Investor Sentiment, Anomalies, and the Macroeconomy

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This paper examines whether the results supporting a recent story that sentiment-related overpricing is the source of a variety of asset pricing anomalies are still maintained after separating out the effect of macroeconomic conditions. We find that after adjusting for the effect of several macroeconomic variables in the proxy for investor sentiment, the results are no longer consistent with the sentiment-related overpricing story. These results indicate that the anomalies are not necessarily attributed to sentiment-related overpricing but rather to macroeconomic conditions.

Keywords: Investor sentiment; Anomalies; Predicted investor sentiment; Macroeconomic variables; Sentiment-related overpricing

JEL classification: G12; G14

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Abstract

This paper examines whether the results supporting a recent story that sentiment-related overpricing is the source of a variety of asset pricing anomalies are still maintained after separating out the effect of macroeconomic conditions. We find that after adjusting for the effect of several macroeconomic variables in the proxy for investor sentiment, the results are no longer consistent with the sentiment-related overpricing story. These results indicate that the anomalies are not necessarily attributed to sentiment-related overpricing but rather to macroeconomic conditions.

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1. Introduction

By combining market-wide investor sentiment with Miller's (1977) argument about the effect of short-sale impediments, Stambaugh, Yu, and Yuan (2012) (hereafter, SYY) suggest three hypotheses regarding the role of investor sentiment in affecting the degree of mispricing in the 11 anomalies widely-known in the literature. The first hypothesis is that the anomalies should be stronger following high sentiment than following low sentiment; the second hypothesis is that the returns on the short-leg portfolio of each anomaly should be lower following high sentiment than following low sentiment; and the third hypothesis is that investor sentiment should not greatly affect returns on the long-leg portfolio of each anomaly. In short, the pattern in the returns of the anomalies is attributed to sentiment-related overpricing, in particular for the stocks in the short-leg portfolio following high sentiment. They provide empirical results consistent with these hypotheses and argue that sentiment-related overpricing provides at least a partial explanation for the 11 asset pricing anomalies.

SYY use the investor sentiment index constructed by Baker and Wurgler (2006) as a measure of market-wide investor sentiment. If this sentiment index is correlated with the premium on some risk factor that varies over time and if the risk factor is more sensitive to the stocks in each short-leg portfolio but less to those in each long-leg portfolio, then the results could be obtained as well that are consistent with SYY's hypotheses. In this sense, SYY's empirical results supporting their hypotheses might be mixed with the effect of such a risk factor. It would be premature, therefore, to conclude that sentiment-related overpricing is the main source of the anomalies.

The primary purpose of this paper is to examine whether the results supporting SYY's

hypotheses are still maintained even after separating the effect of such a risk factor from SYY's original results which are obtained from using the BW sentiment index. In the context of the Merton (1973) Intertemporal Capital Asset Pricing Model (ICAPM), we use a set of macroeconomic variables as state variables that proxy for such a risk factor and that are closely linked to the investor sentiment index, rather than identifying the risk factor itself, because the identification of such a risk factor is a daunting task. As state variables, we select the following five macroeconomic variables: the Lettau and Ludvigson (2001) consumption-wealth ratio, cay, term spread, default spread, three-month Treasury-bill yield, and inflation rate. These variables are often used as stock return predictors in the literature.

We find that results consistent with SYY's three hypotheses are also obtained when the predicted sentiment index by the one-month-lagged five macroeconomic variables is instead used. The component of the BW sentiment index predicted by the five macroeconomic variables has as much predictive power for the returns on the short-leg, long-leg, and long-short portfolios of the anomalies as does the BW sentiment index itself. We find, however, that the results consistent with SYY's hypotheses are no longer obtained, when the residual sentiment index is used, which is the component of the BW sentiment index remaining after removing the component linked to those macroeconomic variables. These results are consistent with those of Sibley, Xing, and Zhang (2012) showing that macro-related sentiment is a driving force of the predictability of investor sentiment for the cross-sectional stock returns. Further, we find that the predictability of the sentiment index for the returns of the anomalies disappears when using a new investor sentiment index constructed by estimating the first principal component of Baker and Wurgler's (2006) six sentiment proxies orthogonalized by a set of the above-mentioned five macroeconomic variables, as in Baker and Wurgler (2006). Note that Baker and Wurgler (2006) use a different set of six macroeconomic

variables to remove business cycle and macroeconomic variations from their sentiment index. These results indicate that a substantial portion of the predictive power of the BW sentiment index for the returns of the anomalies is attributed to the component of the BW sentiment index linked to a risk factor proxied by those macroeconomic variables.

We also provide results showing that the differences in real macroeconomic variables between high- and low-sentiment periods and the differences in exposures (or loadings) of the returns on innovations (or shocks) in the macroeconomic variables between the long-leg and short-leg portfolios in each period are consistent with the pattern in the returns of the long-leg and short-leg portfolios in each period predicted by SYY's hypotheses. In particular, the finding that the exposures on the innovations are greater in absolute value in the short-leg portfolios than in the long-leg portfolios is consistent with the risk-based story that if a risk factor with time-varying risk premium is more sensitive to the stocks in each short-leg portfolio but less to those in each long-leg portfolio, then results consistent with SYY's hypotheses could be obtained. These results indicate that the anomalies are not necessarily attributed to sentiment-related overpricing but rather to macroeconomic conditions.

This paper provides evidence supporting the argument that the sentiment index used in SYY is correlated with the premium on some risk factor that varies over time, and that the risk factor is more sensitive to the stocks in each short-leg portfolio but less to those in each long-leg portfolio. Therefore, the results in this paper support the assertion that the anomalies are more likely explained by an omitted risk factor(s) proxied by time-variation of the macroeconomic variables rather than by sentiment-related overpricing. Nonetheless, we do not assert that investor sentiment plays little role in mispricing the stocks in the anomalies, since the argument for sentiment-driven mispricing, combined with Miller's (1977) argument regarding impediments to

short selling, is still legitimate.

The rest of the paper is organized as follows. Section 2 provides the motivation for the paper, Section 3 describes the data, and Section 4 reports our main empirical results. Section 5 concludes.

2. Motivation

Based on the results consistent with their three hypotheses, SYY argue that the anomalies are attributed to sentiment-related overpricing. SYY obtain their results using the BW sentiment index as a measure of market-wide investor sentiment. To construct an investor sentiment index, Baker and Wurgler (2006) choose six proxies for investor sentiment: the closed-end fund discount, NYSE turnover ratio, annual number of IPOs, average annual first-day returns of IPOs, gross annual equity issuance divided by gross annual equity plus debt issuance, and dividend premium. In fact, these proxies are to some extent an outcome of the changes in market-wide investment opportunities and reflect economic fundamentals; thus, they must be influenced by macroeconomic conditions. As a result, it is inevitable that an investor sentiment index, which uses these proxies as a source of investor sentiment information, will be linked to macroeconomic variables. To remove such influences, Baker and Wurgler regress each of the six raw proxies on a set of six macroeconomic variables (growth in industrial production; growth in consumption of each of durables, nondurables, and services; growth in employment; and a dummy variable for NBER recessions). They regard the residuals from these regressions as their investor sentiment proxies orthogonalized to macroeconomic conditions. To filter out idiosyncratic components in the six orthogonalized proxies and capture their common component, they take the first principal

component of these six orthogonalized proxies as the BW investor sentiment index.

However, if some influences of macroeconomic conditions remain in the BW investor sentiment index, then this sentiment index is correlated with the time-varying premium on a risk factor, which can be regarded as a state variable in the context of the Merton (1973) ICAPM. If this is the case, then results consistent with SYY's hypotheses could be obtained, whether or not (pure) investor sentiment plays a role in explaining for the returns of the anomalies.[1] It is necessary, therefore, to separate out the effect of such a risk factor from the results obtained from using the BW sentiment index. As the state variables, we choose the five macroeconomic variables described earlier to capture the remaining influences of macroeconomic conditions which are not considered by Baker and Wurgler (2006) in constructing their sentiment index. If the results consistent with SYY's hypotheses disappear after adjusting for the macroeconomic variables, it could be asserted that the underlying force of SYY's results could be the risk factor proxied by time-variation of the macroeconomic variables.

The set of macroeconomic variables are often used in the literature as state variables that affect investment opportunity sets and, consequently, investors' expected return. Further, it is commonly perceived that these macroeconomic variables influence investor sentiment. This perception is confirmed by some studies. For example, Kurov (2010) shows that monetary policy decisions have a significant effect on investor sentiment, and Tang and Yan (2010) show that investor sentiment is the most important determinant of credit spreads. These studies show that factors associated with interest rates and default spread affect investor sentiment. Chung, Hung, and Yeh (2012) show that the predictive power of investor sentiment in the cross-section of stock

[1] In addition to SYY, many papers argue that investor sentiment predicts stock returns for the cross-section of stock returns. See, for example, Baker and Wurgler (2006, 2007), Brown and Cliff (2005), and Kumar and Lee (2006).

returns is asymmetric across states of the economy. Sibley, Xing, and Zhang (2012) report that Treasury bill yield and term spread are the most influential variables in explaining the variation of the BW sentiment index. Indeed, we find evidence that investor sentiment is highly correlated with these lagged macroeconomic variables (detailed in Section 3.2 and reported in Tables 1 and 2).[2]

Given the high correlation between the set of five macroeconomic variables and investor sentiment, our focus is to show that the returns in the anomalies are linked to the component of investor sentiment predicted by the macroeconomic variables but not to the component remaining after removing the predicted component. Further, we attempt to justify the role of the macroeconomic variables in explaining for the returns in the anomalies by showing how it actually substitutes, or at least adds to, the role of investor sentiment.

The underlying motivation of SYY's hypotheses is that when sentiment is high, the stocks in both short-leg and long-leg portfolios are overpriced rather than underpriced and such overpricing is more prevalent in the stocks in the short-leg than those in the long-leg portfolio due to short-sale impediments. This implies that the returns are lower following high sentiment than following low sentiment and thus, the difference in average returns between periods following high sentiment and low sentiment is negative in both long-leg and short-leg portfolios. However, this difference is more severe (i.e., more negative) in the short-leg than in the long-leg portfolio. As a result, the difference in average returns between periods following high sentiment and low sentiment is positive in the long-short strategy of each anomaly.

However, the difference in average returns between periods following high sentiment and low sentiment can be attributed to the difference in macroeconomic conditions between these two

[2] Shen and Yu (2013) also show that the BW investor sentiment index is highly correlated with the macro-related factors used in Chen, Roll, and Ross (1986).

periods. Further, this (negative) difference in average returns, which is more severe in the stocks in the short-leg portfolio than those in the long-leg portfolio of the anomalies, can also be attributed to the difference in exposures of the returns on innovations in the macroeconomic variables between the short-leg and long-leg portfolios during the period. In fact, we find that more favorable real economic conditions appear during low sentiment periods than high sentiment periods and that there is a particular difference in the exposures on the innovations between the short-leg and the long-leg portfolios.

3. Data

3.1. Description

To compare our results with those of SYY, we use the same proxy for investor sentiment, the Baker and Wurgler (2006) investor sentiment index ($SENT$), spanning from July 1965 to December 2007, as in SYY (2012).[3] This is constructed by estimating the first principal component of Baker and Wurgler's (2006) six sentiment proxies orthogonalized by a set of the six macroeconomic variables. As predictors for the BW investor sentiment index, we choose five macroeconomic variables: (i) the Lettau and Ludvigson (2001) consumption-wealth ratio, cay, (ii) the term spread (TERM), defined as the difference in yields between three-month and 10-year Treasuries, (iii) the default spread (DEF), defined as the difference in yields between Baa- and Aaa-rated corporate bonds, (iv) the three-month Treasury bill yield, and (v) the monthly inflation rate.[4] According to the argument

[3] The Baker and Wurgler (2006) sentiment index is obtained from Jeffrey Wurgler's website: http://people.stern.nyu.edu/jwurgler/.

[4] The Lettau and Ludvigson (2001) consumption-wealth ratio, cay, is obtained from Martin Lettau's website: http://faculty.haas.berkeley.edu/lettau/data_cay.html. Aaa- and Baa-rated corporate bond yields, three-month and 10-year Treasury yields, and inflation rates are obtained from the Federal Reserve Bank of St. Louis Economic Data website (http://research.stlouisfed.org/fred2/).

of Stambaugh, Yu, and Yuan (2015), we do not include macro variables directly related to the stock market, such as dividend yield, since the distinction between macro and non-macro effects seems less interesting when stock market variables are included in the macro variables.[5] [6] We exclude the macroeconomic variables used in Baker and Wurgler (2006) to construct an orthogonalized measure of investor sentiment. These five variables are a parsimonious set of macro variables.[7]

We use the same 11 market-wide anomalies as in SYY: (i) failure probability, (ii) Ohlson's O-score, (iii) net stock issuance, (iv) composite equity issuance, (v) total accrual, (vi) net operating assets, (vii) momentum, (viii) gross profitability premium, (ix) asset growth, (x) return on assets (ROA), and (xi) investment-to-assets.[8] As in SYY, we also consider a combination strategy that combines the 11 anomalies equally within a given month. For comparison to SYY, this paper covers the same sample period from August 1965 to January 2008, except for anomaly (i), where the data period begins in December 1974, and anomaly (ii) and (x), for which the sample period begins in January 1972.

3.2. Relation between the investor sentiment index and macroeconomic variables

To examine how closely the BW investor sentiment index is related to macroeconomic conditions, we provide figures showing the time-series behavior of the BW sentiment index against each of

[5] Stambaugh, Yu, and Yuan (2015) argue that sentiment that affects stock prices is likely to affect dividend yield by lowering the yield when sentiment is high and vice versa.

[6] Even when dividend yield is included in our set of macroeconomic variables, the overall results remain qualitatively unchanged.

[7] To examine the effect of macro-related sentiment on the predictability of anomaly returns, Sibley, Xing, and Zhang use 13 business cycle variables, including dividend yield, volatility, and a liquidity measure that, as Stamabugh, Yu, and Yuan point out (2015), could contain sentiment effects.

[8] We thank Jianfeng Yuan for providing data for all 11 anomalies.

the five macroeconomic variables in Figure 1. These graphs show the quarterly time-series patterns of the series. It can be observed from this figure that the BW sentiment index tends to move positively with cay, default spread, and three-month Treasury-bill rate and move negatively with term spread. However, it is seemingly uncorrelated with inflation rates. In fact, the degree of these relationships is confirmed by the correlation coefficients.

Panel A of Table 1 reports the Spearman contemporaneous correlation coefficients among the BW sentiment index and the five macroeconomic variables. In particular, the BW sentiment index is statistically significantly correlated with all of these macroeconomic variables except for inflation rates at the 1 percent level. Specifically, the correlation coefficients of the BW sentiment index with these five variables are 0.203 (cay), 0.182 (default spread), 0.312 (three-month Treasury bill yield), -0.089 (term spread), and -0.057 (inflation rate), respectively. To examine preliminarily if these macroeconomic variables have a predictive relation to the BW sentiment index, we also compute the correlation coefficients between the BW sentiment index and the one-month-lagged macroeconomic variables. Panel B reports that these correlation coefficients are similar to the contemporaneous correlation coefficients. They are also all highly statistically significant except for inflation rates. These results indicate that although Baker and Wurgler (2006) try to explicitly remove macroeconomic components from each of the six proxies for investor sentiment, their sentiment index is still linked to some macroeconomic components.

4. Empirical Analysis

4.1. Anomalies According to Investor Sentiment as Predicted by Macroeconomic Variables

The results in Tables 1 and 2 indicate that although the BW sentiment index, $SENT$, is constructed

after removing the influence of some macroeconomic variables, it is still linked to some macroeconomic components. We therefore decompose $SENT$ into two components: the sentiment predicted by the macroeconomic variables, which contains the macroeconomic components, and residual sentiment, which does not. To do this, we estimate the following time-series regression model:

$$SENT_t = \theta_0 + \theta_1 X_{t-1} + \varepsilon_t, \quad (1)$$

where $SENT_t$ is the BW sentiment index at month t and X_{t-1} is a vector of the five one-month-lagged macroeconomic variables. Following Chordia and Shivakumar (2006), the parameters are estimated by rolling over month by month by using the previous 60 monthly observations (a minimum of 24 observations) of the macroeconomic variables available up to $t-1$. We thus allow the parameters to vary every month.[9] The predicted investor sentiment index at month t ($PRED_t$) is computed as the predicted (fitted) value of the BW sentiment index at month t, and the residual investor sentiment index at month t (RES_t) is computed as the residual from the time-series regression, or equivalently as $SENT_t - PRED_t$.

As in SYY, we classify each month as either a high- or a low-sentiment month based on the median value of the predicted investor sentiment index, *PRED*. A high- (low-) sentiment month is one in which the value of the predicted sentiment index in the previous month is above (below) the median value of $PRED$ for the whole sample period. Table 2 presents average excess returns (Panel A) and benchmark-adjusted returns (Panel B) of the 11 anomalies' highest-performing deciles (*long leg*), lowest-performing deciles (*short leg*), and long-short portfolios during months following high and low sentiment classified by *PRED*. The benchmark-adjusted returns are returns

[9] For the first 24 months of the sample period beginning July 1965, we assume the regression parameters to be constant.

after adjusting for the Fama and French (1993) three factors. As in SYY, we also consider a strategy based on an aggregation of the 11 anomalies, denoted as "Combination," which equally combines the 11 anomalies within a given month. In fact, the average returns of each long-leg, short-leg, and long-short portfolios in this combination strategy indicate the average returns of the corresponding portfolios of all 11 anomalies. The results in Table 2 (sorted on *PRED*) are comparable to those in Tables 2 and 3 of SYY (sorted on *SENT*).

The overall results obtained from sorting on *PRED* are similar to those from sorting on *SENT*. In other words, the predicted sentiment index by the five macroeconomic variables is similar to the results obtained from using the BW sentiment index. Recall that SYY's first hypothesis is that the anomalies should be stronger following high sentiment than following low sentiment. SYY argue that this hypothesis is supported since average (excess and benchmark-adjusted) returns of each of the 11 long-short portfolios are higher following high sentiment than following low sentiment. SYY report that the differences in average returns on the long-short portfolios between months following high and low sentiment ("High-Low") are positive in all 11 anomalies (reported in the last column of Tables 2 and 3 of SYY). Among the 11 individual t-statistics for the difference, eight cases are statistically significant at the one-tailed 5% level in the case of average excess returns and seven in the case of average benchmark-adjusted returns. When sorting on $PRED$, we obtain similar returns. As observed in the last column of Table 2, the differences in average returns on the long-short portfolios between months following high and low sentiment classified by $PRED$ are positive in 10 of the 11 anomalies. Further, the magnitude and the statistical significance of the differences are also similar to those obtained from sorting on $SENT$. Among the 11 individual t-statistics for the difference, eight cases are statistically significant at the one-tailed 5% level in the case of average excess returns and five in the case of

average benchmark-adjusted returns. The difference in the combination strategy is also strongly statistically significant for the case of both excess returns and benchmark-adjusted returns.

Recall also that SYY's second hypothesis is that the returns on the short-leg portfolio of each anomaly should be lower following high sentiment than following low sentiment. This implies that the difference in the average (excess and benchmark-adjusted) returns on the short-leg portfolio between months following high and low sentiment should be negative. SYY report that this difference between months following high and low sentiment classified by $SENT$ is negative in all 11 anomalies and is statistically significant at the (one-tailed) 5% level in 10 of the 11 anomalies for the cases of both excess returns and benchmark-adjusted returns. Similar results are also obtained when months are classified by $PRED$. Table 2 shows that the differences in average returns on the short-leg portfolio between months following high and low sentiment classified by $PRED$ are all negative and statistically significant at the 5% level in all 11 and 6 of the 11 anomalies for the cases of excess returns and benchmark-adjusted returns, respectively.

SYY's third hypothesis is that investor sentiment should not greatly affect returns on the long-leg portfolio of each anomaly. In other words, the difference in average returns between high- and low-sentiment months should be less severe in terms of negative values in the long-leg portfolio than in the short-leg portfolio. As predicted by this hypothesis, when sorted on *SENT*, SYY report that the differences in average excess returns on the long-leg portfolio between months following high and low sentiment are negative in all 11 anomalies, but only one is statistically significant. When sorting on PRED, we obtain similar results. That is, the differences in average excess returns are also negative in all 11 anomalies and are much smaller in negative magnitude than in the case of the short-leg portfolio. In particular, the differences in average benchmark-adjusted returns are all statistically insignificant and their sign is random in direction.

In summary, the component of the BW sentiment index predicted by the five macroeconomic variables has as much predictive power for the returns in the anomalies as does the BW sentiment index itself. This indicates that the set of five macroeconomic variables predicts the BW sentiment index quite well. The top graph in Figure 2 depicts the monthly time-series of the BW sentiment index, *SENT*, and its predicted value, *PRED*, over the sample period. It shows that these two time-series move quite closely. We compute some statistics to measure the degree of prediction accuracy of the macroeconomic variables for the BW sentiment index in several ways. First, the Spearman correlation coefficient between *SENT* and *PRED* is quite high; it is 0.788 (with p-value of 0.0000). Second, 77.3% of all high-sentiment months classified by *SENT* overlap with those classified by *PRED*. Third, when we estimate a probit regression model of a binary variable representing high-sentiment months classified by *SENT* on a binary variable representing high-sentiment months classified by *PRED*, the slope coefficient estimate is 0.545, with t-statistic of 14.67. These results confirm that the BW sentiment index is quite well predicted by the set of macroeconomic variables and that it contains components related to macroeconomic conditions.

4.2. Anomalies According to Investor Sentiment Adjusted for Macroeconomic Variables

The results in Tables 3 and 4 indicate that a substantial portion of the predictive power of the BW sentiment index for the returns in the anomalies is attributed to the component of the index linked to the macroeconomic variables. It is necessary, therefore, to examine whether the component of the BW sentiment index remaining after removing the component linked to the macroeconomic variables has predictive power for the anomalies. We measure this remaining component using the residual sentiment index, *RES*, from the regression model of equation (1).

Table 3 presents average (excess and benchmark-adjusted) returns of the long-leg, short-leg, and long-short portfolios of the 11 anomalies during months following high and low sentiment classified by *RES*. Overall, the results obtained from sorting on *RES* are quite different from those from sorting on *SENT*. The strong evidence supporting SYY's three hypotheses found in Table 2 is no longer found in Table 3. The differences in average excess returns on the long-short portfolio between months following high and low sentiment classified by *RES* (the last column of Table 3) are not statistically different from zero for any of the 11 anomalies. The average value of the differences in average excess returns of all 11 anomalies is only 0.13 percent (t-statistic of 0.57). Similar results are found in the differences in average benchmark-adjusted returns. These results do not support SYY's first hypothesis that the anomalies should be stronger following high sentiment than following low sentiment.

Table 3 also shows that there is no evidence supporting SYY's second and third hypotheses when the residual sentiment index, *RES*, is used. There is no statistically significant difference in average excess returns on the short-leg portfolio for any of the 11 anomalies between months following high and low sentiment classified by *RES*. The differences in the short-leg portfolio are even mostly positive in the 11 anomalies, although those are statistically insignificant. There is also no statistically significant difference in average returns on the long-leg portfolio between months following high and low sentiment classified by *RES*. We also find no evidence supporting these hypotheses when using benchmark-adjusted returns.

In summary, there is no evidence that the BW sentiment index has predictive power for the returns in the anomalies after adjusting for macroeconomic conditions. In fact, *RES* has no significant relation to the BW sentiment index. The bottom graph in Figure 2 shows the monthly time-series of *SENT* and *RES* over the sample period; it shows no association between the two

time series. The Spearman correlation coefficient between *RES* and *SENT* is only -0.005.

4.3. Returns of the Anomalies Predicted by Macroeconomic Variables

The previous sections show the averages of the actual returns for each anomaly during months classified by the level of the investor sentiment index. In this section, we examine whether the patterns in the returns of the short-leg, long-leg, and long-short portfolios during months following high and low sentiment as anticipated by SYY's hypotheses are also observed in the predicted return by the macroeconomic variables. We first predict the return of each portfolio in the 11 anomalies in the following predictive regressions:

$$R_{i,t} = \lambda_0 + \lambda_1 X_{t-1} + \varepsilon_{i,t}, \quad (2)$$

$$R_{i,t} = \lambda_0 + \lambda_1 X_{t-1} + \lambda_2 Z_t + \varepsilon_{i,t}, \quad (3)$$

where $R_{i,t}$ is the excess return in month t on the short-leg, long-leg, or long-short portfolio of each anomaly, X_{t-1} is a vector of the one-month lagged five macroeconomic variables, and Z_t is the vector of the Fama-French three factors. The predictive regressions are estimated by rolling over month by month by using the previous 60 monthly observations (a minimum of 24 observations) as in computing *PRED*. The predicted returns in month t are measured as the estimates of $\lambda_1 X_{t-1}$ from equations (2) and (3), respectively. The predicted returns from equation (2) are denoted as the predicted excess return, and those from equation (3) are denoted as the predicted benchmark-adjusted returns.

Table 4 presents the average predicted excess returns (Panel A) and average predicted benchmark-adjusted returns (Panel B) of the portfolios in the 11 anomalies during months following high and low investor sentiment classified by *PRED*. As predicted by SYY's first

hypothesis, the average predicted (excess and benchmark-adjusted) returns of the long-short portfolio are higher following high sentiment than following low sentiment. Specifically, the differences in average predicted returns on the long-short portfolio between months following high and low sentiment are positive in all 11 anomalies and are statistically significant at the (one-tailed) 5% level in 10 and 7 of the 11 anomalies for the cases of excess returns and benchmark-adjusted returns, respectively.

Table 4 also shows that the results using the predicted returns are consistent with the prediction by SYY's second and third hypotheses. The predicted average returns on the short-leg portfolio of each anomaly are lower following high sentiment than following low sentiment. Specifically, the differences in average predicted returns on the short-leg portfolio between months following high and low sentiment are all negative and statistically significant at the 5% level in all 11 anomalies using both excess and benchmark-adjusted returns. However, this phenomenon is hardly observable in the long-leg portfolio. The differences in average predicted returns on the long-leg portfolio between months following high and low sentiment are mostly negative but statistically significant at the 5% level in only six (using excess returns) and three (using benchmark-adjusted returns) of the 11 anomalies, respectively.

Overall, the pattern observed in the actual returns of the anomalies is similarly observed in the return predicted by the five macroeconomic variables, although the magnitude of the average predicted returns in absolute value are slightly smaller than those obtained from using actual returns. The above results again confirm the findings that a substantial portion of the predictive power of the BW sentiment index for the anomalies may be attributed to the component of the index linked to macroeconomic conditions.

4.4. Predictive Regressions

Like SYY, we conduct an alternative analysis to investigate whether the predicted sentiment index, *PRED*, has a predictive relation to the returns of the anomalies as does the BW sentiment index, *SENT*. The alternative analysis is conducted by estimating the following predictive regressions:

$$R_{i,t} = \gamma_0 + \gamma_1 S_{t-1} + \varepsilon_{i,t}, \quad (4)$$

$$R_{i,t} = \gamma_0 + \gamma_1 S_{t-1} + \gamma_2 Z_t + \varepsilon_{i,t}, \quad (5)$$

where $R_{i,t}$ is the excess return in month t on the long-leg, short-leg, or long-short portfolio of each anomaly, S_{t-1} is the lagged investor sentiment index, and Z_t is a vector of the Fama-French three factors. We consider three investor sentiment indexes for S_{t-1}; *SENT, PRED*, and *RES*.

Table 5 reports the coefficient estimates ($\hat{\gamma}_1$) on the lagged investor sentiment index variable and the adjusted R^2 of the regression equations (4) and (5) for the 11 anomalies in Panels A and B, respectively. SYY's first hypothesis predicts a positive sign of γ_1 for the long-short portfolio. SYY's second hypothesis predicts a negative sign of γ_1 for the short-leg portfolio, while SYY's third hypothesis predicts an insignificant value for γ_1 for the long-leg portfolio. As in SYY, Table 5 shows that when $SENT$ is used as the investor sentiment index variable, the estimation results for γ_1 are almost consistent with the prediction by SYY's three hypotheses. Stambaugh, Yu, and Yuan (2014) assert in a simulation study that the results for the predictability of $SENT$ for the returns of the anomalies are extremely unlikely to be obtained from a spurious regression. When *PRED* is used as the investor sentiment index variable, we obtain estimation results for γ_1 similar to those from using *SENT*. That is, the estimates of γ_1 for the long-short portfolio are all positive and statistically significant at the one-tailed 5% level in eight of the 11

anomalies when the Fama and French three factors are not controlled (using equation (4)) and in six of the 11 anomalies when the Fama and French three factors are controlled (using equation (5)). Those for the short-leg portfolio are all negative and are statistically significant at the one-tailed 5% level in eight of the 11 anomalies when the Fama and French three factors are controlled, while those for the long-leg portfolio have random sign and are mostly statistically insignificant. The adjusted R^2's using *PRED* are similar to those using *SENT*.

On the other hand, when RES is used as the investor sentiment index variable, we find no evidence consistent with the prediction by SYY's hypotheses. That is, the estimates of γ_1 on RES for the long-short portfolio are statistically significant at the one-tailed 5% level in only one and two of the 11 anomalies when not controlling for and controlling for the Fama and French three factors, respectively. Further, the sign of the estimates of γ_1 is almost random in direction for the long-leg, short-leg, and long-short portfolios. These results again confirm that after adjusting for the five macroeconomic variables, the investor sentiment index has no predictive power for the return in the 11 anomalies.

4.5. Time-varying versus Constant Parameters

In another predictive regression in which five contemporaneous macroeconomic variables (cay, term spread, default spread, real interest rate defined as one-month Treasury-bill return minus inflation rate, and inflation rate) are added as explanatory variables in equation (5), SYY report that the estimation results for the coefficient (γ_1) on the lagged sentiment index are consistent with their hypotheses even after controlling for some macroeconomic variables.[10] They therefore argue

[10] The regression equation SYY estimate is $R_{i,t} = \gamma_0 + \gamma_1 S_{t-1} + \gamma_2 Z_t + \sum_{j=}^{5} \delta_j X_{j,t} + \varepsilon_{i,t}$, where $X_{j,t}$ is the j-th macroeconomic variable.

that the predictability of the BW sentiment index for the return of the 11 anomalies is robust to controlling for the macroeconomic variables in addition to those already controlled for by Baker and Wurgler (2006). Their results are contradictory to ours, even though both studies use very similar macroeconomic variables to control for macroeconomic variations. The main reason for the gap in the results between these two studies is the consideration of time-variation of the parameters. They estimate the regression parameters using the whole sample period, assuming the parameters are constant over the whole period. Meanwhile, we allow the parameters to change every month.

To show that the difference in the two results may be caused by whether time-variation of the parameters is allowed, we re-estimate equation (5) using two different residual investor sentiment indexes adjusted for the macroeconomic variables, RES^{whole} and RES^{rolling}. RES^{rolling} is the residual sentiment index obtained from estimating the regression equation (1), $SENT_t = \theta_0 + \theta_1 X_{t-1} + \varepsilon_t$, by rolling over month by month using the most recent 60 observations. This is exactly the same as RES used previously in this paper. In the process of adjustment for the macroeconomic variables, the parameter θ_1 is allowed to vary every month. RES^{whole} is the residual sentiment index obtained from estimating the regression equation (1) using the whole sample period. Here, the parameter θ_1 is assumed to be constant over the whole sample period. Table 6 presents the coefficient estimates ($\hat{\gamma}_1$) on the lagged residual sentiment indexes, RES_{t-1}^{whole} and $RES_{t-1}^{\text{rolling}}$ in equation (5), respectively, for the long-leg, short-leg, and long-short portfolios of the 11 anomalies. When RES^{whole} is used as the sentiment index variable, the estimates of γ_1 for the long-short portfolio are positive for all but one anomaly and are statistically significant at the one-tailed 5% level in eight of the 11 anomalies. The estimates of γ_1 for the short-leg portfolio

are all negative and statistically significant at the one-tailed 5% level in nine of the 11 anomalies. The estimation results of γ_1 for the long-leg portfolio are mostly statistically insignificant. These results are similar to those in SYY, which are consistent with SYY's hypotheses even though the macroeconomic variables are adjusted.

On the other hand, when RES^{rolling} is used, we obtain quite different results, as already reported in Table 5. The estimates of γ_1 for the long-short portfolio are mostly statistically insignificant at the one-tailed 5% level; only two of the 11 anomalies have statistically significant estimates of γ_1. The estimates of γ_1 are almost statistically insignificant and their sign almost random in direction for both the long-leg and short-leg portfolios. These results do not support SYY's hypotheses. Therefore, we obtain different results from SYY in the adjustment for the macroeconomic variables mainly because of the allowance of time-variation of the parameters in the process of the adjustment, rather than the method of adjustment for the macroeconomic variables.

4.6. Using a Differently Orthogonalized Investor Sentiment Index

To further examine how the predictability of the sentiment index for the returns in the anomalies is vulnerable to adjustment for the macroeconomic variables, we construct a new investor sentiment index, denoted as $SENT^{\text{new}}$, by orthogonalizing Baker and Wurgler's (2006) six sentiment proxies to the set of five macroeconomic variables used in this study and then taking their first principal component. We also construct another new investor sentiment index, denoted as $SENT^{\text{new}\,2}$, by using the combined 11 macroeconomic variables (the five variables used in this

study and the six variables used in Baker and Wurgler (2006)) to orthogonalize the six sentiment proxies and then taking their first principal component.

Table 7 presents average benchmark-adjusted returns of the long-leg (Panel A), short-leg (Panel B), and long-short portfolios (Panel C) of the 11 anomalies during months following high and low levels of investor sentiment, classified as high or low based on the median value of each of the three sentiment indexes, respectively. Note that the results obtained from sorting on $SENT$ are a replication of Table 3 in SYY. Table 7 shows that the results from sorting on $SENT^{\text{new}}$ are quite different from those from sorting on $SENT$. That is, the strong evidence supporting SYY's three hypotheses found in the results from sorting on $SENT$ is no longer found in the results from sorting on $SENT^{\text{new}}$. Specifically, when sorting on $SENT^{\text{new}}$, the differences in average benchmark-adjusted returns on the long-short portfolios between months following high and low sentiment are positively statistically significant in only five of the 11 anomalies (compared to seven of the 11 anomalies when sorting on $SENT$) and those on the short-leg portfolios are negatively statistically significant in only six of the 11 anomalies (compared to 10 of the 11 anomalies when sorting on $SENT$) at the one-tailed 5% level. Further, the magnitude of the differences in absolute value obtained from sorting on $SENT^{\text{new}}$ is much smaller than that obtained from sorting on $SENT$. When sorting on $SENT^{\text{new}\,2}$, the predictability of the sentiment index for the returns in the 11 anomalies becomes further weakened. That is, individual t-statisitcs for the differences in the long-short portfolios are positively statistically significant at the one-tailed 5% level in only two of the 11 anomalies, and individual t-statisitcs for the differences in the short-leg portfolios are negatively statistically significant in only three of the 11 anomalies.

These above results indicate that the predictability of the sentiment index for the anomalies

reported in SYY could be sensitive to how the influence of macroeconomic conditions is removed from the sentiment proxies.

4.7. Relating the Returns of the Anomalies to Macroeconomic Conditions

The underlying motivation of SYY's hypotheses implies that the returns are lower following high sentiment than following low sentiment and, thus, the difference in average returns between periods following high and low sentiment is negative in both the long-leg and short-leg portfolios. However, this difference is more severe (or more negative) for the short-leg than for the long-leg portfolio, since overpricing is more prevalent in those in the short-leg than those in the long-leg portfolio due to short-sale impediments. In fact, SYY report (in Table 2) that the average excess returns of the combination strategy in the short-leg are -0.68 percent and 0.65 percent in months following high and low sentiment, respectively (the difference is -1.32 percent, with t-statistic of -2.41), and those in the long-leg are 0.56 percent and 0.95 percent, respectively (the difference is -0.39 percent, with t-statistic of -0.93). SYY attribute these differences to sentiment-related overpricing.

However, these differences in average returns between periods following high and low sentiment could be attributed to the difference in macroeconomic conditions between these two periods. Table 8 presents average values of several variables representing real macroeconomic conditions during high and low sentiment months classified by the BW sentiment index. It shows, counter-intuitively, that more favorable real economic conditions appear during low sentiment months than during high sentiment months. Specifically, growth rates in GDP, industrial production, (aggregate) consumption, and employment are higher, and term spread, and inflation

rates are greater during low sentiment months than during high sentiment months. Meanwhile, default spread and Treasury-bill rate are lower during low sentiment months than high sentiment months. This pattern in the real macroeconomic variables between these two (high- and low-sentiment) periods is consistent with that in the differences between recessionary and expansionary periods based on the NBER recession indicator. Further, 41 and 24 months are included in NBER recessionary periods during high- and low-sentiment periods, respectively.[11] This is inconsistent with our perception that high sentiment is prevalent during favorable macroeconomic conditions. Consequently, the average CRSP value-weighted market returns are 0.25 percent and 0.68 percent per month following high and low sentiment month, respectively. It could be argued, therefore, that a substantial amount of the difference in average returns between periods following high and low sentiment may be attributed to the difference in macroeconomic conditions between these two periods rather than simply sentiment-related overpricing.

Why then is the pattern of low returns following high sentiment more severe in the stocks in the short-leg portfolios than those in the long-leg portfolios of the anomalies? We attribute this pattern possibly to the difference in exposures of the returns on innovations in the macroeconomic variables between the short-leg and long-leg portfolios during the period. Table 9 presents the exposures (or loadings) of excess returns of the long-leg (Panel A), short-leg (Panel B), and long-short (Panel C) portfolios of each anomaly on one-month-lagged innovations in the five

[11] Conversely, when high and low sentiment months are classified by the Michigan sentiment index, the average values of the macroeconomic variables show that more favorable real economic conditions tend to appear during high sentiment months than low sentiment months. Specifically, growth rates (in percent) in GDP (0.32 vs. 0.20), industrial production (0.30 vs. 0.11), consumption (0.56 vs. 0.56), employment (0.19 vs. 0.09), and term spread (1.11 vs. 0.91) are greater during high sentiment months than low sentiment months. Meanwhile, default spread (0.94 vs. 1.18) and Treasury-bill rate (5.44 vs. 6.54) are lower during high sentiment months than low sentiment months. The numbers of months included in NBER recessionary periods are 4 and 34 during high and low sentiment periods, respectively. These results indicate that high and low sentiment periods classified by the Michigan sentiment index are close to expansionary and recessionary periods, respectively.

macroeconomic variables. The residuals obtained from the VAR(1) model containing the five macroeconomic variables are regarded as the innovations. Panel D of Table 9 reports the number of positive and negative innovations in each macroeconomic variable during high and low sentiment periods, respectively.

It is observed from Table 9 that the exposures of the returns on (one-month-lagged) innovations in cay, Treasury bill rate, and inflation rate have a negative sign, while those on innovation in term spread and default spread have a positive sign in both the long-leg and short-leg portfolios. Another notable observation is that the exposures in the short-leg portfolios are overall greater in absolute value than those in the long-leg portfolios for innovations in all five macroeconomic variables. This implies that the returns on the short-leg portfolios are more vulnerable to innovations (or shocks) in the macroeconomic variables. As a result, the sign of the exposures in the long-short portfolios (in Panel C) is mostly positive for cay, Treasury bill rate, and inflation rate and negative for term spread and default spread.

It is also observed in Panel D of Table 9 that during high sentiment periods, positive innovations in cay and Treasury bill rate occur more frequently, and do negative innovations in term spread, default spread, and inflation rate. This pattern in the sign frequency of innovations in the four macroeconomic variables (except for inflation rate among the five variables) tends to be unfavorable to both long-leg and short-leg portfolio returns, since the signs of innovations (Panel D) are more often opposite to rather than the same as those of the exposures on the innovation (Panel A and Panel B), which together drive portfolio returns down. More importantly, this tendency becomes more severe in the short-leg portfolios, since the magnitude of the exposures is greater in absolute value in the short-leg portfolios than in the long-leg portfolios. This drives the returns further lower in the short-leg portfolios than in the long-leg portfolios and, consequently,

leads the returns in the long-short portfolios to be positive during high-sentiment periods.

However, the above tendency is weaker during low sentiment periods, since the pattern in the sign frequency of the innovations is less unfavorable to the short-leg portfolios than during high sentiment periods. During low sentiment periods, positive innovations in cay, term spread, and inflation rate occur more frequently, and do negative innovations in default spread and Treasury-bill rate. The pattern in the sign frequency of the innovations in only three macroeconomic variables (cay, default spread, and inflation rate) is more unfavorable for the returns on the short-leg portfolios than for the returns on the long-leg portfolios, compared with that in the four macroeconomic variables (cay, term spread, default spread, and Treasury-bill rate) during high sentiment periods. This results in a less severe return drop in the short-leg portfolios during low sentiment periods than during high sentiment periods. Thus, the returns in the long-short portfolios tend to be less positive during low sentiment periods than during high sentiment periods. As a result, the difference in the returns of the long-short portfolios between months following high and low sentiment periods becomes positive.

The above results of Table 9 are indirect explanations for the pattern in the returns of the anomalies following months of high and low sentiment. Nonetheless, these results provide some possibility that the difference in average returns between periods following high and low sentiment in the anomalies is not necessarily attributed to sentiment-related overpricing but rather to macroeconomic conditions. In particular, the finding that the exposures on innovations in the macroeconomic variables are greater in absolute value for the short-leg portfolios than for the long-leg portfolios is consistent with a story of an (omitted) risk factor that if the risk factor is more sensitive to the stocks in the short-leg portfolio but less so to those in the long-leg portfolio, then the results consistent with the prediction by SYY's hypotheses can be obtained.

4.8. Using An Alternative Sentiment Index

As an alternative measure of sentiment, we also use the monthly series by the University of Michigan Surveys of Consumers to examine whether the remaining component of the Michigan sentiment index after adjusting for the macroeconomic variables has predictive power for the anomalies.[12] Since the Michigan sentiment index is based simply on a survey from randomly selected 500 households, it is probably less linked to particular macroeconomic variables, unlikely the BW sentiment index constructed from using the six sentiment proxies that may be directly influenced by macroeconomic conditions. Table 10 presents average benchmark-adjusted returns of the long-leg (Panel A), short-leg (Panel B), and long-short portfolios (Panel C) of the 11 anomalies during months following high and low investor sentiment, classified as high or low based on the median value of the Michigan sentiment index (*MICH*) and its two residual Michigan sentiment indexes, RES_{MICH} and RES''_{MICH}, respectively. RES_{MICH} is computed as the residual from the predictive regression (1) of $MICH_t$ on a vector of one-month lagged six macroeconomic variables used in Baker and Wurgler (2006) to orthogonalize the BW six sentiment proxies. RES''_{MICH} is computed similarly to RES_{MICH} except that a full set of the combined 11 macroeconomic variables (the six variables used in computing RES_{MICH} plus the five variables used in this paper) are used as predictors (X_{t-1}) in equation (1).

Overall, the results from sorting on $MICH$ barely support the SYY hypotheses. The differences in average returns on the long-short portfolios between months following high and low

[12] Since the monthly series of the Michigan sentiment index are available from January 1978, our sample period in this analysis is from January 1978 to January 2008.

investor sentiment are positive in all 11 anomalies. Among them, however, only two individual t-statistics for the difference are statistically significant at the one-tailed 5% level. For the case of the short-leg portfolios, the differences are negative in 9 of the 11 anomalies, but only five individual t-statistics for the difference are statistically significant at the one-tailed 5% level. Note that when sorting on the BW sentiment index (*SENT*), seven and 10 individual t-statistics for the difference are statistically significant in the case of the long-short portfolios and the short-leg portfolios, respectively. This statistical significance obtained from sorting on *MICH* is weakened after adjusting for the six macroeconomic variables used to orthogonalize *SENT* (i.e., when sorting on RES_{MICH}) and almost disappear after adjusting for the 11 macroeconomic variables (i.e., when sorting on RES''_{MICH}).

The above results of Table 10 indicate that the early findings in this paper that the results consistent with SYY's hypotheses are no longer obtained after adjusting for macroeconomic variables are not necessarily the outcome simply from using the investor sentiment index closely linked to macroeconomic variables. These are evidence showing a weaker role of investor sentiment in explaining for the anomalies than argued in the literature.

5. Conclusions

Recently, SYY have provided empirical results consistent with their hypotheses regarding the role investor sentiment plays in the degree of mispricing (in particular, overpricing) in a variety of asset pricing anomalies and argue that sentiment-related overpricing is the primary source of the profitable opportunities in the anomalies, particularly in the short-leg portfolios. As a measure of market-wide investor sentiment, SYY use the investor sentiment index constructed by Baker and

Wurgler (2006). However, SYY's empirical results might be mixed with the effect of macroeconomic conditions, since the sentiment index used in their study may still contain a link to some macroeconomic variables. In fact, we find evidence that such link exists. It is necessary, therefore, to re-examine the role of investor sentiment after controlling for such a link.

After separating the effect of several macroeconomic variables from SYY's original results, we find that the results consistent with SYY's hypotheses are no longer obtained. When the sentiment index predicted by a set of macroeconomic variables is used, we obtain the results consistent with the prediction by their hypotheses. These results indicate that a substantial portion of the predictive power of the BW sentiment index for the anomalies is attributed to the component of the BW sentiment index linked to a risk factor proxied by those macroeconomic variables. We also provide some results showing that the differences in real macroeconomic variables between high and low sentiment periods and the differences in exposures of the returns on innovations (or shocks) in the macroeconomic variables between the long-leg and short-leg portfolios in each period are consistent with the pattern in the returns of the long-leg and short-leg portfolios in each period as predicted by SYY's hypotheses. These results suggest that the anomalies are not necessarily attributed to sentiment-related overpricing but rather to macroeconomic conditions.

The results in this paper support the assertion that the anomalies are more likely explained by an omitted risk factor(s) proxied by time-variation of the macroeconomic variables rather than by sentiment-related overpricing. Nonetheless, we do not assert that investor sentiment plays little role in the mispricing of the stocks in the anomalies, since the argument of sentiment-driven mispricing, combined with that by Miller (1977) regarding impediments to short selling, is still legitimate.

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Table 1 Correlation Coefficients between the Investor Sentiment Index and Macroeconomic Variables

Panel A presents the Spearman contemporaneous correlation coefficients among the Baker and Wurgler (2006) investor sentiment index (*SENT*) and the macroeconomic variables. "cay" is the Lettau and Ludvigson (2001) consumption-wealth ratio. "T-bill yield" is the three-month Treasury bill yield. Numbers in square brackets indicate p-values. Panel B presents the Spearman correlation coefficients between *SENT* and the one-month-lagged macroeconomic variables. ***, **, and * refer to statistical significance at the 1%, 5%, and 10% levels, respectively. The sample period is July 1965 to December 2007.

	cay	Term spread	Default spread	T-bill yield	Inflation
			Panel A. Correlation coefficients		
Term spread	0.269***				
	[0.000]				
Default spread	-0.083*	0.220***			
	[0.060]	[0.000]			
T-bill yield	0.152***	-0.482***	0.383***		
	[0.001]	[0.000]	[0.000]		
Inflation	-0.215***	-0.342***	0.172***	0.450***	
	[0.000]	[0.000]	[0.000]	[0.000]	
SENT	0.203***	-0.089**	0.182***	0.312***	-0.057
	[0.000]	[0.045]	[0.000]	[0.000]	[0.203]
			Panel B. Correlation coefficients of the investor sentiment index (SENT) with lagged macroeconomic variables		
SENT	0.200***	-0.102**	0.171***	0.318***	-0.050
	[0.000]	[0.022]	[0.000]	[0.000]	[0.261]

Table 2 Average Returns of the Anomalies during Months Following High- and Low-Sentiment Sorted on the Predicted Sentiment

This table presents average excess and benchmark-adjusted returns of the anomalies' highest-performing deciles (*long leg*), lowest-performing deciles (*short leg*), and long-short portfolios during months following high and low levels of investor sentiment, classified as HIGH or LOW based on the median level of the predicted investor sentiment index (*PRED*). The predicted investor sentiment index at month t is computed as the fitted (predicted) value from the following time-series regression model: $SENT_t = \theta_0 + \theta_1 X_{t-1} + \varepsilon_t$, where $SENT_t$ is the Baker and Wurgler (2006) investor sentiment index at month t and X_{t-1} is a vector of the one-month lagged five macroeconomic variables (cay, term spread, default spread, three-month Treasury-bill yield, and inflation rate). The parameters are estimated by rolling over month by month using the previous 60 monthly observations available up to month t-1. The benchmark-adjusted returns are returns after adjusting for the Fama-French three factors. "Combination" is a strategy that equally combines the 11 anomalies within a given month. The sample period covers August 1965 to January 2008, except for anomaly (i), where the data period begins December 1974, and anomaly (ii) and (x), for which the sample period begins January 1972. Numbers in parentheses indicate White's (1980) heteroskedasticity-adjusted *t*-statistics.

Anomaly	Long leg			Short leg			Long−Short		
	High	Low	High-Low	High	Low	High-Low	High	Low	High-Low
					Panel A: Excess returns				
Failure probability	0.63 (1.70)	1.25 (4.31)	-0.62 (-1.31)	-1.04 (-1.41)	1.05 (1.91)	-2.09 (-2.27)	1.67 (2.82)	0.21 (0.47)	1.47 (1.99)
Ohlson's O	0.05 (0.13)	1.00 (3.95)	-0.94 (-2.04)	-1.13 (-1.90)	0.80 (1.87)	-1.93 (-2.63)	1.18 (3.08)	0.20 (0.65)	0.99 (2.00)
Net stock issuance	0.33 (1.09)	1.06 (4.70)	-0.73 (-1.92)	-0.65 (-1.61)	0.79 (2.84)	-1.44 (-2.93)	0.99 (4.95)	0.27 (1.93)	0.71 (2.91)
Composite equity issuance	0.28 (1.01)	0.97 (4.24)	-0.69 (-1.93)	-0.48 (-1.16)	0.89 (2.99)	-1.37 (-2.69)	0.76 (2.75)	0.08 (0.47)	0.68 (2.12)
Total accrual	0.06 (0.13)	1.38 (4.13)	-1.31 (-2.33)	-0.99 (-1.86)	1.26 (3.35)	-2.25 (-3.45)	1.05 (3.51)	0.12 (0.52)	0.94 (2.51)
Net operating assets	0.35 (0.93)	1.07 (3.71)	-0.71 (-1.50)	-0.79 (-1.83)	0.90 (3.07)	-1.69 (-3.24)	1.14 (4.85)	0.16 (0.94)	0.98 (3.35)
Momentum	0.45 (0.99)	1.76 (5.04)	-1.30 (-2.25)	-1.37 (-2.26)	0.47 (1.14)	-1.83 (-2.51)	1.82 (3.86)	1.29 (4.01)	0.53 (0.93)
Gross profitability premium	0.23 (0.67)	1.15 (4.46)	-0.92 (-2.15)	-0.12 (-0.34)	0.69 (2.80)	-0.81 (-1.89)	0.35 (1.46)	0.45 (2.04)	-0.10 (-0.32)
Asset growth	0.63 (1.60)	1.38 (3.96)	-0.76 (-1.44)	-0.89 (-1.88)	0.98 (3.02)	-1.87 (-3.25)	1.52 (5.51)	0.40 (1.78)	1.11 (3.12)
ROA	0.18 (0.46)	1.12 (3.93)	-0.93 (-1.90)	-1.10 (-1.77)	0.47 (1.07)	-1.57 (-2.07)	1.29 (3.01)	0.65 (1.89)	0.64 (1.16)
Investment to asset	0.30 (0.79)	1.52 (4.74)	-1.22 (-2.48)	-0.72 (-1.65)	1.02 (3.25)	-1.74 (-3.25)	1.01 (4.90)	0.50 (2.47)	0.52 (1.79)
Combination	0.27 (0.80)	1.24 (4.90)	-0.97 (-2.32)	-0.87 (-1.94)	0.84 (2.72)	-1.72 (-3.14)	1.14 (6.06)	0.40 (3.48)	0.74 (3.37)
					Panel B: Benchmark-adjusted returns				
Failure probability	0.37 (1.94)	0.39 (3.13)	-0.02 (-0.08)	-1.54 (-3.98)	-0.78 (-2.46)	-0.76 (-1.56)	1.91 (3.97)	1.17 (3.18)	0.74 (1.26)
Ohlson's O	0.19 (1.89)	0.22 (2.93)	-0.03 (-0.22)	-1.19 (-4.91)	-0.66 (-3.81)	-0.53 (-1.81)	1.37 (5.65)	0.87 (4.46)	0.50 (1.63)
Net stock issuance	0.18 (2.16)	0.21 (3.59)	-0.03 (-0.32)	-0.67 (-3.98)	-0.27 (-2.46)	-0.40 (-1.97)	0.85 (4.73)	0.48 (3.75)	0.37 (1.67)
Composite equity issuance	-0.06 (-0.53)	0.11 (1.12)	-0.17 (-1.14)	-0.57 (-3.03)	-0.26 (-2.58)	-0.31 (-1.44)	0.51 (2.21)	0.37 (2.64)	0.14 (0.51)
Total accrual	0.23 (1.02)	0.28 (1.71)	-0.04 (-0.15)	-0.70 (-2.76)	0.01 (0.07)	-0.71 (-2.45)	0.93 (3.04)	0.27 (1.23)	0.67 (1.83)
Net operating assets	0.37 (2.25)	0.11 (0.83)	0.26 (1.28)	-0.79 (-4.32)	-0.25 (-2.04)	-0.54 (-2.45)	1.16 (4.89)	0.35 (1.98)	0.80 (2.74)
Momentum	0.68 (3.44)	0.58 (3.55)	0.10 (0.40)	-1.29 (-3.29)	-1.00 (-4.43)	-0.29 (-0.63)	1.97 (3.79)	1.58 (4.84)	0.39 (0.63)
Gross profitability premium	0.41 (2.77)	0.44 (3.78)	-0.03 (-0.19)	-0.25 (-1.46)	-0.23 (-1.76)	-0.02 (-0.10)	0.65 (2.78)	0.67 (3.36)	-0.01 (-0.05)
Asset growth	0.39 (2.20)	0.04 (0.27)	0.34 (1.49)	-0.73 (-3.79)	-0.17 (-1.40)	-0.56 (-2.45)	1.12 (4.25)	0.21 (1.09)	0.91 (2.82)
ROA	0.40 (3.01)	0.35 (3.18)	0.04 (0.25)	-0.97 (-2.98)	-0.82 (-3.32)	-0.15 (-0.37)	1.37 (3.89)	1.18 (4.05)	0.19 (0.43)
Investment to asset	0.07 (0.40)	0.26 (2.07)	-0.20 (-0.97)	-0.65 (-3.63)	-0.10 (-0.76)	-0.54 (-2.42)	0.71 (3.47)	0.37 (2.03)	0.35 (1.32)
Combination	0.27 (5.19)	0.27 (5.75)	0.00 (0.04)	-0.80 (-5.46)	-0.40 (-4.45)	-0.39 (-2.25)	1.07 (6.95)	0.68 (6.42)	0.39 (2.10)

Table 3 Average Returns of the Anomalies during Months Following High- and Low-Sentiment Sorted on the Residual Sentiment

This table presents average excess and benchmark-adjusted returns of the anomalies' highest-performing deciles (*long leg*), lowest-performing deciles (*short leg*), and long-short portfolios during months following high and low levels of investor sentiment, classified as HIGH or LOW based on the median level of the residual investor sentiment index (*RES*) which is computed as the residual from the following time-series regression model: $SENT_t = \theta_0 + \theta_1 X_{t-1} + \varepsilon_t$, where $SENT_t$ is the Baker and Wurgler (2006) investor sentiment index and X_{t-1} is a vector of the one-month lagged five macroeconomic variables (cay, term spread, default spread, three-month Treasury-bill yield, and inflation rate). The parameters are estimated by rolling over month by month using the previous 60 monthly observations available up to month t-1. The benchmark-adjusted returns are returns after adjusting for the Fama-French three factors. Numbers in parentheses indicate heteroskedasticity-adjusted *t*-statistics of White (1980).

Anomaly	Long leg			Short leg			Long−Short		
	High	Low	High-Low	High	Low	High-Low	High	Low	High-Low
					Panel A: Excess returns				
Failure probability	1.19 (3.78)	0.68 (1.93)	0.50 (1.06)	0.17 (0.25)	-0.19 (-0.31)	0.36 (0.39)	1.02 (1.73)	0.87 (1.95)	0.14 (0.19)
Ohlson's O	0.80 (2.46)	0.24 (0.70)	0.56 (1.19)	0.18 (0.33)	-0.55 (-1.07)	0.73 (0.98)	0.62 (1.72)	0.79 (2.29)	-0.17 (-0.34)
Net stock issuance	0.88 (3.46)	0.51 (1.81)	0.37 (0.96)	0.11 (0.33)	0.03 (0.07)	0.08 (0.17)	0.77 (4.37)	0.49 (2.84)	0.28 (1.15)
Composite equity issuance	0.68 (2.81)	0.56 (2.12)	0.13 (0.36)	0.29 (0.87)	0.12 (0.31)	0.16 (0.32)	0.40 (1.90)	0.44 (1.79)	-0.04 (-0.12)
Total accrual	1.14 (2.78)	0.30 (0.77)	0.84 (1.48)	0.61 (1.31)	-0.34 (-0.73)	0.95 (1.44)	0.53 (1.92)	0.64 (2.50)	-0.11 (-0.30)
Net operating assets	0.82 (2.46)	0.60 (1.76)	0.22 (0.46)	0.16 (0.45)	-0.04 (-0.11)	0.20 (0.39)	0.66 (3.40)	0.64 (2.89)	0.01 (0.05)
Momentum	1.42 (3.27)	0.79 (2.05)	0.64 (1.10)	-0.24 (-0.47)	-0.67 (-1.25)	0.43 (0.59)	1.66 (3.96)	1.46 (3.74)	0.21 (0.36)
Gross profitability premium	0.85 (3.09)	0.52 (1.58)	0.33 (0.77)	0.25 (0.83)	0.32 (1.05)	-0.07 (-0.16)	0.60 (2.63)	0.20 (0.86)	0.40 (1.24)
Asset growth	1.28 (3.76)	0.72 (1.81)	0.56 (1.07)	0.19 (0.49)	-0.11 (-0.26)	0.30 (0.52)	1.09 (3.95)	0.83 (3.60)	0.26 (0.72)
ROA	0.83 (2.40)	0.46 (1.27)	0.37 (0.74)	-0.45 (-0.77)	-0.23 (-0.46)	-0.23 (-0.29)	1.28 (2.92)	0.69 (2.01)	0.60 (1.07)
Investment to asset	1.07 (3.23)	0.74 (2.01)	0.33 (0.67)	0.36 (1.03)	-0.05 (-0.13)	0.41 (0.76)	0.72 (3.53)	0.79 (3.85)	-0.08(-0.27)
Combination	0.96 (3.36)	0.55 (1.77)	0.41 (0.97)	0.13 (0.34)	-0.16 (-0.39)	0.28 (0.51)	0.83 (5.13)	0.71 (4.64)	0.13 (0.57)
					Panel B: Benchmark-adjusted returns				
Failure probability	0.46 (2.82)	0.29 (1.97)	0.17 (0.81)	-1.43 (-3.70)	-0.90 (-2.81)	-0.53 (-1.09)	1.90 (4.04)	1.19 (3.09)	0.71 (1.19)
Ohlson's O	0.23 (2.51)	0.18 (2.09)	0.05 (0.42)	-1.03 (-4.63)	-0.83 (-4.01)	-0.20 (-0.67)	1.26 (5.44)	1.00 (4.60)	0.26 (0.80)
Net stock issuance	0.27 (3.72)	0.12 (1.70)	0.16 (1.58)	-0.62 (-4.18)	-0.32 (-2.53)	-0.30 (-1.60)	0.90 (5.62)	0.44 (2.96)	0.46 (2.17)
Composite equity issuance	0.01 (0.10)	0.03 (0.30)	-0.02 (-0.15)	-0.53 (-3.46)	-0.30 (-2.14)	-0.23 (-1.16)	0.54 (2.88)	0.33 (1.80)	0.21 (0.82)
Total accrual	0.42 (2.02)	0.09 (0.53)	0.32 (1.23)	-0.19 (-0.81)	-0.50 (-2.69)	0.30 (1.03)	0.61 (2.17)	0.59 (2.35)	0.02 (0.05)
Net operating assets	0.18 (1.18)	0.30 (2.02)	-0.12 (-0.60)	-0.64 (-4.07)	-0.39 (-2.78)	-0.25 (-1.21)	0.82 (4.13)	0.69 (3.16)	0.12 (0.43)
Momentum	0.64 (3.52)	0.62 (3.54)	0.03 (0.11)	-1.27 (-3.81)	-1.03 (-3.71)	-0.24 (-0.58)	1.91 (4.32)	1.64 (4.29)	0.27 (0.48)
Gross profitability premium	0.44 (3.27)	0.41 (3.07)	0.03 (0.16)	-0.41 (-2.56)	-0.06 (-0.45)	-0.35 (-1.62)	0.85 (3.77)	0.47 (2.22)	0.38 (1.22)
Asset growth	0.26 (1.59)	0.17 (0.97)	0.09 (0.40)	-0.55 (-3.37)	-0.35 (-2.37)	-0.20 (-0.93)	0.81 (3.46)	0.52 (2.40)	0.29 (0.96)
ROA	0.29 (2.27)	0.46 (3.94)	-0.16 (-0.96)	-1.48 (-4.83)	-0.35 (-1.28)	-1.13 (-2.79)	1.77 (5.10)	0.81 (2.59)	0.96 (2.06)
Investment to asset	0.12 (0.85)	0.21 (1.43)	-0.09 (-0.45)	-0.41 (-2.47)	-0.35 (-2.32)	-0.06 (-0.26)	0.53 (2.76)	0.56 (2.80)	-0.03 (-0.12)
Combination	0.29 (5.72)	0.25 (4.97)	0.04 (0.59)	-0.74 (-5.57)	-0.46 (-4.33)	-0.27 (-1.61)	1.03 (7.23)	0.72 (6.06)	0.31 (1.72)

Table 4 Returns of the Anomalies Predicted by Macroeconomic Variables during Months Following High- and Low-Sentiment

This table presents the predicted average returns of the 11 anomalies by the macroeconomic variables from the following predictive regressions:

Eqn (1): $R_{i,t} = \lambda_0 + \lambda_1 X_{t-1} + \varepsilon_{i,t}$, and Eqn (2): $R_{i,t} = \lambda_0 + \lambda_1 X_{t-1} + \lambda_2 Z_t + \varepsilon_{i,t}$, where $R_{i,t}$ is the excess return in month *t* on the long-leg, short-leg, or the difference (long-short) of each anomaly, X_{t-1} is a vector of the one-month lagged five macroeconomic variables (cay, term spread, default spread, three-month Treasury-bill yield, and inflation rate), and Z_t is the vector of the Fama-French three factors. The predictive regressions are estimated by rolling over month by month using the previous 60 monthly observations available up to month t-1. The predicted returns are measured as the estimates of $\lambda_1 X_{t-1}$ from equations (1) and (2), respectively. The predicted returns from equation (1) are denoted as the predicted excess returns (Panel A), and those from equation (2) are denoted as the predicted benchmark-adjusted returns (Panel B). The predicted returns are then classified as HIGH or LOW based on the median level of predicted investor sentiment which is computed as $\hat{\theta}_1 X_{t-1}$ from the following time-series regression model: $SENT_t = \theta_0 + \theta_1 X_{t-1} + \varepsilon_t$, where $SENT_t$ is the Baker and Wurgler (2006) investor sentiment index. The parameters are estimated by rolling over month by month using the previous 60 monthly observations available up to month t-1. Numbers in parentheses indicate heteroskedasticity-adjusted *t*-statistics of White (1980). The sample period is August 1965 to January 2008.

Anomaly	Long leg			Short leg			Long-Short		
	High	Low	High-Low	High	Low	High-Low	High	Low	High-Low
Panel A: Predicted excess returns by the macroeconomic variables									
Failure probability	1.00 (5.23)	1.11 (6.76)	-0.11 (-0.42)	0.35 (0.92)	1.52 (4.31)	-1.17 (-2.24)	0.65 (2.29)	-0.41 (-1.55)	1.06 (2.73)
Ohlson's O	0.59 (2.73)	0.94 (5.63)	-0.36 (-1.30)	0.07 (0.20)	1.06 (3.60)	-0.99 (-2.15)	0.52 (2.18)	-0.11 (-0.61)	0.63 (2.09)
Net stock issuance	0.68 (4.38)	1.12 (8.35)	-0.43 (-2.11)	-0.17 (-0.76)	0.94 (5.21)	-1.11 (-3.85)	0.85 (7.65)	0.18 (2.01)	0.67 (4.74)
Composite equity issuance	0.65 (4.91)	1.02 (8.12)	-0.37 (-2.03)	-0.10 (-0.48)	1.09 (5.30)	-1.19 (-4.02)	0.75 (5.31)	-0.07 (-0.58)	0.82 (4.47)
Total accrual	0.75 (3.25)	1.72 (9.17)	-0.97 (-3.25)	-0.43 (-1.55)	1.42 (6.28)	-1.85 (-5.18)	1.18 (8.23)	0.30 (2.55)	0.88 (4.79)
Net operating assets	0.80 (4.18)	1.15 (6.81)	-0.34 (-1.34)	-0.38 (-1.84)	0.89 (4.44)	-1.27 (-4.43)	1.18(10.87)	0.26 (2.60)	0.93 (6.32)
Momentum	1.20 (4.15)	1.84 (8.97)	-0.64 (-1.81)	-0.87 (-3.40)	1.21 (4.06)	-2.08 (-5.29)	2.07 (9.46)	0.63 (2.72)	1.44 (4.53)
Gross profitability premium	0.49 (2.76)	1.15 (7.62)	-0.66 (-2.81)	0.30 (1.72)	0.98 (6.27)	-0.68 (-2.88)	0.19 (1.43)	0.17 (1.65)	0.02 (0.11)
Asset growth	1.48 (7.14)	1.65 (8.25)	-0.17 (-0.59)	-0.64 (-2.73)	0.87 (4.21)	-1.51 (-4.83)	2.12(13.63)	0.78 (6.36)	1.34 (6.76)
ROA	0.74 (3.47)	0.65 (4.30)	0.08 (0.32)	0.10 (0.29)	0.91 (3.17)	-0.81 (-1.78)	0.63 (2.90)	-0.25 (-1.34)	0.89 (3.07)
Investment to asset	0.86 (4.19)	1.80 (9.93)	-0.94 (-3.42)	-0.44 (-2.11)	0.89 (4.68)	-1.33 (-4.70)	1.31(11.45)	0.91 (9.57)	0.40 (2.67)
Combination	0.77 (4.32)	1.37 (9.04)	-0.60 (-2.56)	-0.30 (-1.31)	1.12 (5.30)	-1.42 (-4.57)	1.07(13.70)	0.25 (3.04)	0.82 (7.35)
Panel B: Predicted benchmark-adjusted returns by the macroeconomic variables									
Failure probability	0.26 (3.62)	0.47 (6.53)	-0.22 (-2.13)	-1.24 (-6.83)	-0.33 (-2.22)	-0.91 (-3.89)	1.50 (7.34)	0.80 (4.50)	0.70 (2.57)
Ohlson's O	0.19 (4.19)	0.28 (6.20)	-0.10 (-1.52)	-0.97 (-7.54)	-0.41 (-3.56)	-0.56 (-3.22)	1.16 (8.65)	0.70 (5.44)	0.46 (2.49)
Net stock issuance	0.23 (5.77)	0.27 (7.96)	-0.04 (-0.71)	-0.43 (-6.44)	-0.26 (-4.35)	-0.17 (-1.95)	0.67 (8.06)	0.53 (7.68)	0.14 (1.27)
Composite equity issuance	-0.06(-0.96)	0.13 (2.54)	-0.19 (-2.33)	-0.39 (-5.95)	-0.14 (-2.03)	-0.25 (-2.70)	0.33 (3.58)	0.26 (3.00)	0.06 (0.49)
Total accrual	0.47 (4.60)	0.32 (3.41)	0.15 (1.06)	-0.66 (-6.60)	-0.15 (-2.29)	-0.51 (-4.21)	1.13 (8.35)	0.48 (4.24)	0.65 (3.72)
Net operating assets	0.18 (2.53)	0.20 (3.31)	-0.02 (-0.20)	-0.69 (-8.72)	-0.48 (-6.32)	-0.20 (-1.83)	0.86 (8.80)	0.68 (7.32)	0.18 (1.35)
Momentum	0.69 (6.74)	0.32 (3.67)	0.37 (2.79)	-1.42(-10.45)	-0.56 (-3.90)	-0.87 (-4.39)	2.11(10.25)	0.87 (4.32)	1.24 (4.29)
Gross profitability premium	0.31 (3.49)	0.35 (7.24)	-0.04 (-0.43)	-0.41 (-5.39)	-0.01 (-0.15)	-0.41 (-4.21)	0.72 (6.14)	0.36 (4.49)	0.36 (2.55)
Asset growth	0.56 (5.70)	0.27 (3.86)	0.29 (2.38)	-0.77(-10.52)	-0.47 (-7.36)	-0.30 (-3.13)	1.33(10.91)	0.74 (6.93)	0.59 (3.65)
ROA	0.38 (5.75)	0.07 (1.23)	0.31 (3.60)	-1.06 (-7.67)	-0.59 (-5.05)	-0.48 (-2.64)	1.44 (9.78)	0.65 (5.19)	0.79 (4.06)
Investment to asset	0.21 (2.47)	0.46 (9.19)	-0.25 (-2.48)	-0.63 (-8.27)	-0.34 (-5.01)	-0.29 (-2.81)	0.84 (7.81)	0.80(10.01)	0.04 (0.31)
Combination	0.31(10.95)	0.28(14.19)	0.04 (1.03)	-0.75(-12.75)	-0.32 (-6.30)	-0.43 (-5.47)	1.06(15.41)	0.60(10.85)	0.46 (5.23)

Table 5 Predictive Regressions of Anomalies on Investor Sentiment Proxies

This table reports the coefficient estimates ($\hat{\gamma}_1$) on the investor sentiment proxy variables and the adjusted R^2 in the following predictive regression: $R_{i,t} = \gamma_0 + \gamma_1 S_{t-1} + \varepsilon_{i,t}$, and $R_{i,t} = \gamma_0 + \gamma_1 S_{t-1} + \gamma_2 Z_t + \varepsilon_{i,t}$, where $R_{i,t}$ is the excess return in month *t* on the long-leg, short-leg, or long-short portfolio of each anomaly, S_{t-1} is the investor sentiment proxy variable, and Z_t is the vector of the Fama-French three factors. The investor sentiment indexes considered are the Baker and Wurgler (2006) investor sentiment index (*SENT*), the predicted investor sentiment index (*PRED*) by the five macroeconomic variables (cay, term spread, default spread, three-month Treasury-bill yield, and inflation rate), and the residual investor sentiment index (*RES*) adjusted for the five macroeconomic variables. Numbers in parentheses indicate heteroskedasticity-adjusted *t*-statistics of White (1980), and numbers in brackets indicate adjusted R^2.

Anomaly	Investor sentiment proxy variables (S_{t-1})								
	SENT			*PRED*			*RES*		
	Long	Short	Long-Short	Long	Short	Long-Short	Long	Short	Long-Short
	Panel A: Model: $R_{i,t} = \gamma_0 + \gamma_1 S_{t-1} + \varepsilon_{i,t}$								
Failure probability	-0.43	-1.80	1.37	-0.32	-1.46	1.14	-0.41	-1.40	0.99
	(-1.74)	(-2.99)	(2.59)	(-1.32)	(-2.82)	(2.55)	(-0.84)	(-1.25)	(1.13)
	[0.004]	[0.030]	[0.027]	[0.001]	[0.017]	[0.016]	[0.000]	[0.004]	[0.002]
Ohlson's O	-0.24	-1.09	0.85	-0.58	-1.40	0.82	0.61	0.45	0.16
	(-0.8)	(-2.31)	(2.95)	(-2.24)	(-3.48)	(3.09)	(1.10)	(0.56)	(0.31)
	[0.000]	[0.014]	[0.020]	[0.009]	[0.023]	[0.017]	[0.004]	[-0.001]	[-0.002]
Net Stock Issuance	-0.28	-0.84	0.55	-0.39	-0.90	0.51	0.29	0.25	0.04
	(-1.38)	(-2.92)	(3.93)	(-2.08)	(-3.62)	(4.07)	(0.75)	(0.49)	(0.15)
	[0.002]	[0.020]	[0.038]	[0.007]	[0.025]	[0.034]	[0.000]	[-0.001]	[-0.002]
Composite Equity Issuance	-0.21	-0.68	0.47	-0.27	-0.83	0.56	0.16	0.42	-0.26
	(-2.38)	(-1.12)	(2.68)	(-1.42)	(-3.11)	(3.53)	(0.50)	(0.86)	(-0.94)
	[0.001]	[0.012]	[0.015]	[0.003]	[0.019]	[0.023]	[-0.001]	[0.000]	[0.00]
Total Accrual	-0.59	-0.96	0.37	-0.88	-1.26	0.39	0.76	0.83	-0.07
	(-1.82)	(-2.49)	(1.77)	(-3.18)	(-3.85)	(2.13)	(1.43)	(1.25)	(-0.19)
	[0.006]	[0.015]	[0.006]	[0.018]	[0.028]	[0.007]	[0.004]	[0.003]	[-0.002]
Net Operating Assets	-0.34	-0.83	0.49	-0.47	-0.91	0.44	0.36	0.29	0.07
	(-1.29)	(-2.76)	(3.50)	(-2.17)	(-3.46)	(3.19)	(0.74)	(0.56)	(0.27)
	[0.002]	[0.018]	[0.020]	[0.006]	[0.023]	[0.016]	[0.000]	[-0.001]	[-0.002]
Momentum	-0.69	-1.02	0.33	-0.97	-1.06	0.09	0.76	0.21	0.55
	(-2.38)	(-2.41)	(1.07)	(-3.75)	(-3.05)	(0.35)	(1.59)	(0.30)	(1.08)
	[0.009]	[0.013]	[0.001]	[0.021]	[0.015]	[-0.002]	[0.004]	[-0.002]	[0.001]
Gross Profitability Premium	-0.22	-0.54	0.32	-0.48	-0.43	-0.05	0.65	-0.21	0.86
	(-0.94)	(-2.21)	(1.81)	(-2.43)	(-2.12)	(-0.29)	(1.37)	(-0.46)	(2.26)
	[0.000]	[0.010]	[0.006]	[0.008]	[0.006]	[-0.002]	[0.006]	[-0.001]	[0.022]
Asset growth	-0.48	-0.91	0.44	-0.63	-1.11	0.48	0.42	0.56	-0.14
	(-1.68)	(-2.66)	(2.16)	(-2.49)	(-3.75)	(2.75)	(0.85)	(0.89)	(-0.44)
	[0.004]	[0.017]	[0.010]	[0.01]	[0.028]	[0.013]	[0.000]	[0.001]	[-0.001]
ROA	-0.20	-1.14	0.94	-0.54	-1.17	0.64	0.60	-0.07	0.67
	(-0.66)	(-2.35)	(2.79)	(-1.98)	(-3.07)	(2.35)	(1.14)	(-0.09)	(1.21)
	[-0.001]	[0.015]	[0.020]	[0.006]	[0.015]	[0.007]	[0.003]	[-0.002]	[0.003]
Investment to Asset	-0.70	-0.77	0.07	-0.82	-0.99	0.17	0.35	0.61	-0.25
	(-2.46)	(-2.51)	(0.49)	(-3.17)	(-3.60)	(1.29)	(0.76)	(1.05)	(-1.00)
	[0.014]	[0.014]	[-0.002]	[0.02]	[0.025]	[0.001]	[0.000]	[0.002]	[0.001]
Combination	-0.43	-0.93	0.50	-0.60	-1.01	0.41	0.47	0.31	0.16
	(-1.85)	(-2.90)	(3.79)	(-2.95)	(-3.72)	(3.81)	(1.14)	(0.55)	(0.73)
	[0.006]	[0.020]	[0.037]	[0.015]	[0.026]	[0.026]	[0.002]	[-0.001]	[0.000]

Anomaly	Investor sentiment proxy variables (S_{t-1})								
	$SENT$			$PRED$			RES		
	Long	Short	Long-Short	Long	Short	Long-Short	Long	Short	Long-Short
Panel B: Model: $R_{i,t} = \gamma_0 + \gamma_1 S_{t-1} + \gamma_2(\text{FF 3 factors})_t + \varepsilon_{i,t}$									
Failure probability	-0.02	-0.93	0.91	0.03	-0.59	0.62	-0.13	-1.17	1.04
	(-0.13)	(-2.79)	(2.15)	(0.21)	(-1.96)	(1.64)	(-0.46)	(-2.05)	(1.52)
	[0.789]	[0.723]	[0.360]	[0.789]	[0.717]	[0.352]	[0.789]	[0.718]	[0.353]
Ohlson's O	0.06	-0.53	0.59	-0.02	-0.45	0.43	0.15	-0.21	0.36
	(0.85)	(-2.65)	(3.03)	(-0.23)	(-2.72)	(2.60)	(1.05)	(-0.57)	(1.01)
	[0.932]	[0.841]	[0.607]	[0.932]	[0.84]	[0.602]	[0.932]	[0.837]	[0.598]
Net Stock Issuance	0.00	-0.39	0.39	-0.02	-0.31	0.29	0.06	-0.16	0.22
	(0.07)	(-3.60)	(3.38)	(-0.33)	(-3.29)	(2.62)	(0.56)	(-0.84)	(1.08)
	[0.931]	[0.856]	[0.263]	[0.931]	[0.854]	[0.254]	[0.931]	[0.851]	[0.246]
Composite Equity Issuance	0.02	-0.21	0.23	0.00	-0.21	0.22	0.03	0.02	0.01
	(0.23)	(-1.92)	(1.76)	(0.02)	(-2.12)	(1.78)	(0.25)	(0.14)	(0.07)
	[0.844]	[0.823]	[0.371]	[0.823]	[0.844]	[0.371]	[0.823]	[0.843]	[0.367]
Total Accrual	-0.02	-0.27	0.24	-0.11	-0.32	0.21	0.22	0.15	0.07
	(-0.13)	(-1.55)	(1.22)	(-0.76)	(-2.22)	(1.19)	(0.98)	(0.47)	(0.19)
	[0.779]	[0.807]	[0.067]	[0.78]	[0.808]	[0.066]	[0.78]	[0.806]	[0.064]
Net Operating Assets	0.07	-0.32	0.39	0.08	-0.24	0.31	-0.02	-0.17	0.15
	(0.70)	(-2.82)	(2.88)	(0.81)	(-2.27)	(2.31)	(-0.11)	(-0.97)	(0.65)
	[0.818]	[0.848]	[0.074]	[0.818]	[0.846]	[0.069]	[0.818]	[0.845]	[0.061]
Momentum	-0.04	-0.30	0.26	-0.10	-0.10	0.01	0.14	-0.45	0.58
	(-0.32)	(-1.12)	(0.76)	(-0.82)	(-0.44)	(0.02)	(0.6)	(-1.35)	(1.25)
	[0.821]	[0.670]	[0.021]	[0.821]	[0.669]	[0.019]	[0.821]	[0.67]	[0.022]
Gross Profitability Premium	0.14	-0.21	0.34	0.01	0.01	0.00	0.28	-0.49	0.78
	(1.41)	(-1.63)	(1.96)	(0.14)	(0.12)	(0.01)	(1.59)	(-2.00)	(2.23)
	[0.816]	[0.758]	[0.113]	[0.816]	[0.757]	[0.104]	[0.817]	[0.761]	[0.123]
Asset growth	0.06	-0.35	0.41	0.05	-0.35	0.40	0.01	0.01	0.00
	(0.59)	(-2.87)	(2.73)	(0.53)	(-3.32)	(2.82)	(0.04)	(0.05)	(-0.01)
	[0.806]	[0.866]	[0.279]	[0.806]	[0.866]	[0.279]	[0.805]	[0.863]	[0.269]
ROA	0.13	-0.58	0.71	0.07	-0.22	0.29	0.12	-0.75	0.87
	(1.39)	(-2.50)	(2.67)	(0.87)	(-1.03)	(1.23)	(0.75)	(-1.80)	(1.88)
	[0.886]	[0.730]	[0.321]	[0.885]	[0.726]	[0.31]	[0.885]	[0.729]	[0.318]
Investment to Asset	-0.22	-0.24	0.03	-0.20	-0.29	0.08	-0.02	0.11	-0.14
	(-2.11)	(-2.24)	(0.22)	(-2.07)	(-3.01)	(0.75)	(-0.15)	(0.61)	(-0.63)
	[0.845]	[0.843]	[0.169]	[0.845]	[0.844]	[0.17]	[0.844]	[0.842]	[0.17]
Combination	0.00	-0.32	0.32	-0.03	-0.20	0.17	0.09	-0.25	0.34
	(0.07)	(-3.00)	(2.99)	(-1.00)	(-2.31)	(1.78)	(1.38)	(-1.48)	(1.86)
	[0.972]	[0.909]	[0.341]	[0.972]	[0.907]	[0.329]	[0.973]	[0.907]	[0.333]

Table 6 Anomalies and Residual Investor Sentiment

This table presents the coefficient estimates on the investor sentiment index adjusted for the five macroeconomic variables, denoted as the residual investor sentiment index (RES), in the following regression:

$$R_{i,t} = \gamma_0 + \gamma_1 RES_{t-1}^{\text{whole}} + \gamma_2 Z_t + \varepsilon_{i,t}, \quad \text{or} \quad R_{i,t} = \gamma_0 + \gamma_1 RES_{t-1}^{\text{rolling}} + \gamma_2 Z_t + \varepsilon_{i,t},$$

where $R_{i,t}$ is the excess return in month *t* on the long-leg, short-leg, or long-short portfolio, and Z_t is the vector of the Fama-French three factors. RES^{rolling} is the residual investor sentiment index which is measured as the residual obtained from estimating the following regression, $SENT_t = \theta_0 + \theta_1 X_{t-1} + \varepsilon_t$, by rolling over month by month using the most recent 60 observations available up to month t-1, where $SENT_t$ is the Baker and Wurgler (2006) investor sentiment index and X_{t-1} is a vector of the one-month lagged five macroeconomic variables. RES^{whole} is the residual sentiment index obtained from estimating the same regression model by using the whole-period sample. "Combination" is a strategy that equally combines the 11 anomalies within a given month. Numbers in parentheses indicate heteroskedasticity-adjusted *t*-statistics of White (1980).

Anomaly	RES_{t-1}^{whole}			$RES_{t-1}^{\text{rolling}}$		
	Long leg	Short leg	Long-Short	Long leg	Short leg	Long-Short
	$\hat{\gamma}_1$ (t-stat)	$\hat{\gamma}_1$ (t-stat)	$\hat{\gamma}_1$ (t-stat)	$\hat{\gamma}_1$ (t-stat)	$\hat{\gamma}_1$ (t-stat)	$\hat{\gamma}_1$ (t-stat)
Failure probability	0.07 (0.34)	-1.11 (-2.66)	1.18 (2.19)	-0.13 (-0.46)	-1.17 (-2.05)	1.04 (1.52)
Ohlson's O	0.07 (0.82)	-0.55 (-2.12)	0.61 (2.42)	0.15 (1.05)	-0.21 (-0.57)	0.36 (1.01)
Net stock issuance	-0.02(-0.33)	-0.48 (-3.80)	0.46 (3.38)	0.06 (0.56)	-0.16 (-0.84)	0.22 (1.08)
Composite equity issuance	0.03 (0.39)	-0.19 (-1.75)	0.22 (1.65)	0.03 (0.25)	0.02 (0.14)	0.01 (0.07)
Total accrual	0.03 (0.15)	-0.19 (-0.91)	0.22 (0.89)	0.22 (0.98)	0.15 (0.47)	0.07 (0.19)
Net operating asset	0.05 (0.46)	-0.31 (-2.35)	0.36 (2.30)	-0.02 (-0.11)	-0.17 (-0.97)	0.15 (0.65)
Momentum	0.05 (0.35)	-0.18 (-0.57)	0.22 (0.58)	0.14 (0.60)	-0.45 (-1.35)	0.58 (1.25)
Gross profitability premium	0.12 (1.10)	-0.28 (-1.90)	0.40 (1.96)	0.28 (1.59)	-0.49 (-2.00)	0.78 (2.23)
Asset growth	0.02 (0.19)	-0.37 (-2.59)	0.39 (2.29)	0.01 (0.04)	0.01 (0.05)	0.00 (-0.01)
ROA	0.05 (0.42)	-0.73 (-2.44)	0.78 (2.24)	0.12 (0.75)	-0.75 (-1.80)	0.87 (1.88)
Investment to asset	-0.28 (-2.45)	-0.20 (-1.66)	-0.08 (-0.59)	-0.02 (-0.15)	0.11 (0.61)	-0.14 (-0.63)
Combination	0.00 (-0.02)	-0.32 (-2.48)	0.32 (2.40)	0.09 (1.38)	-0.25(-1.48)	0.34 (1.86)

Table 7 Anomalies during Months Following High- and Low-Sentiment Sorted on Three Sentiment Indexes

This table presents average benchmark-adjusted returns of the anomalies' highest-performing deciles (*long leg*), lowest-performing deciles (*short leg*), and long-short portfolios during months following high and low levels of investor sentiment, classified as HIGH or LOW based on the median level of each of the three sentiment indexes. The three sentiment indexes are constructed by estimating the first principal component of the Baker and Wurgler (2006) (BW) six sentiment proxies orthogonalized by a set of the six macroeconomic variables used by BW (growth in industrial production, growth in consumption of each of durables, nondurables, and services, growth in employment, and a dummy variable for NBER recessions), a set of the five macroeconomic variables used in this paper (cay, term spread, default spread, three-month Treasury-bill yield, and inflation rate), and a full set of the combined 11 macroeconomic variables, respectively. These three sentiment indexes are denoted as $SENT$, $SENT^{\text{new}}$, and $SENT^{\text{new 2}}$, respectively. The benchmark-adjusted returns are returns after adjusting for the Fama-French three factors. Numbers in parentheses indicate heteroskedasticity-adjusted *t*-statistics of White (1980). The sample period is August 1965 to January 2008.

Anomaly	Sorting on $SENT$			Sorting on $SENT^{\text{new}}$			Soring on $SENT^{\text{new 2}}$		
	High	Low	High-Low	High	Low	High-Low	High	Low	High-Low
				Panel A: Long-leg portfolio					
Failure probability	0.43 (2.52)	0.33 (2.33)	0.10 (0.44)	0.40 (2.19)	0.36 (2.50)	0.04 (0.16)	0.37 (2.10)	0.39 (2.72)	-0.02 (-0.10)
Ohlson's O	0.25 (2.70)	0.16 (2.09)	0.09 (0.72)	0.26 (2.85)	0.15 (1.70)	0.11 (0.87)	0.28 (3.19)	0.12 (1.40)	0.16 (1.28)
Net stock issuance	0.28 (3.68)	0.11 (1.68)	0.17 (1.69)	0.20 (2.54)	0.19 (2.85)	0.01 (0.06)	0.18 (2.42)	0.21 (2.94)	-0.03 (-0.29)
Composite equity issuance	0.08 (0.69)	-0.03 (-0.31)	0.11 (0.72)	0.07 (0.66)	-0.03 (-0.28)	0.10 (0.69)	0.12 (1.09)	-0.08 (-0.72)	0.20 (1.32)
Total accrual	0.19 (0.85)	0.34 (2.13)	-0.14 (-0.53)	0.19 (0.84)	0.32 (1.86)	-0.13 (-0.47)	0.13 (0.60)	0.38 (2.11)	-0.25 (-0.89)
Net operating assets	0.22 (1.36)	0.27 (2.04)	-0.05 (-0.24)	0.26 (1.66)	0.21 (1.56)	0.05 (0.26)	0.29 (1.88)	0.19 (1.33)	0.10 (0.47)
Momentum	0.66 (3.64)	0.60 (3.46)	0.06 (0.23)	0.53 (2.79)	0.72 (4.18)	-0.19 (-0.72)	0.59 (3.14)	0.67 (3.78)	-0.08 (-0.31)
Gross profitability premium	0.46 (3.17)	0.41 (3.25)	0.05 (0.26)	0.54 (3.83)	0.31 (2.46)	0.23 (1.22)	0.48 (3.46)	0.36 (2.90)	0.12 (0.63)
Asset growth	0.37 (2.23)	0.07 (0.38)	0.30 (1.29)	0.17 (1.01)	0.26 (1.51)	-0.09 (-0.40)	0.12 (0.74)	0.31 (1.77)	-0.18 (-0.78)
ROA	0.49 (4.01)	0.27 (2.26)	0.23 (1.35)	0.38 (3.18)	0.37 (2.99)	0.02 (0.10)	0.38 (3.07)	0.37 (3.10)	0.01 (0.06)
Investment to asset	0.01 (0.09)	0.32 (2.53)	-0.31 (-1.57)	0.06 (0.39)	0.26 (1.96)	-0.20 (-1.02)	-0.02 (-0.14)	0.34 (2.46)	-0.37 (-1.80)
Combination	0.30 (5.62)	0.26 (5.40)	0.04 (0.62)	0.27 (5.15)	0.27 (5.79)	0.00 (-0.06)	0.25 (4.85)	0.29 (6.08)	-0.04 (-0.56)

Anomaly	Sorting on $SENT$			Sorting on $SENT^{new}$			Soring on $SENT^{new\,2}$		
	High	Low	High-Low	High	Low	High-Low	High	Low	High-Low
				Panel B: Short-leg portfolio					
Failure probability	-1.65 (-4.33)	-0.58 (-1.81)	-1.07 (-2.19)	-1.49 (-3.88)	-0.81 (-2.55)	-0.68 (-1.40)	-1.28 (-3.45)	-1.04 (-3.11)	-0.24 (-0.49)
Ohlson's O	-1.24 (-5.29)	-0.60 (-3.23)	-0.64 (-2.16)	-1.09 (-4.86)	-0.77 (-3.81)	-0.32 (-1.06)	-0.98 (-4.31)	-0.88 (-4.47)	-0.10 (-0.34)
Net stock issuance	-0.80 (-4.86)	-0.12 (-1.09)	-0.68 (-3.42)	-0.93 (-5.94)	-0.02 (-0.13)	-0.91 (-4.69)	-0.71 (-4.37)	-0.24 (-1.98)	-0.47 (-2.32)
Composite equity issuance	-0.64 (-3.62)	-0.17 (-1.57)	-0.47 (-2.26)	-0.65 (-3.67)	-0.19 (-1.60)	-0.46 (-2.18)	-0.55 (-3.20)	-0.29 (-2.24)	-0.26 (-1.20)
Total accrual	-0.70 (-2.88)	0.02 (0.15)	-0.73 (-2.53)	-0.51 (-2.06)	-0.19 (-1.08)	-0.32 (-1.11)	-0.30 (-1.25)	-0.39 (-2.15)	0.08 (0.28)
Net operating assets	-0.87 (-4.94)	-0.15 (-1.25)	-0.72 (-3.40)	-0.91 (-5.04)	-0.13 (-1.06)	-0.78 (-3.52)	-0.73 (-4.14)	-0.31 (-2.40)	-0.41 (-1.87)
Momentum	-1.51 (-4.03)	-0.76 (-3.22)	-0.75 (-1.69)	-1.25 (-3.27)	-1.05 (-4.28)	-0.20 (-0.43)	-1.18 (-3.15)	-1.12 (-4.35)	-0.06 (-0.13)
Gross profitability premium	-0.40 (-2.43)	-0.06 (-0.47)	-0.33 (-1.59)	-0.30 (-1.79)	-0.18 (-1.28)	-0.12 (-0.54)	-0.31 (-1.96)	-0.16 (-1.12)	-0.15 (-0.72)
Asset growth	-0.82 (-4.48)	-0.06 (-0.48)	-0.76 (-3.43)	-0.87 (-4.78)	-0.03 (-0.25)	-0.84 (-3.77)	-0.67 (-3.66)	-0.24 (-1.72)	-0.43 (-1.89)
ROA	-1.26 (-3.98)	-0.51 (-2.01)	-0.75 (-1.88)	-1.26 (-4.09)	-0.55 (-2.09)	-0.71 (-1.82)	-1.16 (-3.77)	-0.64 (-2.41)	-0.52 (-1.31)
Investment to asset	-0.73 (-4.31)	-0.01 (-0.07)	-0.72 (-3.34)	-0.74 (-4.15)	-0.01 (-0.11)	-0.73 (-3.24)	-0.53 (-3.05)	-0.23 (-1.56)	-0.30 (-1.35)
Combination	-0.92 (-6.46)	-0.26 (-2.95)	-0.66 (-3.89)	-0.87 (-5.99)	-0.33 (-3.63)	-0.54 (-3.12)	-0.73 (-5.18)	-0.48 (-4.68)	-0.25 (-1.41)
				Panel C: Long-Short portfolio					
Failure probability	2.08 (4.45)	0.91 (2.39)	1.17 (1.95)	1.89 (3.99)	1.17 (3.12)	0.72 (1.21)	1.65 (3.61)	1.43 (3.64)	0.22 (0.37)
Ohlson's O	1.49 (6.13)	0.76 (3.77)	0.73 (2.32)	1.34 (5.85)	0.92 (4.23)	0.43 (1.36)	1.26 (5.36)	1.00 (4.75)	0.26 (0.83)
Net stock issuance	1.08 (6.19)	0.23 (1.79)	0.85 (3.90)	1.13 (6.84)	0.21 (1.49)	0.92 (4.32)	0.89 (5.31)	0.45 (3.11)	0.44 (2.01)
Composite equity issuance	0.72 (3.40)	0.14 (0.89)	0.58 (2.23)	0.72 (3.50)	0.16 (0.96)	0.56 (2.18)	0.67 (3.33)	0.21 (1.22)	0.46 (1.75)
Total accrual	0.89 (3.02)	0.31 (1.33)	0.58 (1.60)	0.70 (2.39)	0.51 (2.07)	0.19 (0.51)	0.43 (1.56)	0.77 (2.97)	-0.33 (-0.90)
Net operating assets	1.09 (4.78)	0.42 (2.20)	0.67 (2.30)	1.17 (5.22)	0.34 (1.77)	0.83 (2.86)	1.01 (4.83)	0.50 (2.40)	0.51 (1.75)
Momentum	2.17 (4.46)	1.36 (3.87)	0.81 (1.35)	1.78 (3.56)	1.77 (4.95)	0.01 (0.02)	1.77 (3.59)	1.78 (4.85)	-0.02 (-0.03)
Gross profitability premium	0.85 (3.77)	0.47 (2.23)	0.38 (1.24)	0.83 (3.59)	0.49 (2.33)	0.34 (1.09)	0.80 (3.55)	0.53 (2.46)	0.27 (0.88)
Asset growth	1.18 (4.81)	0.13 (0.60)	1.05 (3.35)	1.04 (4.07)	0.29 (1.42)	0.75 (2.30)	0.79 (3.16)	0.54 (2.54)	0.25 (0.77)
ROA	1.75 (5.00)	0.78 (2.66)	0.97 (2.16)	1.64 (4.82)	0.91 (3.03)	0.73 (1.61)	1.54 (4.56)	1.01 (3.31)	0.53 (1.19)
Investment to asset	0.74 (3.75)	0.33 (1.76)	0.41 (1.54)	0.80 (4.04)	0.28 (1.48)	0.52 (1.99)	0.51 (2.68)	0.57 (2.87)	-0.06 (-0.24)
Combination	1.22 (7.92)	0.52 (5.01)	0.70 (3.74)	1.14 (7.47)	0.61 (5.71)	0.54 (2.88)	0.98 (6.65)	0.77 (6.65)	0.21 (1.11)

Table 8 Macroeconomic Conditions during High and Low Sentiment Periods

This table presents averages of several macroeconomic variables during months of high and low sentiment, classified as HIGH or LOW based on the median level of the Baker and Wurgler (2006) sentiment index. Numbers in parentheses indicate t-values. The sample period is July 1965 to December 2007.

	Whole months	High sentiment months	Low sentiment months	High-Low
#Months	510	255	255	0
SENT	0.00 (0.00)	0.74 (16.80)	-0.74(-19.10)	1.49 (25.23)
Market return (%)	0.46 (2.34)	0.25 (0.82)	0.68 (2.66)	-0.43 (-1.09)
#Months of recession	65	41	24	17
cay	0.19 (2.32)	0.52 (5.11)	-0.14 (-1.10)	0.65 (4.07)
Term spread (%)	0.85 (16.66)	0.71 (10.22)	0.98 (13.41)	-0.27 (-2.68)
Default spread (%)	1.03 (55.98)	1.13 (38.00)	0.92 (47.60)	0.21 (5.90)
T-bill yield (%)	5.84 (48.30)	6.67 (35.03)	5.01 (38.48)	1.66 (7.18)
Inflation rate (%)	0.37 (27.54)	0.37 (19.28)	0.38 (19.63)	-0.01 (-0.44)
GDP growth (%)	0.26 (20.72)	0.25 (13.51)	0.27 (15.89)	-0.02 (-0.92)
Industrial prod growth (%)	0.23 (7.30)	0.19 (4.27)	0.27 (6.05)	-0.08 (-1.28)
Consumption growth (%)	0.61 (25.25)	0.59 (16.27)	0.63(19.70)	-0.04 (-0.89)
Employment growth (%)	0.16 (17.41)	0.14 (10.61)	0.19 (14.12)	-0.05 (-2.67)

Table 9 Exposures of the Long-Leg, Short-Leg, and Long-Short Portfolios of the Anomalies on Innovations in Macroeconomic Variables

This table presents the coefficient estimates in regressing excess returns of the long-leg, short-leg, and long-short portfolios on one-month-lagged innovations in the five macroeconomic variables. The residuals from the VAR(1) model containing the five macroeconomic variables are regarded as the innovations. Numbers in parentheses indicate heteroskedasticity-adjusted *t*-statistics of White (1980). The sample period is August 1965 to January 2008.

Anomaly	cay (/100)	Term spread	Default spread	T-bill yield	Inflation rate (/100)
			Panel A: Long-leg portfolio		
Failure probability	-3.17 (-14.40)	0.27 (1.93)	6.61 (18.33)	-1.05 (-6.86)	-2.18 (-20.99)
Ohlson's O	-3.36 (-17.04)	0.23 (2.03)	11.37 (31.00)	-1.17 (-10.34)	-0.79 (-8.06)
Net stock issuance	-2.47 (-20.24)	-0.20 (-1.45)	6.61 (22.64)	-1.73 (-28.73)	-0.28 (-2.30)
Composite equity issuance	-1.44 (-14.77)	0.93 (9.00)	3.86 (12.80)	-2.31 (-25.35)	-0.68 (-8.35)
Total accrual	-3.12 (-14.62)	0.95 (5.77)	15.29 (25.61)	-3.24 (-18.63)	-0.92 (-7.55)
Net operating assets	-3.88 (-19.65)	0.78 (5.92)	7.16 (10.62)	-2.71 (-28.56)	-1.94 (-17.05)
Momentum	-3.47 (-10.74)	3.13(16.99)	7.70 (11.60)	-2.70 (-14.56)	-0.84 (-6.47)
Gross profitability premium	-3.79 (-22.13)	0.95 (7.58)	8.56 (21.72)	-2.43 (-21.38)	-1.94 (-21.64)
Asset growth	-3.32 (-13.50)	0.88 (5.80)	10.46 (30.89)	-2.41 (-16.00)	-2.47 (-16.34)
ROA	-3.31 (-14.79)	0.91 (7.16)	11.5 (22.20)	-1.59 (-12.41)	-1.09 (-11.75)
Investment to asset	-1.59 (-8.19)	1.06 (7.42)	8.71 (26.56)	-2.50 (-23.97)	-1.47 (-11.80)
Combination	-2.90 (-16.55)	1.06 (9.29)	8.51 (27.49)	-2.35 (-21.77)	-1.20 (-12.50)
			Panel B: Short-leg portfolio		
Failure probability	-4.67 (-9.35)	2.88 (8.97)	6.17 (8.44)	-3.19 (-16.91)	-3.53 (-18.32)
Ohlson's O	-3.67 (-10.77)	0.93 (3.76)	8.99 (13.11)	-0.57 (-2.52)	-1.30 (-5.71)
Net stock issuance	-2.91 (-14.76)	1.21 (8.38)	12.81 (25.88)	-3.14 (-21.69)	-0.50 (-3.63)
Composite equity issuance	-3.22 (-14.62)	0.93 (5.55)	11.40 (31.13)	-3.11 (-27.28)	-0.73 (-6.17)
Total accrual	-4.16 (-15.72)	1.73(11.05)	15.70 (26.70)	-4.35 (-26.52)	-2.42 (-15.65)
Net operating assets	-3.38 (-17.48)	1.05 (8.00)	12.50 (28.86)	-3.24 (-22.27)	-1.13 (-9.16)
Momentum	-3.85 (-15.44)	1.34 (6.62)	14.45 (18.44)	-4.70 (-27.35)	-1.45 (-9.49)
Gross profitability premium	-2.96 (-17.29)	-0.37 (-2.73)	7.04 (20.49)	-0.89 (-7.56)	-0.64 (-5.13)
Asset growth	-3.84 (-16.65)	1.04 (7.11)	11.25 (22.39)	-3.52 (-31.56)	-1.08 (-8.50)
ROA	-4.52 (-12.54)	1.81 (5.99)	15.62 (22.34)	-1.58 (-7.50)	-3.31 (-15.69)
Investment to asset	-2.96 (-14.26)	0.95 (7.27)	11.26 (27.06)	-2.82 (-26.95)	-1.28 (-9.79)
Combination	-3.67 (-16.15)	1.29 (8.94)	11.63 (27.14)	-3.00 (-23.69)	-1.44 (-11.16)
			Panel C: Long−Short portfolio		
Failure probability	1.50 (4.08)	-2.61(-10.31)	0.44 (0.69)	2.14 (13.79)	1.35 (7.55)
Ohlson's O	0.31 (1.67)	-0.70 (-4.12)	2.38 (4.16)	-0.60 (-3.97)	0.52 (2.68)
Net stock issuance	0.44 (4.33)	-1.41(-10.05)	-6.19(-14.27)	1.40 (11.82)	0.22 (2.36)
Composite equity issuance	1.78(11.55)	0.00 (-0.02)	-7.54(-18.88)	0.80 (10.39)	0.04 (0.45)
Total accrual	1.04 (5.79)	-0.78 (-7.25)	-0.42 (-0.72)	1.11 (12.10)	1.50 (11.98)
Net operating assets	-0.50 (-5.91)	-0.27 (-3.29)	-5.35 (-8.10)	0.53 (6.46)	-0.81(-10.88)
Momentum	0.38 (1.88)	1.79 (7.73)	-6.75(-10.08)	2.00 (9.13)	0.62 (4.57)
Gross profitability premium	-0.83 (-6.54)	1.31 (10.13)	1.52 (5.00)	-1.54(-15.31)	-1.29(-13.66)
Asset growth	0.53 (3.22)	-0.16 (-1.22)	-0.79 (-1.82)	1.11 (10.47)	-1.39(-11.17)
ROA	1.21 (4.79)	-0.91 (-3.93)	-4.12 (-7.87)	-0.01 (-0.06)	2.22 (13.18)
Investment to asset	1.37(10.80)	0.11 (1.76)	-2.54 (-6.55)	0.32 (4.95)	-0.18 (-2.65)
Combination	0.77 (9.05)	-0.23 (-3.67)	-3.12(-12.02)	0.65 (12.89)	0.25 (4.32)
	Panel D: Number of (+) and (-) innovation months during high (low) sentiment periods				
(+) positive innovation	133 (145)	116 (137)	123 (116)	143 (118)	103 (132)
(-) negative innovation	122 (110)	139 (118)	132 (139)	112 (137)	152 (123)

Table 10 Anomalies during Months Following High- and Low-Sentiment Sorted on Michigan Sentiment Indexes

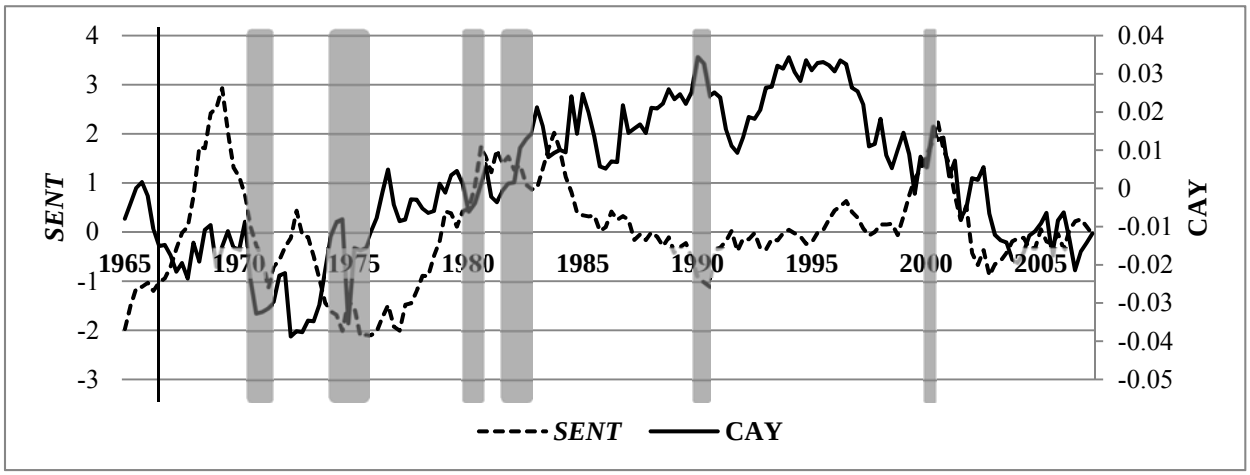
This table presents average benchmark-adjusted returns of the anomalies' highest-performing deciles (*long leg*), lowest-performing deciles (*short leg*), and long-short portfolios during months following high and low levels of investor sentiment, classified as HIGH or LOW based on the median level of each of the three sentiment indexes; $MICH$ is the Michigan sentiment index, and RES_{MICH} is computed as the residual from the following time-series regression model: $MICH_t = \theta_0 + \theta_1 X_{t-1} + \varepsilon_t$, where $MICH_t$ is the Michigan sentiment index and X_{t-1} is a vector of the one-month lagged six macroeconomic variables used in Baker and Wurgler (2006) (BW) to orthogonalize the BW six sentiment proxies (the growth in industrial production, the growth in durables, nondurables, and services consumption, the growth in employment, and a dummy variable for NBER recessions). The parameters are estimated by rolling over month by month using the previous 60 monthly observations available up to month t-1. RES''_{MICH} is computed similarly to RES_{MICH} except that a full set of the combined 11 macroeconomic variables (the six variables used in computing RES_{MICH} plus the five variables used in this paper - cay, term spread, default spread, three-month Treasury-bill yield, and inflation rate) are included in X_{t-1} in the predictive regression. The benchmark-adjusted returns are returns after adjusting for the Fama-French three factors. Numbers in parentheses indicate heteroskedasticity-adjusted *t*-statistics of White (1980). The sample period is August 1965 to January 2008.

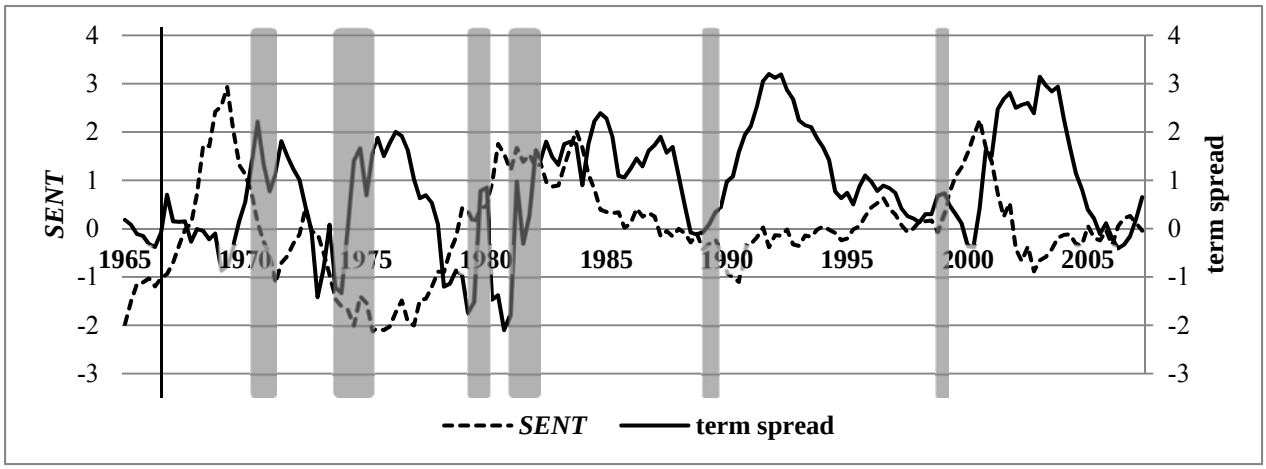
Anomaly	Sorting on $MICH$			Sorting on RES_{MICH}			Soring on RES''_{MICH}		
	High	Low	High-Low	High	Low	High-Low	High	Low	High-Low
				Panel A: Long-leg portfolio					
Failure probability	0.58 (3.06)	0.07 (0.51)	0.51 (2.10)	0.25 (1.74)	0.41 (2.36)	-0.16 (-0.73)	0.32 (2.26)	0.35(1.93)	-0.03 (-0.16)
Ohlson's O	0.29 (3.05)	0.17 (1.89)	0.12 (0.94)	0.27 (2.89)	0.20 (2.15)	0.07 (0.59)	0.29 (3.15)	0.18(1.94)	0.10 (0.83)
Net stock issuance	0.26 (3.04)	0.20 (2.81)	0.06 (0.56)	0.23 (3.15)	0.23 (2.84)	0.00 (0.00)	0.29 (3.85)	0.17(2.20)	0.12 (1.16)
Composite equity issuance	0.02 (0.15)	0.08 (0.55)	-0.06 (-0.31)	-0.05 (-0.35)	0.14 (1.04)	-0.19 (-1.02)	0.04 (0.30)	0.06(0.41)	-0.02 (-0.09)
Total accrual	0.42 (1.50)	0.42 (2.26)	-0.01 (-0.02)	0.57 (2.78)	0.27 (1.09)	0.31 (1.02)	0.45 (2.35)	0.39(1.49)	0.07 (0.23)
Net operating assets	0.17 (0.90)	0.27 (1.40)	-0.11 (-0.42)	0.32 (1.79)	0.12 (0.60)	0.20 (0.80)	0.18 (1.01)	0.25(1.33)	-0.07 (-0.29)
Momentum	0.60 (2.87)	0.43 (2.11)	0.17 (0.57)	0.38 (1.99)	0.65 (3.15)	-0.27 (-1.01)	0.43 (2.19)	0.61(2.97)	-0.18 (-0.66)
Gross profitability premium	0.58 (4.00)	0.22 (1.35)	0.36 (1.67)	0.44 (3.14)	0.36 (2.17)	0.08 (0.36)	0.49 (3.13)	0.31(2.08)	0.18 (0.87)
Asset growth	0.12 (0.62)	0.45 (1.85)	-0.33 (-1.12)	0.03 (0.14)	0.54 (2.38)	-0.51 (-1.73)	0.04 (0.23)	0.52(2.23)	-0.48 (-1.65)
ROA	0.61 (4.62)	0.34 (2.70)	0.28 (1.57)	0.60 (4.57)	0.36 (2.80)	0.24 (1.36)	0.57 (4.52)	0.38(2.90)	0.19 (1.08)
Investment to asset	0.04 (0.23)	0.34 (1.95)	-0.30 (-1.23)	-0.01 (-0.08)	0.40 (2.33)	-0.41 (-1.76)	0.14 (0.81)	0.25(1.36)	-0.11 (-0.48)
Combination	0.34 (5.55)	0.27 (4.47)	0.06 (0.76)	0.28 (4.28)	0.33 (5.89)	-0.06 (-0.70)	0.30 (5.08)	0.32(4.93)	-0.02 (-0.24)

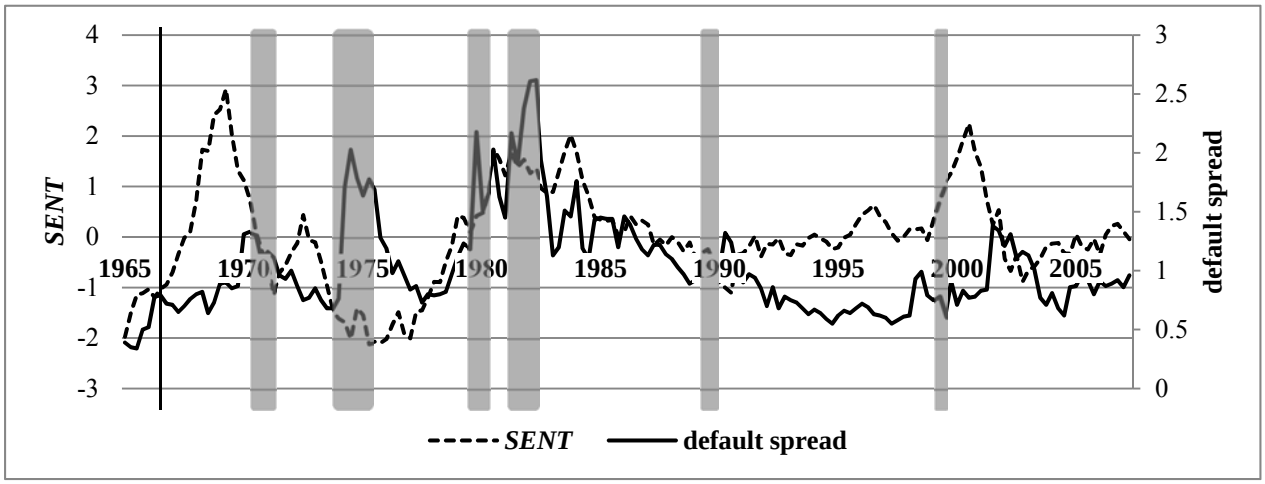
Anomaly	Sorting on $MICH$			Sorting on RES_{MICH}			Soring on RES''_{MICH}		
	High	Low	High-Low	High	Low	High-Low	High	Low	High-Low
				Panel B: Short-leg portfolio					
Failure probability	-1.46 (-3.61)	-1.05 (-2.84)	-0.41 (-0.75)	-1.47 (-4.01)	-1.05 (-2.67)	-0.42 (-0.79)	-1.76 (-4.94)	-0.76 (-1.92)	-1.01 (-1.95)
Ohlson's O	-0.80 (-3.42)	-0.89 (-4.45)	0.09 (0.30)	-0.91 (-3.92)	-0.77 (-3.87)	-0.14 (-0.47)	-0.74 (-3.28)	-0.94 (-4.55)	0.19 (0.63)
Net stock issuance	-0.82 (-4.19)	-0.13 (-0.88)	-0.69 (-2.77)	-0.62 (-3.53)	-0.34 (-2.12)	-0.28 (-1.19)	-0.56 (-3.32)	-0.41 (-2.41)	-0.15 (-0.64)
Composite equity issuance	-0.65 (-3.27)	-0.10 (-0.52)	-0.55 (-1.96)	-0.56 (-2.91)	-0.19 (-1.07)	-0.37 (-1.43)	-0.58 (-3.21)	-0.18 (-0.95)	-0.39 (-1.57)
Total accrual	-1.05 (-3.74)	-0.04 (-0.22)	-1.00 (-2.92)	-0.91 (-3.56)	-0.20 (-0.86)	-0.71 (-2.09)	-0.72 (-3.08)	-0.39 (-1.51)	-0.33 (-0.98)
Net operating assets	-0.92 (-4.18)	-0.30 (-1.75)	-0.62 (-2.21)	-0.88 (-4.74)	-0.34 (-1.80)	-0.54 (-2.14)	-0.79 (-4.42)	-0.44 (-2.23)	-0.35 (-1.39)
Momentum	-1.73 (-3.62)	-0.79 (-2.11)	-0.93 (-1.53)	-1.77 (-4.79)	-0.76 (-1.70)	-1.01 (-1.84)	-1.74 (-4.95)	-0.80 (-1.73)	-0.94 (-1.71)
Gross profitability premium	-0.30 (-1.70)	-0.25 (-1.31)	-0.05 (-0.21)	-0.25 (-1.38)	-0.30 (-1.64)	0.04 (0.18)	-0.41 (-2.41)	-0.14 (-0.75)	-0.26 (-1.07)
Asset growth	-0.82 (-3.55)	-0.18 (-1.10)	-0.64 (-2.23)	-0.80 (-3.93)	-0.21 (-1.20)	-0.58 (-2.26)	-0.54 (-2.78)	-0.47 (-2.50)	-0.07 (-0.29)
ROA	-0.81 (-2.46)	-0.92 (-2.96)	0.11 (0.25)	-0.86 (-2.60)	-0.87 (-2.82)	0.01 (0.02)	-0.96 (-2.84)	-0.77 (-2.57)	-0.19 (-0.43)
Investment to asset	-0.59 (-2.79)	-0.22 (-1.22)	-0.37 (-1.31)	-0.77 (-4.07)	-0.05 (-0.28)	-0.71 (-2.81)	-0.40 (-2.14)	-0.43 (-2.17)	0.03 (0.11)
Combination	-0.90 (-4.91)	-0.44 (-3.31)	-0.46 (-1.98)	-0.89 (-5.67)	-0.46 (-3.00)	-0.43 (-1.99)	-0.84 (-5.52)	-0.52 (-3.27)	-0.32 (-1.48)
				Panel C: Long-Short portfolio					
Failure probability	2.04 (4.11)	1.12 (2.50)	0.92 (1.38)	1.72 (4.06)	1.46 (2.92)	0.26 (0.41)	2.08 (5.11)	1.11 (2.17)	0.97 (1.54)
Ohlson's O	1.09 (4.43)	1.06 (4.93)	0.03 (0.09)	1.18 (4.76)	0.97 (4.58)	0.22 (0.67)	1.03 (4.17)	1.12 (5.20)	-0.09 (-0.27)
Net stock issuance	1.08 (5.22)	0.33 (1.88)	0.75 (2.75)	0.85 (4.25)	0.58 (3.18)	0.28 (1.04)	0.85 (4.54)	0.58 (3.02)	0.27 (1.04)
Composite equity issuance	0.66 (2.85)	0.18 (0.72)	0.49 (1.48)	0.52 (2.12)	0.33 (1.47)	0.18 (0.57)	0.61 (2.78)	0.24 (0.97)	0.38 (1.22)
Total accrual	1.46 (4.57)	0.47 (1.84)	1.00 (2.48)	1.48 (4.73)	0.47 (1.76)	1.01 (2.52)	1.17 (4.14)	0.78 (2.57)	0.40 (0.99)
Net operating assets	1.08 (4.03)	0.57 (2.21)	0.51 (1.41)	1.20 (4.51)	0.46 (1.84)	0.74 (2.13)	0.97 (3.62)	0.69 (2.77)	0.28 (0.80)
Momentum	2.33 (3.84)	1.23 (2.47)	1.10 (1.39)	2.16 (4.52)	1.41 (2.49)	0.74 (1.07)	2.17 (4.67)	1.41 (2.43)	0.76 (1.10)
Gross profitability premium	0.88 (3.38)	0.47 (1.93)	0.41 (1.16)	0.70 (2.75)	0.66 (2.63)	0.03 (0.09)	0.90 (3.96)	0.46 (1.75)	0.45 (1.34)
Asset growth	0.94 (2.96)	0.63 (2.26)	0.31 (0.74)	0.83 (2.82)	0.75 (2.59)	0.07 (0.19)	0.59 (2.19)	0.99 (3.25)	-0.40 (-1.06)
ROA	1.42 (3.90)	1.26 (3.55)	0.16 (0.33)	1.46 (3.91)	1.23 (3.47)	0.23 (0.46)	1.53 (4.20)	1.15 (3.22)	0.38 (0.77)
Investment to asset	0.63 (2.78)	0.57 (2.30)	0.06 (0.20)	0.76 (3.25)	0.45 (1.88)	0.31 (0.97)	0.53 (2.35)	0.67 (2.76)	-0.14 (-0.45)
Combination	1.24 (6.44)	0.72 (4.74)	0.52 (2.12)	1.17 (6.44)	0.80 (5.14)	0.37 (1.61)	1.13 (6.78)	0.83 (4.94)	0.30 (1.30)

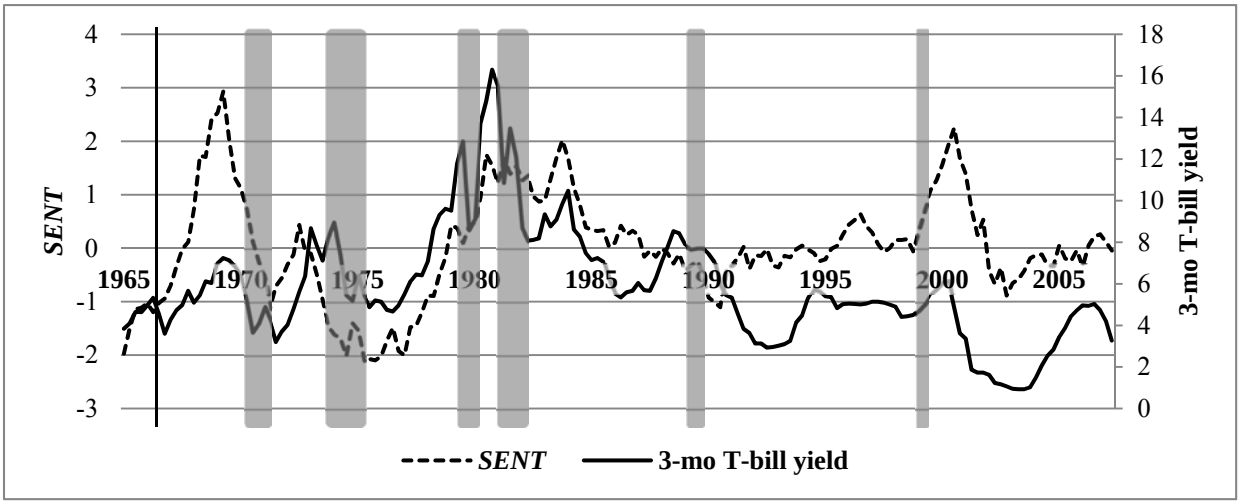
Figure 1 Time-series Patterns of the Investor Sentiment Index and Macroeconomic Variables

These figures depict the quarterly time-series patterns of the Baker and Wurgler (2006) investor sentiment index (*SENT*) against each of the five macroeconomic variables (*cay*, term spread, default spread, 3-month Treasury bill yield, and inflation rate). Gray bars indicate the NBER recession periods.








4
3
2
1
0
-1
-2
-3
18
16
14
12
10
8
6
4
2
0
SENT
3-mo T-bill yield
1965
1970
1975
1980
1985
1990
1995
2000
2005
SENT
3-mo T-bill yield

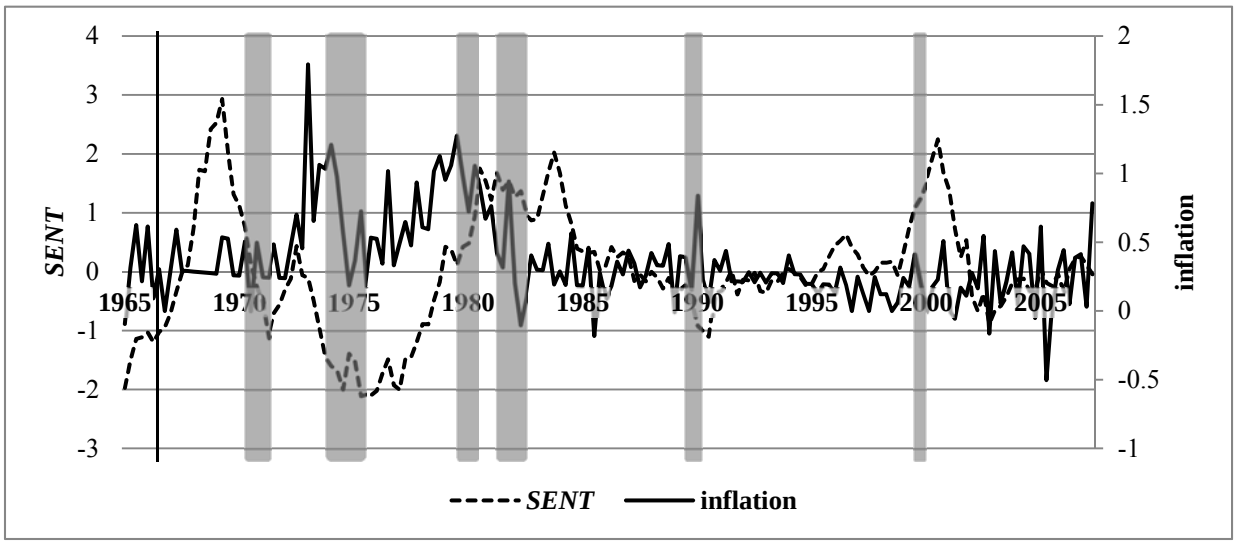

4
3
2
1
0
-1
-2
-3
2
1.5
1
0.5
0
-0.5
-1
SENT
inflation
1965
1970
1975
1980
1985
1990
1995
2000
2005
SENT
inflation

Figure 2 Investor Sentiment versus Predicted and Residual Investor Sentiment

These figures depict the monthly time-series patterns of the Baker and Wurgler (2006) investor sentiment index (*SENT*), the predicted investor sentiment (*PRED*), and the residual investor sentiment. PRED_t is computed as $\hat{\theta}_1 X_{t-1}$ from the following time-series regression model: $SENT_t = \theta_0 + \theta_1 X_{t-1} + \varepsilon_t$, where $SENT_t$ is the Baker and Wurgler (2006) investor sentiment index and X_{t-1} is a vector of the one-month lagged five macroeconomic variables (cay, term spread, default spread, 3-month Treasury-bill yield, and inflation rate). The parameters are estimated by rolling over month by month by using the previous 60 observations (a minimum of 24 observations) available up to month t-1. RES_t is computed as the difference between $SENT_t$ and $PRED_t$. Gray bars indicate the NBER recession periods.