On the Role of Industry in the Cross-Section of Stock Returns*

Pin-Huang Chou   Keng-Yu Ho   Po-Hsin Ho

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Abstract

In spite of its popularity in practice, industry analysis has received only limited attention in the academics of finance. Industry simply plays no role in any asset-pricing theories. From both rational and behavioral viewpoints, we explore the role of industry in explaining the cross-section of expected stock returns. By extracting factors from returns on industry portfolios, we find that the industry factors do provide additional explanatory power beyond size and the ratio of book to market equity (BM). We also find that size and BM premiums are especially prominent for firms whose firms characteristics fall below their industry medians, which seems to be consistent with behavioral views. Using returns on equity (ROEs) as performance measures, we find strong evidence indicating that firms that outperformed their industry average have higher expected returns.

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*All authors are from Department of Finance, National Central University, Jhongli, Taiwan 320. Chou acknowledges financial support from National Science Council of Taiwan (Grant no: NSC 93-2416-H-008-019). For further information, contact: Chou, choup@cc.ncu.edu.tw; K.-Y. Ho, kengyuho@cc.ncu.edu.tw; P.-H. Ho, s1428019@cc.ncu.edu.tw. Corresponding author: Chou.

1 Introduction

In spite of its popularity in investment practice, industry analysis has only received limited attention in the academics of finance. In microeconomics, market analysis depends heavily on the structure of an industry. Surprisingly, however, finance as a field closely related to economics simply ignores the relevance of industry structure. The standard paradigm implies that neither technical nor fundamental analysis is important, as long as there exists neither investor irrationality nor market imperfection. Popular models, be it rational or behavioral (e.g., the one-factor Sharpe-Lintner-Black CAPM, the macroeconomic-based model of Chen, Roll and Ross (1986), the three-factor model of Fama and French (1993), or the characteristic-based model advocated by Daniel and Titman (1997), among others), simply leave no role for industries.

During the past few years, numerous studies have identified industry-related regularities that are not properly characterized by any of the standard asset-pricing models. For example, Fama and French (1997) find that neither the CAPM nor their three-factor model provide precise estimates for the industry cost of equity. Moskowitz and Grinblatt (1999) show that the individual stock momentum is largely driven by industry momentum, and that stocks within an industry tend to be more highly correlated than stocks across industries.[1] The empirical evidence suggests that prevailing pricing models have not yet succeeded in capturing the industry-related characteristics in asset returns.

It is worth noting that although theoretically an industry is defined as a group of firms producing identical products or close substitutes, practically a firm rarely produces just one single product. As a result, broad industry classifications such as the standard industrial classification (SIC) codes have been widely used to define an industry. It has been criticized, however, that industry classifications such as the SIC codes are far from satisfactory. Due to the discrepancy in the definitions of industry in academics and practice, the microeconomic-based industry analysis may not well apply to the real world. Hence, a question worthy of asking is - why do industry-related regularities exist?

Intuitively, the prospect of a firm depends on its own firm-specific characteristics,

[1]Grundy and Martin (2001) and Lewellen (2002), however, show that industry effects do not explain momentum.

on the structure of the industry to which it belongs, and on the state of the economy. Firms of different industries may have different sensitivities to business cycles (i.e., macroeconomic factors) due to different nature of products they produce and the different stages in their "industry life cycle." Returns on industry portfolios may therefore convey information about the fundamentals of the economy. For example, Lamont (2001) and Hong Torous, and Valkanov (2002) find that some combinations of industry portfolios help forecast several macroeconomic variables, and sometimes lead by up to two months. Moreover, industry returns are also able to forecast various indicators of economic activity such as industrial production growth.[2] Hou and Robinson (2003) find that firms in concentrated industries earn lower returns, even after controlling for size, book-to-market and momentum. The premium for industry concentration also exhibits systematic business cycle variation. They suggest that barriers to entry in highly concentrated industries insulate firms from aggregate shocks that lead to economic distress.

While the empirical evidence suggests that industry does play a role in stock returns, it is not clear if the industry-related characteristics are consistent with the standard asset-pricing theories, such as the CAPM or the APT. The first objective of this paper, therefore, is to explore the role of industry in explaining the cross-section of stock returns, from both the rational and behavioral viewpoints.

From rational perspectives, we examine the role of industry in a CAPM world as well as in an APT setting. Specifically, we show that in the CAPM framework, if a firm is closely correlated to firms of the same industry as documented in Moskowitz and Grinblatt (1999), then the systematic risk will be proportional to the product of the market value of the industry portfolio to which the firm belongs and the covariance between the firm and its industry portfolio. We derive an alternative measure for systematic risk, and perform the Fama-MacBeth cross-sectional regressions to examine if the derived "industry-implied risk measure" exhibits any explanatory power.

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[2]Lamont (2001) uses eight industry-sorted stock portfolios, plus the stock market portfolio and four bond portfolios, as the "base assets" to construct "economic tracking portfolios" that track macroeconomic variables. He finds that those base assets help forecast US output, consumption, inflation, labor income, inflation, stock returns, bond returns, and Treasury bill returns. Hong, Torous, and Valkanov (2002) investigate whether the returns of industry portfolios are able to predict the movements of the aggregate stock market. They find that a number of them including retail, services, commercial real estate, metal and petroleum lead the stock market by up to two months.

Since returns on industry portfolios convey information on the fundamentals of the economy, we use principal components to extract various factors from industry portfolios, and examine if the extracted factors serve as "common" factors in an APT setting that explain the cross-section of stock returns. We are particularly interested in the interaction between industry factors and the cross-sectional regularities such as size and booth-to-market (BM) anomalies. Since firms of the same industry may not just be competitive, but also cooperative, we also examine if size and BM effects are stable within and across industries.[3]

Recent behavioral theories suggest that individuals exhibit different attitudes toward gain and loss (Kahneman and Tversky, 1979). Hence it is likely that the manager of a firm has different risk attitudes when the firm's performance is above or below a reference point. Indeed, based on accounting data, Fiegenbaum and Thomas (1988) and Fiegenbaum (1990) document a negative (positive) association between risk and return for firms having returns below (above) their industry median. Thus, it is of interest to investigate if the "pricing" relations about size or BM are stable for firms above and below their industry median. We also examine if the size and BM premiums are related to the asymmetric risk-return relationship in accounting measures.

The rest of the paper is organized as follows. Section 2 explains the sample. Section 3 explores the role of industry from rational perspectives. The explanatory power of industries to explain the cross-section of stock returns is explored from both the CAPM and the APT aspects. Section 4 treats the industry as behavioral factors, and explores the within- and across-industry relations between stock returns and characteristics like size and BM. We identify asymmetric relations for firms above or below industry average. The link to accounting measures such as ROA is also explored. The last section concludes the paper.

[3] Hou (2003) finds that the lead-lag effect is predominantly an intra-industry phenomenon: returns on big firms lead returns on small firms within the same industry. Once this effect is accounted for, little evidence of predictability across industries can be found. Furthermore, this effect is largely driven by sluggish adjustment to negative information. Industry leaders lead industry followers; value firms lead growth firms (within the same industry); firms with low idiosyncratic volatility lead their highly volatile industry peers, controlling for firm size. Small, volatile, less competitive and neglected industries experience a more pronounced lead-lag effect. Finally, it is the intra-industry lead-lag effect that drives the industry momentum anomaly.

2 Data

The data used in this study are ordinary common equities of all firms listed on the NYSE, AMEX, and NASDAQ return files from the Center for Research in Security Prices (CRSP) from July 1963 (1973 for NASDAQ firms) to December 2002. The accounting data is obtained from the COMPUSTAT database.

The way we compute firm size and book-to-market equity is similar to the procedure employed in Fama and French (1992, 1993). We briefly describe the procedure below. We measure a firm's book-to-market equity for July of year t to June of year $t+1$ as the book value of fiscal year $t-1$ divided by the market equity (ME, stock price times shares outstanding) at the end of calendar year $t-1$. The book value is defined as stock-holder's equity plus balance sheet deferred taxes and investment credit (if available), minus the book value of preferred stock. Firms with negative book value are excluded. We use a firm's market equity in June of year t to measure its size for July of year t to June of year $t+1$. Size is the natural logarithm of market equity in millions and BM is the natural logarithm of book-to-market equity. A firm is not included until its data are available on COMPUSTAT for at least two years.

We obtain the industrial classifications from Kenneth French's website.[4] Each month, we assign all firms listed on the NYSE, AMEX, and NASDAQ into one of the 48 industries based on the four-digit Standard Industrial Classification (SIC) codes obtained from CRSP.[5] The value-weighted monthly returns for each industry portfolio are then calculated.

[Insert Table 1 about here]

Table 1 presents summary statistics on the average monthly raw return, standard deviation of raw return, average abnormal return, average total market capitalization, average book-to-market equity, and average number of firms for each of the 48 industry portfolios. The average industry portfolio returns range from 0.61% per month for

[4]See http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/.

[5]Kahle and Walkling (1996) point out that there are large differences between CRSP and COMPUSTAT databases in the SIC codes. More than 36 percent of the classifications disagree at the two-digit level and nearly 80 percent disagree at the four-digit level. Another reason we choose CRSP SIC codes is because CRSP reports the historical time-series SIC codes, whereas COMPUSTAT only reports the most recent SIC codes. However, we reexamine our research using the four-digit SIC codes obtained from COMPUSTAT with similar results.

Non-Metallic and Industrial Metal Mining (Non-Metallic Mining) industry to 1.94% per month for Healthcare industry. We also test whether the abnormal returns are zero for all industries. The joint F-test is significant with a p-value of 0.01. Therefore, we reject the null hypothesis of no industry effect in abnormal returns.

3 Industry as a Rational Factor

3.1 The Role of Industry in a CAPM World

The CAPM implies that in equilibrium the tangency portfolio will be equal to the market portfolio, which is mean-variance efficient. However, as the market portfolio is unobservable, the market index composed of stocks only cannot be perfectly mean-variance efficient, which in turn results in invalid estimates of systematic risks, i.e., βs. Here in this section, we show that if stocks are significantly correlated only for firms of the same industry, then then an alternative estimator of expected returns can be derived under the CAPM framework.

Let r_t denote the $(N \times 1)$ vector of asset returns in excess of the risk-free rate at time t, with mean μ and covariance matrix Ω. N is the number of assets in the economy. Let μ_m and σ_m^2 respectively denote the mean and variance of the return on market portfolio. In equilibrium, it can be shown that the expected excess returns have the following pricing relationship (see Appendix):

$$\mu = \delta \Omega W^*,$$

where $\delta = \frac{\mu_m}{\sigma_m^2}$, and W^* is the $(N \times 1)$ vector of weights of asset market values in the market portfolio. Thus, the expected excess return on asset i is the following:

$$\mu_i = \frac{\delta}{\sum MV_{i,t-1}} (\sigma_i^2 MV_{i,t-1} + \sum_{\substack{j=1 \\ j \neq i}}^{N} \sigma_{ij} MV_{j,t-1}) \tag{1}$$

If $\sigma_{ij} \approx 0$, for all $i \neq j$, then we know that cross-sectionally expected returns are positively correlated to the product of σ_i^2 and MV_i. This suggests that, other things being equal, there exists a weak, positive relation between expected returns and market values. Thus, we provide a theoretical justification for the "counter-size effect" documented in Knez and Ready (1997).

If a stock, say i, that belongs to an industry, say I, is only significantly related to stocks of the same industry as suggested by Moskowitz and Grinblatt (1999), i.e.,

$\sigma_{ij} \approx 0$ for all $j \notin I$, (1) reduces to:

$$\mu_i \approx \delta w^*_{I,t-1} cov(r_{it}, r_{It}), \tag{2}$$

where $w^*_{It} = \frac{MV_{I,t}}{\sum MV_{i,t}}$ is the market value of the industry portfolio I, deflated by the total market capitalization (see Appendix for the proof).

The above "pricing" relation contains two unknown parameters, δ and $cov(r_{it}, r_{It})$. The estimate of δ does not really matter because it is a common term appearing across all stocks. Hence, it is the covariance term and the market value of the industry portfolio that jointly account for the cross-sectional difference in expected return. Empirically, we estimate the equilibrium return implied by the CAPM as the following:

$$\hat{\mu}_{it} = \hat{\delta} w^*_{I,t-1} \widehat{cov(r_{it}, r_{It})}, \tag{3}$$

where $\hat{\mu}_{it}$ refers to the "industry-implied return" of stock i at time t. $\hat{\delta} = \hat{\mu}_m / \hat{\sigma}^2_m$, and $\hat{\mu}_m$ and $\hat{\sigma}^2_m$ are, respectively, the estimates of mean and variance of returns on the market portfolio, calculated over the full-sample period (from July 1963 to December 2002, 474 months). We use the CRSP value-weighted portfolio of NYSE, AMEX, and NASDAQ (after 1972) stocks as the proxy for the market portfolio. For the covariance term, we calculate the "unconditional" estimate $cov(r_{it}, r_{It})$ that uses the full sample (up to 474 months for each portfolio) to estimate the covariance between stock i and industry I.[6]

After the industry-implied returns are obtained, we estimate the following Fama-MacBeth cross-sectional regression:

$$R_{it} = b_{0t} + b_{1t}\hat{\mu}_{it} + b_{2t} MV_{i,t-1} + b_{3t} BM_{i,t-1} + e_{it}. \tag{4}$$

Size and BM are included in the regression to allow for examining the interaction between the implied return and the well-known anomalies. One would expect the

[6] We have also estimated a conditional version of $cov(r_{it}, r_{It})$, which is similar to the "pre-ranking" β in Fama and French (1992). For cross-sectional regressions performed over July of year t to June of year $t+1$, the covariance between stock i and its industry is estimated using data over the preceding five years. Alternatively, we have also estimated $cov(r_{it}, r_{It})$ in terms of 100 size-β portfolios using the estimation techniques in Fama and French (1992). We used the same procedure as in Fama and French (1992) to form the 100 size-β portfolios instead of revising the 100 size-β portfolios as value-weighted portfolios rather than equal-weighted portfolios. We estimate the covariance between each size-β portfolio and each industry portfolio. Then we assign the "post-ranking" covariance to each individual stock i to a size-β portfolio and a industry portfolio. However, employing the 100 portfolios do not alter our conclusions.

coefficient b_{1t} to be significantly positive if industries play a role in the cross-section of stock returns within the CAPM framework.

[Insert Table 2 about here]

Table 2 reports the results on the cross-sectional regressions. The first three columns of Table 2 present the average coefficients of cross-sectional regressions, whereas the last three columns presents the results based on a robust least-trimmed-squares (LTS) procedure suggested by Knez and Ready (1997). Panel A of Table 2 indicates that over the full period, there is a positive, significant relationship between the implied return and stock returns. The coefficients of size and BM remain significant. A closer look at the subperiod results indicates that the coefficient of the industry-implied return is significant (with a t-statistic of 1.84) before 1981, but not after. There remains a significantly negative size effect for both subperiods, but BM premium is significant only after 1981.

Panel B of Table 2 presents the results for January returns. The coefficient of the industry-implied return is significantly positive, but mostly due to its significance at the second subperiod. Size is especially significant in January, coinciding the "January–small-firm effect" well documented in the literature. Panel C of Table 2 presents the cross-sectional results excluding January observations. The results indicate that neither the industry-implied return nor size is significant for non-January months. The size premium even becomes positive for non-January months after 1981, although not significantly different from zero. BM premium is highly significant for non-January months, but is mostly attributed to its significance after 1981.

As a robustness check, the last three columns of Table 2 present the results by excluding the extreme five-percent observations with the largest absolute residuals. The coefficient of the industry-implied return diminishes except for the January months after 1981. The size premium becomes significantly positive as documented in Knez and Ready (1997), but is still negative in January months.[7] The BM premium is mostly significant, but not in January months after 1981 and in non-January months before 1981.

[7]While not closely relevant to the present study, the results here indicate that the small-firm effect is in fact a January-small-firm effect. The effect remains significant after 1981, which contradicts Schwert's (2002) assertion that size effect disappears and markets are becoming efficient with the publication of research findings.

Thus, overall the industry-implied return based on the CAPM only has limited explanatory power, and does not subsume the explanatory power of size and BM.

3.2 The Role of Industry in a Multifactor World

If industry factors matter in the sense of the multifactor model of Merton (1973) or Ross (1976), it is possible to extract common factors from returns on industry portfolios. We extract five factors from returns of 48 industries using principal components. Specifically, let R_I denote a $(T \times M)$ matrix of returns of the industry portfolios, where T refers to the number of time series observations and M refers to the number of industry portfolios. That is, $R_I = (R_1, R_2, \ldots, R_M)$, R_i is a column vector of asset returns of industry i.

Let P denote the orthogonal $(M \times M)$ matrix whose columns p_i's are the characteristic vectors of $C \equiv R_I' R_I$. Then the k factors can be constructed as follows:

$$f_j = R_I \, p_j, \quad j = 1, \cdots, k,$$

where f_j is a $(T \times 1)$ vector that refers to the jth factor extracted from the industry portfolios.

The proportion of variation in industry portfolios captured by a specific factor, say j, can be calculated as $Proportion_j = \frac{\lambda_j}{\sum_{i=1}^{M} \lambda_i}$, and the cumulative explained variation up to the kth factor is computed as $\sum_{j=1}^{k} Proportion_j$.

[Insert Table 3 about here]

Table 3 presents the marginal and cumulative proportions of variations in the returns on industry portfolios explained by the extracted five factors. We also regress each of the five factors on the Fama-French three factors to see how they interact with the three factors. The first and second columns of Table 3 respectively report the marginal and cumulative proportion of variations explained by the five industry factors. The first factor alone captures 59% of the variation in industry returns, and in total the five factors explain more than 74% of the variation in industry returns.

There are some interesting results from the time-series regression of the five industry factors on Fama-French three factors. First, the first extracted factor has a high adjusted R-square of 0.94, and is heavily "loaded" on all three Fama-French factors. Second, while all extracted factors are significantly related to the Fama-French three factors, the first and fourth factors have significant intercepts (with t-values of 7.80 and 7.46, respectively), suggesting that the two factors may convey additional information beyond the Fama-French three factors.[8]

After extracting five common factors from 48 industry portfolios, we estimate the "post-ranking" factor loadings for each security following Fama and French's (1992) procedure. Specifically, the factor loadings are estimated for each of the 192 portfolios, using data over the full sample period. The 192 portfolios are three-way sorting portfolios based on the interaction of 48 industry portfolios, 2 size deciles, and 2 BM deciles.

We describe the procedure of 192 portfolios as follows. In June of year t, stocks that meet the CRSP-COMPUSTAT data requirements are allocated to 2 size portfolios in each industry using the NYSE size (ME) breakpoints. In each size decile of each industry are then sorted into 2 BM portfolios using the book-to-market equity for year $t-1$. The value-weighted monthly returns on the resulting 192 portfolios are then calculated for July of year t to June of year $t+1$.

The industry factor loadings, β_{fp}, for each of the 192 portfolios are calculated by regressing the portfolio returns on the five common factors extracted from industry portfolios. Stocks are then assigned the factor loadings of the 192 portfolios they are in at the end of June of year t. To examine how these factors are related to the size and BM effects, we estimate the following cross-sectional regression:

$$R_{it} = \gamma_{0t} + \gamma_{St} MV_{i,t-1} + \gamma_{Bt} BM_{i,t-1} + \sum_{k=1}^{5} \gamma_{kt} \beta_{ik} + \varepsilon_{it}, \tag{5}$$

where β_{ik} denotes to the factor loading of the kth factor on stock i.

[Insert Tables 4 and 5 about here]

Table 4 reports the average monthly slopes from Fama-MacBeth cross-sectional regressions of size, BM, and the loadings on the five industry factors for various sample periods. Panel A of Table 4 reveals that the premiums on the first and fourth factors are significant, but not on the rest three factors. This evidence is interesting and is consistent with the result from Table 3 where we found that only the first and fourth factors have significant intercepts, and may provide additional explanatory power

[8]The results are consistent with Fama and French (1997) in which they find that the three-factor model fails to provide good estimates of industry cost of equity.

beyond size and BM.[9] Panel B and Panel C of Table 4 show that these two factors are also significant in both January and non-January months. There is also evidence indicating that after 1981 the second factor is significant for non-January months, and the third factor is significant for January months. However, the premiums on size and BM remain significant with the inclusion of the five factors.

Table 5 reports the same regressions based on least trimmed squares robust estimation. The results are not materially altered with the exclusion of extreme observations except the premiums on the second and fourth factors are slightly weakened.

Overall, the empirical results indicate that industry portfolios contain information not fully captured by the Fama-French three factors, and provide additional explanatory power on stock returns beyond size and BM.

4 Industry as a Behavioral Factor

The previous section explores the role of industry from rational perspectives. While industry portfolios convey additional information on stock returns, the explanatory power from industry factors appears to be independent of size and BM. The failure of the "factor" representation to account for size and BM anomalies might be attributed to the fact that size and BM are in fact "behavioral" in nature, as advocated by Daniel and Titman (1997). Thus, this section further investigates the role of industry from behavioral viewpoints. We first investigate if size and BM premiums are the same within and across industries because some researchers (e.g., Hou (2003)) argue that size and BM premiums are essentially intra-industry phenomena, rather than inter-industry ones. We then examine if the premiums are the same for firms above and below their industry averages, because the prospect theory of Kahneman and Tversky (1979) suggests that agents are risk-taking (risk-averse) when they are below (above) a certain reference point.

[9] It is worth noting that although the Fama-French three-factor model yields much higher R-squares than the single-index market model, Fama and French (1993) still reject their three-factor model as a "complete" asset-pricing model because the intercepts in the three-factor model are different from zero, suggesting that there might be some missing factors not captured by the three factors.

4.1 Within vs. Across Industry Effects in Size and BM Premiums

To examine if size and BM premiums are the same within and across industries, we estimate the following model:

$$
\begin{aligned}
R_{it} &= \gamma_{0t} + \gamma_{1t}(MV_{it-1} - MV_{It-1}) + \gamma_{2t}(MV_{It-1} - \overline{MV}_{t-1}) \\
&\quad + \gamma_{3t}(BM_{it-1} - BM_{It-1}) + \gamma_{4t}(BM_{It-1} - \overline{BM}_{t-1}) + e_{it}, \qquad (6)
\end{aligned}
$$

where MV_{It} refers to the median of market value of firms in industry I in month t. $\overline{MV_t}$ is the "market average" defined as the median of all MV_{It}'s. BM_{It} and $\overline{BM_t}$ are defined accordingly. An industry median is calculated with a requirement of at least three firms in that industry. The coefficients γ_1 and γ_3 refer to the within-industry premiums, whereas the coefficients γ_2 and γ_4 refer to the across-industry premiums.

We test if the slopes of within-industry and across-industry are different by examining $\gamma_1 = \gamma_2$ and $\gamma_3 = \gamma_4$, separately. If the within-industry and across-industry premiums are equal, then one may conclude that the inclusion of industry factor is redundant.

[Insert Tables 6 and 7 about here]

Table 6 reports the average within-industry and across-industry premiums of size and BM for various scenarios. Let us first focus on size premiums. Some interesting features emerge from Table 6. First, the within- and across-industry size premiums are mostly negative with one exception: the within-industry size premium becomes positive for non-January months after 1981 (the average premium is 0.01% with a t-statistic of 0.23). The result suggests that after 1981 the size effect is mostly attributed to small-firm effect in January months. Second, by inspecting the hypothesis on the equality of within- and across-industry premiums, one can see that for all scenarios the small-firm premium is stronger in absolute value for firms across industries than those within industries (i.e., $\gamma_1 - \gamma_2$ is positive for all cases). However, there is overall no significant difference in the within- and across-industry premiums, except after 1981 in January months there is still some evidence of significant difference; the across-industry small-firm premium γ_2 in January is 2.01% (in absolute value), which is larger than the within-industries premium γ_1 of 1.52%.

For BM premiums, Panel A of Table 6 indicates that overall BM premium is essentially a within-industry phenomenon because only γ_3 is highly significant. However, overall the results still fail to reject the equality between within- and across-industry BM premiums, except after 1981 there is significant difference in BM premium in January months.

Table 7 presents the empirical result based on the LTS robustness procedure of Knez and Ready (1997). The equality between within- and across-industry size and BM premiums is not statistically altered for almost all scenarios. There are some interesting results, though. First, the within- and across-industry size premiums become significantly positive, yet remain negative in January months. Panel B of Table 7 indicates that size premium is stronger across industries than within industries in January months, but the result is reversed in non-January months. Second, the across-industry BM premium becomes significantly positive with the deletion of extreme observations.

Overall, the results from Table 6 and Table 7 indicate that although there are some patterns of size and BM premiums within and across industries, they are mostly insignificant. The results suggest that the inclusion of industry factor to differentiate the within- and across-industry effect is probably unnecessary. It is worth noting, however, that the five-percent extreme firms have very different attributes as they often change the sign of premiums.

4.2 The asymmetric effect in size and BM premiums

Fiegenbaum and Thomas (1988) and Fiegenbaum (1990) document that firms have different risk attributes when they are above or below their industry averages. More specifically, using ROAs as performance measures, they find that a positive (negative) risk-return relation among firms whose performances are above (below) their industry average. The result is consistent with the prediction of prospect theory proposed by Kahneman and Tversky (1979). If such an asymmetric relation exists in accounting performance measures, would the relation also exist in market performance measures? This is a natural conjecture because conceptually measures like market value and BM reflect investors' expectation about firms' performances.

To the extent that markets are efficient and that investors are not completely risk averse, but embedded with asymmetric preferences as suggested by the prospect theory, it would be of interest to examine if the size and BM premiums exhibit any asymmetric patterns. To examine the possibility from industry aspect, we estimate the following regression:

$$\begin{aligned} R_{it} &= \gamma_{0t} + \gamma_{1t}(MV_{it} - MV_{It}) + \gamma_{2t}(MV_{it} - MV_{It})I(MV_{it} > MV_{It}) \\ &+ \gamma_{3t}(BM_{it} - BM_{It}) + \gamma_{4t}(BM_{it} - BM_{It})I(BM_{it} > BM_{It}) + e_{it}, \end{aligned} \tag{7}$$

where $I(A)$ denotes an indicator function which takes the value of one when the statement A is true and zero otherwise. γ_2 and γ_4 respectively capture the asymmetric effect in size and BM premiums. The results are reported in Table 8.

From Panel A of Table 8 it can be seen that overall γ_2 is significant, but not γ_4. The result suggests an asymmetry in size premiums for firms below and above their industry averages. Since the average size premium for firms above their industry benchmark, captured by $\gamma_1 + \gamma_2$, is not significantly different from zero, the results reveal size premium exists only for firms performing below averages, but not above. In contrast, since both γ_3 and $\gamma_3 + \gamma_4$ are significantly positive, the BM premium is clearly "marketwide," rather than industry-related.

For January months, Panel B of Table 8 indicates that asymmetric patterns are present for both size and BM premiums because both γ_2 and γ_4 are significant. Note that size premiums are negative, regardless of firms' relative performance. Yet, Panel B further reveals an interesting finding that BM premium in January is negative for underperformed firms, but is positive for outperformed firms. This finding seems new to the literature.

For non-January months, Panel C of Table 8 indicates that size premium is negative for below-industry-average firms, but is positive for above-industry-average firms. BM premiums in non-January months are positive regardless of firms' industry-relative performances.

[Insert Tables 8 and 9 about here]

Table 9 reports the results based on LTS robust procedure. Panel A of Table 9 indicates that the pattern of size premium is *entirely* reversed. The below-average size premium γ_1 is -0.26 for the full-sample period, but becomes 0.26 after the five-percent extreme observations are trimmed! Similarly, γ_2 is 0.24 in Table 8, but reversed to -0.09 in Table 9.

For BM premium, Table 9 indicates that after the extreme five-percent observations are trimmed, the BM premium is positive for below-average firms, but is insignificant for above-average firms. For example, the BM premium for under-performing firms is 0.60 (with t-statistic being 5.87) and is 0.06 (with a t-statistic of 0.76) for out-performing firms. The result is also in sharp contrast with the result in Table 8 where BM premium is significantly positive regardless of industry-relative performances.

After trimming five percent extreme observations, a stock has larger size and BM tends to have much higher expected return when its size and/or BM fall below the industry medians. Take size for example, the risk premia for size is 0.17 when the stock is above the industry median comparing with the risk premia for size is 0.26 when the stock is below the industry median.

Panel B of Table 9 reports the results for various subperiods in January. The results reveal the same asymmetric condition as well as the results in Panel B of Table 8. In other words, after trimming five percent extreme observations in January, a stock has smaller size and larger BM still tends to have higher expected return when its size and BM is above the median of the industry to which it belongs.

[Insert Figures 1 and 2 about here]

Figure 1 can help us understand the above asymmetric effects more clearly. It shows the scatter plots for returns against size for Business Service industry in September, 1995. Figure 1A presents the fitted lines of least squares. The dash line has negative slope, which means that there is an overall size effect within the industry. Figure 1A reveals that the observations which below the industry median have more positive returns on small firms. The fitted line of these observations is steeper than the fitted line of all observations. The right hand solid line in Figure 1A is flatter than dash line because of a positively reversal correcting. On the other hand, Figure 1B presents the fitted lines with five percent data trimmed of least trimmed squares. The positive slope of dash line suggests that there is anti-size effect, which is consistent with Knez and Ready (1997), within industry after trimming five percent extreme observations. It is apparent that most of the trimmed observations are extreme positive returns and are below the industry median. These extreme positive observations pull the left hand side of the dash line in Figure 1A upward. The left hand solid line in Figure 1B is more steeper than dash line due to the trimmed observations of extreme positive returns on small firms. Also, a negative reversal correcting can be seen in the right hand solid line in Figure 1B.

On the other hand, Figure 2 shows the scatter plots for returns against BM for Business Service industry in December, 2000. Being consistent with Knez and Ready (1997), the dash lines are always positive slope no matter in Figure 2A or in Figure 2B. The results suggest that BM is positive related to stock returns and is less influenced by extreme observations. However, turning to Figure 2B, the right hand solid line is much flatter than left hand solid line because of a negatively reversal correcting when firms' BM are above the median of the same industry peers. Consequently, a clearly asymmetric phenomenon exists within industry for both size and BM effects.

A possible reason for the asymmetric effect is based on the prospect theory. Specifically, agents have different risk attitudes when they are above or below a target level (reference point). Using the industry median of size and BM as the reference point, there actually exists different relations between risks and returns for firms having returns above or below their industry median if size and BM is really proxy for risk.

4.3 Linkage to accounting fundamentals

Since there is strong evidence indicating that premiums on size and BM premiums are different for firms with different industry-relative performance, it is of interest to examine if the asymmetric patterns in size and BM premiums are related to firms' past operating performance, as suggested by Fiegenbaum and Thomas (1988) and Fiegenbaum (1990). To do so, we include a firm's historical returns on equity (ROEs) as additional independent variables. Similar to the procedure we use to measure size and BM, in June of year t, we include the firm's average ROE of the past three yearends from fiscal year $t-1$ to fiscal year $t-3$ for July of year t to June of year $t+1$. Specifically, we estimate the following equation:

$$
\begin{aligned}
R_{it} &= \gamma_{0t} + \gamma_{At} ROE_{it} + \gamma_{Bt}(ROE_{it} - ROE_{It}) + \gamma_{Ct}(ROE_{It} - \overline{ROE_t}) \\
&+ \gamma_{Dt}(ROE_{it} - ROE_{It}) I(ROE_{it} > ROE_{It}) + \gamma_{1t}(MV_{it} - MV_{It}) + \gamma_{2t}(BM_{it} - BM_{It}) \\
&+ \gamma_{3t}(MV_{it} - MV_{It}) I(MV_{it} > MV_{It}) + \gamma_{4t}(BM_{it} - BM_{It}) I(BM_{it} > BM_{It}) + e_{it}, \quad (8)
\end{aligned}
$$

where ROE refers to the average of the past three yearend ROEs.

Table 10 reports the empirical results. The results reveal that the asymmetric effects of size and BM cannot be subsume by the accounting data. Similar result is reported in the robustness check. Panel B of Table 10 suggests that the asymmetric effects of size and BM cannot be absorbed by the accounting data when trimming five percent extreme observations. Additionally, the significance of γ_D suggests that it seems that the accounting data can provide additional explanatory power beyond size and BM in the last row of Panel A and Panel B. Based on the prospect theory, the results which we have shown here confirm the point of view that managers have different risk attitudes when using the industry median of past operating performance as the reference point.[10]

[Insert Table 10 about here]

The result of this subsection suggests that there exist asymmetric relations between return and size and BM using the industry median as the reference point. Trimming the five percent extreme observations, there is a negative relationship between stock return and size when a firm's size is below the industry median, but a positive correcting when it is above the industry median. Omitting the five percent extreme observations, there is a strong positive relationship between stock return and size when a firm's size is below the industry median, but a negative correcting when it is above the industry median. The more important thing is that the implication of the asymmetric effect for valuation suggests that the institutional investors or fund managers may underestimate the stock returns of firms with smaller size and higher BM which below the industry median, and overestimate the stock returns of firms with smaller size and higher BM which above the industry median. Additionally, the asymmetric phenomenon may be explained by prospect theory, which proposes that the managers have different attitudes toward risk when they are below and above a reference point. However, based on the prospect theory, we find that the asymmetric effects of size and BM cannot be absorbed using ROE as the past operation performance.

[10]Alternatively, we also replace ROE with ROA (return on assets), ROS (return on sales), and sales growth rate in the regression. We find that the results are not materially altered. The results are available upon request.

5 Conclusion

In this paper, we explore the role of industry in the cross section of stock returns. The main findings of our paper are as follows. First, we test the implied returns which are related to firms of the same industry in a CAPM world. From the robustness check based on least trimmed square regression, our empirical results reveal that the implied returns can explain only five percent extreme observations and cannot subsume the size and BM effects. The results imply that the stock return not merely related to the industry it belongs.

Second, we decompose firm's characteristics into within- and across-industry components. based on the robustness check, both within- and across-industry components are significant. We find that the magnitude of within-industry component is larger than across-industry component. However, the equality test between these two components fail to reject the null hypothesis, which implies that the inclusion of industry factor to differentiate the within- and across-industry effect is redundant.

Third, we use 48 industry portfolios as "basis assets" and extract five factors from them. Our empirical results show that the industry factors can provide additional explanatory power beyond size and BM. However, the industry factors still cannot absorb the anomalies of size and BM. Finally, from the behavioral finance view, based on the prospect theory, we examine the relation between return and firms' characteristics using industry median as a reference point. In our empirical results, there are asymmetric relations between return and risk when a firm has larger (or lower) size (or BM) than industry median. Additionally, we examine whether the asymmetric relation are due to the past operating performance. The results reveal that the asymmetric phenomenon cannot be absorbed when using ROE as the measure of past operating performance.

To conclude, we have tried to explore the role of industry factor in cross-sectional stock returns from various aspects. On the characteristic-based model aspect, industry has no power to differentiate from the within- and across-industry aspects. From rational aspects such as the single factor CAPM or the multifactor model, industry may explain the cross-sectional stock returns, but still cannot explain size and BM effect. From the behavioral aspects, industry, which plays a role, displays an asymmetric phenomenon. Hence, it is difficult for us to definitely demonstrate the effect of industry factor.

The findings in our paper raise more questions. Why do firms above or below the industry median have different relations to stock returns? How are managerial decisions affected by the characteristic level (large size or small size) of firms? Can risk-based or behavioral-based model offer better explanations? Do differences industrial classifications, such as industrial classifications from Standard & Poor or Datastream database, have difference empirical results? A better understanding of these phenomenons is likely to lead to richer empirical tests. We leave these issues for future research.

Appendix

Let r_t denote the $(N \times 1)$ vector of asset returns in excess of the risk-free rate at time t, with mean μ and covariance matrix Ω. N is the number of assets in the economy. Mean-variance optimization yields the following "optimal" weights for the tangency portfolio, $W^* = (W_{1,t-1}, ..., W_{N,t-1})'$:

$$W^* = \frac{\Omega^{-1}\mu}{1'\Omega^{-1}\mu}.$$

The market portfolio $r_{mt} = w'_{mt} r_t$ has weights as follows:

$$w_{it} = \frac{MV_{i,t-1}}{\sum MV_{i,t-1}} \quad i = 1, ..., N,$$

where MV_{it} is asset i's market value at time t. In equilibrium, the tangency portfolio coincides with the market portfolio, i.e.,

$$W^* = w_{mt}.$$

The covariances between r_t and the market portfolio are:

$$\begin{aligned} cov(r_t, r_{mt}) &= cov(r_t, W^{*'} r_t) \\ &= \Omega W^*. \end{aligned}$$

Since $\beta \equiv \frac{cov(r_t, r_{mt})}{var(r_{mt})}$, it can be expressed as:

$$\begin{aligned} \beta &= \frac{1}{var(r_{mt})} cov(r_t, r_{mt}) \\ &= \frac{1}{var(r_{mt})} \Omega W^*. \end{aligned}$$

The CAPM posits the following:

$$\begin{aligned} \mu &= \beta \mu_m \\ &= \frac{\mu_m}{\sigma_m^2} \Omega W^* \\ &= \delta \Omega W^*, \end{aligned}$$

where $\delta = \frac{\mu_m}{\sigma_m^2}$. The above equation implies:

$$\mu_i = \delta \begin{pmatrix} \sigma_{i1} & \cdots & \sigma_{iN} \end{pmatrix} \begin{pmatrix} w_{1t}^* \\ \vdots \\ w_{Nt}^* \end{pmatrix}$$

$$
\begin{aligned}
&= \frac{\delta}{\sum MV_{i,t-1}} \begin{pmatrix} \sigma_{i1} & \cdots & \sigma_{iN} \end{pmatrix} \begin{pmatrix} MV_{1,t-1} \\ \vdots \\ MV_{N,t-1} \end{pmatrix} \\
&= \frac{\delta}{\sum MV_{i,t-1}} \sum_{j=1}^{N} \sigma_{ij} MV_{j,t-1} \\
&= \frac{\delta}{\sum MV_{i,t-1}} (\sigma_i^2 MV_{i,t-1} + \sum_{\substack{j=1 \\ j \neq i}}^{N} \sigma_{ij} MV_{j,t-1})
\end{aligned}
$$

If $\sigma_{ij} \approx 0$, for all $i \neq j$, then we know that cross-sectionally expected returns are positively correlated to the product of σ_i^2 and MV_i.

If the stock is only significantly related to stocks of the industry to which it belongs, i.e., $\sigma_{ij} \approx 0$ for all $j \notin I$, the above relation reduces to the following:

$$
\begin{aligned}
\mu_i &= \frac{\delta}{\sum MV_{i,t-1}} (\sum_{j \in I} \sigma_{ij} MV_{j,t-1} + \sum_{j \notin I} \sigma_{ij} MV_{j,t-1}) \\
&\approx \frac{\delta}{\sum MV_{i,t-1}} cov(r_{it}, r_{It}) MV_{I,t-1}, \qquad (9) \\
&= \delta w^*_{I,t-1} cov(r_{it}, r_{It}), \qquad (10)
\end{aligned}
$$

where $MV_{I,t-1}$ refers to the total market values of the stocks in industry I, i.e., $MV_{It} = \sum\limits_{j \in I} MV_{jt}$. $w^*_{It} = \frac{MV_{I,t}}{\sum MV_{i,t}}$ is the industry's market value in proportion to the total market value. The proof of equation (9) is given in the following.

Let the value-weighted industry portfolio be:

$$
r_{It} = \sum_{j \in I} W_{j,t-1} r_{jt},
$$

where $W_{jt} = \frac{MV_{jt}}{\sum\limits_{j \in I} MV_{jt}}$ Thus, the covariance between r_{it} and r_{It} is:

$$
\begin{aligned}
cov(r_{it}, r_{It}) &= cov(r_{it}, \sum_{j \in I} W_{j,t-1} r_{jt}) \\
&= \sum_{j \in I} W_{j,t-1} cov(r_{it}, r_{jt}) \\
&= \frac{\sum\limits_{j \in I} \sigma_{ij} MV_{j,t-1}}{\sum\limits_{j \in I} MV_{j,t-1}}
\end{aligned}
$$

Multiplying both sides of the above equation by the denominator of the right-hand-side, we have the following:

$$
\sum_{j \in I} \sigma_{ij} MV_{j,t-1} = cov(r_{it}, r_{It}) \cdot MV_{I,t-1}.
$$

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Table 1: Descriptive and Summary Statistics of 48 Industry Portfolios

In each month from July 1963 to December 2002, the industries are formed monthly based on the four-digit SIC codes from CRSP. The calculation in Table 1 are based on the maximum available time-series length in each industry. The average raw return is the time-series average of value-weighted returns in each industry. The standard deviation of raw return is the time-series standard deviation of raw return in each industry. The abnormal return is the adjusted return using the three-factor model. The average ln(ME) is the time-series average of total market capitalization in each industry. The average BM is the time-series average of book-to-market equity in each industry. The average number of firms is the time-series average of firms in each industry. In each June of year t, book-to-market equity calculated from the book value of fiscal year $t-1$ to the market equity at the end of year $t-1$. The book value is stock-holder's equity plus balance sheet deferred taxes and investment credit (if available), minus the book value of preferred stock. We exclude firms with negative book value and only include firms have been on COMPUSTAT for at least two years. The F-statistic for the the abnormal returns are significantly differ from zero. The joint test of GRS statistic correspond to the September 1976 to December 2002 time period. As in Fama and French (1992), the smallest and largest 0.5% of the observations on book-to-market equity are set equal to the next smallest or largest value of the variable.

	Industry	Avg. Raw Return (%)	S.d. of Raw Return (%)	Abnormal Return (%)	Avg. ln(ME)	Avg. BM	Avg. No. of Firms
1	Agriculture	1.63	6.68	0.35	7.68	0.54	10
2	Food Products	1.10	4.73	0.21	10.87	0.75	46
3	Candy and Soda	1.38	5.64	0.50	10.48	0.46	9
4	Beer and Liquor	1.15	5.42	0.10	9.40	1.02	10
5	Tobacco Products	1.38	5.38	0.30	8.97	0.73	5
6	Recreation	1.23	7.85	0.21	9.29	0.91	23
7	Entertainment	1.45	8.05	0.30	9.68	0.63	20
8	Printing and Publishing	1.03	6.06	−0.08	10.45	0.53	29
9	Consumer Goods	0.91	4.88	0.15	11.66	0.63	63
10	Apparel	1.01	6.74	−0.28	9.28	0.91	39
11	Healthcare	1.94	8.29	0.47	10.18	0.58	43
12	Medical Equip.	1.24	5.65	0.65	10.50	0.41	59
13	Pharmaceutical Products	1.27	5.43	0.69	11.69	0.31	68
14	Chemicals	0.89	5.35	−0.18	11.15	0.64	54
15	Rubber and Plastic Products	1.09	6.75	−0.01	8.41	0.80	24
16	Textiles	0.95	6.60	−0.42	8.03	1.26	23
17	Construction Materials	1.02	5.79	−0.22	10.60	0.82	86
18	Construction	1.20	7.56	−0.09	8.54	0.96	28
19	Steel Works Etc	0.69	6.66	−0.56	10.10	1.00	42
20	Fabricated Products	0.73	7.53	−0.68	7.72	0.94	13

Table 1 Continued

	Industry	Avg. Raw Return (%)	S.d. of Raw Return (%)	Abnormal Return (%)	Avg. ln(ME)	Avg. BM	Avg. No. of Firms
21	Machinery	0.92	6.08	−0.10	10.71	0.75	92
22	Electrical Equip.	1.09	6.93	0.25	10.53	0.55	56
23	Automobiles and Trucks	0.81	6.13	−0.44	10.91	0.81	40
24	Aircraft	1.21	7.30	0.01	10.30	0.76	16
25	Shipbuilding, Railroad Equip.	1.20	7.53	0.08	8.36	0.93	5
26	Defense	1.52	7.04	0.25	9.28	0.65	6
27	Precious Metals	1.27	10.85	0.26	8.10	0.41	11
28	Non-Metallic Mining.	0.61	6.91	−0.55	8.66	0.70	12
29	Coal	0.63	8.41	−0.80	7.19	0.65	6
30	Petroleum and Natural Gas	1.03	5.46	0.09	11.94	0.64	101
31	Utilities	0.78	4.27	−0.20	11.86	0.85	121
32	Communication	1.06	5.06	0.31	11.39	0.50	31
33	Personal Services	1.07	8.18	−0.13	9.00	0.70	19
34	Business Services	1.17	7.42	0.22	11.69	0.53	181
35	Computers	0.90	6.39	0.25	11.66	0.49	66
36	Electronic Equip.	1.10	7.81	0.21	11.34	0.60	113
37	Measuring and Control Equip.	1.32	8.50	0.49	9.90	0.60	53
38	Business Supplies	0.94	5.84	−0.17	10.56	0.79	32
39	Shipping Containers	0.92	5.33	0.03	9.92	0.71	18
40	Transportation	0.92	6.66	−0.31	10.41	0.80	49
41	Wholesale	1.19	6.87	0.05	10.55	0.83	95
42	Retail	1.07	5.80	0.07	11.61	0.77	108
43	Restaraunts, Hotels, Motels	1.25	7.04	0.11	10.25	0.64	49
44	Banking	1.15	6.20	−0.12	11.78	0.93	102
45	Insurance	1.10	5.79	−0.08	11.59	0.80	61
46	Real Estate	1.34	9.04	−0.28	8.25	0.89	22
47	Trading	1.08	5.73	−0.04	12.34	0.81	146
48	Miscellaneous	1.38	8.48	−0.12	9.77	0.60	16
	Average	1.11	6.63	0.02	10.06	0.73	49
	F-statistic (all = 0)			1.61			
	(p-value)			(0.01)			

Table 2: Average Slopes of Industry-implied return, Size, and Book-to-Market Equity

The stock implied return, $\hat{\mu}_{it}$, is estimated as $\hat{\mu}_{it} = \hat{\delta} cov(r_{it}, r_{It}) mv_{I,t-1}$, where $\hat{\delta} = \hat{\mu}_m / \hat{\sigma}_m^2$, and $\hat{\mu}_m$ and $\hat{\sigma}_m^2$ are the full period sample estimation of mean and variance of the market portfolio, respectively. mv_{It} is the market value of the industry portfolio I, deflated by the total market capitalization. We use the CRSP value-weighted portfolio as the proxy for the market. We estimate $cov(r_{it}, r_{It})$ for each individual stock i using the full period sample estimation of covariance between stock i and industry I which stock i belongs. In each month, we estimate the following cross-sectional regressions:

$$R_{it} = b_{0t} + b_{1t}\hat{\mu}_{it} + b_{2t}MV_{it} + b_{3t}BM_{it} + \eta_{it}.$$

The average slopes from the time-series average slopes of the monthly cross-sectional regressions are reported, and in the parenthesis are the Newey-West (1987) adjusted for serial correlation and heteroscedastic t-statistics. The no trimming reports the Fama-MacBeth two-pass methodology, and the five percent trimming reports the least trimmed square of Knez and Ready (1997). Panel A, Panel B , and Panel C report the results of various subperiods for all months, January, and non-January, respectively.

	No Trimming			5% Trimming		
	$\hat{\mu}$	ln(ME)	ln(BM)	$\hat{\mu}$	ln(ME)	ln(BM)
Panel A: All months						
1963/07 – 2002/12	2.51	−0.15	0.32	−0.10	0.26	0.46
	(2.26)	(−2.81)	(3.99)	(−0.10)	(6.04)	(6.24)
1963/07 – 1981/12	2.39	−0.17	0.19	0.30	0.15	0.26
	(1.84)	(−2.04)	(1.58)	(0.24)	(2.17)	(2.18)
1982/01 – 2002/12	2.61	−0.13	0.43	−0.45	0.35	0.65
	(1.55)	(−1.92)	(4.27)	(−0.34)	(7.47)	(7.76)
Panel B: January						
1963/07 – 2002/12	12.62	−1.83	0.22	7.28	−1.05	0.60
	(3.63)	(−8.19)	(0.71)	(2.65)	(−5.95)	(2.25)
1963/07 – 1981/12	5.95	−1.90	0.92	1.85	−1.30	1.18
	(1.13)	(−6.67)	(2.13)	(0.41)	(−5.23)	(3.05)
1982/01 – 2002/12	18.33	−1.77	−0.39	11.92	−0.82	0.11
	(4.23)	(−5.19)	(−0.99)	(3.84)	(−3.41)	(0.31)
Panel C: Non-January						
1963/07 – 2002/12	1.60	0.00	0.33	−0.76	0.37	0.45
	(1.36)	(−0.02)	(4.01)	(−0.76)	(8.52)	(5.74)
1963/07 – 1981/12	2.08	−0.02	0.13	0.17	0.28	0.18
	(1.55)	(−0.27)	(1.09)	(0.13)	(3.95)	(1.50)
1982/01 – 2002/12	1.18	0.02	0.50	−1.58	0.45	0.70
	(0.65)	(0.28)	(4.76)	(−1.10)	(9.20)	(7.69)

Table 3: The marginal and cumulative explaining proportion of the five factors and the regressions of the five factors on the three-factor model

The five factors are estimated as "unconditional" estimation from the 48 industry portfolios using principal components analysis. The marginal is the marginal explaining proportion to industry portfolios variation for each extracted factor. The cumulative is the sequential cumulative explaining proportion to industry portfolios variation from the extracted factor 1 to factor 5. Regressions of the five extracted factors on the three-factor model, respectively, are as following:

$$F_i = a_i + b_i(R_m - R_f) + s_i SMB + h_i HML + e_i, \quad \text{for } i = 1, \ldots, 5$$

The coefficients and t-statistics of regressions are reported. $Adj.\, R^2$ represents the adjusted r-square of regressions.

Factor	Marginal	Cumulative	a	b	s	h	$t(a)$	$t(b)$	$t(s)$	$t(h)$	$Adj.\, R^2$
F1	0.590	0.590	0.09	0.20	0.06	0.03	7.80	76.67	15.80	8.84	0.94
F2	0.054	0.644	−0.05	−0.01	0.06	0.04	−1.06	−1.30	3.74	2.38	0.03
F3	0.045	0.690	0.04	0.02	−0.06	0.13	0.97	1.94	−4.46	9.73	0.22
F4	0.027	0.717	0.23	0.05	−0.19	−0.09	6.46	5.99	−16.46	−8.01	0.40
F5	0.024	0.741	−0.04	0.04	−0.07	0.05	−0.96	3.32	−4.45	3.20	0.07

Table 4: Average Slopes of Size, BM, and Five Factors (No Trimming)

We estimate the factor loading of stocks using the full period sample in terms of 192 portfolios. In June of year t, the NYSE, AMEX, and NASDAQ stocks that must meet the CRSP-COMPUSTAT data requirements are allocated to 2 size portfolios in each industry using the NYSE size breakpoints. The NYSE, AMEX, and NASDAQ stocks in each size decile of each industry are then sorted into 2 BM portfolios using the book-to-market equity for year $t-1$. The value-weighted monthly returns on the resulting 192 portfolios are then calculated for July of year t to June of year $t+1$. The industry factor loadings, β_{fp}, calculated from using the full period sample of post-ranking returns for each portfolio to regress on the five common factors. Stocks are assigned the industry factor loadings of one of the 192 portfolios they belong to in at the end of June of year t. We estimate the following cross-sectional regressions:

$$R_{it} = \gamma_{0t} + \gamma_{At} MV_{it} + \gamma_{Bt} BM_{it} + \sum_{f=1}^{5} \gamma_{ft} \beta_{if,t} + \varepsilon_{it},$$

where $\beta_{if,t}$ denotes to the industry factor loadings of the factor f of 192 industry portfolios to which stock i belongs in time t. The average slopes of the monthly cross-sectional regressions are reported, and in the parenthesis are the Newey-West (1987) adjusted for serial correlation and heteroscedastic t-statistics. Panel A, Panel B , and Panel C report the results of various subperiods for all months, January, and non-January, respectively.

	γ_A	γ_B	γ_1	γ_2	γ_3	γ_4	γ_5
Panel A : All Months							
1963/07 – 2002/12	−0.17	0.42	0.15	−0.05	−0.04	0.28	−0.03
	(−4.12)	(6.90)	(2.82)	(−0.93)	(−0.65)	(5.22)	(−0.40)
1963/07 – 1981/12	−0.18	0.30	0.22	0.10	−0.02	0.27	0.07
	(−3.08)	(2.91)	(2.62)	(1.40)	(−0.38)	(4.21)	(0.87)
1982/01 – 2002/12	−0.16	0.53	0.08	−0.18	−0.05	0.29	−0.12
	(−2.71)	(7.92)	(1.33)	(−2.75)	(−0.56)	(3.52)	(−1.07)
Panel B : January							
1963/07 – 2002/12	−1.64	0.69	0.62	0.07	−0.46	0.54	−0.12
	(−8.39)	(2.30)	(3.53)	(0.36)	(−2.56)	(2.59)	(−0.52)
1963/07 – 1981/12	−1.63	1.12	0.60	0.38	−0.17	0.09	−0.03
	(−6.93)	(2.52)	(1.99)	(1.27)	(−0.88)	(0.43)	(−0.09)
1982/01 – 2002/12	−1.65	0.33	0.63	−0.20	−0.71	0.92	−0.20
	(−5.36)	(0.81)	(3.12)	(−0.81)	(−2.50)	(2.89)	(−0.62)
Panel C : Non−January							
1963/07 – 2002/12	−0.04	0.40	0.11	−0.06	0.00	0.26	−0.02
	(−1.01)	(6.35)	(2.09)	(−1.14)	(0.01)	(4.76)	(−0.27)
1963/07 – 1981/12	−0.06	0.23	0.19	0.08	0.00	0.29	0.08
	(−0.94)	(2.33)	(2.30)	(1.11)	(−0.08)	(4.25)	(0.94)
1982/01 – 2002/12	−0.03	0.54	0.03	−0.18	0.00	0.23	−0.11
	(−0.50)	(7.54)	(0.55)	(−2.62)	(0.05)	(2.85)	(−0.98)

Table 5: Average Slopes of Size, BM, and Five Factors (5% Trimming)

We estimate the factor loading of stocks using the full period sample in terms of 192 portfolios. In June of year t, the NYSE, AMEX, and NASDAQ stocks that must meet the CRSP-COMPUSTAT data requirements are allocated to 2 size portfolios in each industry using the NYSE size breakpoints. The NYSE, AMEX, and NASDAQ stocks in each size decile of each industry are then sorted into 2 BM portfolios using the book-to-market equity for year $t-1$. The value-weighted monthly returns on the resulting 192 portfolios are then calculated for July of year t to June of year $t+1$. The industry factor loadings, β_{fp}, calculated from using the full period sample of post-ranking returns for each portfolio to regress on the five common factors. Stocks are assigned the industry factor loadings of one of the 192 portfolios they are belong to at the end of June of year t. We estimate the following cross-sectional regressions:

$$R_{it} = \gamma_{0t} + \gamma_{At} MV_{it} + \gamma_{Bt} BM_{it} + \sum_{f=1}^{5} \gamma_{ft} \beta_{if,t} + \varepsilon_{it},$$

where $\beta_{if,t}$ denotes to the industry factor loadings of the factor f of 192 industry portfolios to which stock i belongs in time t. The average slopes of the monthly cross-sectional of the LTS regressions are reported, and in the parenthesis are the Newey-West (1987) adjusted for serial correlation and heteroscedastic t-statistics. Panel A, Panel B , and Panel C report the results of various subperiods for all months, January, and non-January, respectively.

	γ_A	γ_B	γ_1	γ_2	γ_3	γ_4	γ_5
Panel A : All Months							
1963/07 – 2002/12	0.23	0.50	0.06	−0.09	0.02	0.13	−0.07
	(7.01)	(8.64)	(1.15)	(−1.83)	(0.30)	(2.86)	(−1.06)
1963/07 – 1981/12	0.12	0.33	0.12	0.04	−0.02	0.20	−0.01
	(2.66)	(3.32)	(1.50)	(0.61)	(−0.51)	(3.26)	(−0.19)
1982/01 – 2002/12	0.32	0.65	0.01	−0.21	0.05	0.08	−0.12
	(7.55)	(11.71)	(0.08)	(−3.29)	(0.55)	(1.14)	(−1.19)
Panel B : January							
1963/07 – 2002/12	−0.87	0.98	0.41	−0.04	−0.44	0.24	−0.18
	(−5.49)	(3.92)	(2.66)	(−0.23)	(−2.84)	(1.49)	(−0.92)
1963/07 – 1981/12	−1.10	1.26	0.39	0.31	−0.23	0.01	−0.17
	(−4.98)	(2.99)	(1.48)	(1.10)	(−1.39)	(0.03)	(−0.57)
1982/01 – 2002/12	−0.68	0.73	0.44	−0.34	−0.63	0.44	−0.18
	(−3.05)	(2.54)	(2.32)	(−1.62)	(−2.51)	(1.83)	(−0.72)
Panel C : Non−January							
1963/07 – 2002/12	0.32	0.46	0.03	−0.09	0.06	0.12	−0.06
	(9.76)	(7.66)	(0.53)	(−1.96)	(1.03)	(2.54)	(−0.87)
1963/07 – 1981/12	0.23	0.25	0.10	0.02	0.00	0.21	0.00
	(4.95)	(2.59)	(1.21)	(0.27)	(−0.07)	(3.33)	(0.00)
1982/01 – 2002/12	0.41	0.64	−0.03	−0.19	0.11	0.04	−0.11
	(9.18)	(10.54)	(−0.54)	(−3.03)	(1.17)	(0.63)	(−1.08)

Table 6: Average Slopes of Within- and Across-Industry Components of Size and BM

In each month from July 1963 to December 2002, the industries are formed monthly based on the four-digit SIC codes from CRSP. In each June of year t, we form BM for July of year t to June of year $t+1$ as the book value of prior fiscal year divided by the market equity of prior calendar yearend. The book value as defined stockholder's equity plus balance sheet deferred taxes and investment credit (if available), minus the book value of preferred stock. As in Fama and French (1992), the smallest and largest 0.5% of the observations on book-to-market equity are set equal to the next smallest or largest value of the variable. We use a firm's market equity in June of year t to measure its size for July of year t to June of year $t+1$. we exclude firms with negative book value and do not include firms until they are on COMPUSTAT for at least two years. We employ the Fama-MacBeth (1973) procedure to estimate the following equation:

$$\begin{aligned} R_i &= \gamma_0 + \gamma_1(MV_i - MV_I) + \gamma_2(MV_I - \overline{MV}) + \gamma_3(BM_i - BM_I) \\ &+ \gamma_4(BM_I - \overline{BM}) + e_i, \end{aligned}$$

where MV_{It} refers to the median of market values of firms in industry I in month t. $\overline{MV_t}$ refers to the median of MV_{It} in month t. BM_{It} and $\overline{BM_t}$ are defined accordingly. We require the industry median to be calculated from a minimum of three firms. The average slopes of the monthly cross-sectional regressions are reported, and in the parenthesis are the Newey-West (1987) adjusted for serial correlation and heteroscedastic t-statistics. Panel A, Panel B , and Panel C report the results of various subperiods for all months, January, and non-January, respectively.

	γ_1	γ_2	$\gamma_1 - \gamma_2$	γ_3	γ_4	$\gamma_3 - \gamma_4$
Panel A: All months						
1963/07 – 2002/12	−0.13	−0.19	0.06	0.30	0.07	0.24
	(−2.89)	(−2.28)	(1.17)	(4.45)	(0.28)	(1.24)
1963/07 – 1981/12	−0.15	−0.20	0.05	0.24	0.08	0.16
	(−2.12)	(−1.48)	(0.63)	(2.29)	(0.28)	(0.77)
1982/01 – 2002/12	−0.11	−0.19	0.07	0.36	0.06	0.30
	(−1.93)	(−1.76)	(1.03)	(4.13)	(0.15)	(0.99)
Panel B: January						
1963/07 – 2002/12	−1.62	−2.07	0.46	0.38	−1.06	1.45
	(−7.89)	(−6.38)	(2.32)	(1.25)	(−1.29)	(2.26)
1963/07 – 1981/12	−1.73	−2.14	0.41	1.10	0.87	0.22
	(−7.28)	(−4.20)	(1.25)	(2.67)	(1.13)	(0.32)
1982/01 – 2002/12	−1.52	−2.01	0.50	−0.23	−2.73	2.50
	(−4.66)	(−4.72)	(2.07)	(−0.55)	(−2.12)	(2.55)
Panel C: Non-January						
1963/07 – 2002/12	0.00	−0.02	0.02	0.30	0.17	0.13
	(0.06)	(−0.29)	(0.50)	(4.12)	(0.68)	(0.67)
1963/07 – 1981/12	−0.01	−0.03	0.02	0.16	0.01	0.16
	(−0.13)	(−0.21)	(0.24)	(1.60)	(0.02)	(0.74)
1982/01 – 2002/12	0.01	−0.02	0.03	0.42	0.31	0.11
	(0.23)	(−0.20)	(0.48)	(4.28)	(0.79)	(0.34)

Table 7: Average Slopes of Within- and Across-Industry Components of Size and BM (5% Trimming)

In each month from July 1963 to December 2002, the industries are formed monthly based on the four-digit SIC codes from CRSP. In each June of year t, we form BM for July of year t to June of year $t+1$ as the book value of prior fiscal year divided by the market equity of prior calendar yearend. The book value as defined stock-holder's equity plus balance sheet deferred taxes and investment credit (if available), minus the book value of preferred stock. As in Fama and French (1992), the smallest and largest 0.5% of the observations on book-to-market equity are set equal to the next smallest or largest value of the variable. We use a firm's market equity in June of year t to measure its size for July of year t to June of year $t+1$. we exclude firms with negative book value and do not include firms until they are on COMPUSTAT for at least two years. We employ the Fama-MacBeth (1973) procedure to estimate the following equation:

$$\begin{aligned} R_i &= \gamma_0 + \gamma_1(MV_i - MV_I) + \gamma_2(MV_I - \overline{MV}) + \gamma_3(BM_i - BM_I) \\ &+ \gamma_4(BM_I - \overline{BM}) + e_i, \end{aligned}$$

where MV_{It} refers to the median of market values of firms in industry I in month t. $\overline{MV_t}$ refers to the median of MV_{It} in month t. BM_{It} and $\overline{BM_t}$ are defined accordingly. We require the industry median to be calculated from a minimum of three firms. The average slopes of the monthly cross-sectional of the least trimmed square regressions are reported, and in the parenthesis are the t-statistics based on Newey-West (1987) adjustment for serial correlation and heteroscedasticity. Panel A, Panel B , and Panel C report the results of various subperiods for all months, January, and non-January, respectively.

	γ_1	γ_2	$\gamma_1 - \gamma_2$	γ_3	γ_4	$\gamma_3 - \gamma_4$
Panel A: All months						
1963/07 – 2002/12	0.23	0.18	0.05	0.40	0.52	−0.12
	(6.66)	(2.54)	(0.96)	(6.33)	(2.66)	(−0.77)
1963/07 – 1981/12	0.14	0.08	0.06	0.24	0.23	0.01
	(2.46)	(0.67)	(0.71)	(2.37)	(0.92)	(0.06)
1982/01 – 2002/12	0.32	0.28	0.04	0.54	0.77	−0.23
	(7.86)	(3.30)	(0.64)	(7.68)	(2.70)	(−1.00)
Panel B: January						
1963/07 – 2002/12	−0.90	−1.38	0.48	0.77	−0.07	0.84
	(−5.63)	(−5.03)	(2.55)	(3.07)	(−0.10)	(1.57)
1963/07 – 1981/12	−1.22	−1.67	0.45	1.32	1.21	0.11
	(−5.96)	(−3.72)	(1.46)	(3.47)	(1.76)	(0.16)
1982/01 – 2002/12	−0.64	−1.13	0.50	0.30	−1.16	1.46
	(−2.77)	(−3.39)	(2.16)	(0.99)	(−1.14)	(1.85)
Panel C: Non-January						
1963/07 – 2002/12	0.34	0.32	0.02	0.37	0.57	−0.20
	(9.21)	(4.49)	(0.21)	(5.26)	(2.76)	(−1.29)
1963/07 – 1981/12	0.26	0.24	0.02	0.14	0.14	0.00
	(4.57)	(1.96)	(0.28)	(1.39)	(0.56)	(0.01)
1982/01 – 2002/12	0.40	0.40	0.00	0.56	0.95	−0.39
	(9.22)	(4.85)	(0.02)	(6.97)	(3.10)	(−1.60)

Table 8: Average Slopes of Industry Asymmetric Effects (No Trimming)

In each month from July 1963 to December 2002, the industries are formed monthly based on the four-digit SIC codes from CRSP. In each June of year t, we form BM for July of year t to June of year $t+1$ as the book value of prior fiscal year divided by the market equity of prior calendar yearend. The book value as defined stockholder's equity plus balance sheet deferred taxes and investment credit (if available), minus the book value of preferred stock. As in Fama and French (1992), the smallest and largest 0.5% of the observations on book-to-market equity are set equal to the next smallest or largest value of the variable. We use a firm's market equity in June of year t to measure its size for July of year t to June of year $t+1$. we exclude firms with negative book value and do not include firms until they are on COMPUSTAT for at least two years. This table reports the time-series average of the coefficients of the following cross-sectional equation:

$$\begin{aligned} R_{it} &= \gamma_{0t} + \gamma_{1t}(MV_{it} - MV_{It}) + \gamma_{2t}(MV_{it} - MV_{It})I(MV_{it} > MV_{It}) \\ &+ \gamma_{3t}(BM_{it} - BM_{It}) + \gamma_{4t}(BM_{it} - BM_{It})I(BM_{it} > BM_{It}) + e_{it}, \end{aligned}$$

where MV_{It} refers to the median of market values of firms in industry I in month t. BM_{It} is defined accordingly, and $I(A)$ denotes an indicator function which takes the value of one when the statement A is true and zero otherwise. The average slopes of the monthly cross-sectional regressions are reported, and in the parenthesis are the Newey-West (1987) adjusted for serial correlation and heteroscedastic t-statistics. Panel A, Panel B , and Panel C report the results of various subperiods for all months, January, and non-January, respectively.

	γ_1	γ_2	γ_3	γ_4	$\gamma_1+\gamma_2$	$\gamma_3+\gamma_4$
Panel A: All months						
1963/07 – 2002/12	−0.26	0.24	0.23	0.14	−0.01	0.37
	(−4.49)	(4.14)	(2.00)	(0.84)	(−0.30)	(4.16)
1963/07 – 1981/12	−0.20	0.13	0.07	0.39	−0.07	0.46
	(−2.48)	(1.88)	(0.43)	(1.73)	(−1.18)	(3.21)
1982/01 – 2002/12	−0.30	0.34	0.37	−0.08	0.04	0.29
	(−3.75)	(3.74)	(2.31)	(−0.37)	(0.64)	(2.66)
Panel B: January						
1963/07 – 2002/12	−2.09	1.15	−0.85	3.16	−0.94	2.31
	(−8.23)	(4.76)	(−1.89)	(5.27)	(−4.92)	(5.54)
1963/07 – 1981/12	−1.99	0.82	−0.02	3.03	−1.17	3.02
	(−6.72)	(2.52)	(−0.03)	(4.04)	(−5.06)	(4.36)
1982/01 – 2002/12	−2.17	1.43	−1.57	3.26	−0.74	1.69
	(−5.39)	(4.13)	(−2.30)	(3.53)	(−2.54)	(3.61)
Panel C: Non-January						
1963/07 – 2002/12	−0.09	0.16	0.33	−0.13	0.07	0.19
	(−1.58)	(2.79)	(2.67)	(−0.79)	(1.72)	(2.36)
1963/07 – 1981/12	−0.05	0.07	0.07	0.16	0.03	0.23
	(−0.57)	(1.00)	(0.46)	(0.67)	(0.46)	(1.74)
1982/01 – 2002/12	−0.13	0.24	0.55	−0.39	0.11	0.16
	(−1.66)	(2.72)	(3.17)	(−1.69)	(1.88)	(1.64)

Table 9: Average Slopes of Industry Asymmetric Effects (5% Trimming)

In each month from July 1963 to December 2002, the industries are formed monthly based on the four-digit SIC codes from CRSP. In each June of year t, we form BM for July of year t to June of year $t+1$ as the book value of prior fiscal year divided by the market equity of prior calendar yearend. The book value as defined stockholder's equity plus balance sheet deferred taxes and investment credit (if available), minus the book value of preferred stock. As in Fama and French (1992), the smallest and largest 0.5% of the observations on book-to-market equity are set equal to the next smallest or largest value of the variable. We use a firm's market equity in June of year t to measure its size for July of year t to June of year $t+1$. we exclude firms with negative book value and do not include firms until they are on COMPUSTAT for at least two years. This table reports the time-series average of the coefficients of the following cross-sectional equation based on least trimmed squares:

$$\begin{aligned} R_{it} &= \gamma_{0t} + \gamma_{1t}(MV_{it} - MV_{It}) + \gamma_{2t}(MV_{it} - MV_{It})I(MV_{it} > MV_{It}) \\ &+ \gamma_{3t}(BM_{it} - BM_{It}) + \gamma_{4t}(BM_{it} - BM_{It})I(BM_{it} > BM_{It}) + e_{it}, \end{aligned}$$

where MV_{It} refers to the median of market values of firms in industry I in month t. BM_{It} is defined accordingly, and $I(A)$ denotes an indicator function which takes the value of one when the statement A is true and zero otherwise. The average slopes of the monthly cross-sectional regressions are reported, and in the parenthesis are the Newey-West (1987) adjusted for serial correlation and heteroscedastic t-statistics. Panel A, Panel B , and Panel C report the results of various subperiods for all months, January, and non-January, respectively.

	γ_1	γ_2	γ_3	γ_4	$\gamma_1+\gamma_2$	$\gamma_3+\gamma_4$
Panel A: All months						
1963/07 – 2002/12	0.26	−0.09	0.60	−0.54	0.17	0.06
	(5.82)	(−1.84)	(5.87)	(−3.53)	(4.74)	(0.76)
1963/07 – 1981/12	0.15	−0.05	0.27	−0.14	0.10	0.13
	(2.21)	(−0.71)	(1.87)	(−0.62)	(2.01)	(0.91)
1982/01 – 2002/12	0.35	−0.13	0.89	−0.89	0.22	0.00
	(6.20)	(−1.73)	(7.07)	(−4.72)	(4.72)	(0.05)
Panel B: January						
1963/07 – 2002/12	−1.14	0.56	−0.09	2.30	−0.58	2.21
	(−5.25)	(2.53)	(−0.25)	(4.51)	(−3.78)	(5.98)
1963/07 – 1981/12	−1.46	0.63	0.41	2.59	−0.83	3.00
	(−4.59)	(1.84)	(0.76)	(3.35)	(−4.68)	(4.69)
1982/01 – 2002/12	−0.86	0.50	−0.52	2.05	−0.36	1.53
	(−2.97)	(1.69)	(−1.03)	(2.98)	(−1.54)	(4.18)
Panel C: Non-January						
1963/07 – 2002/12	0.38	−0.15	0.66	−0.79	0.23	−0.13
	(8.32)	(−3.07)	(5.85)	(−5.02)	(6.52)	(−1.61)
1963/07 – 1981/12	0.29	−0.11	0.26	−0.38	0.19	−0.12
	(4.29)	(−1.61)	(1.74)	(−1.68)	(3.58)	(−0.91)
1982/01 – 2002/12	0.46	−0.18	1.02	−1.15	0.28	−0.13
	(7.74)	(−2.57)	(7.06)	(−5.76)	(5.67)	(−1.50)

Table 10: Average Slopes of ROE and Industry Effects: July 1963 to December 2002

In each month from July 1963 to December 2002, the industries are formed monthly based on the four-digit SIC codes from CRSP. In each June of year t, we form BM for July of year t to June of year $t+1$ as the book value of prior fiscal year divided by the market equity of prior calendar yearend. The book value as defined stockholder's equity plus balance sheet deferred taxes and investment credit (if available), minus the book value of preferred stock. As in Fama and French (1992), the smallest and largest 0.5% of the observations on book-to-market equity are set equal to the next smallest or largest value of the variable. We use a firm's market equity in June of year t to measure its size for July of year t to June of year $t+1$. we exclude firms with negative book value and do not include firms until they are on COMPUSTAT for at least two years. This table reports the time-series average of the coefficients of the following cross-sectional equation:

$$\begin{aligned} R_{it} &= \gamma_{0t} + \gamma_{At} ROE_{it} + \gamma_{Bt}(ROE_{it} - ROE_{It}) + \gamma_{Ct}(ROE_{It} - \overline{ROE_t}) \\ &+ \gamma_{Dt}(ROE_{it} - ROE_{It}) I(ROE_{it} > ROE_{It}) + \gamma_{1t}(MV_{it} - MV_{It}) + \gamma_{2t}(BM_{it} - BM_{It}) \\ &+ \gamma_{3t}(MV_{it} - MV_{It}) I(MV_{it} > MV_{It}) + \gamma_{4t}(BM_{it} - BM_{It}) I(BM_{it} > BM_{It}) + e_{it}, \end{aligned}$$

where ROE refers to the average of the past three fiscal yearend ROE and MV_{It} refers to the median of market values of firms in industry I in month t. BM_{It} is defined accordingly, and $I(A)$ denotes an indicator function which takes the value of one when the statement A is true and zero otherwise. The average slopes of the monthly cross-sectional regressions are reported, and in the parenthesis are the Newey-West (1987) adjusted for serial correlation and heteroscedastic t-statistics. Panel A reports the results for no trimmed observations, and Panel B reports the results for five percent trimming.

γ_A	γ_B	γ_C	γ_D	γ_1	γ_2	γ_3	γ_4	$\gamma_1+\gamma_3$	$\gamma_2+\gamma_4$
Panel A: No Trimming									
				−0.26	0.23	0.24	0.14	−0.01	0.37
				(−4.49)	(2.00)	(4.14)	(0.84)	(−0.30)	(4.16)
−0.40				−0.25	0.21	0.24	0.11	−0.01	0.33
(−1.35)				(−4.72)	(2.08)	(4.17)	(0.81)	(−0.27)	(3.83)
	−0.25	−3.28		−0.26	0.21	0.25	0.10	−0.01	0.32
	(−0.97)	(−1.66)		(−4.75)	(2.17)	(4.36)	(0.81)	(−0.30)	(3.94)
	−0.97		2.31	−0.24	0.32	0.24	0.01	−0.01	0.33
	(−1.84)		(2.61)	(−4.68)	(3.45)	(4.13)	(0.08)	(−0.15)	(3.69)
Panel B: 5% Trimming									
				0.26	0.60	−0.09	−0.54	0.17	0.06
				(5.82)	(5.87)	(−1.84)	(−3.53)	(4.74)	(0.76)
0.62				0.21	0.46	−0.07	−0.39	0.14	0.08
(2.21)				(4.96)	(4.88)	(−1.49)	(−2.83)	(4.13)	(0.98)
	0.63	3.22		0.22	0.44	−0.08	−0.32	0.14	0.12
	(3.03)	(1.83)		(5.18)	(4.78)	(−1.71)	(−2.50)	(4.13)	(1.59)
	−0.19		1.16	0.22	0.48	−0.07	−0.45	0.15	0.03
	(−0.36)		(1.20)	(5.26)	(5.71)	(−1.50)	(−3.63)	(4.44)	(0.37)

Figure 1: Scatterplots and fitted regression line of Size for least squares and least trimmed squares for Business Service industry. (September, 1995)

Size is the natural logarithm of market equity in millions. Figure 1A presents the fitted lines of least squares and Figure 1B presents the fitted lines with 5 percent data trimmed of least trimmed squares. The observations are shown with a dot symbol. The dash lines are the fitted lines of all observations and the vertical dash lines represents the industry median value of size. The solid lines are the fitted lines of the observations, which are above and below the industry median of size, respectively.

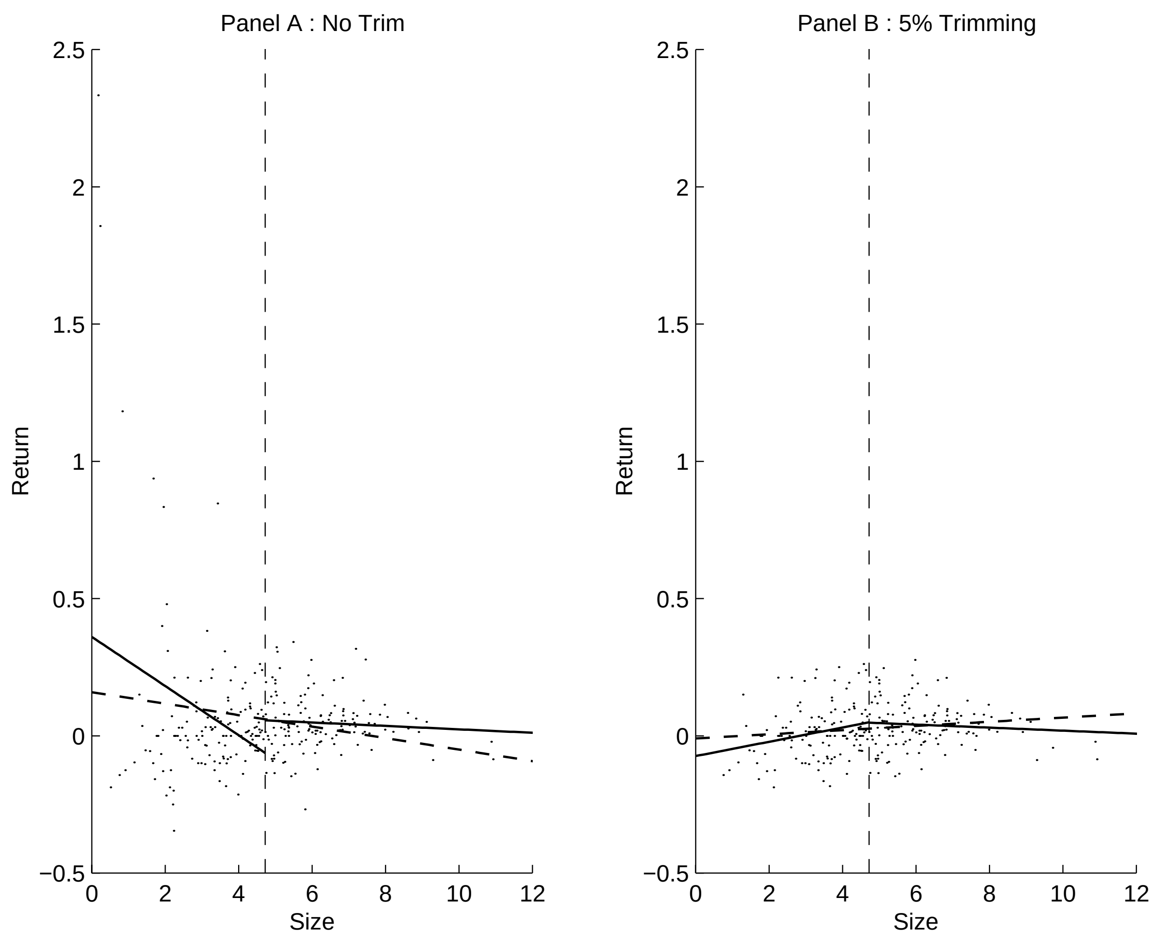

Figure 2: Scatterplots and fitted regression line of BM for least squares and least trimmed squares for Business Service industry. (December, 2000)

BM is the natural logarithm of book-to-market equity in millions. Figure 2A presents the fitted lines of least squares and Figure 2B presents the fitted lines with 5 percent data trimmed of least trimmed squares. The observations are shown with a dot symbol. The dash lines are the fitted lines of all observations and the vertical dash lines represents the industry median value of BM. The solid lines are the fitted lines of the observations, which are above and below the industry median of BM, respectively.