Advances in Behavioral Finance & Economics: The Journal of the Academy of Behavioral Finance Volume 1, Issue 2, Spring 2011 87-101

ISSN: 1551-9570

# Value Premium and Investor Sentiment

Ding Du

*The W. A. Franke College of Business, PO Box 15066*
*Northern Arizona University*
*Flagstaff, AZ 86011*
*E-mail: ding.du@nau.edu*
*Phone: (928) 523-7274*
*Fax: (928) 523-7331*

---

**Abstract**

There are two competing explanations for the value premium. One suggests that value premium is a compensation for risk, while the other implies that it is driven by investor sentiment. Previous empirical studies typically test these two competing explanations of value premium in isolation, which may lead to incorrect inferences. In this paper, we extend the literature by testing these two competing explanations of value premium in a joint fashion. We find that while value premium is correlated with investor sentiment, it shows very little correlation with the state of the economy. Based on this evidence, it is very difficult to argue that value premium is due to risk.

*Keywords:* value premium; investor sentiment

---

**Value Premium and Investor Sentiment**

## I. Introduction

There is substantial evidence suggesting that stocks with high book-to-market equity (BE/ME) have higher average returns than stocks with low BE/ME (e.g. Rossenberg, Reid, and Lanstein, 1985; Chan, Hamao, and Lakonishok, 1991; Capaul, Rowley, and Sharp, 1993; Fama and French, 1998; and Davis, Fama, and French, 2000). What explains the value premium is still controversial.

There are two competing explanations for the value premium. One suggests that value premium is a compensation for risk (e.g. Fama and French, 1996; Carlson, Fisher, and Giammarino, 2004; Zhang, 2005; Cooper, 2006). In particular, Zhang (2005) presents a neoclassical rational expectation model showing that costly reversibility cause assets in place to be harder to reduce, and hence are riskier than growth options especially in bad times when the price of risk is high. As a result, high BE/ME stocks are riskier than low BE/ME stocks, and have higher expected returns in economic downturns.

Another explanation implies that value premium is driven by investor sentiment (e.g. DeBondt and Thaler, 1987; Lakonishok, Shleifer, and Vishny, 1994; Daniel and Titman, 1997; Baker and Wurgler, 2006). If investor sentiment is high, investors may over-price stocks with high growth options, thus leading to the overpricing of low BE/ME stocks. Since overpricing will eventually be corrected, the returns of low BE/ME stocks will decrease and result in the value premium following high investor sentiment.

Gulen, Xing, and Zhang (2008) test the risk-based explanation proposed by Zhang (2005), and find some evidence suggesting that value premium is high following the high-volatility state. However, their high-volatility state does not necessarily mean a recession state, which makes it difficult to interpret their results given that the theory in Zhang (2005) predicts the value premium based upon the state of the economy. Furthermore, we find that the economic variables that they use to proxy aggregate economic conditions do not have reliable association with the state of the economy, which makes it even more difficult to interpret their results.[1]

Baker and Wurgler (2006) test the sentiment-based explanation, and find some weak supporting evidence. For instance, in one out of eight cases, the value premium (measured by the return difference between medium BE/ME stocks and low BE/ME stocks) is high following high investor sentiment.

The present paper intends to extend the value premium literature based on Gulen, Xing, and Zhang (2008) and Baker and Wurgler (2006). First, different from Gulen, Xing, and Zhang (2008), we use a more informative and parsimonious measure of the state of the economy to test the risk-based explanation of the value premium. Specifically, we use the Chicago Fed National Activity Index (CFNAI-MA3) to measure aggregate economic conditions. This index is originally proposed by Stock and Watson (1999), which is used by Boyd, Jagannathan, and Hu (2005) to identify the state of the economy. Basically, this index is the first principal component (the common component) of 85 macroeconomic indicators. Therefore, it is a more informative and parsimonious measure of overall economic activity and related inflationary pressure than any individual macroeconomic variables or a smaller set of macroeconomic variables. The national activity index is also more useful than the NBER business cycle dates data. The NBER's

[1] See also García-Feijóo and Jorgensen (2010) and Rytchkov (2010).

decision of an official turning point usually comes many months after the turning point date, while the national activity index is released on a monthly basis and provides a more real-time measure of aggregate economic conditions.

Second, different from Baker and Wurgler (2006), we focus on the value premium within big ME stocks and that within small ME stocks, not the overall value premium for all stocks. As Baker and Wurgler (2006) among others point out, small ME stocks may be more sensitive to investor sentiment than big ME stocks. Therefore, the mispricing due to investor sentiment and hence the value premium should be more evident among small ME stocks. In fact, in our sample, the value premium within big ME stocks is 0.28 percent per month (which is not statistically significant), while that within small ME stocks is 0.63 percent per month (which is statistically significant at one percent level). Therefore, if we do not differentiate between the value premium within big ME stocks and that within small ME stocks, we may bring noise into our estimations and reduce the power of tests.

Third, previous empirical studies typically test these two competing explanations of the value premium in isolation. A natural and important extension is to examine these two explanations in a joint fashion. Studying these two potential explanations of the value premium in isolation may be problematic. If only one factor is relevant and the other factor simply has a spurious correlation with this factor, studying these two factors in isolation could incorrectly lead to a conclusion that both factors are relevant. However, in a joint test, the factor that has no association with the value premium will lose its explanatory power as soon as the relevant factors are included.

Therefore, in this paper, we examine these two competing explanations of the value premium jointly in a regression framework. Empirically, we find that while value premium is correlated with the investor sentiment, it shows very little correlation with aggregate economic conditions. Based on this evidence, it is very difficult to argue that value premium is due to risk.

The remainder of the paper is organized as follows: Section 2 briefly discusses our data and motivation. Section 3 presents our empirical methodology and results. Section 4 concludes the paper with a brief summary.

.

## 2. Data and Motivation

We use the sentiment index proposed by Baker and Wurgler (2006) to measure the investor sentiment. The index is based on six popular sentiment indicators: trading volume as measured by NYSE turnover; the dividend premium; the closed-end fund discount; the number and first-day returns on IPOs; and the equity share in new issues. The sentiment level index is the first principal component of these six indicators, while the sentiment changes index is the first principal component of the changes in these six indicators. The sentiment index is constructed to be orthogonal to a set of macroeconomic variables including growth in industrial production, real growth in durable, nondurable, and services consumption, growth in employment, and an NBER recession indicator. Panel A of Figure 1 shows the sentiment level index with the shaded areas corresponding to recession periods dated by NBER. Since the sentiment data from Jeffrey Wurgler's site are only available from 1967:5 to 2007:12, we focus on the sample period from 1968:1 to 2007:12 in this paper.

The Chicago Fed National Activity Index (CFNAI-MA3) is used as the measure of aggregate economic conditions. The economic indicators comprising the index are drawn from five broad categories of data: (1) output and income (21 series); (2) employment, unemployment and hours (24 series); (3) personal consumption, housing starts and sales (13 series); (4)

manufacturing and trade sales (11 series); and (5) inventories and orders (16 series). The index is basically the first principal component of these 85 data series. If all 85 series were proportional to a single common variable plus individual noise, the index would be the estimate of the common variable that minimizes the implied noise discrepancies in a least-squares sense. The index is constructed to have an average value of zero and a standard deviation of one over long run. Since economic activity tends toward trend growth rate over time, an index reading of zero corresponds to an economy growing at trend.[2] Panel B of Figure 1 shows the activity index with the shaded areas corresponding to recession periods dated by NBER. It seems that the activity index tracks the US aggregate economic activity well.

[Figure 1]

Gulen, Xing, and Zhang (2008) use the one-month Treasury bill rate (TB), the default premium (DEF), the growth in the monetary base (ΔM), and the dividend yield (DIV) as proxies of aggregate economic conditions. To examine the explanatory power of these variables, we estimate the following regression model in a similar fashion as Gulen, Xing, and Zhang (2008).

$$NAI_t = a_0 + a_1 TB_{t-1} + a_2 DEF_{t-1} + a_3 \Delta M_{t-2} + a_4 DIV_{t-1} + e_t \qquad (1)$$

where NAI is the Chicago Fed National Activity Index. The results for the whole sample period as well as for the two equal sub-sample periods are reported in Table 1. The t-ratios are based on Newey-West HAC standard errors with the lag parameter set to 12. The significant coefficients (at the 5% level for the two-sided test) are in bold. As we can see, none of the four variables has a reliable association with the national activity index. Our findings therefore suggest that the results in Gulen, Xing, and Zhang (2008) may not be the decisive supporting evidence of the risk-based explanation of the value premium, and it is important to re-test the risk-based explanation with the national activity index (a more informative measure of aggregate economic conditions).

[Table 1]

Our stock returns data are from Kenneth French's website. In Table 2, we report the value premium over the whole sample period as well as over the two equal sub-sample periods. As we can see, the value premium within big ME stocks is usually much smaller than that within small ME stocks and are often not statistically significant. For instance, for the whole sample period, the value premium within big ME stocks is 0.28 percent per month (which is not statistically significant), while that within small ME stocks is 0.63 percent per month (which is statistically significant at one percent level). Therefore, if we do not differentiate between the value premium within big ME stocks and that within small ME stocks (as in Baker and Wurgler, 2006), we may bring noise into our estimations and reduce the power of tests.

[Table 2]

Previous empirical studies usually test the two competing explanations of the value premium in isolation. We argue that testing these two explanations in isolation may be problematic. If only one factor is relevant and the other factor simply has a spurious correlation

[2] For more details, please go to http://www.chicagofed.org/economic_research_and_data/cfnai.cfm.

with this factor, testing these two factors in isolation could incorrectly suggest that both factors are relevant. However, in a joint test, the factor that has no association with the value premium will lose its explanatory power as soon as the relevant factors are included. Therefore, in this paper, we examine these two competing explanations of the value premium jointly.

## 3. Empirical Methodology and Results

The two competing explanations of the value premium offer distinct predictions. The risk-based explanation of Zhang (2005) predicts that: (1) it is high BE/ME stocks that drive the value premium, since they become more risky in economic downturns; (2) since value stocks become more risky with worsen economic conditions, their returns should be positively correlated with the change in economic conditions (i.e. their returns decrease with worsen economic conditions); (3) since higher risk means higher expected returns, the returns of high BE/ME stocks should be high following economic downturns. In other words, there should be a negative correlation between the returns of high BE/ME stocks and the prior aggregate economic conditions.

The sentiment-based explanation alternatively predicts: (1) it is low BE/ME stocks that drive the value premium, since they are over-priced when investor sentiment is high; (2) since growth stocks are over-priced when investor sentiment is high, their returns should be positively correlated with the change in investor sentiment; (3) since overpricing will eventually be corrected, the returns of low BE/ME stocks should be low following high investor sentiment. Put differently, there should be a negative association between the returns of low BE/ME stocks and the prior investor sentiment. We next test these three sets of predictions in a joint fashion.

### *3.1 Testing the first set of predictions*

We test the first set of their predictions by simply decomposing the value premium into two components: the return difference between high BE/ME stocks and medium BE/ME stocks and the return difference between medium BE/ME stocks and low BE/ME stocks. As we can see from Table 2, the value premium is more due to the return difference between medium BE/ME stocks and low BE/ME stocks. For instance, for small ME stocks, the return difference between medium BE/ME and low BE/ME stocks is 76%, 65% and 87% of the value premium for the whole sample period as well as for the two sub-sample periods, respectively. Therefore, the evidence seems to suggest that the sentiment-based explanation may be more important.

### *3.2 Testing the second set of the predictions*

To test the second set of predictions, we run the following regressions.

$$HML_t = \alpha_1 + \beta_{11}\Delta NAI_t + \beta_{12}\Delta SEN_t + \varepsilon_t \quad (2a)$$

$$HMM_t = \alpha_2 + \beta_{21}\Delta NAI_t + \beta_{22}\Delta SEN_t + \varepsilon_t \quad (2b)$$

$$MML_t = \alpha_3 + \beta_{31}\Delta NAI_t + \beta_{32}\Delta SEN_t + \varepsilon_t \quad (2c)$$

where HML represents the return difference between high BE/ME and low BE/ME stocks, HMM is the return difference between high BE/ME and medium BE/ME stocks, MML is the return difference between medium BE/ME and low BE/ME stocks, $\Delta NAI_t$ is the change in the national activity index which is a proxy of the change in aggregate economic conditions, and $\Delta SEN_t$ is the sentiment change index which measures the change in investor sentiment.

Eq. (2b) and Eq. (2c) are practically useful for testing the two competing explanations of the value premium. The risk-based explanation implies that since value stocks become more risky with worsen economic conditions, their returns should be positively correlated with the change in economic conditions. Therefore, $\beta_{21}$ should be positive if value premium is due to risk. On the other hand, the sentiment-based explanation predicts that since growth stocks are over-priced when investor sentiment is high, their returns should be positively correlated with the change in investor sentiment. Therefore, $\beta_{32}$ should be negative if the value premium is indeed due to investor sentiment (note that MML is the return of medium BE/ME stocks minus the return of low BE/ME stocks).

[Table 3]

The results for the whole sample period as well as for the two sub-sample periods are reported in Table 3. The t-ratios are based on Newey-West HAC standard errors with the lag parameter set to 12. The significant coefficients (at the 5% level for the two-sided test) are in bold. We focus on the results for small ME stocks because Table 2 shows that value premium is more a small ME stock phenomenon. As we can see, none of $\beta_{21}$ is significant, while all $\beta_{32}$ coefficients are significantly negative at the one percent level. Therefore, the evidence further suggests that the value premium may be more due to investor sentiment.

*3.3 Testing the third set of the predictions*

To test the third set of predictions, we run the following regressions.

$$CHML_t = \alpha_1 + \beta_{11} NAI_{t-1} + \beta_{12} SEN_{t-1} + \varepsilon_t \tag{3a}$$

$$CHMM_t = \alpha_2 + \beta_{21} NAI_{t-1} + \beta_{22} SEN_{t-1} + \varepsilon_t \tag{3b}$$

$$CMML_t = \alpha_3 + \beta_{31} NAI_{t-1} + \beta_{32} SEN_{t-1} + \varepsilon_t \tag{3c}$$

where CHML represents the cumulative return of HML from January through December of year t, CHMM is the cumulative return of HMM, CMML is the cumulative return of CMML, $NAI_{t-1}$ is the national activity index that prevailed at the end of the prior year, and $SEN_{t-1}$ represents the sentiment index that prevailed at the end of the prior year.

[Table 4]

Eq. (3b) and Eq. (3c) are especially useful for testing the two competing explanations of value premium. The risk-based explanation predicts that since higher risk means higher expected returns, the returns of high BE/ME stocks should be high following economic downturns. Therefore, $\beta_{21}$ should be negative if the value premium is driven by risk. In contrast, the sentiment-based explanation predicts that since overpricing will eventually be corrected, the returns of low BE/ME stocks should be low following high investor sentiment. Therefore, $\beta_{32}$ should be positive if the value premium is driven by investor sentiment (note again that MML is the return of medium BE/ME stocks minus the return of low BE/ME stocks).

The results for the whole sample period as well as for the two sub-sample periods are reported in Table 3. The t-ratios are based on Newey-West HAC standard errors with the lag parameter set to 1. The significant coefficients (at the 5% level for the two-sided test) are in bold. Again, we focus on the results for small ME stocks because the value premium is mainly a small ME stock phenomenon. As we can see, none of $\beta_{21}$ is significantly negative, while all $\beta_{32}$

coefficients are significantly positive at the one percent level. Therefore, again, the evidence confirms that the value premium is mainly due to investor sentiment.

## 4. Conclusions

The present paper intends to extend the value premium literature based on Gulen, Xing, and Zhang (2008) and Baker and Wurgler (2006). Specifically, we add to the literature by using a more informative and parsimonious measure of aggregate economic conditions, focusing on small ME stocks, and testing the competing explanations of value premium in a joint fashion. We find that while value premium is correlated with investor sentiment, it shows very little correlation with the state of the economy. Based on this evidence, it is very difficult to argue that value premium is due to risk.

**References:**

Baker, M., and J. Wurgler, 2006. "Investor Sentiment and the Cross-Section of Stock Returns" *Journal of Finance* 61:4, 1645-1680.

Boyd, J. H., J. Hu, and R. Jagannathan, 2005, "The Stock Market's Reaction to Unemployment News: Why Bad News Is Usually Good for Stocks" *Journal of Finance* 60:2, 649-672.

Capaul, C., I. Rowley, and W. F. Sharpe, 1993, "International Value and Growth Stock Returns" *Financial Analysts Journal* 49:1, 27-36.

Carlson, M., A. Fisher, and R. Giammarino, 2004, "Corporate Investment and Asset Price Dynamics: Implications for the Cross Section of Returns" *Journal of Finance* 59:6, 2577-2603.

Chan, L. K. C., Y. Hamao, and J. Lakonishok, 1991,"Fundamentals and Stock Returns in Japan" *Journal of Finance* 46:5, 1739-1789.

Cooper, I., 2006, "Asset Pricing Implications of Non-Convex Adjustment Costs and Irreversibility of Investment" *Journal of Finance* 61:1, 139-170.

Daniel, K. and S. Titman, 1997, "Evidence on the Characteristics of Cross-Sectional Variation in Stock Returns" *Journal of Finance* 52:1, 1-33.

Davis, J. L., E. F. Fama, and K. R. French, 2000, "Characteristics, Covariances, and Average Returns: 1929-1997" *Journal of Finance* 55:1, 389-406.

De Bondt, W. F. M., and R. H. Thaler, 1987, "Further Evidence on Investor Overreaction and Stock Market Seasonality" *Journal of Finance* 42:3, 557-581.

Fama, E. F. and K. R. French, 1996, "Multifactor Explanations of Asset Pricing Anomalies" *Journal of Finance* 51:1, 55-84.

Fama, E. F. and K. R. French, 1998, "Value versus Growth: The International Evidence" *Journal of Finance* 53:6, 1975-1999.

García-Feijóo, L., and R. D. Jorgensen, 2010. "Can Operating Leverage Be the Cause of the Value Premium?" *Financial Management* 39:3, 1127-1154.

Gulen, H., Y. Xing, and L. Zhang, 2008, "Value versus Growth: Time-Varying Expected Stock Returns" Ross School of Business Paper 1115

Lakonishok, J., A. Shleifer, and R. W. Vishny, 1994, "Contrarian Investment, Extrapolation and Risk" *Journal of Finance* 49:5, 1541-1578.

Rosenberg, B., K. Reid, and R. Lanstein, 1985, "Persuasive Evidence of Market Inefficiency" *Journal of Portfolio Management* 11:3, 9-17.

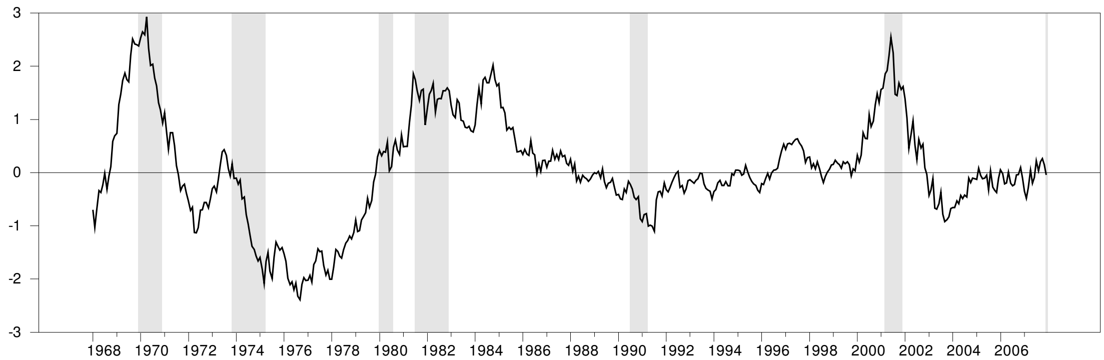
Rytchkov, O., 2010, "Expected Returns on Value, Growth, and HML" *Journal of Empirical Finance* 17:4, 552–565.

Stock, J. H. and M. W. Watson, 1999, "Forecasting Inflation" *Journal of Monetary Economics* 44:2, 293-335.

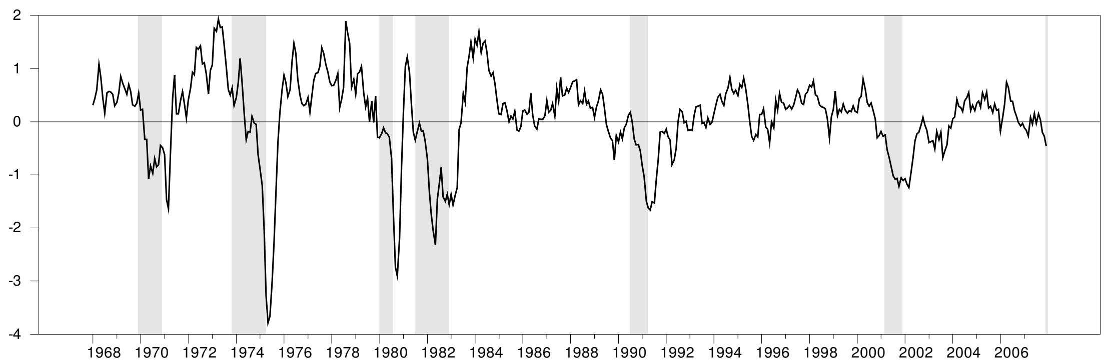
Zhang, L., 2005, "The Value Premium" *Journal of Finance* 60:1, 67-103.

**Figure 1 Sentiment index and Chicago Fed National Activity Index**

Panel A: Sentiment Index




Panel B: Chicago Fed National Activity Index




Panel A of Figure 1 shows the sentiment level index with the shaded areas corresponding to recession periods dated by NBER. Panel B of Figure 1 shows the activity index with the shaded areas corresponding to recession periods dated by NBER.

**Table 1 Explanatory power tests**

| | Constant | TB | DEF | ΔM | DIV | $R^2$ |
|---|---|---|---|---|---|---|
| | | | 1968-2007 | | | |
| Coef. | 0.43 | -0.51 | **-0.74** | 5.88 | 0.76 | 0.16 |
| T-stat | 1.29 | -1.08 | -3.69 | 1.64 | 0.83 | |
| | | | 1968-1987 | | | |
| Coef. | 0.93 | -0.30 | -0.50 | **22.24** | -3.35 | 0.35 |
| T-stat | 0.91 | -0.43 | -1.87 | 2.24 | -1.81 | |
| | | | 1988-2007 | | | |
| Coef. | 0.97 | -0.70 | **-0.99** | 0.75 | 0.43 | 0.17 |
| T-stat | 1.73 | -1.93 | -2.66 | 0.33 | 0.47 | |

We estimate the following regression model:

$$NAI_t = a_0 + a_1 TB_{t-1} + a_2 DEF_{t-1} + a_3 \Delta M_{t-2} + a_4 DIV_{t-1} + e_t$$

where NAI is the Chicago Fed National Activity Index, TB is the one-month Treasury bill rate, DEF is the default premium, ΔM is the growth in the monetary base, and DIV is the dividend yield. The results for the whole sample period as well as for the two equal sub-sample periods are reported in Table 1. The t-ratios are based on Newey-West HAC standard errors with the lag parameter set to 12. The significant coefficients (at the 5% level for the two-sided test) are in bold.

**Table 2 Value premium**

| Big ME | | H - L | H – M | M - L | $\frac{H-M}{H-L}$ (%) | $\frac{M-L}{H-L}$ (%) |
|---|---|---|---|---|---|---|
| 1968-2007 | Mean | 0.27 | 0.13 | 0.14 | 48 | 52 |
| | t-stat | 1.59 | 1.52 | 0.98 | | |
| 1968-1987 | | **0.42** | **0.24** | 0.18 | 57 | 43 |
| | | 2.03 | 2.02 | 1.07 | | |
| 1988-2007 | | 0.12 | 0.02 | 0.10 | 17 | 83 |
| | | 0.45 | 0.19 | 0.42 | | |
| **Small ME** | | **H - L** | **H – M** | **M - L** | $\frac{H-M}{H-L}$ **(%)** | $\frac{M-L}{H-L}$ **(%)** |
| 1968-2007 | Mean | **0.62** | **0.15** | **0.47** | 24 | 76 |
| | t-stat | 3.25 | 2.34 | 3.18 | | |
| 1968-1987 | | **0.62** | **0.22** | **0.40** | 35 | 65 |
| | | 2.56 | 2.50 | 2.23 | | |
| 1988-2007 | | **0.62** | 0.09 | **0.54** | 15 | 87 |
| | | 2.11 | 0.92 | 2.30 | | |

In Table 2, we report the value premium over the whole sample period as well as over the two equal sub-sample periods.

**Table 3 Contemporaneous regressions**

| 1968-2007 | | Constant | $\Delta NAI_t$ | $\Delta SEN_t$ | $R^2$ |
|---|---|---|---|---|---|
| | | | Big ME | | |
| HM L | Coef. | 0.26 | -0.17 | -0.46 | 0.02 |
| | T-stat | 1.56 | -0.29 | -1.27 | |
| HMM | | 0.13 | -0.19 | 0.02 | 0.00 |
| | | 1.52 | -0.45 | 0.19 | |
| MML | | 0.13 | 0.01 | -0.48 | 0.03 |
| | | 0.90 | 0.03 | -1.60 | |
| | | | Small ME | | |
| HM L | | **0.58** | -0.47 | **-1.18** | 0.11 |
| | | 3.44 | -0.77 | -3.58 | |
| HMM | | **0.15** | -0.15 | -0.13 | 0.01 |
| | | 2.31 | -0.73 | -1.60 | |
| MML | | **0.44** | -0.32 | **-1.05** | 0.14 |
| | | 3.46 | -0.66 | -3.65 | |
| 1968-1987 | | Constant | $\Delta NAI_t$ | $\Delta SEN_t$ | $R^2$ |
| | | | Big ME | | |
| HM L | Coef. | **0.43** | -0.58 | 0.36 | 0.01 |
| | T-stat | 2.06 | -0.89 | 1.33 | |
| HMM | | **0.24** | -0.31 | 0.16 | 0.00 |
| | | 1.99 | -0.65 | 1.06 | |
| MML | | 0.19 | -0.27 | 0.20 | 0.00 |
| | | 1.11 | -0.59 | 0.70 | |
| | | | Small ME | | |
| HM L | | **0.61** | -1.13 | -0.41 | 0.03 |
| | | 2.69 | -1.73 | -1.55 | |
| HMM | | **0.22** | -0.31 | -0.01 | 0.00 |
| | | 2.56 | -1.40 | -0.05 | |
| MML | | **0.39** | -0.83 | **-0.40** | 0.04 |
| | | 2.35 | -1.54 | -2.08 | |
| 1988-2007 | | Constant | $\Delta NAI_t$ | $\Delta SEN_t$ | $R^2$ |
| | | | Big ME | | |
| HM L | Coef. | 0.09 | 0.59 | **-1.16** | 0.13 |
| | T-stat | 0.36 | 0.59 | -2.64 | |
| HMM | | 0.02 | 0.14 | -0.10 | 0.00 |
| | | 0.17 | 0.23 | -0.76 | |
| MML | | 0.07 | 0.45 | **-1.06** | 0.16 |
| | | 0.32 | 0.54 | -3.06 | |
| | | | Small ME | | |
| HM L | | **0.57** | 1.33 | **-1.83** | 0.24 |
| | | 2.32 | 1.34 | -4.63 | |
| HMM | | 0.08 | 0.33 | **-0.23** | 0.03 |
| | | 0.89 | 0.84 | -2.33 | |
| MML | | **0.49** | 1.00 | **-1.60** | 0.27 |
| | | 2.64 | 1.34 | -4.40 | |

To test the second set of predictions, we run the following regressions.

$$HML_t = \alpha_1 + \beta_{11}\Delta NAI_t + \beta_{12}\Delta SEN_t + \varepsilon_t$$

$$HMM_t = \alpha_2 + \beta_{21}\Delta NAI_t + \beta_{22}\Delta SEN_t + \varepsilon_t$$

$$MML_t = \alpha_3 + \beta_{31}\Delta NAI_t + \beta_{32}\Delta SEN_t + \varepsilon_t$$

where HML represents the return difference between high BE/ME and low BE/ME stocks, HMM is the return difference between high BE/ME and medium BE/ME stocks, MML is the return difference between medium BE/ME and low BE/ME stocks, $\Delta NAI_t$ is the change in the national activity index which is a proxy of the change in aggregate economic conditions, and $\Delta SEN_t$ is the sentiment change index which measures the change in investor sentiment. The results for the whole sample period as well as for the two sub-sample periods are reported in Table 3. The t-ratios are based on Newey-West HAC standard errors with the lag parameter set to 12. The significant coefficients (at the 5% level for the two-sided test) are in bold.

**Table 4 Predictive regressions**

| 1968-2007 | | Constant | $NAI_{t-1}$ | $SEN_{t-1}$ | $R^2$ |
|---|---|---|---|---|---|
| | | | Big ME | | |
| CHM L | Coef. | 2.98 | 3.71 | 0.69 | -0.03 |
| | T-stat | 1.43 | 1.91 | 0.34 | |
| CHMM | | 1.45 | 1.83 | -0.27 | -0.02 |
| | | 1.49 | 1.10 | -0.41 | |
| CMML | | 1.53 | 1.88 | 0.96 | -0.04 |
| | | 0.83 | 0.95 | 0.48 | |
| | | | Small ME | | |
| CHM L | | **6.85** | **6.41** | **5.86** | 0.10 |
| | | 3.08 | 2.31 | 2.75 | |
| CHMM | | **1.67** | **2.23** | 0.65 | 0.01 |
| | | 2.18 | 2.37 | 1.07 | |
| CMML | | **5.18** | **4.18** | **5.21** | 0.13 |
| | | 3.14 | 1.98 | 2.87 | |
| **1968-1987** | | **Constant** | **$NAI_{t-1}$** | **$SEN_{t-1}$** | **$R^2$** |
| | | | Big ME | | |
| CHM L | Coef. | 4.59 | **4.00** | -0.92 | 0.00 |
| | T-stat | 1.94 | 2.12 | -0.85 | |
| CHMM | | **2.77** | 0.67 | 0.10 | -0.11 |
| | | 2.26 | 0.44 | 0.15 | |
| CMML | | 1.82 | 3.33 | -1.03 | -0.01 |
| | | 0.88 | 1.41 | -0.91 | |
| | | | Small ME | | |
| CHM L | | **6.14** | **9.65** | **3.79** | 0.21 |
| | | 2.34 | 3.83 | 3.88 | |
| CHMM | | **2.27** | **2.85** | 0.38 | 0.05 |
| | | 2.47 | 3.79 | 0.78 | |
| CMML | | **3.87** | **6.80** | **3.42** | 0.26 |
| | | 2.08 | 3.46 | 4.48 | |
| **1988-2007** | | **Constant** | **$NAI_{t-1}$** | **$SEN_{t-1}$** | **$R^2$** |
| | | | Big ME | | |
| CHM L | Coef. | 1.19 | 1.79 | 7.80 | -0.02 |
| | T-stat | 0.39 | 0.26 | 1.17 | |
| CHMM | | 0.29 | 4.05 | -2.37 | 0.01 |
| | | 0.22 | 1.36 | -1.31 | |
| CMML | | 0.90 | -2.26 | 10.17 | 0.14 |
| | | 0.39 | -0.37 | 1.87 | |
| | | | Small ME | | |
| CHM L | | **7.06** | -1.95 | **15.98** | 0.22 |
| | | 2.34 | -0.35 | 3.24 | |
| CHMM | | 1.00 | 0.12 | 1.94 | -0.06 |
| | | 0.88 | 0.05 | 1.26 | |
| CMML | | **6.06** | -2.06 | **14.04** | 0.30 |
| | | 2.79 | -0.47 | 3.44 | |

To test the third set of predictions, we run the following regressions.

$$CHML_t = \alpha_1 + \beta_{11} NAI_{t-1} + \beta_{12} SEN_{t-1} + \varepsilon_t$$
$$CHMM_t = \alpha_2 + \beta_{21} NAI_{t-1} + \beta_{22} SEN_{t-1} + \varepsilon_t$$
$$CMML_t = \alpha_3 + \beta_{31} NAI_{t-1} + \beta_{32} SEN_{t-1} + \varepsilon_t$$

where CHML represents the cumulative return of HML from January through December of year t, CHMM is the cumulative return of HMM, CMML is the cumulative return of CMML, $NAI_{t-1}$ is the national activity index that prevailed at the end of the prior year, and $SEN_{t-1}$ represents the sentiment index that prevailed at the end of the prior year. The results for the whole sample period as well as for the two sub-sample periods are reported in Table 3. The t-ratios are based on Newey-West HAC standard errors with the lag parameter set to 12. The significant coefficients (at the 5% level for the two-sided test) are in bold.