 | 1.04 | 0.95 | 1.14 | 1.40 | 0.63 | 1.31 | 1.09 |
| | (-0.75) | (2.61) | (1.30) | (0.72) | (1.58) | (1.48) | (1.54) | (1.20) | (2.34) | (2.74) | (0.93) | (1.86) | (2.55) |
| 3 | 0.75 | 0.91 | 0.83 | 0.80 | 0.63 | 0.73 | 1.03 | 0.93 | 0.72 | 0.79 | 1.40 | 0.76 | 2.04 |
| | (1.19) | (2.28) | (1.25) | (1.55) | (1.01) | (0.91) | (1.71) | (1.73) | (1.60) | (1.32) | (2.00) | (0.97) | (3.23) |
| 4 | 0.76 | 1.27 | 0.71 | 1.05 | 0.29 | 0.27 | 0.30 | 0.81 | 1.54 | 1.57 | 1.12 | 1.44 | 1.01 |
| | (1.85) | (1.80) | (1.13) | (1.51) | (0.44) | (0.34) | (0.52) | (0.94) | (2.12) | (3.25) | (1.60) | (2.11) | (0.98) |
| 5 | 1.30 | 0.57 | 0.27 | 0.51 | 0.94 | 0.41 | 1.35 | 0.50 | 0.99 | 1.51 | 1.20 | 0.69 | 1.08 |
| | (2.36) | (0.93) | (0.62) | (0.86) | (1.40) | (0.78) | (2.51) | (1.22) | (1.95) | (3.02) | (2.29) | (0.92) | (1.64) |
| 6 | 1.26 | 0.62 | 1.02 | 0.41 | 0.54 | 0.55 | 0.24 | 0.40 | 1.17 | 1.12 | 0.56 | 0.75 | 1.13 |
| | (3.49) | (1.02) | (1.87) | (0.73) | (0.95) | (0.65) | (0.32) | (0.52) | (2.49) | (2.19) | (0.71) | (1.03) | (2.30) |
| 7 | 1.00 | 0.30 | 0.51 | 0.67 | 0.56 | 0.82 | 0.53 | 0.57 | 0.79 | 1.01 | 0.55 | 0.89 | 0.99 |
| | (1.74) | (0.61) | (0.98) | (1.27) | (0.79) | (1.25) | (0.74) | (0.85) | (1.36) | (1.84) | (0.78) | (0.95) | (1.77) |
| 8 | 1.62 | 0.83 | 0.46 | 0.47 | 0.30 | 0.29 | 0.50 | 0.30 | 1.06 | 1.02 | 0.56 | 0.72 | 1.42 |
| | (3.50) | (1.52) | (0.63) | (0.90) | (0.68) | (0.38) | (0.84) | (0.37) | (1.99) | (2.14) | (0.76) | (1.09) | (2.78) |
| 9 | 2.05 | 0.45 | 0.33 | 0.52 | 0.44 | 0.36 | 0.35 | 0.12 | 0.77 | 1.32 | 0.97 | 1.04 | 1.00 |
| | (4.95) | (0.83) | (0.67) | (0.93) | (0.78) | (0.61) | (0.58) | (0.16) | (1.82) | (2.40) | (1.66) | (2.00) | (1.91) |
| 10 | 3.08 | 0.65 | 0.23 | 0.23 | 0.81 | 0.43 | 0.22 | 0.18 | 0.40 | 1.07 | 0.53 | 0.93 | 1.17 |
| | (5.24) | (1.13) | (0.50) | (0.34) | (1.18) | (0.69) | (0.50) | (0.27) | (0.66) | (2.08) | (1.01) | (1.65) | (2.24) |
| DIF(10-1) | 4.48 | -0.11 | -0.25 | -0.42 | 0.32 | -0.08 | -0.50 | -0.67 | -1.71 | -0.84 | -1.08 | 0.06 | -0.56 |
| | (11.14) | (-0.44) | (-0.56) | (-2.28) | (0.71) | (-0.25) | (-0.73) | (-2.93) | (-3.64) | (-2.49) | (-2.53) | (0.12) | (-1.54) |

**Panel C Monthly stock raw returns in sentiment portfolios for size subsamples**

| **Full sample** | **Diff Dec10-Dec 1** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Large firms | Equal weighted | 6.62 | -0.10 | 0.04 | -0.33 | 0.29 | -0.15 | 0.12 | -0.87 | -0.78 | -1.05 | -0.65 | 0.02 | -0.40 |
| | | (15.36) | (-0.41) | (0.06) | (-0.88) | (0.52) | (-0.33) | (0.18) | (-2.42) | (-1.54) | (-2.44) | (-1.17) | (0.05) | (-1.44) |
| | Value weighted | 4.41 | -0.25 | -0.27 | -0.26 | 0.27 | 0.12 | -0.50 | -0.78 | -1.46 | -0.83 | -1.12 | 0.14 | -0.28 |
| | | (11.63) | (-1.20) | (-0.66) | (-1.15) | (0.51) | (0.29) | (-0.66) | (-3.01) | (-2.92) | (-1.76) | (-2.75) | (0.18) | (-0.55) |
| Small firms | Equal weighted | 11.66 | -0.61 | -0.47 | -0.24 | 0.24 | -0.11 | 0.12 | -0.73 | -0.65 | 0.05 | -0.63 | -0.98 | -1.37 |
| | | (18.69) | (-1.25) | (-0.75) | (-0.47) | (0.38) | (-0.21) | (0.34) | (-3.85) | (-2.55) | (0.13) | (-1.47) | (-2.36) | (-5.36) |
| | Value weighted | 10.27 | -0.67 | -0.38 | -0.13 | 0.56 | -0.35 | -0.23 | -1.19 | -0.68 | -0.03 | -0.68 | -0.55 | -1.43 |
| | | (20.40) | (-1.49) | (-0.56) | (-0.21) | (1.00) | (-0.75) | (-0.36) | (-4.75) | (-2.27) | (-0.06) | (-2.02) | (-0.92) | (-2.57) |

**Appendix 1**

Size (lnme) – natural logarithm of the stock's market value (price per share multiplied by shares outstanding) each quarter.

Book-to-market ratio (lnbm) – natural logarithm of the ratio of book to market value, where book value is the book value of stockholders' equity, plus deferred taxes and investment tax credit (if available), minus the book value of preferred stock for the last fiscal year end in t -1; the market value is calculated at the end of December of t -1.[10]

Momentum (mom) - the cumulative return of a stock over 11 months ending one month prior to the portfolio formation month (the month preceding the quarter of institutional trading), as in Jegadeesh and Titman (1993).

Illiquidity level (illiq) Illiquidity of the stock (illiq) is measured monthly, following Amihud (2002), as the average of daily ratios of a daily $r_{i,d}$ to dollar trading volume $vold_{i,d}$. illiq is scaled by $10^{11}$.

$$illiq_{i,t} = Avg\left[\frac{|r_{i,d}|}{vold_{i,d}}\right]$$

illiq measures the daily impact of order flow on price arising from adverse selection and inventory costs (Amihud and Mendelson, 1980; Amuhud, 2002) in the spirit of Kyle (1985).

Earnings surprise - stock's quarterly announced earnings less the median earnings forecast from I/B/E/S divided by the price as of the end of fiscal year.

Stock idiosyncratic volatility (ivol) is measured monthly as the standard deviation of the residuals from the following regression of daily excess stock returns on market excess returns and size and book-to-market factors of Fama and French (1993). Risk free rate used to compute excess returns

[10]For the book value of preferred stock, redemption, liquidation or par value are used depending on availability.
[11] Following Gao and Ritter (2010), we adjust for institutional features of the way that NASDAQ and NYSE/AMEX volume are counted. Specifically, we divide NASDAQ volume by 2.0, 1.8, 1.6, and 1 for the periods prior to February 2001, between February 2001 and December 2001, between January 2002 and December 2003, and January 2004 and later years, respectively.

is the rate of one-month treasury bills and market return is the CRSP value-weighted index; the rates and factors are downloaded from Kenneth French's website.[12]

$$R_{i,d} - R_{f,d} = \alpha_i + \beta_i\left(R_{m,d} - R_{f,d}\right) + \gamma_i SMB_d + \varphi_i HML_d + \varepsilon_{i,d}$$

Market beta of the stock (beta) is estimated based on time-series regression of monthly excess stock returns on current and lagged market excess returns over 60 months (minimum 24). The beta is calculated as a sum of coefficients of current and lagged excess stock returns. Risk free rate used to compute excess returns is the rate of one-month treasury bills and market return is the CRSP value-weighted index.

Analyst earnings forecast dispersion (disp) is computed as the standard deviation of annual EPS forecasts divided by the absolute value of the average outstanding forecast (Diether, Malloy, Sherbina, 2002).

Stock's monthly co-skewness (coskew) is computed as estimate of $\gamma_i$ in the regression based on monthly returns over 60 months (min 24)

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_i\left(R_{m,t} - R_{f,t}\right) + \gamma_i\left(R_{m,t} - R_{f,t}\right)^2 + \varepsilon_{i,t} \quad ,$$

where Ri , Rf , and Rm are the monthly returns on stock i, the one-month Treasury bills, and the CRSP value-weighted index.

Stock's extreme positive return (max) is the maximum daily return in a given month.

Abnormal dollar volume (voldu) is the shock to monthly dollar volume computer as a difference of a given month's dollar volume and past 12 month average.

[12] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html