Rational Expectation and Expected Stock Returns

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Abstract

The primary purpose of the study is neither to resolve the dispute over the linkage between the common risk factor and the documented characteristic nor to pursue the correct assets pricing model. Instead, we examine whether these observed empirical regularities are consistent with the rational expectations framework in which current available information can help predict future stock returns. The results indicate that accounting-related attributes such as asset-to-market, book-to-market, cash flow-to-market, dividends-to-market, and earnings-to-market appear to have little predictive power on future stock returns. In contrast, the market-related attributes such as firm size, momentum strategy, trading volume, and market returns are found to capture variations in future stock returns.

1. Introduction

There is growing empirical evidence that cross-sectional variations in stock returns can be explained by certain firm specific characteristics such as size (CAPT), book-to-market (BE_ME), earnings-to-price (EA_ME), cash flow-to-price (CF_ME), and dividend yield (DV_ME). For example, Banz (1981) shows that small firms earn significantly higher risk adjusted returns than large firms. Basu (1983) also finds that earnings-to-price captures variation in average stock return after controlling firm size and beta. While Bhandari (1988) documents that average returns are positively related to the ratio of debt to equity.

In an important series of papers, Fama and French (1992, 1993, 1996) (henceforth FF) find that size and book-to-market play a more dominant role in explaining cross-sectional differences in expected returns and subsume the apparent effects of other well known factors. In their subsequent tests, FF (1993) adopt the time-series regression approach of Black et al. (1972) and identify three common risk factors related to the average stock returns; market, firm size (SMB, small minus big) and book-to-market (HML, high minus low). They conclude that size and book-to-market equity are proxies for sensitivity to common risk factors in stock returns.

In addition to firm specific characteristics, numerous studies have documented several patterns in average stock returns. Most notably, Debondt and Thaler (1985) find that past losers tend to become future winners. In line with the finding that stock returns exhibit long-term reversals, Lakonishok at al. (1994) (henceforth LSV) also show that value stocks (with high book-to-market, earnings-to-price, or cash flow-to-price) outperform growth stocks (with low book-to-market, earnings-to-price, or cash flow-to-price). While these findings seem to suggest that contrarian strategies using past returns or firm characteristics could generate excess returns in the long run, Jagadeesh and Titman (1993) find that over a short investment horizon of 3 to 12 months, past winners, on average, continue to outperform past losers. Stocks therefore appear to carry “momentum” in the short run.

Although there is some consensus that size and book-to-market equity factor in particular, are important in pricing stocks, a fundamental disagreement on the underlying reasons has emerged. FF argues that higher returns of high book-to-market stocks are due to higher systematic risk. LSV however, explain that higher returns are caused by the overreaction of investors. That is, investors are too optimistic (pessimistic) to firms that have performed well (poorly) in the past. Daniel and Titman (1997) indicate that although high book-to-market stocks do strongly covary with higher expected returns, the covariance does not result from compensation for factor risk suggested by FF (1993), but it rather reflects the fact that high book-to-market stocks tend to have similar properties. For example, these stocks might be from the same industry, or they might be in related lines of businesses. The evidence suggests that factor loadings do not explain the higher returns of small or high book-to-market stocks once characteristics are taken into account. In other words, it is the characteristics rather than factor loadings that determine expected returns.

Furthermore, from the market microstructure point of view, numerous studies suggest that trading volume is also an important source of cross-sectional variations in stock returns. For example, Simon et al. (1998) report that stocks experiencing unusually high trading volume over a day or a week tend to experience large returns over the subsequent months. More precisely, a high-volume return premium seems to exist in stock prices. In other related work, Dater et al. (1998) suggest that turnover rate, a proxy for trading volume and liquidity, may reduce the size impact of different stocks. They also provide evidence of negative relationships between stock returns and turnover rate.

The primary purpose of the study is neither to resolve the dispute over the linkage between the common risk factors and the documented characteristics nor to pursue the correct assets pricing model. Rather, our focus is on whether these observed empirical regularities are consistent with the rational expectations framework in which current available information can help predict future stock returns. In particular, we would like to see which regularities are more powerful on that regard when they are put together. Since we have no idea on the true asset generating process, we conduct the study based on previously documented empirical regularities without resorting to a so-called asset pricing model.

Our paper is organized as follows. In the next section, we describe the data, the hypothesized attributes, and our methodology. We also discuss why we use daily observations instead of adopting data at a specific time point when forming portfolios. We then present the empirical results in section 3 and conclude the paper in the last section.

2. Methodology

2.1 Data

The sample in this study includes all New York Stock Exchange (NYSE), American Stock Exchange Stock Exchange (AMEX), and National Association of Securities Dealers Automated Quotation (NASDAQ) firms from the Center for Research in Security Prices (CRSP) and COMPUSTAT from July 1962 to Dec 2003. Daily stock returns and the financial statement items are obtained from CRSP and COMPUSTAT respectively. We exclude financial firms in our sample since these high leveraged firms may associate with higher financial distress. Preferred stocks and ADRs are also excluded in our sample. From the data, we construct the following attributes that have been hypothesized to explain expected returns: Size (CAPT), book-to-market (BE_ME), earnings-to-market (EA_ME), cash flow-to-market (CF_ME), dividends-to-market (DV_ME), momentum strategy (MOMT), contrarian strategy (CONT), leverage (AT_ME), and trading volume (TRDV).

To be included in the sample at the end of a given month, a firm is required to meet the following criteria: (1) it must have complete daily observations of the following variables for the past 12-month period: asset-to-market, book-to-market, cash flow-to-market, dividends-to-market, earnings-to-market, size, and trading volume; (2) it must have complete daily returns for the past 5-year period. We use a 5-year period to implement the contrarian strategy, while the momentum strategy will be tested using return data of both 1-month and 12-month periods. At the end of the month, the qualified stocks are ranked respectively by the average of each of these firm-related attributes for the specified period. Across each of the firm-related attributes, the stocks are then stratified into quintile and decile portfolios according to their ranks of the attribute based on the breakpoints of the rank values of NYSE firms.[1]

2.2 The Rational Expectation Approach

Suppose that the stock return has the following linear relation with an observed firm-related attribute:

$$R_{i,t} - R_{F,t} = a + bA_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

Now we rank the attribute so that $A_{B,t-1}$ and $A_{S,t-1}$ respectively represent the biggest and the smallest attributes across all firms at time $t-1$.

$$R_{B,t} - R_{F,t} = a + bA_{B,t-1} + \varepsilon_{B,t} \quad (2)$$

$$R_{S,t} - R_{F,t} = a + bA_{S,t-1} + \varepsilon_{S,t} \quad (3)$$

[1] For each of the five accounting-related attributes such as asset-to-market, book-to-market, cash flow-to-market, dividends-to-market, and earnings-to-market, only those stocks with a positive average of the attributed are ranked and assigned to a portfolio according to the ranked value.

These two equations imply that

$$(R_{B,t} - R_{S,t}) + (\varepsilon_{B,t} - \varepsilon_{S,t}) = E_{t-1}[R_{B,t}] - E_{t-1}[R_{S,t}] = b(A_{B,t-1} - A_{S,t-1}) \tag{4}$$

If we believe that higher expected returns are to compensate for higher risk, then $(A_{B,t-1} - A_{S,t-1})$ can proxy for the expected risk premium induced by the observed firm-related attribute. We can then define the sensitivity of firm $i's$ risk premium to the attribute-related risk premium as follows:

$$\beta = \frac{Cov(R_{i,t} - R_{F,t}, R_{B,t-1} - R_{S,t-1})}{Var(R_{B,t-1} - R_{S,t-1})} \tag{5}$$

The sensitivity measure can be rewritten in the following form:

$$\begin{aligned}\beta &= \frac{Cov(R_{i,t} - R_{F,t}, R_{B,t-1} - R_{S,t-1})}{Var(R_{B,t-1} - R_{S,t-1})} \\ &= \frac{Cov(bA_{i,t-1} + \varepsilon_{i,t-1}, R_{B,t-1} - R_{S,t-1})}{Var(R_{B,t-1} - R_{S,t-1})} \\ &= \frac{Cov(bA_{i,t-1} + \varepsilon_{i,t-1}, bA_{B,t-1} + \varepsilon_{B,t-1} - bA_{S,t-1} - \varepsilon_{S,t-1})}{Var(bA_{B,t-1} + \varepsilon_{B,t-1} - bA_{S,t-1} - \varepsilon_{S,t-1})}\end{aligned} \tag{6}$$

It follows that firm $i's$ attribute $A_{i,t-1}$ can be viewed as a proxy for sensitivity to the risk premium related to the attribute. On the other hand, due to the presence of $(\varepsilon_{B,t} - \varepsilon_{S,t})$, the difference in realized returns, $(R_{B,t} - R_{S,t})$, can only serve as a noisy proxy for the expected risk premium induced by the observed firm-related attribute. Although each firm's error term is orthogonal to the attribute, contemporaneous error terms across various firms might still co-vary strongly due possibly to the misspecification of the model and/or possibly to the occurrence of significant unexpected news common to these firms. Therefore, forming portfolios based on the rank of the attribute can fix, though not completely resolve the problem. Despite its limitation, we will follow the convention in the literature to find the attribute-related risk premium.

To ensure that the accounting information is available to investors before they put money into the equities, we follow the treatment in FF (1992). The annual accounting measure is used to mitigate the seasonal effect. We impose a 6-month delay in the announcement of the accounting number to the public. The 6-month gap between the fiscal yearend and the announcement time would avoid look-ahead bias proposed by Banz and Breen (1986).

Previous studies usually use the measure of an attribute at a specific time point (e.g., the end of December or June) to form these portfolios and adjust the portfolios annually. Since the time point is not randomly determined, the observed attribute could possibly suffer seasonal and cyclical patterns such as the January effect and the window dressing phenomenon. Instead, we form the portfolios based on daily observations of the attribute over a past period to smooth out the unwanted effect. At the end of each month, we rank the qualified firms according to the average of the daily observations of the attribute over the past T-month period. To be included in the sample a stock will therefore require a complete history of daily observations of the attribute for the past T-month period. These firms are then divided into M portfolios based on the breakpoints of the rank values of NYSE firms. The next month's value-weighted returns of these portfolios are then calculated. The absolute difference in returns between the first and the last portfolios serves as a proxy for the risk premium related to the attribute.[2] This process is repeated monthly for the sample period across various firm-related attributes. After the

[2] Depending on the linear or nonlinear (e.g., FF (1992) propose that the relation between average return and earnings-to-price has a familiar U-shape) relation between the stock return and the firm related attributes, the risk premium could be either equal to the return of the first portfolio minus the return of the last portfolio (it is likely to be the other way around) or the average of the bottom and top portfolios minus the central portfolio (if U-shape).

repetitive process, we form a time series of monthly attribute-related risk premium for each attribute.

Daily observations of the accounting-related attributes such as book-to-market, earnings-to-price, cash flow-to-price, dividend yield and market leverage are obtained in the following manner. These attributes are first measured at the fiscal yearend and all have the market value of common equity at that particular time. Assuming that the accounting elements of these attributes remain constant during the 17 months following the fiscal yearend, these attributes are recalculated daily by updating the market value input for the 17 months following the fiscal yearend.[3] Furthermore, we adjust the market value of equity so that it can be immune from impacts of firm specified factors such as cash dividends and seasoned equity offerings. Specifically, we fix the number of shares outstanding at the fiscal yearend and adjust the stock price daily forward according to $P_{t+1} = P_t(1 + R_{t+1})$ for the 17-month period following the fiscal yearend.

The next step is to estimate the sensitivity of a firm's risk premium to the risk premium related to the k^{th} attribute by running the following regression at the end of each month:

$$RP_{i,t} = \alpha_{i,A_k,t} + \beta_{i,A_k,t} \times RP_{A_k,t} + e_{i,t} \qquad t = -59, \cdots, 0 \tag{7}$$

where $RP_{i,t}$ is firm $i's$ risk premium for month t, $RP_{A_k,t}$ is the risk premium related to the k^{th} attribute, t represents the order of a month relative to the current month and k ranges from 1 to 10. The 10 attribute-related risk premiums are market leverage risk premium, book-to-market risk premium, cash flow-to-market risk premium, dividends-to-market risk

[3] Since at the end of each of the first five months following the yearend of fiscal year y, the accounting measure of the fiscal year has not been publicly announced, the most recent accounting measure refers to that of the fiscal year $y-1$. Therefore, a period of 17 months rather than 12 months is relevant.

premium, earnings-to-market risk premium, size risk premium, trading volume risk premium, momentum risk premium, contrarian risk premium, and market risk premium. To be included in the risk-sensitivity regression analysis, a firm must have at least 36 consecutive monthly returns back from the current month over the 5-year estimation period prior to the current month. The regression is run across the 10 firm-related attributes so that at the end of each month firm i possesses a vector of sensitivity estimates to the 10 firm-related attributes. This estimation process is repeated monthly for the sample period.

To examine whether these attribute-related sensitivities have predictive power over stock returns, we use the method of Fama and MacBeth (1973) to run the following cross-sectional regression at the end of each month:

$$R_{i,t+1} = \alpha_{A_k,t+1} + \sum_{k=1}^{K} \gamma_{A_k,t+1} \beta_{i,A_k,t} + e_{i,t+1} \qquad i = 1, \cdots, N \tag{8}$$

Under the null hypothesis, test statistics for $\gamma_{A_k,t+1}$ can be obtained as follows:

$$t_{A_k} = \frac{\overline{\gamma}_{A_k} - 0}{\sigma_{\bar{r}_{A_k}}} \tag{9}$$

where $\bar{\gamma}_{A_k} = \frac{1}{T} \sum_{j=1}^{T} \gamma_{A_k,j}$

3. Empirical Results

Table 1 reports summary statistics for the quintile portfolios according to each of the firm-related attributes. Panel A and B of Table 1 summarizes the case of 1-month and 12-month momentum strategy. Consistent with previous studies, we find that the mean returns of the quintile portfolios sorted by asset-to-market, book-to-market, cash flow-to-market, and earnings-to-market bear a positive relation with these attributes. However, average returns according to dividends-to-market and trading volume ratios do not appear to have a consistent pattern across the portfolios. As expected, size quintiles exhibit a negative relation with average returns in which smaller portfolios tend to have larger returns. The contrarian strategy also appears to be effective when using the past 5-year returns. Among the preliminary findings, the most surprising result comes from the negative relation between momentum portfolios and their average returns when using past one-month returns. However, the negative relation is reversed when the momentum strategy is implemented using the past 12-month returns. This finding highlights the sensitivity of the momentum strategy to the past information and explains why previous studies on the momentum strategy (e.g., FF (1996)) usually exclude the first month return when the strategy is implemented.

Since AMEX/NASDAQ stocks tend to be relatively small, Table 1 also shows that there are more stocks in the low quintile portfolio especially those formed by cash flow-to-market, dividends-to-market, earnings-to-market, and firm size. On the other hand, trading volume and short-term returns of AMEX/NASDAQ stocks are found to be concentrated at both end of the spectrum compared with those of NYSE stocks. In contrast, long-term returns of AMEX/NASDAQ stocks are usually higher than those of NYSE stocks and are found in the highest quintile portfolio.

In addition to the preliminary findings sorted in quintile portfolios in Table 1, we also conduct the same analysis by forming portfolios in deciles. Tables 2 shows that the patterns on the average returns across the portfolios in each attribute are consistent with those reported in Table 1. One apparent difference however is the difference in the magnitude of the average returns between the lowest and the highest ranked portfolios. The differences in the average returns are usually larger in deciles than in quintiles. This implies that there could be differences in the portfolio ranks and average returns when the stocks are divided into different numbers of portfolios.

In our next analysis, we examine the average risk premiums of the 10 firm-related attributes. To measure the risk premiums, we take the difference in returns between the first and the last portfolios related to the attribute. Depending on the relation between the stock return and the firm-related attribute, the risk premium could be either equal to the return of the first portfolio minus the return of the last portfolio or the other way around. For asset-to-market, book-to-market, cash flow-to-market, dividends-to-market, earnings-to-market, and trading volume, the risk premium is defined as the excess return of the highest rank portfolio relative to the lowest rank portfolio. On the other hand, size risk premium is the difference between the return of the smallest-size portfolio and the return of the biggest-size portfolio. The momentum-related risk premium is defined as the return of the highest-return portfolio excess of the return of the lowest-return portfolio, while the contrarian-related risk is defined in the opposite way. The market risk premium is the market return minus the risk free rate. Monthly market returns are value-weighted returns of the qualified stocks at the end of the month. Average risk premiums of these attributes are computed as the simple averages of monthly measures of these attributes.

As expected and shown in Table 3, average risk premiums from the decile portfolios are usually greater than those from the quintile portfolios. It also confirms the linear relationship between returns and these attributes. Furthermore, the size of the average risk premiums across the attributes varies substantially. Risk premiums related to book-to-market, size and momentum appear to be among the largest while those related to trading volume, dividends-to-market, and earnings-to market are much less significant. These findings are also consistent with those documented in Fama and French (1992) where portfolios formed by size and book-to-market ratio appear to generate the wider spread of portfolio returns.

Table 4 reports pairwise correlations of monthly risk premiums of the firm-related attributes. Correlations shown in Panel A and B are based on the 1 and 12-month momentum strategies for the quintile portfolios and those in Panel C and D are from the same momentum strategies for the decile portfolios respectively. Not surprisingly, all accounting-related risk premiums have high correlations where the magnitudes tend to be well above 0.5. If the stock price actually reflects the state of the firm, then these accounting attributes such as asset-to-market (AT_ME), book-to-market (BE_ME), cash flow-to-market (CF_ME), dividends-to-market (DV_ME), and earnings-to-market (EA_ME) should behave in a similar way. Therefore, the high-degree co-movements among the risk premiums of these accounting-related attributes provide evidence supporting the relationship between returns and the accounting attributes.

In contrast, pairwise correlations among risk premiums of the market-related attributes such as trading volume (TRDV), the momentum strategy (MOMT), the contrarian strategy (CONT), and the market (VP_RET) tend to be well below 0.5 and are relatively small when compared to those among the risk premiums of the accounting-related attributes. Correlations between risk premiums of the accounting-related and the market-related attributes are also quite small suggesting that each type of attributes (accounting vs. market) is capturing different aspect of risk premiums. In particular, the size-related risk premium appears to bear little co-variation with other risk premiums. These results suggest that if stock returns are spanned by risk premiums of these attributes, then the accounting-related attributes as a whole, the size attribute, and the individual market-related attributes can co-vary with future movements in stock returns.

In our next analysis, we examine the time series averages of monthly cross-sectional correlations between sensitivities (i.e., betas or loadings) of a firm's returns to the firm-related attributes. The cross-sectional pairwise correlations between the sensitivities of a firm's returns to the risk premiums of the 10 firm-related attributes are calculated at the end of each month. The monthly measures of sensitivities of each sample stock's returns to these risk premiums are estimated by running a time-series regression of the stock's returns on a risk premium. The stock's return is regressed on the risk premium of a specific attribute, one each time, across the 10 risk premiums such that at the end of each month firm i possesses a vector of 10 sensitivity estimates. This estimation process is repeated monthly for the period from September 1972 to December 2003.

Consistent with the results of Table 4, Table 5 shows that the sensitivities of the accounting-related attributes are highly correlated. On the contrary, those of the market-related attributes seem to share little correlation with each other. Among them, size is again found to correlate with other 9 firm-related attributes the least. The findings also seem to be robust irrespective of how many portfolios and momentum strategy are formed.

According to the results reported in Tables 4 and 5 where loadings of accounting-related attribute risk premiums tend to be highly correlated, we test how each of these sensitivities interacts with those of market-related attributes in predicting future returns. Table 6 reports Fama-MacBeth regression results. The accounting-related loadings in general do not perform well in predicting future stock returns. Even the well-documented book-to-market effect is only significant but with the opposite sign in the decile portfolios. On the other hand, the market-related betas tend to capture more variation in future returns. In particular, size and liquidity effects tend to be significant and robust to different portfolio formation and momentum strategy. However, similar to the book-to-market beta, the coefficient of the beta of trading volume does not have the anticipated sign. Both market and momentum betas also show up significant on future stock returns in most of our regression tests. Contrary to earlier empirical findings, we find that the beta of contrarian strategy does not have predictive power on future stock returns.

4. Conclusions

The purpose of this study is to investigate whether the observed empirical regularities of previous studies are consistent with the rational expectation framework in which current available information can help predict future stock returns. We do not emphasize on finding the correct asset pricing model nor argue about the relation between the common risk factor and the documented characteristic. Furthermore, instead of adopting the way of sorting stocks by an attribute at a specific point in time, we form the portfolios based on daily observations of the attributes over a past period to smooth out the cyclical and seasonal effects.

The results indicate that at the portfolio level, there appears to be a linear relationship between the betas of the firm-related attributes and the next period stock return. We also find that all the accounting-related risk premiums are highly correlated. If the stock price actually reflects the state of the firm, then these accounting attributes such as asset-to-market, book-to-market, cash flow-to-market, dividends-to-market, and earnings-to-market should behave in a similar way. Therefore, the high-degree co-movements among risk premiums of these accounting-related attributes provide evidence supporting the relationship between returns and these accounting attributes.

The Fama-Macbeth cross-sectional regression results, however, do not overall offer evidence supporting a significant linkage between accounting-related attributes and future stock returns. On the other hand, firm size appears to have significant predictive power on future stock returns. In general, market-related attributes appear to have stronger predictive power on future stock returns than accounting-related attributes.

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Table 1. Summary Statistics of Monthly Returns of Portfolios Formed in Quintiles (July 1963 to December 2003)

We form the portfolios based on daily observations of the attribute over a past period. To be included in the sample a stock must have a complete history of daily observations of all the attributes for the past 12-month period and furthermore complete data of daily past returns for the past 5-year period. We use a 5-year period to implement the contrarian (i.e., CONT) strategy, while the momentum (MOMT) strategy is tested using return data of the past 1-month and 12-month periods. At the end of each month, we rank firms with complete data respectively according to the average of the daily observations of each of the attributes over the specified period. The qualified stocks are then divided into quintiles based on the breakpoints of the rank values of NYSE firms. The next month's value-weighted returns of these portfolios are then calculated.

Panel A : Attribute quintile for the 1-month momentum strategy					
	Low	2	3	4	High
Asset-to-market (AT_ME)					
Mean returns (%)	0.86	1.02	1.08	1.09	1.25
Number of stocks	400.56	332.16	317.94	294.11	340.31
Book-to-market (BE_ME)					
Mean returns (%)	0.89	0.97	1.12	1.07	1.31
Number of stocks	374.05	303.38	308.39	316.57	382.70
Cash flow-to-market (CF_ME)					
Mean returns (%)	0.92	0.95	1.01	1.05	1.32
Number of stocks	584.43	274.09	269.03	257.89	299.64
Dividends-to-market (DV_ME)					
Mean returns (%)	1.17	0.85	0.84	0.89	0.90
Number of stocks	972.76	183.75	183.11	178.25	167.21
Earnings-to-market (EA_ME)					
Mean returns (%)	0.87	1.04	0.97	1.13	1.21
Number of stocks	687.74	242.54	237.25	242.00	275.56
Size (CAPT)					
Mean returns (%)	1.44	1.35	1.15	1.07	0.92
Number of stocks	840.87	275.23	210.24	187.47	171.27
Trading volume (TRDV)					
Mean returns (%)	1.00	0.91	1.02	0.82	0.96
Number of stocks	452.33	280.24	261.10	273.69	417.72
Contrarian (CONT)					
Mean returns (%)	1.32	1.06	1.10	0.87	0.97
Number of stocks	298.98	256.75	253.80	298.91	576.63

Momentum (MOMT)					
Mean returns (%)	1.26	1.11	1.05	0.80	0.79
Number of stocks	398.95	297.27	282.78	288.80	417.29

Table 1- *Continued*

Panel B : Attribute quintile for the 12-month momentum strategy					
	Low	2	3	4	High
Asset-to-market (AT_ME)					
Mean returns (%)	0.86	1.02	1.08	1.09	1.25
Number of stocks	400.56	332.16	317.94	294.11	340.31
Book-to-market (BE_ME)					
Mean returns (%)	0.89	0.97	1.12	1.07	1.31
Number of stocks	374.05	303.38	308.39	316.57	382.70
Cash flow-to-market (CF_ME)					
Mean returns (%)	0.92	0.95	1.01	1.05	1.32
Number of stocks	584.43	274.09	269.03	257.89	299.64
Dividends-to-market (DV_ME)					
Mean returns (%)	1.17	0.85	0.84	0.89	0.90
Number of stocks	972.76	183.75	183.11	178.25	167.21
Earnings-to-market (EA_ME)					
Mean returns (%)	0.87	1.04	0.97	1.13	1.21
Number of stocks	687.74	242.54	237.25	242.00	275.56
Size (CAPT)					
Mean returns (%)	1.44	1.35	1.15	1.07	0.92
Number of stocks	840.87	275.23	210.24	187.47	171.27
Trading volume (TRDV)					
Mean returns (%)	1.00	0.91	1.02	0.82	0.96
Number of stocks	452.33	280.24	261.10	273.69	417.72
Contrarian (CONT)					
Mean returns (%)	1.32	1.06	1.10	0.87	0.97
Number of stocks	298.98	256.75	253.80	298.91	576.63
Momentum (MOMT)					
Mean returns (%)	0.93	0.91	0.85	1.00	1.33
Number of stocks	360.82	280.05	268.12	287.36	488.73

Table 2. Summary Statistics of Monthly Returns of Portfolios Formed in Deciles (July 1963 to December 2003)

We form the portfolios based on daily observations of the attribute over a past period. To be included in the sample a stock must have a complete history of daily observations of all the attributes for the past 12-month period and furthermore complete data of daily past returns for the past 5-year period. We use a 5-year period to implement the contrarian (i.e., CONT) strategy, while the momentum (MOMT) strategy is tested using return data of the past 1-month and 12-month periods. At the end of each month, we rank firms with complete data respectively according to the average of the daily observations of each of the attributes over the specified period. The qualified stocks are then divided into quintiles based on the breakpoints of the rank values of NYSE firms. The next month's value-weighted returns of these portfolios are then calculated.

Panel A : Attribute decile for the 1-month momentum strategy										
	Low	2	3	4	5	6	7	8	9	High
Asset-to-market (AT_ME)										
Mean returns (%)	0.89	0.84	1.03	1.04	1.12	1.01	1.12	1.02	1.20	1.33
Number of stocks	227.2	173.4	167.3	164.9	163.6	154.3	149.0	145.1	157.7	182.6
Book-to-market (BE_ME)										
Mean returns (%)	0.87	0.98	0.99	0.96	1.10	1.12	1.11	1.02	1.19	1.60
Number of stocks	211.9	162.1	153.7	149.7	152.8	155.6	156.2	160.3	168.9	213.8
Cash flow-to-market (CF_ME)										
Mean returns (%)	0.93	1.00	0.87	1.02	0.99	1.02	0.98	1.11	1.35	1.29
Number of stocks	437.2	147.2	140.4	133.7	135.2	133.8	129.6	128.3	136.4	163.2
Dividends-to-market (DV_ME)										
Mean returns (%)	1.20	1.17	1.00	0.77	0.94	0.78	0.87	0.93	0.90	0.91
Number of stocks	875.5	97.3	92.7	91.0	90.6	92.5	90.0	88.2	87.4	79.8
Earnings-to-market (EA_ME)										
Mean returns (%)	0.89	0.91	1.02	1.04	0.98	1.01	1.09	1.20	1.27	1.11
Number of stocks	552.3	135.4	123.0	119.6	118.1	119.1	120.1	121.9	127.7	147.9
Size (CAPT)										
Mean returns (%)	1.51	1.38	1.40	1.31	1.14	1.17	1.13	1.04	1.03	0.90
Number of stocks	647.6	193.2	148.5	126.7	110.1	100.1	96.2	91.3	86.7	84.6
Trading volume (TRDV)										
Mean returns (%)	0.98	1.03	0.89	0.97	1.04	1.00	0.79	0.90	0.84	1.08
Number of stocks	283.4	168.9	147.7	132.6	130.2	130.9	134.3	139.4	157.2	260.6
Contrarian (CONT)										
Mean returns (%)	1.49	1.26	1.07	1.10	1.16	1.05	1.00	0.84	0.93	1.03
Number of stocks	158.7	140.3	131.0	125.8	124.8	129.0	139.7	159.3	188.9	387.8

Momentum (MOMT)										
Mean returns (%)	1.34	1.23	1.17	1.10	1.07	1.04	0.78	0.83	0.85	0.76
Number of stocks	232.9	166.0	152.0	145.3	141.6	141.2	141.4	147.4	162.4	254.9

Table 2- *Continued*

Panel B : Attribute decile for the 12-month momentum strategy										
	Low	2	3	4	5	6	7	8	9	High
Asset-to-market (AT_ME)										
Mean returns (%)	0.89	0.84	1.03	1.04	1.12	1.01	1.12	1.02	1.20	1.33
Number of stocks	227.2	173.4	167.3	164.9	163.6	154.3	149.0	145.1	157.7	182.6
Book-to-market (BE_ME)										
Mean returns (%)	0.87	0.98	0.99	0.96	1.10	1.12	1.11	1.02	1.19	1.60
Number of stocks	211.9	162.1	153.7	149.7	152.8	155.6	156.2	160.3	168.9	213.8
Cash flow-to-market (CF_ME)										
Mean returns (%)	0.93	1.00	0.87	1.02	0.99	1.02	0.98	1.11	1.35	1.29
Number of stocks	437.2	147.2	140.4	133.7	135.2	133.8	129.6	128.3	136.4	163.2
Dividends-to-market (DV_ME)										
Mean returns (%)	1.20	1.17	1.00	0.77	0.94	0.78	0.87	0.93	0.90	0.91
Number of stocks	875.5	97.3	92.7	91.0	90.6	92.5	90.0	88.2	87.4	79.8
Earnings-to-market (EA_ME)										
Mean returns (%)	0.89	0.91	1.02	1.04	0.98	1.01	1.09	1.20	1.27	1.11
Number of stocks	552.3	135.4	123.0	119.6	118.1	119.1	120.1	121.9	127.7	147.9
Size (CAPT)										
Mean returns (%)	1.51	1.38	1.40	1.31	1.14	1.17	1.13	1.04	1.03	0.90
Number of stocks	647.6	193.2	148.5	126.7	110.1	100.1	96.2	91.3	86.7	84.6
Trading volume (TRDV)										
Mean returns (%)	0.98	1.03	0.89	0.97	1.04	1.00	0.79	0.90	0.84	1.08
Number of stocks	283.4	168.9	147.7	132.6	130.2	130.9	134.3	139.4	157.2	260.6
Contrarian (CONT)										
Mean returns (%)	1.49	1.26	1.07	1.10	1.16	1.05	1.00	0.84	0.93	1.03
Number of stocks	158.7	140.3	131.0	125.8	124.8	129.0	139.7	159.3	188.9	387.8
Momentum (MOMT)										
Mean returns (%)	0.87	0.90	1.01	0.84	0.90	0.82	0.97	1.04	1.11	1.58
Number of stocks	205.6	155.3	143.0	137.0	133.8	134.4	138.3	149.1	174.4	314.3

Table 3. Average Risk Premiums of the Firm-related Attributes for Quintile and Decile Portfolios

This table documents average risk premiums of the attributes investigated in the study. The difference in returns between the first and the last portfolios serves as a proxy for the risk premium related to the attribute. Depending on the relation between the stock return and the firm-related attribute, the risk premium could be either equal to the return of the first portfolio minus the return of the last portfolio or the other way around. For asset-to-market, book-to-market, cash flow-to-market, dividends-to-market, earnings-to-market, and trading volume, the risk premium is defined to be the excess return of the highest rank portfolio relative to the lowest rank portfolio. Size risk premium is the difference between the return of the smallest-size portfolio and the return of the biggest-size portfolio. The momentum-related risk premium is defined to be the return of the highest-return portfolio excess of the return of the lowest-return portfolio, while the contrarian-related risk is defined the other way around. The market risk premium is the market return minus the risk free rate. Monthly market returns are value-weighted returns of the qualified stocks at then end of that month. Average risk premiums of these attributes are the simple averages of monthly measures of these attributes.

	Panel A : 1-month momentum strategy		Panel B : 12-month momentum strategy	
	Quintiles	Deciles	Quintiles	Deciles
AT_ME	0.39	0.44	0.39	0.44
BE_ME	0.42	0.73	0.42	0.73
CF_ME	0.40	0.36	0.40	0.36
DV_ME	0.27	0.30	0.27	0.30
EA_ME	0.33	0.22	0.33	0.22
CAPT	0.52	0.61	0.52	0.61
TRDV	-0.03	0.10	-0.03	0.10
CONT	0.35	0.46	0.35	0.46
MOMT	-0.47	-0.58	0.40	0.71
VP_RETf	0.47	0.47	0.47	0.47

Table 4. Correlations between Risk Premiums of Firm-related Attributes for the Quintile and Decile portfolios

Correlations are calculated from the time series of monthly risk premiums of pairwise combinations of the firm-related attributes hypothesized in this paper. AT_ME denotes the ratio of book assets to market equity, or the market leverage. BE_ME represents the book-to-market equity (BE is the shareholder's equity, plus deferred taxes of balance-sheet preferred stock, minus the book value of preferred stock). CAPT is the market capitalization of firms (stock price times number of shares outstanding). CF_ME is the cash flow-to-market equity (cash flow, CF, is earnings before extraordinary items but after interest, depreciation, taxes, and preferred dividends, plus depreciation). CONT denotes the contrarian strategy based on the past 5-year return data. DV_ME is the ratio of dividends paid to the market equity. EA_ME represents the earnings-to-market equity (earnings is income before extraordinary items, plus income-statement deferred taxes, minus preferred dividends). MOMT denotes the momentum strategy based on either past 1-month or past 12-month return data. TRDV represents the turnover ratio of the stock (the number of traded shares divided by the number of shares outstanding). Finally, VP_RET denotes the market risk premium, which is the market return minus the risk free rate. Monthly market returns are value-weighted returns of the qualified stocks at then end of that month.. The sample period expands 436 months from September 1967 to December 2003.

Panel A: The 1-month momentum strategy for the quintile portfolios

	AT_ME	BE_ME	CF_ME	DV_ME	EA_ME	CAPT	TRDV	CONT	MOMT	VP_RET
AT_ME	1.00									
BE_ME	0.93	1.00								
CF_ME	0.87	0.86	1.00							
DV_ME	-0.71	-0.74	-0.74	1.00						
EA_ME	0.80	0.82	0.89	-0.74	1.00					
CAPT	0.36	0.36	0.25	-0.02	0.22	1.00				
TRDV	-0.25	-0.28	-0.32	0.64	-0.38	0.41	1.00			
CONT	0.68	0.65	0.63	-0.6	0.59	0.14	-0.40	1.00		
MOMT	-0.06	-0.02	-0.05	0.06	-0.08	-0.11	-0.01	-0.23	1.00	
VP_RET	-0.20	-0.29	-0.26	0.52	-0.30	0.13	0.59	-0.26	-0.13	1.00

Table 4- *Continued*

Panel B: The 12-month momentum strategy for the quintile portfolios

	AT_ME	BE_ME	CF_ME	DV_ME	EA_ME	CAPT	TRDV	CONT	MOMT	VP_RET
AT_ME	1.00									
BE_ME	0.93	1.00								
CF_ME	0.87	0.86	1.00							
DV_ME	-0.71	-0.74	-0.74	1.00						
EA_ME	0.80	0.82	0.89	-0.74	1.00					
CAPT	0.36	0.36	0.25	-0.02	0.22	1.00				
TRDV	-0.25	-0.28	-0.32	0.64	-0.38	0.41	1.00			
CONT	0.68	0.35	0.63	-0.60	0.59	0.14	-0.40	1.00		
MOMT	-0.32	-0.28	-0.32	0.64	-0.38	0.41	0.13	-0.40	1.00	
VP_RET	-0.20	-0.29	-0.26	0.52	-0.30	0.13	0.59	-0.26	0.01	1.00

Table 4- *Continued*

Panel C: The 1-month momentum strategy for the decile portfolios

	AT_ME	BE_ME	CF_ME	DV_ME	EA_ME	CAPT	TRDV	CONT	MOMT	VP_RET
AT_ME	1.00									
BE_ME	0.88	1.00								
CF_ME	0.83	0.80	1.00							
DV_ME	-0.48	-0.53	-0.51	1.00						
EA_ME	0.72	0.74	0.82	-0.60	1.00					
CAPT	0.46	0.49	0.35	0.05	0.25	1.00				
TRDV	-0.20	-0.22	-0.23	0.68	-0.38	0.27	1.00			
CONT	0.62	0.62	0.54	-0.47	0.52	0.17	-0.43	1.00		
MOMT	-0.39	-0.02	-0.02	0.07	-0.07	-0.07	0.00	-0.23	1.00	
VP_RET	-0.06	-0.17	-0.15	0.53	-0.26	0.09	0.64	-0.19	-0.14	1.00

Table 4- *Continued*

Panel D: The 12-month momentum strategy for the decile portfolios

	AT_ME	BE_ME	CF_ME	DV_ME	EA_ME	CAPT	TRDV	CONT	MOMT	VP_RET
AT_ME	1.00									
BE_ME	0.88	1.00								
CF_ME	0.83	0.80	1.00							
DV_ME	-0.48	-0.53	-0.51	1.00						
EA_ME	0.72	0.74	0.82	-0.60	1.00					
CAPT	0.46	0.49	0.35	0.05	0.25	1.00				
TRDV	-0.20	-0.22	-0.23	0.68	-0.38	0.27	1.00			
CONT	0.62	0.62	0.54	-0.47	0.52	0.17	-0.43	1.00		
MOMT	-0.28	-0.27	-0.25	0.2	-0.29	0.02	0.18	-0.56	1.00	
VP_RET	-0.06	-0.17	-0.15	0.53	-0.26	0.09	0.64	-0.19	-0.03	1.00

Table 5. Time series averages of Correlations of Risk Sensitivities of Firm-related Attributes for the Quintile and Decile Portfolios

This table presents time series averages of monthly cross-sectional correlations between sensitivities (i.e., betas or loadings) of a firm's returns to the firm-related attributes hypothesized in this paper. The cross-sectional pairwise correlations between the sensitivities of a firm's returns to the risk premiums of the 9 firm-related attributes and the market are calculated at the end of each month. The monthly measures of sensitivities of each sample stock's returns to these 10 attribute-related risk premiums are estimated by running a time-series regression of the stock's returns on a risk premium each time. To be included in the sample, a firm must have at least 36 consecutive monthly returns back from the current month over the 5-year estimation period prior to the current month. The stock's return is regressed on the risk premium of a specific attribute, one each time, across the 10 risk premiums so that at the end of each month firm i possesses a vector of 10 sensitivity estimates. This estimation process is repeated monthly for the period from September 1972 to December 2003.

Panel A: 1-month momentum strategy for the quintile portfolios

	AT_ME	BE_ME	CF_ME	DV_ME	EA_ME	CAPT	TRDV	CONT	MOMT	VP_RET
AT_ME	1.00									
BE_ME	0.93	1.00								
CF_ME	0.85	0.86	1.00							
DV_ME	-0.72	-0.79	-0.77	1.00						
EA_ME	0.73	0.78	0.86	-0.75	1.00					
CAPT	0.32	0.30	0.18	0.02	0.10	1.00				
TRDV	-0.27	-0.35	-0.38	0.64	-0.45	0.34	1.00			
CONT	0.66	0.62	0.59	-0.54	0.49	0.15	-0.35	1.00		
MOMT	-0.10	-0.06	-0.09	0.07	-0.14	-0.12	0.05	-0.22	1.00	
VP_RET	-0.25	-0.36	-0.31	0.51	-0.34	0.07	0.54	-0.27	-0.11	1.00

Table 5- *Continued*

Panel B: 12-month momentum strategy for the quintile portfolios

	AT_ME	BE_ME	CF_ME	DV_ME	EA_ME	CAPT	TRDV	CONT	MOMT	VP_RET
AT_ME	1.00									
BE_ME	0.93	1.00								
CF_ME	0.85	0.86	1.00							
DV_ME	-0.72	-0.79	-0.77	1.00						
EA_ME	0.73	0.78	0.86	-0.75	1.00					
CAPT	0.32	0.30	0.18	0.02	0.10	1.00				
TRDV	-0.27	-0.35	-0.38	0.64	-0.45	0.34	1.00			
CONT	0.66	0.62	0.59	-0.54	0.49	0.15	-0.35	1.00		
MOMT	-0.33	-0.28	-0.28	0.23	-0.30	-0.07	0.14	-0.61	1.00	
VP_RET	-0.25	-0.36	-0.31	0.51	-0.34	0.07	0.54	-0.27	0.03	1.00

Table 5- *Continued*

Panel C: 1-month momentum strategy for the decile portfolios

	AT_ME	BE_ME	CF_ME	DV_ME	EA_ME	CAPT	TRDV	CONT	MOMT	VP_RET
AT_ME	1.00									
BE_ME	0.84	1.00								
CF_ME	0.79	0.80	1.00							
DV_ME	-0.47	-0.60	-0.56	1.00						
EA_ME	0.62	0.70	0.81	-0.59	1.00					
CAPT	0.43	0.41	0.27	0.09	0.15	1.00				
TRDV	-0.23	-0.33	-0.31	0.68	-0.40	0.19	1.00			
CONT	0.58	0.61	0.53	-0.43	0.44	0.16	-0.42	1.00		
MOMT	-0.03	-0.01	-0.04	-0.04	-0.09	-0.05	-0.01	-0.22	1.00	
VP_RET	-0.09	-0.26	-0.22	0.52	-0.29	0.04	0.61	-0.21	-0.15	1.00

Table 5- *Continued*

Panel D: 12-month momentum strategy for the decile portfolios

	AT_ME	BE_ME	CF_ME	DV_ME	EA_ME	CAPT	TRDV	CONT	MOMT	VP_RET
AT_ME	1.00									
BE_ME	0.84	1.00								
CF_ME	0.79	0.80	1.00							
DV_ME	-0.47	-0.60	-0.56	1.00						
EA_ME	0.62	0.70	0.81	-0.59	1.00					
CAPT	0.43	0.41	0.27	0.09	0.15	1.00				
TRDV	-0.23	-0.33	-0.31	0.68	-0.40	0.19	1.00			
CONT	0.58	0.61	0.53	-0.43	0.44	0.16	-0.42	1.00		
MOMT	-0.28	-0.28	-0.27	0.20	-0.31	-0.03	0.20	-0.61	1.00	
VP_RET	-0.09	-0.26	-0.22	0.52	-0.29	0.04	0.61	-0.21	0.02	1.00

Table 6. Fama-Macbeth Regression Estimates

At the end of each month, the following cross-sectional regression is run:

$$R_{i,t+1} = \alpha_{A_k,t+1} + \sum_{k=1}^{K} \gamma_{A_k,t+1} \beta_{i,A_k,t} + e_{i,t+1} \qquad i = 1, \cdots, N$$

The test statistic for $\gamma_{A_k,t+1}$ is obtained as follows: $t_{A_k} = \frac{\bar{r}_{A_k} - 0}{\sigma_{\bar{r}_{A_k}}}$ where $\bar{\gamma}_{A_k} = \frac{1}{T} \sum_{j=1}^{T} \gamma_{A_k,j}$.

Panel A : 1-month momentum strategy for the Quintile portfolios

AT_ME	BE_ME	CF_ME	DV_ME	EA_ME	CAPT	TRDV	MOMT	CONT	VP_RET
-0.003					0.007	-0.009	0.004	-0.001	0.005
(-1.160)					(2.809)**	(-3.246)**	(3.133)**	(-0.394)	(2.551)**
	-0.004				0.007	-0.010	0.004	-0.001	0.005
	(-1.574)				(2.821)**	(-3.270)**	(3.138)**	(-0.395)	(2.721)**
		0.006			0.006	-0.010	0.004	-0.001	0.004
		(-1.407)			(2.767)**	(-3.346)**	(3.368)**	(-0.241)	(2.315)*
			0.003		0.005	-0.010	0.004	-0.001	0.004
			(1.263)		(2.164)*	(-3.240)**	(3.433)**	(-0.376)	(2.169)*
				-0.003	0.005	-0.009	0.004	0.000	0.005
				(-1.512)	(2.423)*	(-2.933)**	(3.304)**	(-0.190)	(2.476)**
0.000	-0.001	-0.006	0.000	0.004	0.006	-0.009	0.004	-0.001	0.004
(-0.099)	(-0.238)	(-1.402)	(-0.080)	(1.317)	(2.164)*	(-2.747)**	(3.193)**	(-0.276)	(2.099)*

Table 6 - *Continued*

Panel B : 12-month momentum strategy for the quintile portfolios									
AT_ME	BE_ME	CF_ME	DV_ME	EA_ME	CAPT	TRDV	MOMT	CONT	VP_RET
-0.003					0.007	-0.009	0.002	-0.001	0.004
(-1.405)					(2.780)**	(-3.067)**	(0.908)	(-0.292)	(2.085)**
	-0.003				0.007	-0.010	0.003	-0.001	0.004
	(-1.420)				(2.718)**	(-3.116)**	(0.996)	(-0.373)	(2.308)*
		-0.003			0.007	-0.010	0.002	0.000	0.003
		(-1.621)			(2.773)**	(-3.158)**	(0.882)	(-0.141)	(1.707)*
			0.003		0.005	-0.010	0.002	-0.001	0.003
			(1.630)		(2.255)*	(-3.234)**	(0.735)	(-0.285)	(1.631)
				-0.003	0.006	-0.009	0.002	0.000	0.004
				(-1.641)	(2.509)**	(-2.813)**	(0.668)	(-0.165)	(1.931)*
0.000	-0.001	-0.007	-0.001	0.004	0.006	-0.009	0.002	0.000	0.003
(-0.069)	(-0.173)	(-1.518)	(-0.273)	(1.131)	(2.223)*	(-2.797)**	(0.987)	(-0.046)	(1.804)*

Table 6 - *Continued*

Panel C : 1-month momentum strategy for the decile portfolios									
AT_ME	BE_ME	CF_ME	DV_ME	EA_ME	CAPT	TRDV	MOMT	CONT	VP_RET
-0.003					0.006	-0.010	0.005	-0.002	0.005
(-1.145)					(2.093)*	(-3.012)**	(3.322)**	(-0.545)	(2.924)**
	-0.008				0.008	-0.012	0.006	0.001	0.005
	(-2.811)**				(2.446)**	(-3.110)**	(3.872)**	(0.236)	(2.940)**
		-0.002			0.005	-0.010	0.005	-0.004	0.005
		(-0.848)			(1.769)*	(-2.979)**	(3.501)**	(-0.866)	(2.653)**
			0.004		0.004	-0.012	0.005	-0.003	0.005
			(1.551)		(1.750)*	(-3.224)**	(3.477)**	(-0.884)	(2.307)*
				-0.004	0.005	-0.010	0.006	-0.002	0.005
				(-1.794)*	(1.832)*	(-3.000)**	(3.743)**	(-0.506)	(2.504)**
0.001	-0.010	0.006	0.002	-0.004	0.007	-0.010	0.006	0.002	0.002
(0.286)	(-1.863)*	(1.990)*	(0.606)	(-1.177)	(2.037)*	(-2.511)**	(3.512)**	(0.588)	(1.322)

Table 6 - *Continued*

Panel D : 12-month momentum strategy for the decile portfolios									
AT_ME	BE_ME	CF_ME	DV_ME	EA_ME	CAPT	TRDV	MOMT	CONT	VP_RET
-0.005					0.007	-0.010	0.007	0.002	0.005
(-1.582)					(2.221)*	(-2.856)**	(2.050)*	(0.414)	(2.840)**
	-0.008				0.008	-0.011	0.008	0.004	0.005
	(-2.651)**				(2.415)*	(-2.863)**	(2.446)**	(1.298)	(2.825)**
		-0.002			0.005	-0.010	0.008	0.000	0.005
		(-1.168)			(1.804)*	(-2.659)**	(2.314)*	(0.108)	(2.483)**
			0.005		0.004	-0.013	0.007	0.001	0.005
			(1.877)*		(1.558)	(-3.132)**	(2.174)*	(0.324)	(2.184)*
				-0.005	0.005	-0.009	0.008	0.002	0.004
				(-1.917)*	(1.909)*	(-2.522)**	(2.238)*	(0.715)	(2.184)*
0.000	-0.008	0.007	0.001	-0.005	0.007	-0.010	0.007	0.005	0.003
(-0.047)	(-1.466)	(2.164)*	(0.576)	(-1.383)	(2.017)*	(-2.628)**	(2.031)*	(1.522)	(1.373)