Investor Sentiment and Industry Returns[1]

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Abstract

This paper investigates the interaction between investor sentiment and industry performance. Investor sentiment has a widespread and systematic effect on performance, and predicts short-term mispricing at industry level. Predictable long-term reversals are weaker. We find limited evidence of cross-sectional industry differences. Moreover, there is no relationship between investor sentiment and industry characteristics that proxy valuation uncertainty. Results generally show that investor sentiment has a market-wide effect, questioning merit of industry timing strategy based on sentiment.

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1. Introduction and Hypotheses

Traditional financial theory does not allow a role for investor sentiment in asset pricing. Yet casual observation suggests that irrational investor behavior periodically drives prices from fundamentals over protracted periods. NASDAQ stock valuations in the 1990s illustrate one well-documented example. Other examples of stock market cycles further suggest that stock prices periodically reflect investor sentiment and that prices revert to fair value only with a delay.[2] An evolving body of literature, coupled with practitioner interest in the topic, provides evidence that investor sentiment, in some part, affects stock valuations. Brown and Cliff (2005), for instance, document a statistically and economically significant relationship between investor sentiment and the market. Baker and Wurgler (2006) argue that mispricing is prevalent in stocks that are difficult to objectively value. Additionally, the financial media (such as *Barron's*, *Wall Street Journal*, *Forbes*, and *CNBC*) regularly report on different market sentiment measures.[3] Practitioner interest in market sentiment measures reflects conventional market wisdom that sentiment affects stock values. Indeed, Tetlock (2007) confirms that financial media reporting affects investor sentiment and, ultimately, market values.

Fisher and Statman (2000), Brown and Cliff (2005) and Baker and Wurgler (2006) establish a positive correlation between investor sentiment and contemporaneous market mispricing, followed by predictable market reversals. However, Barberis and Shleifer (2003) describe a behavioral style-investing theory. The theory posits that investors base their investments on styles (such as market capitalization or industry affiliation) rather than rational expectations. Empirical research, such as Baker and Wurgler (2006), already confirms the effect of sentiment on stocks that share common styles. Further, Kumar and Lee (2006), Edelen, Marcus, and Tehranian (2010) and Froot and Teo (2008) document investor herding in styles, which leads to mispricing. Small investors, moreover, are particularly prone to trade on sentiment. An analysis of the industry-level effect of sentiment helps better to understand its market-wide effect previously documented in the literature. Additionally, industries represent one of the important style categories described by the Barberis and Shleifer (2003) model. The popularity of industry investing also makes an examination of industry return predictability interesting from a practical perspective.

[2] Baker and Wurgler (2006) discuss episodes where sentiment anecdotally appears to drive market values.
[3] See, for example, the *Barron's* weekly summary of various investor sentiment readings available at http://online.barrons.com/public/page/9_0210-investorsentimentreadings.html

Overall, existing research supports a role for investor sentiment in asset price determination. Research also shows that mispricing results from investors who base their trades on styles, such as industries, rather than underlying fundamentals. However, despite the academic and practical importance of better understanding industry performance, the literature has given the topic only limited attention.

This study addresses three specific research questions: First, does investor sentiment systematically predict industry returns? Second, does investor sentiment systematically affect the performance of industries that share certain characteristics? Lastly, does investor sentiment provide a practical signal for profitable industry rotation? These questions, from both financial theory and practical perspectives, remain largely unanswered.

The study's main result is that investor sentiment has a market-wide effect rather than an industry-specific effect. Additionally, the results document only marginal strategy returns timing industry investments with investor sentiment. The results are consistent with previous research that investor sentiment predicts market mispricing, followed by reversals. Results similarly confirm a stronger effect of investor sentiment in equal-weighted indices. The results document the same pattern of investor sentiment predictability in industry returns. At a one-week horizon, investor sentiment positively predicts systematic performance, irrespective of the industry. Predictability turns largely negative over longer 8- to 52-week horizons. However, long-term predictability generally lacks statistical significance. Observing different periods of sentiment, industry reversal predictability is greater during bear markets than during bull markets. Contrasting prior firm-level studies, industry-wide characteristics, which act as a proxy for valuation uncertainty, do not systematically attract speculative mispricing. To that extent, markets appear more efficient at industry level. Lastly, the study evaluates the practical application of an industry rotation strategy that times investor sentiment. Results document statistically significant performance of 3 to 6 percent, which varies across time horizon, sentiment measure, and risk correction. While such a return may appear large enough for some, a sentiment rotation strategy would incur high turnover and transactions costs.

This study contributes to the literature in two important respects. First, it documents limited cross-sectional differences in the effect of investor sentiment on predictable industry performance. Investor sentiment almost universally affects the performance of all industries at short horizons up to four weeks. Thus, the effect of investor sentiment broadly extends

from the market to industries. However, unlike market studies, systematic long-term predictability is almost absent. An interpretation of the results here is that industry prices revert quickly to fundamental values. Additionally, industry values appear to correct sooner in bear markets. Moreover, while the literature documents mispricing related to firm characteristics causing valuation difficulties, the results show no equivalent relationship with similar industry characteristics.

Secondly, the study adds to a growing body of literature that investigates the practical importance of industry-level investment strategies. Moskowitz and Grinblatt (1999) provide evidence, for example, that industry return co-movement largely explains momentum trading profits. They argue that "investors simply herd toward (away from) hot (cold) industries, causing price pressures that create [return] persistence." The results provide limited evidence that investors can profitably use investor sentiment to form a simple industry timing strategy. Effectively, the market rationally prices industry values, to the extent that strategy outperformance would quickly dissipate with reasonable transaction fees. The results thus do not support the Barberis and Shleifer (2003) model's predictions of profitable style rotation trading strategies. Nonetheless, the study adds to others, such as Cavaglia, Brightman, and Aked (2000), Baca, Garbe, and Weiss (2000), and Phylaktis and Xia (2006), that explore the practical validity of industry-level investing.

Analysis of industry return predictability is subject to a battery of alternative robustness tests. One test examines whether the effect of sentiment on industry performance varies across sub-periods, dividing the full sample into equal 1987–1997 and 1997–2007 sub-periods. Overall, the results remain largely comparable. Next, we examine industry returns corrected for well-known sources of systematic risk. After a four-factor risk correction, short-term positive predictability decreases slightly, while negative long-term predictability noticeably increases. Thus, risk corrections do partially explain return predictability for some industries, while not for others. Lastly, we examine alternative industry classifications. The results are comparable for Fama and French (1993), Kacperczyk, Sialm, and Zheng (2005), and Global Industry Classification Standard (GICS) industry and sector classifications. Generally, the results continue to hold regardless of the period, industry classification, or risk correction.

The rest of the paper is organized as follows. Section 2 presents the data Section 3 describes the empirical findings. Robustness issues are discussed in Section 4. Section 5 concludes.

2. Data

2.1. Sentiment Measures

Of the many available investor sentiment measures, none is without its critics. To counter the criticism that the results are sample specific, the analysis investigates three different investor sentiment measures. Generally, the literature categorizes them as direct or indirect (Brown and Cliff (2004)). Investor surveys provide direct measures, while historical financial data provides indirect measures of investor sentiment. The analysis uses two direct measures and one indirect measure of investor sentiment.[4]

The American Association of Independent Investors (AAII) survey is one of the direct measures. The AAII survey measures the sentiment of small investors. The literature commonly describes small investors as noise traders, who are prone to trade on sentiment rather than fundamental analysis.[5] Studies by Kumar and Lee (2006) and Schmeling (2009), among others, also provide empirical evidence that small investors herd in particular stock categories, such as small-cap stocks. Moreover, such market studies show that the collective trades of small traders cause predictable mispricing. The AAII conducts a weekly survey of its members on their view of future market direction. Specifically, the survey asks members whether they have a bullish, neutral, or bearish stock market outlook for the next six months.[6] Prior to January 2000, the AAII mailed its survey to a random selection of 200 members. Since then, the AAII has conducted an online survey, which is available to all registered members. The AAII publishes its survey results every Thursday. Historical data is available online from 24/07/1987 at no cost. The AAII data comes from the association's website.[7]

The Investors Intelligence (II) survey is the other direct measure. The II survey reflects the sentiment of financial newsletter writers. Brown and Cliff (2004) argue that the II survey proxies the sentiment of professional investors, as newsletter writers are mostly retired institutional traders. The financial media, such as The Wall Street Journal, widely report II survey results. Editors at Investor Intelligence categorize the sentiment of newsletter writers from a selection of approximately 150 newsletters as bullish, bearish or correction. The

[4] Qiu and Welch (2005) provide a good discussion of differences in investor sentiment measures.
[5] See, for example, Black (1986) and Barber, Odean, and Zhu (2009).
[6] http://www.aaii.com/sentimentsurvey
[7] http://www.aaii.com/files/surveys/sentiment.xls

categorization of newsletter sentiment is a subjective process. However, Investors Intelligence editorial staffing has been consistent, with the same two editors since the survey's inception in 1963.[8] The newsletters included in the survey do change over time, with continual additions and deletions. Newsletters enter the survey only after they have been in print for a period of months. Fisher and Statman (2000) conclude that the II survey provides a measure of investor sentiment distinct from the AAII survey. Investors Intelligence releases its survey results each Thursday. Historical data is available by subscription from 01/04/1963. The II survey data comes directly from Investor Intelligence.

The analysis uses a bull-bear spread for both the AAII and II surveys, calculated as the difference between the reported measure of bullish and bearish sentiment. The AAII and II surveys report bullish sentiment, bearish sentiment and neutral/correction sentiment as a percentage of the total survey results. An example illustrates the bull-bear calculation. For instance, on 24 July 1987, the AAII survey results show bull, bear, and neutral investor sentiment at 36, 14, and 50 percent. The bull-bear spread for that period is therefore 22 percent, calculated as 36 minus 14 percent. Alternatively, one could calculate a bull/bear ratio. However, the financial media widely report on bull-bear spreads. For instance, The Wall Street Journal and Barron's report weekly bull-bear spreads for both the AAII and II surveys. Other studies, such as Fisher and Statman (2000) and Brown and Cliff (2005), similarly use the bull-bear spread, also citing its popularity with practitioners. As such, the analysis adopts the bull-bear spread as the preferable measure. Results are, however, robust to the use of either bull-bear spreads or bull/bear ratios.

The Baker and Wurgler (2006) index is the indirect investor sentiment measure. They construct the sentiment index as the first principal component of six common investor sentiment proxies described in the literature. The six proxies are [1] closed end fund discounts; [2] NYSE share turnover; [3] the number of initial public offerings (IPO); [4] first day average IPO returns; [5] the percentage of equity in capital budgets; [6] and the return premium between dividend-paying and dividend-non-paying firms. The Baker and Wurgler (2006) index is available at a monthly frequency from July 1965 to December 2007. To match AAII and II survey frequencies, the study constructs a weekly index (BW) from the Baker and Wurgler (2006) monthly index. Each week during a month assumes the month-end value of the Baker and Wurgler (2006) index. As such, the analysis assumes that the month-

[8] http://www.investorsintelligence.com/x/us_advisors_sentiment.html

end sentiment prevails throughout the month. The Baker and Wurgler (2006) sentiment index comes from Jeffrey Wurgler's website.[9]

Baker and Wurgler (2006) construct a level sentiment index and a change index. The change index consists of the first principal component of changes in each individual proxy. The level-index series contains an explosive unit root, which consequently invalidates the economic and statistical inferences of predictive regressions.[10] The analysis uses the Baker and Wurgler (2006) change index, which has no unit root and thus allows reliable estimations.

Figure 1 provides a graphical comparison of the AAII, II, and BW investor sentiment measures. To facilitate comparison, the figure uses a six-month moving average of normalized sentiment measures. Shaded areas denote National Bureau of Economic Research (NBER) periods of economic recession. All three measures indicate periodic sentiment spikes. The BW sentiment index particularly spikes during the technology industry boom, reflecting the inclusion of IPO returns and IPO issuance as components of that index. While different, the AAII and II sentiment measures do visually move closely together, particularly subsequent to the 2001 recession. The sentiment of small investors, measured by AAII, if anything, lags behind the sentiment of newsletter writers, measured by II.

2.2. Market Data

Market index data comes from multiple sources. All Centre for Research in Security Prices (CRSP) stock market data comes from the Kenneth French website.[11] The CRSP market data comprises all NYSE, AMEX, and NASDAQ listed stocks. The Standard & Poor's 500 index data comes from Global Financial Data and Data Stream.[12] The small stock index represents the bottom NYSE breakpoint capitalization decile of all stocks in the CRSP database. The growth stock index represents the bottom NYSE breakpoint book-to-market ratio (BE/ME) decile of all stocks in the CRSP database. Prior research, by Baker and Wurgler (2006) and Kumar and Lee (2006), concludes that investor sentiment particularly affects the valuation of small-cap stocks. As such, the analysis examines both value- and equal-weighted indices. The

[9] http://pages.stern.nyu.edu/~jwurgler/
[10] See, for example, Campbell and Yogo (2006).
[11] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html
[12] https://www.globalfinancialdata.com/platform/Welcome.aspx

one-month Treasury bill, from Ibbotson Associates and downloaded from the Kenneth French website, serves as a proxy for the risk free rate. The common period of data availability for the AAII, II, and BW sentiment measures determines the sample period from 24/07/1987 to 28/12/2007.

2.3 Industry Data

The main analysis investigates the effect of investor sentiment on industry returns using the Fama and French 49 industry portfolios.[13] The Fama and French industry classification maps all NYSE, AMEX, and NASDAQ stocks to one of 49 industry portfolios, using the Standard Industrial Classification (SIC).[14] Prior investor sentiment studies, notably Kumar (2009) and Choi and Sias (2009), similarly use the Fama and French classification. The analysis focuses on the equal-weighted industry returns. Baker and Wurgler (2006) argue that, "large firms will be less affected by sentiment, and hence value weighting will obscure the more relevant patterns." The earlier analysis also confirms investor sentiment has a greater effect on equal-weighted indices. Unfortunately, the Fama and French industry portfolios are only available at daily and monthly frequencies. Analysis using daily data is inappropriate as it is noisy and, most importantly, because daily data does not match the weekly frequency of AAII and II investor sentiment data. Fortunately, a resolution to those issues simply requires constructing weekly returns by compounding daily returns over each weekly period. The resultant weekly industry return series have 1224 observations that start on 24/07/1987 and end on 28/12/2007.

Table 1 provides descriptive statistics for the Fama and French 49 industries. The second column reports the average number of industry constituent firms. The number of industry firms is important for two reasons. First, idiosyncratic risk may dominate the returns of industry portfolios with a small number of firms. For instance, the tobacco, soft drink, and coal industries contain fewer than 10 firms each. As such, the observed effect of sentiment on those industries may reflect fundamental news affecting firm values. Additionally, the number of firms indicates the level of industry competition. Hoberg & Phillips (2010) theorize that firms in highly competitive industries are more prone to cash flow uncertainty than non-competitive industries. The table also reports a single-index market beta to measure industry exposure to market risk. Size is the average market capitalization in millions of U.S. dollars for industry constituent firms. The table also reports annualized industry returns,

[13] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html
[14] See http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html for more information.

standard deviations, and average industry book-to-market equity (BE/ME) valuations as a growth proxy. Small stocks and growth stocks are especially subject to investor sentiment (Baker and Wurgler (2006)). The final three columns report industry return correlations with the AAII, II, and BW investor sentiment measures. The bottom row reports average statistics across all industries.

Investor sentiment correlations with industry returns vary widely. Similar to the market, average industry correlations with the AAII sentiment measure (0.14) are the highest and BW sentiment measure (0.07) the lowest. Generally, it appears that returns for competitive industries – those with a large number of firms – have higher investor sentiment correlations than non-competitive industries. For instance, the business services industry, with 280 firms, has the highest AAII sentiment correlation (0.19). In contrast, the tobacco industry, with five firms, has the lowest AAII sentiment correlation (0.06). Additionally, industries characterized by many small-cap firms, such as business services (0.19), wholesale (0.19), and lab equipment (0.18), have the highest AAII sentiment correlations. Conversely, industries characterized by a few large-cap firms have the lowest sentiment correlations. No obvious pattern appears between sentiment correlations and industry standard deviations, betas, and valuation ratios.

3. Empirical Analysis

3.1. Market and Sentiment

This section verifies that investor sentiment predicts market returns, as prior empirical research documents. Taken together, the empirical evidence provides convincing evidence that investor sentiment predicts market returns.

$$R_{i,t} = a_0 + a_1 Sent_{s,t-k} + e_{i,t} \qquad \text{(Eq. 1)}$$

Table 2 reports the a_1 coefficients from Equation 1. The equation runs a regression of excess market returns (R_i) on a constant and each investor sentiment measure ($Sent_i$) for different *k*-week lags. The a_1 coefficients measure investor sentiment predictability of excess market returns. Based on prior studies, the expectation is to observe positive short-term a_1 coefficients and negative long-term a_1 coefficients.

The results confirm investor sentiment predictability of market returns. The interpretation is that investor enthusiasm causes prices initially to overshoot, before a delayed price reversion

to fundamental value. All statistically significant a_1 coefficients, at a one-week lag, have the expected positive sign. The a_1 coefficients are more statistically and economically significant for the equal-weighted indices. The results are consistent with Baker and Wurgler (2006), among others, who document that investor sentiment has a more pronounced effect on small-cap stocks. The statistically significant a_1 coefficients at 8- to 52-week lags, with one exception, also have the expected negative sign. Here again, at long-term horizons, investor sentiment has greater predictability of equal-weighted returns. Interestingly, there is no statistically significant predictability at a lag of 26 weeks. Predictability is greatest at a lag of 52 weeks, mostly for the Baker and Wurgler (2006) index. Generally, however, the Investors Intelligence survey provides the greatest long-term return predictability and the AAII survey the least.

3.2. Basic Regressions

The analysis now examines whether investor sentiment systematically predicts industry returns. Additionally, the analysis further investigates cross-sectional differences in the effect of investor sentiment on industry performance. Equation 2 runs a regression of excess industry returns (R_i) on a constant, the sentiment measures ($Sent_s$) for the indicated k-week lag, and the market risk premium (R_m). The variable of interest in Equation 2 is the a_1 regression coefficient. Effectively, the a_0 and a_1 coefficients together represent a traditional Jensen's alpha.

$$R_{i,t} = a_0 + a_1 Sent_{s,t-k} + b_0 R_{m,t} + e_t \qquad \text{(Eq. 2)}$$

Table 3 reports the a_1 regression coefficient. At a casual glance, investor sentiment systematically predicts returns for a high percentage of industries. Based on market studies, the expectation is that initial investor overreaction causes short-term positive predictability. Significant and negative return predictability at longer horizons would indicate industry price reversion to fundamental value. The a_1 coefficients on all sentiment measures have the correct positive sign at a one-week lag, with one exception. The a_1 coefficients on AAII sentiment are, on average, the largest of all sentiment measures. The AAII sentiment measures are all statistically significant, with the exception of precious metals (gold). In contrast, the BW index has significant coefficients at a one-week lag for only about 60 percent of all industries.

Investor sentiment predictability provides mixed results at longer horizons. At an eight-week lag, there is a ratio of 2:3 positive to negative a_1 coefficients. Predictability drops substantially at 13- to 52-week horizons, along with the magnitude of a_1 coefficients. Most statistically significant a_1 coefficients have the expected negative sign at 13-week and 52-week horizons. As with the market, investor sentiment has the least significant predictability at a 26-week lag. Generally, the BW index provides the least predictability and the AAII measure the greatest, at all horizons.

The economic impact of sentiment on industries varies across measures, industries, and horizons. Economic significance is greatest for AAII sentiment and at one-week horizons. A one standard deviation change in the AAII survey, on average, results in 19 percent annualized industry returns. Comparably, the II and BW measures are 13 percent and 7 percent. Economic significance is greatest for shipping (0.28) and least for coal (-0.17) for the AAII and BW measures. Investor sentiment seemingly has the smallest economic effect on large-cap industries. Take, for instance, the economic impact of AAII sentiment on utilities (.05), banking (0.09), beer (0.11), and tobacco (0.12). There are notable exceptions, such as the large-cap drug industry (0.26), which question whether industry characteristics, such as capitalization, systematically attract investor sentiment. At longer horizons, the absolute value of economically significant predictability diminishes.

3.3. Sentiment and Industry Characteristics

Next, we take several approaches to investigate whether industries that share certain characteristics attract investor sentiment. The prior results indicate that the effect of investor sentiment is market wide, affecting the performance of most industries without distinction. Prior research also establishes that certain characteristics, which make objective valuations difficult, lead to speculative demand. In a similar way, industries grouped by certain characteristics are potentially more subject to mispricing than are others.

3.3.1. Industry Characteristics

The literature identifies greater speculative demand for stocks characterized as difficult to value and costly to arbitrage. In a similar spirit, the analysis identifies industry characteristics that potentially attract speculative demand due to valuation difficulties. Specifically, the industry characteristics investigated are [1] return momentum, [2] return volatility, [3] systematic market risk, [4] valuation ratios, [5] sales volatility, [6] capitalization, [7] number

of constituent firms, and [8] Herfindahl concentration measures. Industry characteristics data comes from a variety sources. Monthly data for industry firms, BE/ME ratios, and capitalization come from the Kenneth French website. Quarterly data for industry sales, book equity, and total assets come from Compustat. In order to match the frequency of investor sentiment measures, the analysis assumes that the monthly and quarterly reported data remain constant during the weeks included in each period. The following discussion motivates each industry characteristic.

Momentum provides a measure of speculative industry mispricing. The literature describes momentum as short-term return continuation, unexplained by traditional asset-pricing models. Moskowitz and Grinblatt (1999) argue that industry momentum largely explains stock-return momentum. Investor herding in popular industries potentially leads to predictable return momentum driven by investor sentiment. The analysis uses 12-week rolling windows to estimate industry momentum, which has an expected positive relationship with investor sentiment.

Industry standard deviations of returns and market betas provide two volatility measures. Barberis and Shleifer (2003), Peng and Xiong (2006), and Kumar (2009) argue that speculative demand in popular investment styles leads to more volatile returns. The analysis uses a 12-week rolling window estimation of industry standard deviations. A market beta estimated with a single-index model provides an additional measure of industry volatility, estimated over 26-week rolling windows. The expected relationship between investor sentiment and both industry standard deviations and market betas is positive.

Industry sales volatility and book-to-market valuation ratios (BE/ME) provide measures of industry growth potential. Baker and Wurgler (2006) argue that high-growth firms face greater speculative price pressure, due to valuation uncertainty. Sales volatility characterizes uncertain industry profitability, such as for technology stocks in the dot.com market. Baker and Wurgler (2006) document a positive relationship between investor sentiment and sales volatility. They also provide evidence that investor sentiment has a greater effect on growth firms as characterized by small BE/ME ratios. The expectation is to observe that investor sentiment has a positive relationship with sales volatility and a negative relationship with BE/ME ratios.

The structure of an industry further determines its level of competitiveness. Average firm capitalization and the average number of constituent firms define industry structure. Hoberg

and Phillips (2010) argue that industry structures determine cash flow volatility and analyst coverage. Peng and Xiong (2006) also discuss how a lack of analyst coverage in small-cap industries leads to informational inefficiencies. The analysis uses the natural log of industry market capitalization in millions of U.S. dollars. The number of constituent industry firms also proxies for industry competition, which is greater in industries characterized by a large number of small firms. The analysis uses the natural log of industry firms. The expectation is that investor sentiment has a negative relationship with industry capitalization and a positive relationship with the number of industry firms.

The Herfindahl index measures industry concentration, estimated as the sum of the squared market share for each firm in an industry. A lower Herfindahl score indicates greater industry competition. Hoberg and Phillips (2010) hypothesize that gathering information for competitive industries is costly. Consequently, investors rely on industry-specific rather than firm-specific information for valuations. The results reported in Hoberg and Phillips (2010) are robust to traditional risk corrections, leaving the possibility of a behavioral explanation linked to investor sentiment. Following Hou and Robinson (2006), the analysis uses three Herfindahl index measures, calculated as the sum of squared market share for industry sales, book equity and total assets. The expectation is for a negative relationship between Herfindahl concentration measures and investor sentiment.

3.3.2 Interaction between investor sentiment and industry characteristics

The analysis now investigates the relationship between industry returns and the interaction between investor sentiment and industry characteristics, estimated with Equation 3. The objective of this section is to evaluate whether investor sentiment has systematic effect on the returns of industries that share certain characteristics. As a point of difference, the focus of previous sections has been investor sentiment predictability of industry mispricing and long-term reversals. As such, the analysis now considers the contemporaneous relationship between industry characteristics and investor sentiment. The equation runs a regression of excess industry returns (R_i) on a constant, investor sentiment ($Sent_s$), industry characteristics ($Char_c$), an investor sentiment and industry characteristic interaction term ($Sent_s Char_c$), and the market-risk premium (R_m). All data is weekly and described in an earlier section. The variable of interest is the a_3 regression coefficient, reported in Table 4.

$$R_{i,t} = a_0 + a_1 Sent_{s,t} + a_2 Char_{c,t} + a_3 Sent_{s,t} Char_{c,t} + b_0 R_{m,t} + e_t \qquad \text{(Eq. 3)}$$

The results reported in Table 4 are inconclusive. Based on the literature, the expectation is for a positive investor interaction with industry standard deviation, momentum, beta, firms, and sales volatility characteristics. The expectation is for negative investor-sentiment interaction terms with size and the three Herfindahl competition measures. For instance, research shows that higher investor sentiment creates higher return volatility, which should result in a positive sentiment and standard deviation interaction term. Indeed, AAII and II sentiment indices have a significantly positive interaction with standard deviation for 23 and 20 industries. Industry firm numbers and capitalization also have the expected negative interaction with BW sentiment for 16 and 29 industries. Otherwise, statistical significance is not much more than expected by random chance, at 10 percent, or has the incorrect sign.

3.3.3 Regression of industry characteristics on investor sentiment

This section examines the interaction between investor sentiment and portfolios formed on decile sorts of industry characteristics. Similarly, Baker and Wurgler (2006) construct long-short portfolios to evaluate firm characteristics that are subject to investor speculation. Table 5 reports the a_1 regression coefficients from Equation 4. The interpretation of the a_1 coefficients is the sensitivity of industry characteristics to investor sentiment. The analysis first constructs portfolios long (short) in the five industries in the top (bottom) decile for each industry characterization ($r_c^l - r_c^s$). Equation 4 then runs a regression of the industry characteristic portfolios on a constant, the indicated investor sentiment measures ($Sent_s$), and the market-risk premium (R_m). The second column reports the expected sign of the a_1 regression coefficients. The table reports results for both bull and bear markets, in comparison with the full sample. Bull (bear) markets are periods that have a positive (negative) bull-bear sentiment spread, for each sentiment measure.

$$r_{c,t}^l - r_{c,t}^s = a_0 + a_1 Sent_{s,t} + b_0 R_{m,t} + e_t \qquad \text{(Eq. 4)}$$

Table 5 reports mixed results. The a_1 coefficients have the correct sign approximately 56 percent of the time, for all measures and sample periods. However, the number of statistically significant coefficients with the correct sign drops dramatically to around 20 percent. For instance, industry capitalization and valuation (BE/ME) characteristics consistently have the correct sign, but mostly lack statistical significance. Overall, the BW index has the highest number of statistically significant a_1 coefficients with the correct sign, especially during periods of bearish sentiment. The results for AAII sentiment are overall the weakest.

Generally, while the analysis indicates a link between industry characteristics and investor sentiment, the correlation is only weak, at best.

3.4. Investor Sentiment Strategy Returns

Does investor sentiment provide the opportunity for profitable industry rotation? Barberis and Shleifer (2003) and Peng and Xiong (2006) provide the theoretical basis for a style-rotation model. The Barberis and Shleifer (2003) and Peng and Xiong (2006) models theorize that profitable trading strategies result from shifts in investor style preferences, including industry styles. For robustness, the analysis investigates sentiment rotation strategies for different holding periods, risk corrections, and sub-periods.

Table 6 reports returns for a strategy that rotates industry allocations based on their time-variant sentiment alphas. First, Equation 2 estimates industry a_1 regression coefficients, estimated over 26-week and 52-week rolling windows. After allowing for the initial 26-week and 52-week alpha estimations, the first strategy holding periods start on 15/01/1988 and 18/07/1988. The interpretation of the a_1 coefficients is the portion of industry excess returns, or alpha performance, attributable to time-variant investor sentiment. Next, the analysis constructs self-financing strategy portfolios (r^l-r^s), which are long (short) in the 15 of 49 industries with the lowest (highest) a_1 regression coefficients. The table then evaluates strategy performance over different holding periods from four to 52 weeks. The strategy performance evaluation largely follows Moskowitz and Grinblatt (1999) and Brown and Cliff (2005). Those studies similarly construct and evaluate self-financing portfolios to evaluate strategy performance over different holding periods. Panel A and Panel B report strategy returns for portfolios formed on industry sentiment alphas, estimated over 26-week and 52-week rolling windows, for the indicated holding periods.[15] Table 6 reports annualized Jensen's alphas (α_J), Fama and French alphas (α_F), and Carhart alphas (α_C), estimated with Equations 5 – 7 to measure risk-adjusted strategy performance.

$$r_{i,t}^{l} - r_{i,t}^{s} = \alpha_J + b_1 R_{m,t} + e_t \qquad \text{(Eq. 5)}$$

$$r_{i,t}^{l} - r_{i,t}^{s} = \alpha_F + b_1 R_{m,t} + b_2 SMB_t + b_3 HML_t + e_t \qquad \text{(Eq. 6)}$$

[15] The study reports strategy results for non-overlapping holding periods. Unreported analysis also evaluates strategy returns with overlapping holding periods, similar to Brown and Cliff (2005). The use of overlapping periods results in overestimated statistical significance, which requires correcting t-statistics following the methodology of Valkanov (2003). Results for overlapping regressions are quantitatively similar to non-overlapping regressions.

$$r_{it}^{L} - r_{it}^{S} = \alpha_i + b_1 R_{mt} + b_2 SMB_t + b_3 HML_t + b_4 UMD_t + \epsilon \quad \text{(Eq. 7)}$$

Strategy performance varies substantially across all dimensions: portfolio formation, sentiment measures, and risk adjustment. As such, the expectation is to observe positive strategy returns for portfolios long (short) in industries with low (high) investor sentiment alphas. Portfolios formed on 26-week alpha estimations, as Panel A reports, show the least significant return performance. Overall, BW sentiment portfolios have the highest statistical and economic significance. Portfolios formed on AAII sentiment have positively significant Jensen's alphas at longer horizons of 13–26 weeks. However, statistical significance dissipates for AAII sentiment after three-factor and four-factor risk corrections. Results for portfolios formed on 52-week alpha forecasts have the greatest overall statistical significance. However, with 52-week estimations, while II portfolio performance is now stronger, AAII portfolio performance is weaker. Interestingly, II portfolio performance is significantly negative, for all holding periods. Negative strategy performance indicates continued momentum for high-alpha industries, which the strategy portfolios hold short.

Table 6 reports strategy performance before an allowance for transaction costs. Thus, inclusion of transaction costs would partially explain portfolio return performance. An industry rotation strategy based on investor sentiment would have extremely high turnover and related transaction costs. For instance, portfolios formed on 52-week alphas and updated every four weeks turn over approximately four times per annum. Round-trip transaction costs would amount to a minimum 4 percent a year, assuming modest transaction costs of 1 percent per turnover over the full sample. Of course, transaction costs decrease with an increase in holding periods. Portfolios held for 52 weeks, for instance, turn over on average once a year.

4. Robustness

4.1. Bullish and Bearish Sentiment

This section investigates whether there are differences in industry return predictability when investor sentiment is bullish or bearish. Differences may occur due to investor preferences or market frictions. Conventional wisdom holds that certain industries perform best during bull (bear) markets, characterized by high (low) investor sentiment. For instance, *CNN Money* reports that finance and technology shares are good bets as market sentiment ebbs in the later stage of a bull market.[16] On the other hand, bearish sentiment favors the energy, health-care,

[16] http://money.cnn.com/2011/03/04/markets/bull_market_sector_rotation/index.htm

and tech industries.[17] Additionally, short-sale limitations restrict the ability of arbitrage investors to correct inflated values when the market is bullish (Gromb and Vayanos (2010)). Conversely, arbitrage investors face no restrictions taking the opposite side of deflated values during bear markets. The expectation is to observe greater investor predictability during periods of bullish sentiment than periods of bearish sentiment.

Industry exposure to sentiment thus potentially relates to cyclical bullish and bearish investor sentiments, which Equation 8 investigates.

$$R_{i,t} = a_0 + a_2 Sent_{s,t-k} * Bull_{s,t-k} + a_3 Sent_{s,t-k} * Bear_{s,t-k} + b_0 R_{m,t} + e_t \qquad \text{(Eq. 8)}$$

The equation runs a regression of excess industry returns (R_i) on a constant, investor sentiment ($Sent_s$) delineated by *Bull* and *Bear* dummy variables for the indicated *k*-week lags, and the market risk premium (R_m). The analysis defines bullish (bearish) sentiment for the AAII and II measures by a positive (negative) bull-bear spread. Brown and Cliff (2005) similarly delineate bull and bear markets. Positive (negative) BW index values define periods of bullish (bearish) sentiment. The *bull* dummy variables take a value of one during periods of bullish sentiment and zero otherwise. The AAII has 739 weeks of bullish sentiment and 328 weeks of bearish sentiment. The BW index, by construction, has roughly equal periods of bullish and bearish sentiment.

The results document three distinctions between investor sentiment predictability for bull and bear markets. First, statistically significant and positive predictability increases with bullish sentiment at an eight-week lag. AAII sentiment significantly predicts positive returns for 33 industries during bull markets, compared with AAII predictability of 11 industries for the full sample. Economic significance for all measures also increases at an eight-week lag. Conversely, significant predictability diminishes at long horizons. An interpretation is that bullish sentiment, particularly of small investors, causes short-term momentum and reversals. Secondly, positive predictability decreases at short horizons with bearish sentiment. The II survey now predicts positive returns for 22 industries at a one-week horizon and one industry at an eight-week horizon. At long horizons, negative predictability increases, compared with the full sample and bullish sentiment. The BW index now negatively predicts the returns of 31 and 23 industries at 8-week and 52-week lags, comparing with BW index predictability of twelve and five industries at similar horizons over the full sample. The evidence here

[17] http://blogs.forbes.com/investor/2011/05/26/investors-favor-energy-health-care-and-tech/

suggests that investor sentiment results in greater price reversals when sentiment is bearish. Lastly, there is no clear difference in the effect of investor sentiment on cyclical and non-cyclical industries across periods of bullish and bearish sentiment.

Furthermore, in the spirit of an event study, the analysis investigates industry response to the release of extreme investor sentiment news. Nofsinger and Sias (1999) and Lemmon and Portniaguina (2006) document that institutional and retail investor herding leads to mispricing. Moreover, extreme investor sentiment potentially captures a greater degree of investor herding. As such, extreme investor sentiment is more likely to have an observable and immediate effect on industry performance. Bullish or bearish sentiment that is one standard deviation above average defines extreme. There are roughly 200 weeks each with extreme bullish and bearish sentiment, for both the AAII and II measures. Interestingly, the correlation between extreme AAII and II bullish sentiment is relatively low at 35 percent, and lower yet for bearish sentiment at -17 percent. The analysis uses daily industry returns over the sample period 24/07/1987 to 28/12/2007, with data from the Kenneth French website.

Equation 9 estimates industry response to bullish or bearish sentiment, with a regression of excess industry returns (R_i) on a constant daily dummy variables (*dayN*), and the market-risk premium (R_m). For bullish sentiment, the *day0* dummy variables equals one on Thursday survey release days, when bull sentiment exceeds one standard deviation above average, and zero otherwise. The *day1* and *day2* dummy variables take the value of one on the first and second days subsequent to the release of extreme bullish sentiment and zero otherwise. Construction of the bearish sentiment dummy variables is similar. The analysis is limited to the AAII and II sentiment measures, which have weekly release dates whereas Baker and Wurgler (2006) construct their sentiment index from historical data and do not provide regular updates.

$$R_{i,t} = a_0 + AR_0 day0_t + AR_1 day1_t + AR_2 day2_t + b_0 R_{m,t} + e_t \qquad \text{(Eq. 9)}$$

Industry response to the announcement of extreme bullish and bearish sentiment is mostly significant with the correct sign. The results show significant and positive *day0* and *day1* industry performance following the release of extreme AAII and II bullish sentiment measures. For instance, there are 29 and 43 industries with significant *day0* and *day1* performance following extreme AAII bullish sentiment. The average AAII *day1* response (.0018) shows slightly greater economic significance than *day0* (.0011). Results for II

sentiment are comparable with AAII sentiment. Notably, there is only weak evidence of statistically significant *day2* reversals, for either measure. More interestingly, the results document an opposite effect following the release of extremely bearish sentiment, except with a two-day delay. There is only negligible evidence of *day0* or *day1* excess industry returns in response to extreme bearish sentiment announcements. However, there is a highly significant and negative *day2* industry response for both measures. There are 41 and 40 industries with significantly negative *day2* returns following the release of extreme bearish AAII and II sentiment, averaging -.0022 and -.0024 for each measure. The results indicate investors respond more quickly to extreme bullish sentiment than to bearish sentiment. Such results align with Hong, Lim, and Stein (2000), who similarly document that investors process bad news more slowly than good news.

Generally, the immediate effect of extreme investor sentiment on industry performance is significant and widespread. Here again, the effect of sentiment appears to be market wide rather than industry specific. Investor response to extreme bullish and bearish sentiment suggests that investors believe that sentiment projects a continuation of prevailing market direction. This belief runs counter to prior market studies, including the industry analysis, which shows that initial investor sentiment-driven mispricing leads to predictable price reversals. To that end, excess returns following the announcement of extreme bullish and bear sentiment appear to reflect an element of rational industry performance expectations.

4.2. Fama-McBeth Regressions

Fama and MacBeth (1973) regression analysis provides a further test of the interaction between investor sentiment and industry characteristics. First, Equation 10 runs a regression of excess industry returns (R_i) on a constant, investor sentiment ($Sent_s$), industry characteristics ($Char_c$), the interaction of investor sentiment with industry characteristics ($Sent_s Char_c$), and the market-risk premium (R_m). Equation 11 then estimates cross-sectional γ_i coefficients for each time period. The variable of interest is the γ_3 coefficient.

$$R_{i,t} = a_0 + a_1 Sent_{s,t} + a_2 Char_{c,t} + a_3 Sent_{s,t} * Char_{c,t} + b_0 R_{m,t} + e_t \quad \text{(Eq. 10)}$$

$$R_i = \gamma_0 + \gamma_1 a_{1,i} + \gamma_2 a_{2,i} + \gamma_3 a_{3,i} + \gamma_4 b_{0,i} + e_i \quad \text{(Eq. 11)}$$

$$\bar{\gamma}_3 = \frac{1}{T}\sum_{t=1}^{T} \gamma_3 \quad \text{(Eq. 12)}$$

$$t = \frac{\bar{\gamma}_3}{\sigma(\gamma_3)/\sqrt{T}} \qquad \text{(Eq. 13)}$$

The Fama and MacBeth (1973) results corroborate the earlier findings. The results document only limited evidence of industry characteristics that systematically attract investor sentiment-driven mispricing. Only 23 percent of the Fama and MacBeth (1973) γ_3 coefficients are statistically significant and have the correct sign. Now, however, BW results show the weakest statistical significance, while AAII sentiment shows the strongest. In further contrast, results are now stronger during periods of bullish sentiment when estimated with the Fama and MacBeth (1973) regressions. Overall, the relationship between investor sentiment and industry characteristics lacks robustness across sentiment measures, samples periods, and estimations.

4.3. Other Issues

Control for Conditional Time-Variant Market Risk Premium

The possibility exists that investor sentiment captures time-variant differences in the expected market-risk premium. For instance, rational investors may require less compensation for market risk when sentiment is high and more when sentiment is low. As such, the industry return predictability previously documented may serve as a proxy for a market-risk premium, conditioned by prevailing investor general market sentiment.

Equation 14 runs a regression of excess industry returns (R_i) on a constant, investor sentiment at different *k*-week lags ($Sent_{t-k}$), the market-risk premium (R_m), and an interaction term between the market-risk premium and investor sentiment ($R_m Sent_{t-k}$). The interaction term effectively controls for the market-risk premium conditional on investor sentiment, following the methodology of Baker and Wurgler (2006, pg. 1673). Collectively, the a_0 and a_1 coefficient represent a decomposed Jensen's alpha, modified with a conditional risk premium.

$$R_{it} = a_0 + a_1 Sent_{t-k} + b_0 R_{mt} + b_1 R_{mt} Sent_{t-k} + e_t \qquad \text{(Eq. 14)}$$

After correcting for conditional market risk, if anything, predictability strengthens. Thus, the effect of investor sentiment on industry return predictability appears unrelated to a conditional market-risk premium.

Sub-period comparison

The effect of investor sentiment on industry performance potentially varies across different sub-periods. Brown and Cliff (2005), for instance, show that the effect of investor sentiment on the market was greater prior to 1990, and that the effect of sentiment on returns has declined due to a greater dissemination of investor sentiment measures. Thus, for robustness, the analysis examines two equal sub-periods, from 24/07/87 to 03/10/1997 and from 10/10/1997 to 28/12/2007.

The study's general results remain largely unchanged for the two sub-periods. Investor sentiment systematically predicts returns for most industries at a one-week lag. AAII sentiment remains the best predictor of industry returns at a one-week horizon, followed by II, and then the BW sentiment measure. Again, predictability quickly diminishes for all measures, at longer horizons, especially at 26 and 52 weeks. For those horizons, statistical significance occurs only slightly more than expected by random chance, in the absence of true return predictability. Overall, the biggest change is substantially greater short-horizon and long-horizon predictability for BW sentiment during the earlier sub-period. Alternatively, AAII sentiment predictability is slightly more significant in more recent years, for all horizons, which runs contrary to the findings of Brown and Cliff (2005) for the market.

Control for risk factors

The analysis controls industry returns for well-known risk factors using the Fama and French (1993) three-factor and Carhart (1997) four-factor risk-correction models. The three-factor model includes corrections for a size factor (*SMB*) and a growth factor (*HML*), in addition to the market. Additionally, the four-factor model includes a momentum factor (*UMD*). The *SMB*, *HML*, and *UMD* risk factors come from the Kenneth French website, where complete details are available on the construction of these risk factors.

The results provide evidence that well-known risk factors at least partially explain investor sentiment predictability, at both short horizons and long horizons. For instance, at a one-week horizon, statistically significant and positive AAII predictability drops from 48 to 34 for industries after a three-factor risk correction. The results are more striking for AAII positive predictability at a one-week lag for periods of bearish sentiment. Significant and positive predictability drops from 20 to five industries after a four-factor risk correction. More interestingly, the economic significance of investor sentiment predictability drops noticeably.

For instance, AAII sentiment has an average a_1 regression coefficient of 0.017 for industry returns corrected for the market at a one-week lag. In comparison, the average a_1 regression coefficient for AAII sentiment is 0.006 for industry returns corrected with a four-factor model at a one-week lag. The statistical significance of risk-adjusted return predictability increases at longer horizons, especially for II sentiment and during periods of bullish sentiment. For instance, II sentiment significantly predicts four-factor adjusted returns for 24 industries at a 52-week lag with bullish sentiment. That directly compares with the predictability of market-adjusted returns for eight industries. The absolute economic value of significant and negative predictability also increases for risk-adjusted returns at longer horizons. While short-term positive predictability decreases somewhat, the results for negative long-term reversals strengthen after three-factor and four-factor risk corrections. Consequently, the predictability of industry returns actually strengthens after correcting for well-known sources, particularly bullish II sentiment at all horizons.

Alternative industry portfolios

The choice of industrial classification scheme can determine the outcomes of empirical research (Bhojraj, Lee, and Oler (2003)). Additionally, the returns of industry portfolios comprising a few firms or a few dominant firms may merely represent idiosyncratic risk. The results may therefore misestimate the effect of investor sentiment predictability on industry values. For additional robustness, the analysis compares results for the Fama and French industries with results for alternative sector and industry groups. Specifically, the analysis maps the Fama and French 49 industry portfolios to the Kacperczyk, Sialm, and Zheng (2005) and GICS sector and industry classifications. Kacperczyk, Sialm, and Zheng (2005) map the Fama and French 48 industry portfolios to one of 10 sector portfolios. Additionally, the analysis maps the extra software industry included in the Fama and French 49 industry classification to the Kacperczyk, Sialm, and Zheng (2005) business equipment and services sector. The analysis also uses the GICS 10 sector and 24 industry mappings. Results for investor sentiment predictability of alternative industry returns remain fundamentally unaltered from the previous analysis.

5. Conclusion

This study examines the interaction between investor sentiment and industry performance. As no universally accepted measure exists, the study examines return predictability using three

popular investor sentiment measures. These measures are from the American Association of Independent Investors, Investors Intelligence and Baker and Wurgler (2006). First, the results confirm that investor sentiment positively predicts short-term and negatively predicts long-term market returns. The results also confirm that equal-weighted indices, in which small-cap stocks have a greater weight, are more susceptible to investor sentiment. Next, the results document widespread investor sentiment predictability of industry performance. At a one-week horizon, investor sentiment positively predicts performance for most industries. As expected, at long horizons, investor sentiment predicts negative industry performance. Interestingly, predictable performance differs between bull and bear markets, with greater predictability of reversals during bear markets. Additionally, in contrast to previous market studies, there is no evidence that industry-wide characteristics, which act as a proxy for valuation uncertainty, attract investor sentiment. Lastly, the study evaluates the practical application of an industry rotation strategy using investor sentiment. The strategy holds self-financing portfolios that are long (short) industries with the least (greatest) exposure to time-variant investor sentiment. Strategy performance ranges from 3 to 6 percent for different holding periods, which turnover and transaction costs would quickly dissipate.

Overall, the study provides limited evidence of cross-sectional differences in investor sentiment predictability of industry performance and questions the practical application of investor sentiment in industry allocations. Better understanding how investor sentiment drives industry performance would require industry-specific measures of investor sentiment. For now, this remains a topic for further research.

References

Baca, S., B. Garbe, and R. Weiss, 2000, The rise of sector effects in major equity markets, *Financial Analysts Journal* 56, 34-40.

Baker, M. and J. Wurgler, 2006, Investor sentiment and the cross-section of stock returns, *The Journal of Finance* 61, 1645-1680.

Barber, B., T. Odean, and N. Zhu, 2009, Do retail trades move markets?, *Review of Financial Studies* 22, 151-186.

Barberis, N. and A. Shleifer, 2003, Style investing, *Journal of Financial Economics* 68, 161-199.

Bhojraj, S., C. Lee, and D. Oler, 2003, What's my line? A comparison of industry classification schemes for capital market research, *Journal of Accounting Research* 41, 745-774.

Black, F., 1986, Noise, *Journal of Finance* 41, 529-543.

Brambor, T., W. Clark, and M. Golder, 2006, Understanding interaction models: Improving empirical analyses, *Political Analysis* 14, 63.

Brown, G. and M. Cliff, 2004, Investor sentiment and the near-term stock market, *Journal of Empirical Finance* 11, 1-27.

Brown, G. and M. Cliff, 2005, Investor sentiment and asset valuation, *The Journal of Business* 78, 405-440.

Campbell, J. and M. Yogo, 2006, Efficient tests of stock return predictability, *Journal of Financial Economics* 81, 27-60.

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

Cavaglia, S., C. Brightman, and M. Aked, 2000, The increasing importance of industry factors, *Financial Analysts Journal* 56, 41-54.

Choi, N. and R. Sias, 2009, Institutional industry herding, *Journal of Financial Economics* 94, 469-491.

Edelen, R., A. Marcus, and H. Tehranian, 2010, Relative sentiment and stock returns, *Financial Analysts Journal* 66, 355-373.

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

Fama, E. and K. French, 2008, Dissecting anomalies, *The Journal of Finance* 63, 1653-1678.

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

Fisher, K. and M. Statman, 2000, Investor sentiment and stock returns, *Financial Analysts Journal* 56, 16-23.

Froot, K. and M. Teo, 2008, Style investing and institutional investors, *Journal of Financial and Quantitative Analysis* 43, 883-906.

Goyenko, R., C. Holden, and C. Trzcinka, 2009, Do liquidity measures measure liquidity?, *Journal of Financial Economics* 92, 153-181.

Gromb, D. and D. Vayanos, 2010, Limits of arbitrage, *Annual Review of Financial Economics* 2, 251-275.

Hoberg, G. and G. Phillips, 2010, Real and financial industry booms and busts, *The Journal of Finance* 65, 45-86.

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

Hou, K. and D. Robinson, 2006, Industry concentration and average stock returns, *The Journal of Finance* 61, 1927-1956.

Kacperczyk, M., C. Sialm, and L. Zheng 2005, On the industry concentration of actively managed equity mutual funds, *Journal of Finance* 60, 1983-2011.

Kumar, A., 2009, Dynamic style preferences of individual investors and stock returns, *Journal of Financial and Quantitative Analysis* 44, 607-640.

Kumar, A. and C. Lee, 2006, Retail investor sentiment and return comovements, *The Journal of Finance* 61, 2451-2486.

Moskowitz, T. and M. Grinblatt, 1999, Do industries explain momentum?, *Journal of Finance* 54, 1249.

Peng, L. and W. Xiong, 2006, Investor attention, overconfidence and category learning, *Journal of Financial Economics* 80, 563–602.

Phylaktis, K. and L. Xia, 2006, The changing roles of industry and country effects in the global equity markets, *The European Journal of Finance* 12, 627-648.

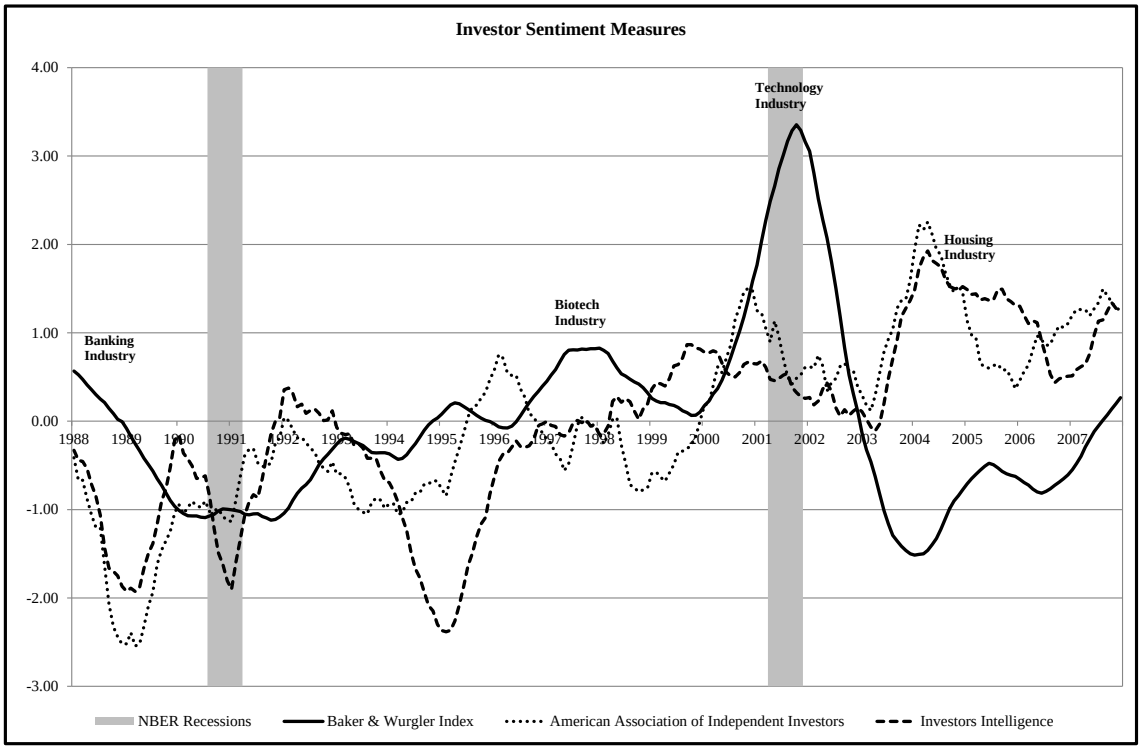
Qiu, L. and I. Welch, 2005, Investor sentiment measures, *NBER working paper*.

Schmeling, M., 2009, Investor sentiment and stock returns: Some international evidence, *Journal of Empirical Finance* 16, 394-408.

Valkanov, R., 2003, Long-horizon regressions: Theoretical results and applications, *Journal of Financial Economics* 68, 201-232.

White, H., 1980, A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity, *Econometrica* 48, 817-838.

Figure 1. Investor sentiment cycles



Notes: Figure 1 illustrates investor sentiment cycles for the American Association of Independent Investors (AAII), Investors Intelligence (II), and Baker & Wurgler sentiment measures. The shaded areas indicate NBER defined periods of economic recession. The figure also indicates peaks in industry valuation cycles.

Table 1. Industry descriptive statistics

Industry	Firms	Mean	Stdev	$Beta_{Mkt}$	Size	B/M	$\rho_{i,AAII}$	$\rho_{i,II}$	$\rho_{i,BW}$
Agric	16	0.221	0.246	0.76	1,255	0.37	0.12	0.11	0.04
Food	85	0.197	0.137	0.59	2,508	0.37	0.13	0.12	0.06
Soda	8	0.159	0.240	0.65	1,914	0.65	0.10	0.05	0.05
Beer	15	0.190	0.166	0.51	12,677	0.19	0.11	0.09	0.04
Smoke	5	0.203	0.297	0.63	17,376	0.40	0.06	0.03	-0.03
Toys	45	0.212	0.222	0.83	448	0.39	0.17	0.12	0.11
Fun	81	0.229	0.229	0.97	1,423	0.54	0.18	0.13	0.10
Books	49	0.143	0.211	0.89	1,641	0.44	0.15	0.10	0.11
Hshld	89	0.190	0.195	0.86	2,947	0.30	0.16	0.16	0.09
Clths	73	0.204	0.215	0.90	709	0.41	0.15	0.17	0.11
Hlth	103	0.278	0.203	0.82	678	0.42	0.16	0.10	0.07
MedEq	173	0.292	0.201	0.84	860	0.27	0.18	0.11	0.10
Drugs	261	0.268	0.264	1.07	2,675	0.21	0.16	0.10	0.08
Chems	86	0.195	0.208	0.95	2,253	0.45	0.15	0.10	0.06
Rubbr	49	0.234	0.208	0.78	468	0.45	0.18	0.11	0.08
Txtls	30	0.113	0.237	0.86	584	0.74	0.13	0.11	0.09
BldMt	92	0.248	0.222	0.80	937	0.49	0.15	0.08	0.07
Cnstr	63	0.210	0.274	1.10	789	0.57	0.14	0.17	0.07
Steel	68	0.168	0.267	1.17	1,146	0.72	0.15	0.13	0.08
FabPr	22	0.186	0.257	0.96	195	0.64	0.13	0.07	0.07
Mach	174	0.230	0.218	1.04	1,245	0.45	0.16	0.12	0.08
ElcEq	79	0.282	0.213	0.94	1,637	0.36	0.19	0.07	0.13
Autos	66	0.160	0.254	1.10	1,745	1.02	0.16	0.13	0.10
Aero	23	0.235	0.221	0.87	5,328	0.48	0.17	0.15	0.09
Ships	10	0.126	0.274	0.91	1,573	0.53	0.14	0.13	0.04
Guns	10	0.213	0.240	0.64	2,587	0.50	0.14	0.09	0.00
Gold	22	0.320	0.428	0.45	1,291	0.35	0.04	0.07	-0.03
Mines	18	0.261	0.280	0.93	1,397	0.51	0.11	0.09	0.05
Coal	7	0.133	0.405	1.22	1,650	0.78	0.09	0.08	-0.06
Oil	182	0.280	0.266	0.96	3,686	0.55	0.15	0.08	-0.01
Util	153	0.124	0.135	0.53	2,756	0.94	0.10	0.06	0.00
Telcm	129	0.188	0.253	1.12	4,473	0.62	0.13	0.07	0.13
PerSv	58	0.237	0.206	0.86	633	0.43	0.16	0.12	0.10
BusSv	280	0.264	0.192	0.91	707	0.33	0.19	0.12	0.13
Hardw	158	0.258	0.275	1.18	3,201	0.36	0.14	0.06	0.13
Softw	337	0.290	0.261	1.12	1,575	0.20	0.15	0.07	0.14
Chips	292	0.283	0.274	1.21	1,525	0.37	0.15	0.08	0.12
LabEq	116	0.343	0.226	1.02	603	0.40	0.18	0.07	0.12
Paper	65	0.142	0.214	0.95	2,256	0.51	0.12	0.10	0.05
Boxes	14	0.151	0.234	0.93	1,402	0.49	0.11	0.05	0.06
Trans	110	0.193	0.209	0.95	1,477	0.75	0.15	0.12	0.08
Whlsl	203	0.246	0.187	0.87	668	0.47	0.19	0.15	0.12
Rtail	264	0.201	0.216	1.01	2,405	0.34	0.13	0.13	0.08
Meals	99	0.239	0.192	0.81	1,059	0.35	0.16	0.16	0.09
Banks	552	0.215	0.150	0.62	1,516	0.59	0.14	0.10	0.04
Insur	190	0.199	0.176	0.81	2,872	0.67	0.12	0.11	0.04
RlEst	36	0.218	0.223	0.77	399	0.62	0.15	0.14	0.10
Fin	320	0.256	0.176	0.82	1,677	0.54	0.14	0.11	0.10
Other	73	0.235	0.191	0.76	4,372	0.37	0.20	0.13	0.11
Average		0.218	0.230	0.88	2,269	0.49	0.14	0.10	0.07

Notes: Table 1 reports industry descriptive statistics for the weekly Fama and French 49 equal-weight industry portfolio returns from 24/07/1987 to 28/12/2007. The descriptive statistics include the average number of industry firms, annualized means, annualized standard deviations, single-index market betas, average industry firm market capitalization (millions USD), and average industry book-to-market valuation ratios. The last three columns report cross-correlations ($\rho_{i,s}$) between industry returns and the American Association of Independent Investors (AAII), Investors Intelligence (II), and Baker and Wurgler (BW) investor sentiment measures. The bottom row reports averages for all industries.

Table 2. Investor sentiment predictability of index returns

		Sample period 24/07/1987 - 28/12/2007				
Sentiment	**Market Indices**	**Lag 01**	**Lag 08**	**Lag 13**	**Lag 26**	**Lag 52**
AAII	CRSP value-weighted index	**0.009**	0.001	0.001	0.000	-0.002
	CRSP equal-weighted index	**0.024**	0.002	-0.001	-0.001	-0.004
	S&P 500 value-weighted index	0.006	0.000	0.002	0.000	-0.001
	S&P 500 equal-weighted index	**0.012**	0.001	0.001	-0.002	0.000
	Small stock equal-weighted index	**0.027**	**0.006**	-0.002	-0.002	-0.004
	Growth stock equal-weighted index	**0.013**	-0.002	-0.006	0.000	**-0.008**
II	CRSP value-weighted index	0.004	**-0.010**	**-0.008**	-0.002	-0.006
	CRSP equal-weighted index	**0.018**	**-0.009**	**-0.009**	-0.002	**-0.007**
	S&P 500 value-weighted index	0.002	**-0.009**	**-0.007**	-0.003	-0.006
	S&P 500 equal-weighted index	0.008	-0.006	-0.005	-0.002	-0.002
	Small stock equal-weighted index	**0.024**	-0.006	**-0.008**	0.002	-0.005
	Growth stock equal-weighted index	0.008	**-0.013**	**-0.011**	0.000	**-0.011**
BW	CRSP value-weighted index	0.001	-0.001	0.000	0.001	**-0.001**
	CRSP equal-weighted index	**0.002**	**-0.002**	0.000	0.001	**-0.002**
	S&P 500 value-weighted index	**0.001**	-0.001	0.000	0.001	-0.001
	S&P 500 equal-weighted index	**0.001**	-0.001	0.000	0.000	**-0.001**
	Small stock equal-weighted index	0.001	-0.001	0.000	0.001	**-0.002**
	Growth stock equal-weighted index	0.001	-0.001	0.001	0.001	**-0.003**

Notes: Table 2 reports the a_1 regression coefficients from Equation 1. Equation 1 estimates investor sentiment predictability of excess market returns at the indicated *k*-week lags over the sample period 24/07/1987 to 28/12/2007. The analysis uses the American Association of Independent Investors (AAII), Investors Intelligence (II), and Baker and Wurgler (BW) sentiment measures. The small-stock index is an equally weighted index of the bottom capitalization decile of all stocks in the CRSP database. The growth-stock index is an equally weighted index of the bottom book-to-market ratio (BE/ME) decile of all stocks in the CRSP database. Bold indicates 10 percent or greater statistical significance estimated with White (1980) standard errors.

Table 3. Investor sentiment predictability of industry returns

	1 week			8 week			13 week			26 week			52 week		
Industry	**AAII**	**II**	**BW**	**AAII**	**II**	**BW**	**AAII**	**II**	**BW**	**AAII**	**II**	**BW**	**AAII**	**II**	**BW**
Agric	**0.019**	**0.019**	0.000	**0.012**	0.007	0.000	0.000	0.002	-0.001	**0.008**	0.004	0.001	0.003	0.000	0.001
Food	**0.010**	**0.011**	0.001	0.002	-0.002	**-0.001**	0.000	-0.003	0.000	0.001	0.002	0.000	**-0.003**	-0.002	0.000
Soda	**0.013**	0.009	0.001	**0.009**	0.001	**-0.002**	0.006	0.003	0.000	-0.001	0.002	0.000	0.001	0.000	0.001
Beer	**0.011**	**0.011**	0.000	0.001	-0.001	0.000	0.002	0.004	**-0.001**	0.003	**0.008**	0.000	0.001	0.002	-0.001
Smoke	**0.011**	0.005	-0.002	-0.006	-0.012	-0.001	0.000	-0.008	0.000	0.004	-0.004	-0.002	0.004	0.000	0.000
Toys	**0.021**	**0.019**	**0.002**	0.003	-0.005	-0.001	-0.003	-0.004	0.000	0.000	-0.002	0.000	**-0.008**	**-0.008**	**-0.002**
Fun	**0.022**	**0.019**	**0.002**	0.003	-0.002	-0.001	0.002	-0.004	-0.001	0.002	0.000	0.000	0.001	0.002	**-0.001**
Books	**0.015**	**0.012**	**0.002**	0.001	**-0.005**	**-0.001**	-0.002	**-0.005**	0.000	**0.004**	0.003	0.000	-0.002	0.000	**-0.001**
Hshld	**0.019**	**0.019**	**0.001**	0.003	-0.001	-0.001	-0.003	-0.002	-0.001	-0.004	-0.001	0.000	-0.002	-0.001	0.000
Clths	**0.020**	**0.024**	**0.002**	0.000	0.001	**-0.002**	-0.003	-0.004	-0.001	-0.002	0.000	0.000	0.001	0.000	-0.001
Hlth	**0.016**	**0.015**	0.001	0.002	**-0.009**	-0.001	-0.003	**-0.010**	-0.001	-0.001	-0.001	0.000	**-0.007**	**-0.008**	0.000
MedEq	**0.020**	**0.015**	**0.002**	0.002	-0.006	0.000	**-0.006**	**-0.009**	**-0.001**	-0.001	-0.002	0.000	**-0.009**	**-0.010**	-0.001
Drugs	**0.024**	**0.018**	0.002	0.002	-0.003	0.000	**-0.010**	-0.003	-0.001	-0.001	0.003	0.001	**-0.015**	**-0.016**	-0.002
Chems	**0.013**	**0.012**	0.001	0.002	0.000	-0.001	0.003	0.002	0.000	-0.002	0.002	0.000	-0.003	0.003	0.000
Rubbr	**0.020**	**0.016**	**0.001**	0.000	-0.003	**-0.001**	-0.002	-0.003	0.000	-0.003	-0.001	0.000	-0.003	0.000	-0.001
Txtls	**0.018**	**0.016**	**0.002**	0.001	-0.004	-0.001	0.001	-0.007	-0.001	**-0.007**	-0.005	0.000	-0.005	0.000	-0.001
BldMt	**0.018**	**0.013**	**0.001**	0.004	0.002	-0.001	0.003	0.000	0.000	-0.002	0.000	0.000	-0.001	-0.001	0.000
Cnstr	**0.024**	**0.027**	0.001	0.002	-0.001	0.000	-0.003	-0.001	**-0.001**	-0.002	-0.002	0.000	-0.006	-0.005	-0.001
Steel	**0.019**	**0.020**	**0.001**	**0.007**	0.005	-0.001	0.000	0.005	-0.001	-0.003	**0.008**	**0.002**	-0.003	**0.008**	0.000
FabPr	**0.017**	**0.010**	0.001	0.002	-0.004	-0.001	-0.005	**-0.007**	0.000	0.000	0.005	0.001	-0.006	0.001	0.000
Mach	**0.016**	**0.016**	**0.001**	**0.004**	-0.001	0.000	-0.004	**-0.005**	0.000	-0.002	0.002	0.000	**-0.004**	0.001	0.000
ElcEq	**0.021**	**0.010**	**0.003**	0.002	**-0.007**	0.001	-0.002	**-0.007**	0.001	-0.003	**-0.006**	0.001	**-0.006**	-0.005	0.000
Autos	**0.020**	**0.018**	**0.002**	0.001	-0.004	**-0.001**	0.000	-0.003	-0.001	-0.001	0.001	0.000	-0.004	-0.001	0.000
Aero	**0.021**	**0.023**	**0.002**	**0.006**	0.005	0.000	**0.012**	0.005	0.000	0.003	0.004	0.001	-0.004	0.003	0.000
Ships	**0.025**	**0.025**	0.001	0.007	0.005	-0.001	0.000	0.008	-0.001	-0.008	0.003	-0.001	-0.005	-0.002	0.000
Guns	**0.021**	**0.018**	0.000	0.007	0.006	-0.001	0.006	0.007	-0.001	-0.001	0.003	-0.001	-0.003	0.001	0.000
Gold	0.010	**0.025**	-0.002	**0.015**	**0.020**	0.001	0.006	0.008	-0.002	-0.014	0.000	**0.004**	-0.003	-0.007	0.004
Mines	**0.015**	**0.018**	0.001	**0.010**	**0.012**	-0.001	0.001	0.009	0.000	-0.004	-0.001	0.001	**-0.009**	0.003	0.001
Coal	**0.015**	**0.021**	**-0.003**	**0.015**	**0.014**	0.000	**0.015**	**0.021**	-0.001	0.011	0.010	**0.003**	-0.001	0.005	0.002
Oil	**0.015**	**0.013**	-0.001	**0.016**	**0.011**	0.001	**0.009**	**0.010**	0.001	-0.001	-0.001	**0.002**	-0.002	0.001	0.000
Util	**0.005**	**0.005**	0.000	0.002	0.003	0.000	0.003	**0.005**	0.000	0.002	0.002	-0.001	0.000	**0.004**	0.000
Whlsl	**0.015**	**0.012**	**0.003**	**-0.007**	**-0.008**	-0.001	**-0.009**	**-0.012**	0.001	0.000	0.000	0.002	-0.004	0.000	0.000
PerSv	**0.019**	**0.017**	**0.002**	-0.003	-0.003	**-0.001**	**-0.008**	-0.006	**-0.001**	-0.001	0.003	0.000	**-0.006**	-0.004	0.000
BusSv	**0.020**	**0.015**	**0.002**	0.000	**-0.005**	-0.001	-0.004	**-0.008**	0.000	0.000	-0.001	0.001	-0.004	-0.004	-0.001
Hardw	**0.021**	**0.011**	**0.004**	-0.007	**-0.010**	0.000	**-0.014**	**-0.013**	0.000	-0.002	-0.002	0.001	**-0.007**	-0.007	-0.001
Softw	**0.021**	**0.012**	**0.004**	-0.006	**-0.010**	0.000	**-0.016**	**-0.012**	-0.001	0.001	0.001	0.001	-0.007	-0.006	**-0.002**
Chips	**0.022**	**0.014**	**0.003**	-0.001	-0.001	0.000	**-0.009**	-0.007	0.001	-0.002	0.000	0.002	-0.006	-0.003	0.000
LabEq	**0.023**	**0.009**	**0.003**	0.003	**-0.007**	0.000	-0.005	**-0.013**	0.001	0.000	-0.005	**0.001**	**-0.009**	**-0.008**	0.000
Paper	**0.012**	**0.011**	0.000	0.002	-0.001	0.000	0.000	-0.003	0.000	-0.001	-0.001	0.000	-0.001	0.001	0.000
Boxes	**0.014**	0.007	0.001	**-0.009**	**-0.011**	**-0.002**	-0.002	**-0.008**	-0.001	-0.001	-0.007	-0.001	-0.001	-0.004	-0.001
Trans	**0.017**	**0.016**	**0.001**	**0.005**	0.000	**-0.001**	0.002	-0.003	-0.001	-0.003	0.001	0.001	-0.002	0.003	0.000
Whlsl	**0.020**	**0.018**	**0.002**	**0.004**	0.000	-0.001	-0.002	-0.002	-0.001	0.000	0.004	0.000	-0.002	0.000	0.000
Rtail	**0.016**	**0.018**	**0.001**	-0.001	-0.003	**-0.002**	-0.003	-0.003	**-0.002**	-0.001	-0.001	0.000	-0.001	0.000	-0.001
Meals	**0.019**	**0.020**	**0.001**	0.002	0.000	-0.001	0.000	-0.004	**-0.001**	-0.001	-0.001	0.000	-0.002	-0.002	**-0.001**
Banks	**0.009**	**0.009**	0.000	0.000	**-0.004**	**-0.001**	-0.003	**-0.004**	**-0.001**	-0.002	-0.003	0.000	**-0.005**	**-0.006**	0.000
Insur	**0.010**	**0.010**	0.000	0.002	-0.001	-0.001	-0.003	-0.003	**-0.001**	-0.001	-0.002	-0.001	-0.001	-0.003	-0.001
RlEst	**0.020**	**0.019**	**0.002**	0.002	-0.003	**-0.002**	-0.003	-0.002	0.000	-0.002	0.002	0.000	-0.005	-0.002	0.000
Fin	**0.012**	**0.011**	**0.001**	-0.002	-0.001	0.000	**-0.005**	-0.004	**-0.001**	**-0.005**	-0.003	**0.001**	**-0.005**	-0.001	0.000
Other	**0.021**	**0.019**	**0.002**	0.004	-0.001	0.000	0.001	0.000	**-0.001**	0.002	0.002	0.001	-0.004	-0.003	0.000
Positive	48	46	28	11	4	0	3	3	0	2	2	6	0	2	0
Negative	0	0	1	2	10	12	8	13	10	2	1	0	13	6	5

Notes: Table 3 reports the a_1 coefficients estimated with Equation 2. The equation runs a regression of excess industry returns on a constant, sentiment measures for the indicated *k*-week lags, and the market-risk premium. Sentiment measures are from the American Association of Independent Investors (AAII), Investors Intelligence (II), and Baker and Wurgler (BW). Bold indicates statistical significance of 10 percent or greater estimated with White (1980) standard errors.

Table 4. Interaction between investor sentiment and industry characteristics

	Stdev			Mom			Beta			Firms			Size		
Industry	**AAII**	**II**	**BW**	**AAII**	**II**	**BW**	**AAII**	**II**	**BW**	**AAII**	**II**	**BW**	**AAII**	**II**	**BW**
Agric	-0.174	0.684	-0.109	**-1.018**	-0.828	-0.093	0.016	0.002	**0.013**	0.009	0.027	0.004	-0.005	**-0.012**	0.000
Food	**0.676**	**1.181**	0.047	-0.130	0.314	0.083	0.013	**-0.076**	**0.005**	-0.007	-0.008	**0.005**	0.004	0.000	-0.002
Soda	0.872	-0.045	**0.187**	1.124	1.270	0.123	0.003	-0.016	**0.007**	0.001	-0.001	0.000	-0.006	0.004	-0.002
Beer	0.214	0.715	0.165	0.296	-0.142	0.014	-0.008	0.003	0.003	0.020	0.029	0.000	-0.002	-0.002	0.000
Smoke	0.036	-0.558	-0.012	-0.121	-0.994	-0.250	**-0.028**	-0.016	0.003	-0.043	-0.069	**0.021**	0.005	0.001	**-0.003**
Toys	**1.074**	**1.889**	-0.009	0.037	0.612	0.071	0.004	**-0.050**	0.001	**0.022**	**0.048**	-0.002	-0.002	**-0.011**	**-0.003**
Fun	**0.716**	**1.447**	-0.024	-0.135	0.341	0.068	**0.027**	**-0.038**	-0.001	0.006	0.023	0.001	-0.002	-0.003	**-0.002**
Books	**1.213**	**1.626**	0.000	0.043	0.381	0.098	0.026	-0.032	-0.006	**-0.021**	**-0.035**	**0.006**	**0.013**	**0.015**	-0.001
Hshld	**0.984**	**0.995**	0.012	-0.262	0.272	0.088	**0.035**	-0.020	0.004	**-0.012**	-0.009	**0.005**	0.003	0.001	**-0.004**
Clths	**0.921**	**1.531**	0.095	-0.281	0.474	**0.161**	0.013	-0.018	0.003	-0.006	0.017	0.005	0.000	-0.001	**-0.004**
Hlth	**0.893**	**1.363**	0.036	0.018	0.260	0.043	-0.025	**-0.039**	0.002	**-0.022**	**-0.023**	**0.006**	**0.006**	0.002	**-0.003**
MedEq	0.140	0.423	**-0.114**	-0.024	0.360	-0.038	-0.024	**-0.063**	0.002	0.012	0.026	-0.003	**0.009**	0.000	**-0.003**
Drugs	-0.016	-0.211	**-0.168**	-0.104	0.473	-0.084	-0.024	**-0.060**	0.002	**0.036**	-0.017	**-0.008**	**0.023**	-0.004	**-0.004**
Chems	**0.639**	**1.175**	-0.031	-0.130	0.218	-0.008	0.010	-0.001	0.000	-0.024	-0.024	0.007	0.009	0.006	**-0.004**
Rubbr	**0.798**	**1.861**	0.063	-0.021	0.325	0.019	0.000	**-0.067**	0.003	-0.013	0.004	**0.005**	0.000	**-0.014**	-0.002
Txtls	**1.611**	**2.146**	0.026	-0.166	-0.172	0.074	0.005	-0.027	0.001	-0.009	**-0.018**	0.001	0.001	-0.001	0.000
BldMt	-0.077	1.754	0.182	**-0.692**	-0.288	0.044	**0.020**	-0.011	-0.001	**-0.030**	-0.031	**0.006**	-0.001	-0.002	**-0.004**
Cnstr	**1.073**	0.637	-0.024	-0.316	0.508	0.075	0.015	-0.006	0.000	-0.015	-0.017	**0.009**	0.005	0.006	**-0.003**
Steel	**0.592**	0.776	0.006	-0.255	0.161	0.042	0.004	0.001	-0.001	**-0.029**	-0.020	0.004	0.002	**0.020**	-0.001
FabPr	0.288	0.807	-0.049	-0.233	0.407	0.010	-0.009	**0.031**	0.000	0.003	-0.016	0.000	-0.016	-0.004	0.003
Mach	**0.660**	**1.148**	-0.058	-0.232	0.020	0.029	0.011	0.015	-0.003	-0.018	-0.029	**0.010**	0.001	**0.010**	**-0.003**
ElcEq	0.490	**1.020**	**-0.143**	-0.006	0.086	-0.006	**-0.023**	**-0.067**	**-0.006**	-0.017	0.002	0.004	0.004	0.001	-0.001
Autos	**0.956**	**1.655**	0.093	-0.325	0.203	0.066	-0.005	**-0.040**	-0.001	**-0.049**	**-0.036**	0.000	-0.007	-0.015	**-0.007**
Aero	0.900	1.385	0.036	-0.269	0.000	0.011	0.015	0.025	-0.001	**-0.048**	**-0.059**	0.002	**0.013**	**0.015**	-0.001
Ships	0.875	0.105	0.120	-0.359	-0.331	0.170	**0.028**	0.023	0.001	**-0.052**	-0.018	-0.003	-0.004	-0.001	**-0.003**
Guns	0.123	-0.241	-0.213	-0.059	0.256	0.052	0.003	-0.008	**0.009**	**-0.069**	**-0.095**	**0.009**	**0.028**	0.008	**-0.003**
Gold	-0.050	0.509	**-0.284**	-1.057	-0.230	-0.198	-0.002	-0.028	0.005	0.007	0.004	**0.005**	0.005	0.000	-0.003
Mines	-0.737	-0.501	0.168	-0.444	-0.188	0.118	0.012	0.001	-0.003	-0.020	-0.013	**0.008**	0.008	0.012	**-0.004**
Coal	-0.267	0.849	**-0.241**	0.077	0.087	0.010	-0.001	0.015	0.001	0.006	0.000	0.004	-0.001	0.010	-0.001
Oil	-0.032	0.784	-0.110	-0.355	0.256	**0.119**	0.008	0.009	-0.003	**-0.041**	**-0.060**	**0.010**	0.009	0.013	**-0.004**
Util	**1.244**	0.960	0.058	-0.656	0.198	-0.111	-0.003	0.022	**0.005**	**-0.018**	-0.018	-0.001	0.004	0.003	0.000
Telcm	-0.076	0.519	-0.022	0.018	**0.660**	0.006	-0.002	-0.009	0.001	0.017	0.011	0.000	0.008	0.006	-0.002
PerSv	-0.359	0.986	-0.006	-0.086	-0.025	**0.162**	0.000	**-0.035**	0.002	-0.018	0.009	**-0.010**	0.006	0.000	**-0.003**
BusSv	**0.745**	**1.077**	-0.042	-0.233	0.060	0.037	0.018	-0.017	-0.001	**0.049**	**0.077**	-0.005	0.004	0.000	**-0.002**
Hardw	0.123	0.514	-0.004	0.384	0.525	-0.024	-0.024	**-0.030**	0.002	-0.017	0.010	0.001	**0.011**	0.005	-0.001
Softw	0.232	0.320	-0.013	0.308	0.582	-0.003	-0.010	**-0.024**	0.002	**0.019**	0.008	-0.001	0.005	-0.003	-0.001
Chips	-0.012	0.183	-0.046	0.523	0.631	-0.047	-0.017	**-0.028**	-0.001	0.024	0.080	-0.002	0.004	0.000	-0.001
LabEq	0.304	0.494	**-0.094**	0.089	0.178	-0.044	-0.013	**-0.056**	-0.003	0.015	-0.003	0.005	0.002	-0.007	**-0.003**
Paper	**0.729**	0.640	-0.059	-0.247	0.339	0.046	0.005	**-0.038**	0.001	**-0.015**	-0.017	0.002	0.005	**0.012**	**-0.002**
Boxes	0.442	0.642	0.028	0.115	0.145	**-0.204**	-0.001	-0.006	-0.002	0.011	0.013	-0.002	-0.006	0.000	0.000
Trans	**0.722**	**1.422**	0.068	-0.357	-0.026	0.020	0.011	-0.015	0.002	-0.007	0.010	-0.003	0.004	0.001	**-0.003**
Whlsl	**0.748**	**1.156**	-0.058	-0.135	0.249	0.048	0.010	-0.018	-0.003	**-0.017**	-0.010	**0.005**	**0.006**	0.004	**-0.003**
Rtail	**0.800**	**1.739**	-0.052	-0.174	0.162	0.000	0.002	**-0.031**	-0.003	-0.020	**0.032**	-0.002	0.001	-0.001	**-0.003**
Meals	**1.343**	**1.669**	**0.123**	-0.302	0.198	0.057	0.003	**-0.033**	0.003	0.001	**0.035**	-0.001	0.005	-0.001	**-0.004**
Banks	0.272	**1.045**	0.079	0.086	0.615	0.108	-0.006	**-0.050**	**0.005**	-0.008	**-0.026**	**-0.007**	**-0.007**	**-0.015**	**-0.003**
Insur	**0.529**	0.552	-0.035	-0.203	0.019	0.095	0.000	**-0.033**	0.003	-0.009	-0.001	0.004	0.000	-0.005	**-0.002**
RlEst	0.615	0.718	**0.143**	-0.158	0.051	0.074	-0.013	-0.029	-0.002	0.001	**0.021**	**0.007**	-0.001	0.002	**-0.003**
Fin	0.066	0.550	-0.008	0.113	0.527	0.102	0.001	**-0.026**	0.002	-0.003	-0.001	0.000	0.000	-0.001	-0.001
Other	**0.709**	**1.374**	-0.058	-0.128	0.299	0.013	0.000	0.012	0.003	0.004	-0.006	**0.011**	0.000	0.001	**-0.001**
Positive	23	20	3	0	1	3	4	1	6	4	5	16	8	5	0
Negative	0	0	6	2	0	1	2	20	1	13	8	3	1	4	29

Continued:

	BE/ME			HH sales			HH equity			HH assets			Sales σ		
Industry	**AAII**	**II**	**BW**	**AAII**	**II**	**BW**	**AAII**	**II**	**BW**	**AAII**	**II**	**BW**	**AAII**	**II**	**BW**
Agric	0.014	0.026	-0.003	0.031	0.074	**0.044**	0.023	**0.108**	-0.005	-0.020	0.068	-0.010	-0.002	-0.021	-0.003
Food	-0.027	**-0.108**	0.007	**0.444**	0.129	0.025	**0.100**	0.055	0.008	0.095	-0.125	**0.045**	0.033	-0.016	0.012
Soda	-0.012	-0.004	-0.003	0.011	0.027	0.026	0.004	-0.028	0.005	0.048	-0.092	0.009	-0.006	0.057	0.009
Beer	-0.033	-0.030	0.001	-0.146	**-0.211**	0.022	0.000	-0.088	0.011	-0.070	-0.085	0.029	**0.042**	-0.018	0.006
Smoke	0.029	0.015	0.003	-0.052	0.012	**0.021**	-0.066	-0.022	**0.018**	**-0.080**	-0.025	**0.022**	0.014	-0.014	-0.005
Toys	-0.021	**0.074**	**0.013**	0.012	0.089	0.003	-0.007	0.044	0.003	-0.003	0.046	-0.003	0.009	0.013	0.002
Fun	**0.018**	**0.037**	0.000	0.046	**0.193**	-0.012	0.040	**0.224**	**0.025**	-0.022	0.062	0.009	**-0.045**	-0.035	0.000
Books	-0.055	-0.053	-0.003	0.324	0.329	**-0.133**	**0.158**	**0.219**	**-0.054**	0.177	0.163	-0.047	0.021	0.015	**0.011**
Hshld	-0.007	-0.029	**0.018**	0.097	-0.214	**0.079**	**0.046**	0.051	0.006	**0.068**	-0.005	**0.018**	-0.024	0.061	**0.023**
Clths	**-0.082**	-0.046	0.003	0.290	**-1.306**	**0.174**	0.093	-0.278	**0.216**	0.022	-0.878	**0.233**	-0.026	**-0.070**	-0.008
Hlth	0.015	0.031	-0.007	0.042	**0.306**	0.004	0.165	**0.308**	-0.018	0.159	**0.325**	-0.030	0.007	-0.075	0.009
MedEq	**-0.102**	**-0.099**	0.013	**0.866**	-0.288	**-0.170**	**0.523**	0.169	**-0.115**	0.099	-0.244	-0.022	0.026	0.010	-0.002
Drugs	**-0.171**	**-0.228**	0.024	**1.017**	-0.442	-0.129	0.187	-0.047	0.044	0.470	-0.177	-0.030	-0.100	-0.105	-0.022
Chems	0.002	0.016	0.005	-0.234	-0.118	0.039	-0.018	0.000	-0.018	-0.307	-0.334	0.061	-0.017	-0.068	0.010
Rubbr	-0.027	**0.177**	-0.004	**0.274**	**0.290**	**-0.073**	0.060	0.183	**-0.083**	0.160	0.254	**-0.096**	-0.024	0.013	0.004
Txtls	-0.009	0.054	0.002	0.020	0.049	-0.007	0.022	0.045	-0.005	0.011	0.026	-0.006	-0.029	**-0.236**	0.002
BldMt	**0.044**	-0.034	0.000	**0.358**	**0.776**	-0.064	**0.491**	**0.643**	-0.049	**0.282**	**0.344**	0.022	-0.012	0.004	0.008
Cnstr	0.017	-0.049	0.000	-0.339	0.162	**0.202**	0.005	**0.815**	0.068	-0.259	-0.238	0.053	-0.034	-0.015	0.005
Steel	0.018	-0.019	0.002	**0.520**	**0.898**	0.031	**0.332**	**0.582**	0.010	**0.257**	**0.532**	0.017	-0.024	-0.016	0.009
FabPr	**0.033**	0.024	0.001	-0.098	-0.196	0.014	0.001	0.155	-0.010	-0.107	-0.205	-0.004	-0.027	-0.053	-0.005
Mach	-0.007	-0.045	**0.015**	-0.177	**-1.966**	**0.264**	0.082	0.025	0.076	-0.253	-0.665	**0.222**	-0.002	**-0.072**	0.002
ElcEq	-0.010	-0.076	**0.018**	-0.043	0.164	-0.024	-0.056	0.286	0.018	-0.148	0.056	**0.125**	-0.052	**-0.228**	-0.010
Autos	**0.026**	**0.049**	0.002	0.109	0.193	-0.007	**0.163**	**0.128**	-0.008	**-0.112**	0.035	**0.033**	-0.008	**-0.024**	0.001
Aero	**-0.058**	**-0.062**	0.006	**0.268**	**0.346**	-0.017	0.229	0.102	0.006	**0.323**	**0.311**	-0.029	0.030	0.018	0.001
Ships	0.052	0.035	**0.023**	0.054	0.041	**-0.015**	0.032	0.030	**-0.016**	0.042	0.039	-0.012	-0.063	**-0.153**	0.004
Guns	**-0.064**	-0.035	0.000	**0.055**	0.035	**-0.009**	0.037	-0.041	**-0.010**	0.047	-0.011	**-0.008**	-0.042	-0.015	-0.008
Gold	-0.131	-0.198	-0.006	0.011	0.076	-0.065	-0.012	0.416	-0.069	0.047	0.274	-0.082	0.131	0.077	**-0.035**
Mines	-0.032	-0.030	0.010	-0.006	-0.229	**0.075**	0.024	-0.240	**0.068**	-0.019	**-0.306**	**0.058**	-0.032	0.002	-0.008
Coal	-0.003	-0.023	0.003	0.011	-0.079	0.013	0.024	-0.028	0.003	0.031	-0.042	**0.026**	-0.020	-0.054	0.007
Oil	-0.009	-0.027	**0.010**	0.190	0.498	**-0.120**	**-0.705**	0.739	-0.019	-0.974	1.270	-0.030	0.026	**0.168**	0.004
Util	0.010	0.010	0.003	0.654	1.099	0.026	**1.524**	**2.615**	-0.201	**2.333**	2.449	0.097	**0.028**	**0.042**	**-0.007**
Telcm	0.011	-0.024	0.008	**-0.444**	**-0.768**	**-0.108**	0.140	0.143	-0.042	-0.311	-0.084	-0.019	-0.101	-0.087	-0.023
PerSv	-0.033	-0.034	-0.002	0.047	**0.164**	**0.051**	**0.157**	**0.238**	0.027	**0.139**	**0.191**	**0.029**	-0.002	0.010	0.005
BusSv	-0.070	0.016	**0.021**	-0.313	-0.138	0.076	-0.227	0.217	**0.106**	-0.348	0.036	**0.135**	-0.006	-0.018	0.005
Hardw	**-0.064**	-0.041	0.005	0.148	0.134	0.000	0.203	0.052	0.052	**-0.317**	-0.235	0.032	-0.042	0.010	0.005
Softw	-0.025	0.000	0.013	-0.049	0.018	**0.014**	-0.025	0.034	0.008	**-0.041**	-0.002	0.009	-0.019	-0.019	0.000
Chips	-0.007	0.027	0.005	-0.193	-0.008	0.071	0.361	0.584	-0.012	-0.030	0.044	**0.023**	-0.043	0.024	0.015
LabEq	-0.025	0.020	0.005	**-0.188**	0.119	0.056	-0.047	0.149	-0.033	-0.182	0.074	0.044	-0.083	**-0.209**	0.002
Paper	-0.008	-0.041	**0.010**	0.146	**0.262**	-0.042	0.158	-0.023	-0.039	**0.210**	**0.336**	-0.030	0.020	-0.064	-0.007
Boxes	0.024	0.009	0.000	-0.137	-0.049	0.003	-0.131	0.015	0.010	-0.022	0.038	-0.007	**-0.070**	-0.073	-0.002
Trans	0.008	**0.038**	-0.001	-0.434	**-1.585**	0.079	0.113	-0.438	**0.085**	**-1.066**	-0.580	**0.282**	0.020	-0.014	0.015
Whlsl	-0.042	-0.032	**0.030**	**0.262**	**0.386**	**-0.077**	0.629	**1.099**	-0.024	0.286	0.429	-0.013	0.092	-0.014	-0.003
Rtail	-0.002	**-0.127**	**0.015**	0.131	-0.348	-0.101	0.239	**-0.592**	0.002	0.006	-0.047	**0.029**	0.005	**0.078**	0.001
Meals	-0.019	0.074	0.009	-0.124	-0.290	**0.088**	-0.051	**-0.125**	**0.022**	**-0.102**	-0.126	**0.042**	-0.045	0.026	0.012
Banks	**0.023**	**0.032**	**0.010**	**-0.400**	**-0.744**	**-0.160**	**-0.411**	**-0.738**	**-0.200**	**-0.355**	**-0.726**	**-0.173**	0.027	-0.053	0.011
Insur	-0.006	0.039	**0.015**	0.065	0.222	0.134	-0.170	-0.468	**-0.229**	0.113	-0.151	-0.033	0.032	**0.116**	**0.029**
RlEst	-0.008	-0.002	**0.010**	0.018	**-0.139**	0.010	0.064	-0.069	**0.057**	**0.103**	-0.011	0.011	-0.017	-0.004	**-0.006**
Fin	0.009	0.025	**0.007**	0.244	0.110	**0.104**	-0.099	0.005	0.030	**0.221**	0.085	**0.054**	-0.016	0.007	0.006
Other	**-0.061**	**-0.149**	**0.011**	**0.237**	0.150	-0.018	-0.047	**0.232**	0.003	**0.179**	0.019	**-0.057**	0.003	0.018	0.002
Positive	5	6	15	10	9	11	9	12	8	10	6	16	2	4	3
Negative	7	6	0	3	7	9	2	3	7	7	2	4	2	7	3

Notes: Table 4 reports the a_3 coefficients from Equation 3, which runs a regression of excess industry returns on a constant, investor sentiment, industry characteristics, an interaction term of industry characteristics with investor sentiment, and the market-risk premium. Sentiment measures are from the American Association of Independent Investors (AAII), Investors Intelligence (II), and Baker and Wurgler (BW). Bold indicates 10 percent or greater statistical significance estimated with White (1980) standard errors.

Table 5. Regressions for industry characteristics

High - Low Decile	Expected	Full Sample			Bull Market			Bear Market		
Characteristic Portfolios	Coefficient	AAII	II	BW	AAII	II	BW	AAII	II	BW
Stdev	positive	0.017	0.003	-0.003	0.018	0.012	-0.003	0.045	-0.030	-0.004
Mom	positive	**0.035**	**0.037**	-0.003	**0.060**	0.041	0.008	0.003	**0.093**	-0.013
Beta	positive	0.007	-0.015	**0.012**	0.039	0.006	0.013	**-0.091**	**-0.135**	**0.018**
Firms	positive	0.006	**-0.036**	**0.015**	0.018	**-0.060**	**0.010**	-0.026	-0.002	**0.027**
Size	negative	-0.017	**-0.026**	-0.003	-0.018	-0.026	-0.002	-0.041	**-0.076**	**-0.006**
BE/ME	negative	-0.027	-0.023	-0.006	-0.035	-0.016	-0.008	-0.043	**-0.095**	-0.009
HH sales	negative	**0.025**	0.016	-0.004	**0.037**	0.025	0.000	0.026	0.010	**-0.010**
HH equity	negative	**0.025**	**0.023**	**-0.008**	**0.033**	**0.036**	-0.003	0.035	0.011	**-0.016**
HH assets	negative	0.014	0.007	**-0.007**	0.024	0.017	-0.004	0.003	-0.021	**-0.015**
Sales σ	positive	-0.012	-0.003	-0.002	-0.006	-0.002	-0.005	**-0.049**	-0.009	0.001

Notes: Table 5 reports the a_1 coefficients from Equation 4. The analysis first constructs long-short portfolios based on the top-bottom deciles from sorts on each different industry's characteristics. The average industry characteristics evaluated are 12-week return volatility (stdev), 12-week return momentum (Mom), 26-week systematic market risk (Beta), number of firms (Firms), market capitalization (Size), book-to-market valuation ratios (BE/ME), Herfindahl sales (HH sales), Herfindahl book equity (HH equity), Herfindahl total assets (HH assets), and sales volatility (Sales σ). The analysis next uses Equation 2.7 to estimate the a_1 coefficients with a regression of long-short characteristic portfolios on a constant, the indicated investor sentiment measures, and the market-risk premium. The second column indicates the expected sign of the a_1 regression coefficients. Sentiment measures come from the American Association of Independent Investors (AAII), Investors Intelligence (II), and Baker and Wurgler (BW). The table reports results for the full sample, bull markets and bear markets. Postive (negative) bull-bear spreads define bull (bear) markets,for each sentiment measure. Bold indicates statistical significance at 10 percent or greater, estimated with White (1980) standard errors.

Table 6. Investor sentiment strategy performance

Panel A:	Portfolios formed on sentiment alphas estimated with 26-week rolling regressions					
		04 Week	08 Week	13 Week	26 Week	52 Week
AAII	Jensen's alpha	0.020	0.029	**0.043**	**0.053**	**0.057**
	t-statistic	1.16	1.62	2.38	2.66	2.56
	Fama & French alpha	0.007	0.009	0.023	0.024	0.021
	t-statistic	0.41	0.52	1.29	1.33	1.03
	Carhart alpha	0.010	0.024	**0.033**	0.023	0.014
	t-statistic	0.54	1.33	1.75	1.14	0.63
II	Jensen's alpha	0.007	0.005	-0.018	-0.016	0.007
	t-statistic	0.40	0.25	-0.96	-0.74	0.32
	Fama & French alpha	-0.009	-0.013	**-0.034**	**-0.041**	-0.019
	t-statistic	-0.52	-0.69	-1.85	-2.09	-0.91
	Carhart alpha	0.009	0.009	-0.016	-0.012	0.022
	t-statistic	0.51	0.48	-0.88	-0.62	1.18
BW	Jensen's alpha	-0.024	-0.007	-0.017	0.004	**0.068**
	t-statistic	-1.07	-0.38	-0.83	0.26	3.79
	Fama & French alpha	-0.020	-0.007	-0.018	-0.016	**0.044**
	t-statistic	-0.98	-0.34	-0.95	-1.00	2.47
	Carhart alpha	**-0.053**	-0.027	**-0.050**	-0.023	**0.035**
	t-statistic	-2.57	-1.45	-2.48	-1.37	1.94

Panel B:	Portfolios formed on sentiment alphas estimated with 52-week rolling regressions					
		04 Week	08 Week	13 Week	26 Week	52 Week
AAII	Jensen's alpha	-0.003	0.004	0.019	0.036	0.011
	t-statistic	-0.13	0.22	0.93	1.62	0.52
	Fama & French alpha	-0.028	-0.023	-0.010	-0.002	-0.022
	t-statistic	-1.62	-1.32	-0.58	-0.09	-1.19
	Carhart alpha	-0.010	-0.005	0.009	0.006	-0.019
	t-statistic	-0.57	-0.29	0.47	0.29	-0.94
II	Jensen's alpha	**-0.043**	-0.028	**-0.035**	**-0.031**	0.000
	t-statistic	-2.40	-1.53	-2.04	-1.85	-0.02
	Fama & French alpha	**-0.057**	**-0.044**	**-0.049**	**-0.045**	-0.024
	t-statistic	-3.11	-2.47	-2.77	-2.62	-1.35
	Carhart alpha	**-0.044**	-0.028	**-0.037**	**-0.033**	-0.001
	t-statistic	-2.41	-1.54	-2.07	-1.88	-0.03
BW	Jensen's alpha	-0.020	0.006	-0.002	**0.041**	**0.033**
	t-statistic	-1.03	0.30	-0.07	2.30	1.76
	Fama & French alpha	**-0.035**	-0.018	-0.004	0.019	**0.034**
	t-statistic	-1.89	-0.99	-0.21	1.08	1.78
	Carhart alpha	**-0.062**	-0.033	**-0.036**	0.003	0.002
	t-statistic	-3.28	-1.64	-1.75	0.16	0.13

Notes: Table 6 reports annualised returns for an investment strategy that uses time-variant sentiment alphas to allocate industry investments. The analysis first uses Equation 2 to estimate time-variant industry sentiment alphas (a_1) over 26- and 52-week rolling windows. Next, the analysis then constructs self-financing portfolios that are long (short) in the 15 lowest (highest) sentiment alpha industries. The table reports annualized Jensen's (α_J), Fama and French (α_F), and Carhart alphas (α_C), estimated with Equations 5-7, for the indicated weekly holding periods. Panel A and Panel B report results for strategies based on 26-week and 52-week rolling window alpha estimations. Bold indicates statistical significance at 10 percent or greater estiamted with White (1980) standard errors.