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AN INVESTMENT APPROACH

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ABSTRACT

Motivated from investment-based asset pricing, we propose a new factor model consisting of the market factor, a size factor, an investment factor, and a return on equity factor. The new factor model outperforms the Carhart four-factor model in pricing portfolios formed on earnings surprise, idiosyncratic volatility, financial distress, net stock issues, composite issuance, as well as on investment and return on equity. The new model performs similarly as the Carhart model in pricing portfolios formed on size and momentum, abnormal corporate investment, as well as on size and book-to-market, but underperforms in pricing the total accrual deciles. The new model's performance, combined with its clear economic intuition, suggests that it can be used as a new workhorse model for academic research and investment management practice.

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1 Introduction

In an extremely influential article, Fama and French (1996) show that their three-factor model, which includes the market excess return, a factor based on market equity (SMB), and a factor based on book-to-market (HML), summarizes the state-of-the-art understanding of the cross-section of returns as of the mid-1990s. Over the past 15 years, however, it has become clear that even the Fama-French model fails to explain a wide range of cross-sectional anomalies. Prominent examples include momentum, post-earnings-announcement drift, as well as the negative relations of average returns with idiosyncratic volatility, financial distress, and net stock issues.[1]

We propose a new multifactor model motivated from investment-based asset pricing, which is in turn based on the q-theory of investment. In the new model (which we call the q-factor model), the expected return of a testing asset in excess of the riskless rate, denoted $E[r^i] - r^f$, is described by the sensitivity of its return to four factors: (i) the market excess return (MKT), (ii) the difference between the return on a portfolio of small-market equity stocks and the return on a portfolio of big-market equity stocks (r_{ME}), (iii) the difference between the return on a portfolio of low-investment stocks and the return on a portfolio of high-investment stocks ($r_{\triangle A/A}$), and (iv) the difference between the return on a portfolio of high return on equity (ROE) stocks and the return on a portfolio of low return on equity stocks (r_{ROE}). More formally,

$$E[r^i] - r^f = \beta^i_{MKT}\, E[MKT] + \beta^i_{ME}\, E[r_{ME}] + \beta^i_{\triangle A/A}\, E[r_{\triangle A/A}] + \beta^i_{ROE}\, E[r_{ROE}], \qquad (1)$$

in which $E[MKT], E[r_{ME}], E[r_{\triangle A/A}]$, and $E[r_{ROE}]$ are expected factor premiums, and the loadings, $\beta^i_{MKT}, \beta^i_{ME}, \beta^i_{\triangle A/A}$, and β^i_{ROE}, are time series slopes from regressing the excess returns of testing asset i on $MKT, r_{ME}, r_{\triangle A/A}$, and r_{ROE}, respectively. Over the 1972–2011 period, $E[r_{ME}]$ is 0.31% per month ($t = 2.09$), $E[r_{\triangle A/A}]$ 0.44% per month ($t = 4.73$), and $E[r_{ROE}]$ 0.60% ($t = 4.85$).

Through extensive factor regressions, we show that the q-factor model goes a long way toward explaining many anomalies that the Fama-French model cannot. First, the q-factor model outperforms the Fama-French model and the Carhart (1997) four-factor model in explaining anomalies related to earnings surprise, idiosyncratic volatility, financial distress, net stock issues, composite

[1] See, for example, Ritter (1991), Jegadeesh and Titman (1993), Ikenberry, Lakonishok, and Vermaelen (1995), Loughran and Ritter (1995), Spiess and Affleck-Graves (1995), Chan, Jegadeesh, and Lakonishok (1996), Dichev (1998), Griffin and Lemmon (2002), Ang, Hodrick, Xing, and Zhang (2006), Daniel and Titman (2006), and Campbell, Hilscher, and Szilagyi (2008). Many argue that their evidence is due to mispricing that arises from investors' over- or underreaction to news. For instance, Campbell et al. suggest that their evidence "is a challenge to standard models of rational asset pricing in which the structure of the economy is stable and well understood by investors (p. 2934)."

issuance, as well as investment and ROE. For example, the average magnitude of the Fama-French alphas across deciles formed on earnings surprise is 0.17% per month, and the high-minus-low decile has a Fama-French alpha of 0.54% ($t = 4.26$). The Carhart model reduces the average magnitude of alphas to 0.11% and the high-minus-low alpha to 0.32% ($t = 2.43$). The q-factor model reduces the average magnitude of the alphas further to 0.06% and the high-minus-low alpha to 0.14% ($t = 0.92$). Across the idiosyncratic volatility deciles, the average magnitude of the alphas is 0.19% in the Fama-French model, 0.15% in the Carhart model, and 0.10% in the q-factor model. The high-minus-low alphas for the three factor models are -0.91% ($t = -4.48$), -0.58% ($t = -2.59$), and -0.04% ($t = -0.19$), respectively. Finally, across the Campbell, Hilscher, and Szilagyi (2008) financial distress deciles, the average magnitude of the alphas is 0.25% in the Fama-French model, 0.12% in the Carhart model, and 0.15% in the q-factor model. The high-minus-low alphas for the three factor models are -1.43% ($t = -5.21$), -0.55% ($t = -2.51$), and 0.02% ($t = 0.07$), respectively.

Second, the q-factor model performs similarly as the Carhart model in pricing the 25 size and momentum portfolios. Across the 25 portfolios, the average magnitude of the alphas in the q-factor model is 0.11% per month, which is identical to that from the Carhart model, and is one half of that in the Fama-French model. Two out of 25 individual portfolios have significant alphas at the 5% level in the q-factor model, compared with six in the Carhart model and 15 in the Fama-French model. Only one out of five winner-minus-loser alphas is significant, in contrast to three in the Carhart model and five in the Fama-French model. The average magnitude of the winner-minus-loser alphas is 0.19% in the q-factor model, which is less than one quarter of that in the Fama-French model, 0.90%, and is lower than 0.25% in the Carhart model.

The q-factor model also performs similarly as the Carhart model in pricing the 25 size and book-to-market portfolios. The average magnitude of the alphas across the 25 portfolios is 0.12% in the q-factor model, which is largely in line with 0.10% in the Fama-French model and 0.11% in the Carhart model. Four individual portfolios have significant alphas in the q-factor model, compared with four in the Fama-French model and five in the Carhart model. Only one value-minus-growth quintile has a significant alpha in the q-factor model, compared with three in the Fama-French model and two in the Carhart model. The average magnitude of the value-minus-growth alphas is 0.24% in the q-factor model, which is lower than 0.32% in the Fama-French model and 0.29% in the Carhart model.

However, the q-factor model has trouble in explaining the Sloan (1996) total accrual effect. Across the accrual deciles, the average magnitude of the alphas is 0.13% per month in the Fama-

French model, 0.11% in the Carhart model, and is 0.14% in the q-factor model. The high-minus-low alphas are -0.29% ($t = -1.96$) and -0.29% ($t = -1.69$) in the Fama-French model and the Carhart model, respectively, but is -0.39% ($t = -2.48$) in the q-factor model. Augmenting the market factor with the investment factor alone reduces the high-minus-low alpha to an insignificant -0.05%. While the investment factor loading goes in the right direction, the ROE factor loading goes in the wrong direction in explaining the accrual effect. Intuitively, high accrual firms invest more, but are also more profitable (and load more on the ROE factor) than low accrual firms.

As noted, we motivate the q-factor model from investment-based asset pricing. Intuitively, investment predicts returns because given expected cash flows, high costs of capital mean low net present values of new capital and low investment, whereas low costs of capital mean high net present values of new capital and high investment. ROE predicts returns because high expected ROE relative to low investment means high discount rates. The high discount rates are necessary to counteract the high expected ROE to induce low net present values of net capital and subsequently low investment. If the discount rates are not high enough to offset the high expected ROE, firms would instead observe high net present values of new capital and invest more. Similarly, low expected ROE relative to high investment (such as small-growth firms in the late 1990s) means low discount rates. If the discount rates are not low enough to counteract the low expected ROE, the firms would instead observe low net present values of new capital and invest less. Finally, we include the size factor primarily to reduce the average magnitude of the alphas across size-related portfolios. As such, the size factor plays only a secondary role in the q-factor model, whereas the investment and the ROE factors are more prominent.

Our central contribution is to provide a new workhorse factor model for estimating expected returns. In particular, we create a new incarnation of Fama and French (1996) by showing that the q-factor model summarizes what we know about the cross-section of returns as of the early 2010s. In so doing, we also elaborate a unified conceptual framework in which almost all of the anomalies can be interpreted in an internally consistent and economically meaningful way. The q-factor model's performance, combined with its clear economic intuition, suggests that the model can be used in practical applications such as evaluating mutual fund performance, measuring abnormal returns in event studies, estimating costs of capital for capital budgeting and stock valuation, and obtaining expected return estimates for optimal portfolio choice.

The traditional approach in empirical finance and capital markets research in accounting is to look for common factors from the consumption side of the economy (e.g., Breeden, Gibbons, and Litzenberger (1989)). We instead exploit a direct link between stock returns and firm characteristics from the production side. Cochrane (1991) first uses q-theory to study asset prices. Berk, Green, and Naik (1999) and Carlson, Fisher, and Giammarino (2004) construct real option models to explain anomalies. Liu, Whited, and Zhang (2009) estimate the characteristics-expected return relations derived from q-theory via structural estimation. We differ by using the portfolio approach to produce a workhorse factor model. A factor model is more flexible in practice because of its powerful simplicity and the availability of high frequency returns data. Finally, it should be noted that the investment effect and the earnings effect are not new to our work.[2] However, recognizing their fundamental importance in investment-based asset pricing, we build a new workhorse factor model on these two effects to summarize the cross-section of average stock returns.

The rest of the paper is organized as follows. Section 2 constructs the new factors. Section 3 tests the q-factor model via factor regressions. Section 4 reports specification tests by dropping the size factor from the q-factor model. Section 5 interprets the results. While the results are consistent with investment-based asset pricing, we also consider alternative interpretations based on common risk factors and mispricing. Finally, Section 6 concludes. Appendix A contains detailed variable definition, and Appendixes B to E report supplementary results.

2 The Explanatory Factors

Monthly returns, dividends, and prices are from the Center for Research in Security Prices (CRSP) and accounting information from the Compustat Annual and Quarterly Fundamental Files. The sample is from January 1972 to December 2011. The starting date is restricted by the availability of quarterly earnings announcement dates as well as quarterly earnings and assets data. We also exclude financial firms and firms with negative book equity.

We measure investment-to-assets ($\triangle A/A$) as the annual change in total assets (Compustat annual item AT) divided by lagged total assets. The change in total assets is in the most comprehensive measure of investment. We measure ROE as income before extraordinary items (Compustat quar-

[2] Fairfield, Whisenant, and Yohn (2003), Titman, Wei, and Xie (2004), Anderson and Garcia-Feijóo (2006), Cooper, Gulen, and Schill (2008), Xing (2008), and Polk and Sapienza (2009) show that investment and average returns are negatively correlated. Ball and Brown (1968), Bernard and Thomas (1989, 1990), Ball, Kothari, and Watts (1993), Chan, Jagadeesh, and Lakonishok (1996), Haugen and Baker (1996), Abarbanell and Bushee (1998), Frankel and Lee (1998), Dechow, Hutton, and Sloan (1999), Piotroski (2000), Fama and French (2006), and Novy-Marx (2012) show that firms with higher earnings surprises and more profitable firms earn higher average returns..

terly item IBQ) divided by one-quarter-lagged book equity. Book equity is shareholders' equity, plus balance sheet deferred taxes and investment tax credit (item TXDITCQ) if available, minus the book value of preferred stock. Depending on availability, we use stockholders' equity (item SEQQ), or common equity (item CEQQ) plus the carrying value of preferred stock (item PSTKQ), or total assets (item ATQ) minus total liabilities (item LTQ) in that order as shareholders' equity. We use redemption value (item PSTKRQ) if available, or carrying value for the book value of preferred stock.[3]

We construct the size factor, r_{ME}, the investment factor, $r_{\triangle A/A}$, and the ROE factor, r_{ROE}, from a triple two-by-three-by-three sort on size, $\triangle A/A$, and ROE. Bernard and Thomas (1990) show that the earnings effect in returns seems stronger in small firms than in big firms. Also, Fama and French (2008) show that the investment effect is strong in microcaps and small stocks, but is largely absent in big stocks. As such, we control for size when constructing the investment and the ROE factors. Controlling for size in this way seems a standard practice in constructing the Fama and French (1993) value factor, HML, and the Carhart (1997) momentum factor, WML. Finally, sorting on $\triangle A/A$ and ROE independently helps orthogonalize the two new factors.

In June of each year t, we use the median NYSE market equity (stock price times shares outstanding from CRSP) at the end of June to split NYSE, Amex, and NASDAQ stocks into two groups, small and big. Independently, in June of year t, we also break NYSE, Amex, and NASDAQ stocks into three $\triangle A/A$ groups using the NYSE breakpoints for the low 30%, middle 40%, and high 30% of the ranked values of $\triangle A/A$ for the fiscal year ending in calendar year $t-1$. Also independently, at the beginning of each month, we sort all stocks into three groups based on the NYSE breakpoints for the low 30%, middle 40%, and the high 30% of the ranked values of ROE. Earnings and other accounting variables in Compustat quarterly files are used in the monthly sorts in the months immediately after the most recent public earnings announcement dates (Compustat quarterly item RDQ). For example, if the earnings for the fourth fiscal quarter of year $t-1$ are publicly announced on March 5 (or March 25) of year t, we use the announced earnings (divided by the book equity from the third quarter of year $t-1$) to form portfolios at the beginning of April of year t.

Taking the intersections of the two size, the three $\triangle A/A$, and the three ROE groups, we form 18 portfolios. Monthly value-weighted portfolio returns are calculated for the current month,

[3]Our measure of the book equity is the quarterly version of the annual book equity measure in Davis, Fama, and French (2000). Fama and French (2006) measure shareholders' equity as total assets minus total liabilities. We follow Davis et al. because Compustat quarterly items SEQQ (stockholders' equity) and CEQQ (common equity) have a broader coverage than items ATQ (total assets) and LTQ (total liabilities) before 1980.

and the portfolios are rebalanced monthly. (The ROE portfolios are reconstructed monthly at the beginning of each month, but the size and the $\triangle A/A$ portfolios are resorted annually in each June.)

The size factor, r_{ME}, is the difference (small-minus-big), each month, between the simple average of the returns on the nine small portfolios and the simple average of the returns on the nine big portfolios. Designed to mimic the common variation in returns related to $\triangle A/A$, the investment factor, $r_{\triangle A/A}$, is the difference (low-minus-high), each month, between the simple average of the returns on the six low-$\triangle A/A$ portfolios and the simple average of the returns on the six high-$\triangle A/A$ portfolios. Finally, designed to mimic the common variation in returns related to ROE, the ROE factor is the difference (high-minus-low), each month, between the simple average of the returns on the six high-ROE portfolios and the simple average of the returns on the six low-ROE portfolios.[4]

From Panel A of Table 1, the size factor earns an average return of 0.31% per month from January 1972 to December 2011 ($t = 2.09$). The Capital Asset Pricing Model (CAPM) explains this average return, leaving an alpha of 0.24% ($t = 1.64$). Regressing our size factor on the Fama-French three factors produces an SMB loading of 0.99. Also, Panel B shows that our size factor and SMB have an almost perfect correlation of 0.95. As such, the two size factors are effectively the same.

The investment factor, $r_{\triangle A/A}$, earns an average return of 0.44% per month ($t = 4.73$). Regressing $r_{\triangle A/A}$ on the market factor produces an alpha of 0.51% and a beta of -0.15, both of which are significant (Panel A). Regressing the investment factor on the Fama-French factors shows a large and significantly positive HML loading of 0.40. From Panel B, $r_{\triangle A/A}$ and HML have a high correlation of 0.69, suggesting that $r_{\triangle A/A}$ would play a similar role as HML in factor regressions.

The ROE factor, r_{ROE}, earns an average return of 0.60% per month, which is more than 4.5 standard errors from zero (Panel A). Regressing r_{ROE} on the Fama-French factors produces a low

[4] Let p_{ijk}, with $i = 1, 2$ and $j, k = 1, 2, 3$, be the value-weighted portfolio that contains all the firms in the i_{th} group sorted by size, in the j_{th} group sorted by $\triangle A/A$, and in the k_{th} group sorted by ROE. For example, p_{132} is the portfolio containing all the firms that reside simultaneously in the small-size portfolio, the high-$\triangle A/A$ portfolio, and the median-ROE portfolio. Formally, the size, the investment, and the ROE factors are defined as, respectively,

$$r_{ME} \equiv \left(\sum_{j=1}^{3} \sum_{k=1}^{3} p_{1jk} - \sum_{j=1}^{3} \sum_{k=1}^{3} p_{2jk} \right) /9, \tag{2}$$

$$r_{\triangle A/A} \equiv \left(\sum_{i=1}^{2} \sum_{k=1}^{3} p_{i1k} - \sum_{i=1}^{2} \sum_{k=1}^{3} p_{i3k} \right) /6, \tag{3}$$

$$r_{\triangle ROE} \equiv \left(\sum_{i=1}^{2} \sum_{j=1}^{3} p_{ij3} - \sum_{i=1}^{2} \sum_{j=1}^{3} p_{ij1} \right) /6. \tag{4}$$

R^2 of only 19%, meaning that r_{ROE} represents an important source of common variation missing from the Fama-French model. Interestingly, even though it is constructed from a triple sort with size controlled, r_{ROE} still has a (relatively) large correlation of -0.30 with r_{ME} (Panel B). A finer sort on size can help reduce the magnitude of the correlation, but it would likely only reinforce the explanatory power of the new factors. Also, Panel B shows that r_{ROE} has a high correlation of 0.50 with the momentum factor, WML, meaning that r_{ROE} would play a similar role as WML in factor regressions. Finally, the investment and the ROE factors have a low and insignificant correlation of 0.05. As such, the triple sort seems successful in orthogonalizing the two new factors.[5]

3 Factor Regressions

We use the standard time-series factor regressions to test the q-factor model:

$$r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i MKT_t + \beta_{ME}^i r_{ME,t} + \beta_{\triangle A/A}^i r_{\triangle A/A,t} + \beta_{ROE}^i r_{ROE,t} + \epsilon^i. \quad (5)$$

If the model's performance is adequate, α_q^i should be economically small and statistically insignificant from zero. As a convention, we use the NYSE breakpoints in constructing testing portfolios. Doing so is consistent with our construction of the q-factors, which is in turn comparable with the construction of SMB, HML, and WML. A good economic reason for using the NYSE breakpoints is to alleviate the impact of microcaps and small stocks. Due to transaction costs and lack of liquidity, the portion of anomalies in microcaps and small stocks might not be exploitable in practice. For completeness, however, we also report in Appendix B the detailed results from using the NYSE-Amex-NASDAQ breakpoints in constructing a given set of anomaly portfolios if the original paper that documents the anomaly uses such breakpoints.

[5]When constructing the factors, we construct the $\triangle A/A$ portfolios with annual sorts but the ROE portfolios with monthly sorts. There are two reasons for this practice. First, as shown in Section 3, the ROE factor is most relevant for explaining momentum, post-earnings-announcement drift, the idiosyncratic volatility effect, and the distress effect. Because these testing portfolios are all constructed monthly, we use a similar approach to construct the ROE factor. In Appendix E, we report detailed results that the aforementioned anomalies do not exist in annually sorted portfolios. Specifically, none of the high-minus-low portfolios produce mean excess returns or CAPM alphas that are significantly different from zero. Because the targeted anomalies only exist in monthly sorts, it seems natural to also construct the explanatory ROE factor with monthly sorts. Second, as shown in Section 5.1, ROE forecasts future returns to the extent that it forecasts future ROE. Because the most recent ROE contains up-to-date information about future ROE, constructing the ROE factor with monthly sorts makes economic sense.

3.1 One-way Sorted Testing Portfolios

Post-earnings-announcement Drift

The q-factor model largely explains the post-earnings announcement drift. Following Foster, Olsen, and Shevlin (1984), we measure earnings surprise as Standardized Unexpected Earnings (SUE). We calculate SUE as the change in the most recently announced quarterly earnings per share from its value announced four quarters ago divided by the standard deviation of this change in quarterly earnings over the prior eight quarters. (We require a minimum of six quarters in calculating SUE.) We use the NYSE breakpoints to rank all NYSE, Amex, and NASDAQ stocks at the beginning of each month based on their most recent past SUE. Monthly value-weighted portfolio returns are calculated for the current month, and the portfolios are rebalanced at the beginning of next month.

Table 2 shows that consistent with Chan, Jegadeesh, and Lakonishok (1996), high SUE stocks earn higher average returns than low SUE stocks. The high-minus-low decile earns an average return of 0.43% per month ($t = 3.39$), a CAPM alpha of 0.49% ($t = 4.03$), a Fama-French alpha of 0.54% ($t = 4.26$), and a Carhart alpha of 0.32% ($t = 2.43$). The mean absolute error (m.a.e., calculated as the average absolute value of the alphas) across the deciles are 0.16%, 0.17%, and 0.11% for the CAPM, the Fama-French model, and the Carhart model, respectively. Among the ten deciles, six have significant alphas in the CAPM, five in the Fama-French model, and three in the Carhart model. All three models are strongly rejected by the Gibbons, Ross, and Shanken (1989, GRS) test on the null that the alphas across the ten deciles are jointly zero.

The q-factor model reduces the high-minus-low alpha to insignificance: 0.14% per month, which is within one standard error of zero. The q-factor model derives its explanatory power mostly from the ROE factor. The high-minus-low decile has an ROE factor loading of 0.49, which is more than 5.5 standard errors from zero, whereas all the other factor loadings are economically small and mostly insignificant. Intuitively, firms that have recently experienced positive earnings surprises are more profitable than firms that have recently experienced negative earnings surprises. The q-factor model also produces a small m.a.e. of 0.06%, which is smaller than 0.11% from the Carhart model. Across the ten deciles, only one out of ten has a significant alpha in the q-factor model, relative to three in the Carhart model. While the traditional models are all rejected by the GRS test, the q-factor model cannot be rejected at the 5% significance level (p-value = 0.41).

Idiosyncratic Volatility

Following Ang, Hodrick, Xing, and Zhang (2006), we measure a stock's idiosyncratic volatility ($IVOL$) as the standard deviation of the residuals from regressing the stock's returns on the Fama-French three factors. Each month we form value-weighted deciles by using the NYSE breakpoints to sort all NYSE, Amex, and NASDAQ stocks on the $IVOL$ estimated using daily returns over the previous month. (We require a minimum of 15 daily stock returns.) We hold the value-weighted deciles for the current month, and rebalance the portfolios at the beginning of next month.

Consistent with Ang, Hodrick, Xing, and Zhang (2006), high $IVOL$ stocks earn lower average returns than low $IVOL$ stocks. From Table 3, the high-minus-low decile earns an average return of -0.54% per month, which is, however, only about 1.5 standard errors from zero. More important, traditional factor loadings often go in the wrong direction in explaining the $IVOL$ effect. In the CAPM, for example, the market beta of the high-minus-low decile is 0.91, giving rise to a large CAPM alpha of -0.95%, which is about 3.5 standard errors from zero. In the Fama-French model and the Carhart model, the market and the SMB betas are large and positive, going in the wrong direction, but the HML and WML loadings are large and negative, going in the right direction. The two alphas for the high-minus-low decile are -0.91% and -0.58%, both of which are significant. The m.a.e.'s are 0.20%, 0.19%, and 0.15% for the CAPM, the Fama-French model, and the Carhart model, respectively. All three models are strongly rejected by the GRS test.

The q-factor model reduces the high-minus-low alpha to a tiny -0.04% per month ($t = -0.19$). The m.a.e. drops to 0.10% from 0.15% in the Carhart model. Notably, none of the ten $IVOL$ deciles have significant alphas in the q-factor model. In contrast, four out of ten deciles have significant alphas in all three traditional factor models. Although the market and the size factor loadings go in the wrong direction, the investment and the ROE factor loadings both go in the right direction in explaining the $IVOL$ effect. The high-minus-low decile has negative loadings of -0.98 and -0.96 on the investment factor and the ROE factor, respectively, both of which are more than five standard errors from zero. As such, high $IVOL$ stocks, which are relatively small, tend to invest more, but are less profitable than low $IVOL$ stocks. Controlling for investment and ROE is sufficient to explain the $IVOL$ effect. However, the q-factor model is still rejected by the GRS test (p-value = 0.02).

Financial Distress

At the beginning of each month, we use the NYSE breakpoints to sort all NYSE, Amex, and NASDAQ stocks into deciles on Campbell, Hilscher, and Szilagyi's (2008) failure probability (see Appendix A for the detailed definition). Earnings and other accounting data for a fiscal quarter are used in portfolio sorts in the months immediately after the quarter's public earnings announcement dates (Compustat quarterly item RDQ). The starting point of the sample for the failure probability deciles is January 1976, which is restricted by the availability of the quarterly data items required in calculating failure probability. (Campbell et al. start their sample in 1981.) Monthly value-weighted portfolio returns are calculated for the current month, and the portfolios are rebalanced monthly.

From Table 4, more financially distressed firms earn lower average returns than less financially distressed firms. The high-minus-low distress decile earns an average return of -0.57% per month, which is, however, within 1.5 standard errors from zero. More important, controlling for traditional risk measures exacerbates the distress anomaly because more distressed firms appear riskier. In particular, the high-minus-low decile has a CAPM beta of 0.84, giving rise to a CAPM alpha of -1.04%, which is more than three standard errors from zero. In the Fama-French model, all three factor loadings go in the wrong direction in explaining the distress effect. The high-minus-low decile has a market beta of 0.76, an SMB loading of 0.97, and an HML loading of 0.46. These large and positive risk measures produce a huge Fama-French alpha of -1.43%, which is more than five standard errors from zero. The Carhart model shrinks the high-minus-low alpha to -0.55% because of a negative WML loading of -1.02. Intuitively, most distressed firms tend to be losers, and least distressed firms tend to be winners. The m.a.e. across the deciles is 0.17% in the CAPM, 0.25% in the Fama-French model, and 0.12% in the Carhart model. The CAPM and the Fama-French model are strongly rejected by the GRS test, but the test of the Carhart model is only marginally significant.

The q-factor model helps explain the distress effect. The high-minus-low decile has a tiny alpha of 0.02% per month ($t = 0.07$). Going in the right direction in explaining the average returns, more distressed firms have lower ROE factor loadings than less distressed firms. The loading spread across the extreme deciles is -1.79, which is more than 7.5 standard errors from zero. Intuitively, more distressed firms are less profitable (and load less on the ROE factor) than less distressed firms. In particular, profitability enters the failure probability measure with a large and negative coefficient (see Appendix A). The ROE factor loading of the high-minus-low decile alone is enough to overcome the large and positive loadings on the market and the size factors that go in the wrong direction in explaining the distress effect. The investment factor loading of the high-minus-low decile is only 0.11. However, the q-factor model produces an m.a.e. of 0.15%, which is slightly higher than 0.12% in the Carhart model. And the model is rejected by the GRS test (p-value = 0.01).

Net Stock Issues

Fama and French (2008) and Pontiff and Woodgate (2008) show that firms with high net stock issues underperform firms with low net stock issues. Following Fama and French, we measure net stock issues as the natural log of the ratio of the split-adjusted shares outstanding at the fiscal yearend in $t-1$ to the split-adjusted shares outstanding at the fiscal yearend in $t-2$. The split-adjusted shares outstanding is shares outstanding (Compustat annual item CSHO) times the adjustment factor (item AJEX). In June of each year t, we use the NYSE breakpoints to sort all NYSE, Amex, and NASDAQ stocks into deciles based on net stock issues for the fiscal year ending in calendar year $t-1$. Because a disproportionately large number of firms have zero net stock issues, we group all the firms with negative net issues into deciles one and two (equal-numbered), and all the firms with zero net issues into decile three. We then sort the firms with positive net issues into the remaining seven (equal-numbered) deciles. Monthly value-weighted portfolio returns are calculated from July of year t to June of year $t+1$, and the deciles are rebalanced in June of $t+1$.

From Table 5, firms with high net issues earn lower average returns than firms with low net issues, 0.20% versus 0.88% per month. The high-minus-low decile earns an average return of -0.68%, a CAPM alpha of -0.77%, a Fama-French alpha of -0.62%, and a Carhart alpha of -0.57%, all of which are more than 3.5 standard errors from zero. Across the ten deciles, six CAPM alphas, six Fama-French alphas, and five Carhart alphas are significantly different from zero. The m.a.e.'s are 0.21%, 0.20%, and 0.17% in the CAPM, the Fama-French model and the Carhart model, respectively. All three factor models are again strongly rejected by the GRS test.

The q-factor model reduces the high-minus-low alpha to -0.32% per month, which is still significant ($t = -2.10$). This alpha represents 44% reduction in magnitude from the Carhart alpha of -0.57%. The m.a.e. also drops from 0.17% in the Carhart model to 0.12% in the q-factor model. However, the q-factor model is still rejected by the GRS test. Both the investment and the ROE factors contribute to the q-factor model's explanatory power. The high-minus-low decile has an investment factor loading of -0.66 ($t = -6.33$), going in the right direction in explaining the net issues effect. Intuitively, high net issues firms invest more than low net issues firms. The ROE

factor loading also moves in the right direction. The high-minus-low decile has an ROE factor loading of -0.23 ($t = -3.43$). The evidence suggests that high net issues firms are somewhat less profitable than low net issues firms at the portfolio formation.[6]

Composite Issuance

Following Daniel and Titman (2006), we measure composite issuance as the growth rate in the market equity not attributable to the stock return, $\log(ME_t/ME_{t-5}) - r(t-5,t)$. For June of year t, $r(t-5,t)$ is the cumulative log return on the stock from the last trading day of June in year $t-5$ to the last trading day of June in year t, and ME_t is the total market equity on the last trading day of June in year t from CRSP. Equity issuance such as seasoned equity issues, employee stock option plans, and share-based acquisitions increase the composite issuance, whereas repurchase activities such as share repurchases and cash dividends reduce the composite issuance. In June of each year t, we use the NYSE breakpoints to sort NYSE, Amex, and NASDAQ stocks into deciles on composite issuance. Monthly value-weighted portfolio returns are calculated from July of year t to June of year $t+1$, and the portfolios are rebalanced in June.

Table 6 shows that high composite issuance firms earn lower average returns than low composite issuance firms. The average return spread is -0.58% per month, which is almost three standard errors from zero. The CAPM beta of the high-minus-low decile is 0.46, which goes in the wrong direction in explaining the average return. As a result, the CAPM alpha is -0.79%, which is more than 4.5 standard errors from zero. In the Fama-French model and the Carhart model, the HML betas are -0.67 and -0.70, which help reduce the high-minus-low alphas in magnitude to -0.50% and -0.40%, ($t = -3.61$ and -2.91), respectively.

The q-factor model reduces the high-minus-low alpha further to -0.21% per month, which is within 1.5 standard errors of zero. The m.a.e. is 0.12%, which is lower than 0.15% for the Carhart model. However, similar to the traditional factor models, the q-factor model is still rejected by the GRS test. The main source of the explanatory power is the investment factor. The high-minus-low decile has an investment factor loading of -1.11, which is more than 14 standard errors from zero. Although also going in the right direction, the ROE factor loading for the high-minus-low decile, -0.11, is economically small and statistically insignificant.

[6] Loughran and Ritter (1995) show that new equity issuers are more profitable than nonissuers. Because net stock issues are new issues net of share repurchases, our evidence is consistent with Lie (2005), who shows that share repurchasing firms exhibit superior operating performance relative to industry peers.

Abnormal Corporate Investment

Titman, Wei, and Xie (2004) show that firms which increase capital investments earn negative subsequent benchmark-adjusted returns. Following Titman et al., we measure abnormal corporate investment that applies for the portfolio formation year t, as $ACI_{t-1} \equiv CE_{t-1}/[(CE_{t-2}+CE_{t-3}+CE_{t-4})/3]-1$, in which CE_{t-1} is capital expenditure (Compustat annual item CAPX) scaled by its sales (item SALE) in year $t-1$. The last three-year average capital expenditure aims to project the benchmark investment at the portfolio formation year. Using sales as the deflator implicitly assumes that the benchmark investment grows proportionately with sales. As in Titman et al., we exclude firms with sales less than ten million dollars.

In June of each year t, we use the NYSE breakpoints to sort NYSE, Amex, and NASDAQ stocks into deciles based on ACI for the fiscal year ending in calendar year $t-1$. Monthly value-weighted decile returns are computed from July of year t to June of $t+1$, and the portfolios are rebalanced in June. Table 7 shows that the ACI effect is weak. High ACI stocks underperform low ACI stocks only by 0.26% per month ($t = 1.57$). The high-minus-low alphas are insignificant in all the factor models. The high-minus-low alpha is -0.11% in the q-factor model, and is somewhat lower in magnitude than -0.16% in the Carhart model. However, the m.a.e. is higher in the q-factor model than in the Carhart model, 0.15% versus 0.12%. Both models are still rejected by the GRS test.

Total Accruals

Table 8 documents a weakness of the q-factor model. Sloan (1996) shows that firms with high total accruals earn lower average returns than firms with low total accruals. Following Sloan, we measure total accruals as changes in noncash working capital minus depreciation expense scaled by total assets averaged over the prior two years. The noncash working capital is the change in noncash current assets minus the change in current liabilities less short-term debt and taxes payable.[7] In June of each year t, we use the NYSE breakpoints to sort NYSE, Amex, and NASDAQ stocks into deciles on total accruals scaled by average total assets (Compustat annual item AT) as of the fiscal year ending in calendar year $t-1$. Monthly value-weighted portfolio returns are calculated from July of year t to June of year $t+1$, and the portfolios are rebalanced in June.

[7]Specifically, total accruals $\equiv (\triangle CA - \triangle CASH) - (\triangle CL - \triangle STD - \triangle TP) - DP$, in which $\triangle CA$ is the change in current assets (Compustat annual item ACT), $\triangle CASH$ is the change in cash or cash equivalents (item CHE), $\triangle CL$ is the change in current liabilities (item LCT), $\triangle STD$ is the change in debt included in current liabilities (item DLC), $\triangle TP$ is the change in income taxes payable (item TXP), and DP is depreciation and amortization expense (item DP).

From Table 8, high accrual stocks underperform low accrual stocks by 0.30% per month ($t = 1.94$). The CAPM and the Fama-French model both fail to explain this average return, with significant alphas of -0.35% and -0.29%, respectively. The Carhart alpha is -0.29%, but is within 1.7 standard errors of zero. The m.a.e. is 0.13% in the CAPM and in the Fama-French model, and is 0.11% in the Carhart model. All three models are rejected by the GRS test.

The q-factor model underperforms the Fama-French model and the Carhart model. The high-minus-low alpha is -0.39% per month, which is about 2.5 standard errors from zero. In contrast, the Carhart alpha is only -0.29% ($t = -1.69$). The m.a.e. is 0.14% in the q-factor model, and is higher than 0.11% in the Carhart model. The investment factor loading goes in the right direction as the average returns. The high-minus-low decile has an investment factor loading of -0.56, which is more than five standard errors from zero.[8] The trouble of the q-factor model is caused by the ROE factor loading, which goes in the wrong direction in explaining the accrual effect. The ROE factor loading for the high-minus-low decile is 0.34, which is more than four standard errors from zero. Intuitively, high accrual stocks are more profitable (and load more on the ROE factor) than low accrual stocks. The high-minus-low decile has a size factor loading of 0.42, also going in the wrong direction. As noted, the ROE factor is critical for the q-factor model to explain cross-sectional predictability related to earnings surprise, idiosyncratic volatility, and financial distress. As such, the difficulty of the q-factor model with the accrual effect appears unavoidable in our effort to produce a new workhorse model for the broad cross-section of average returns.

Industries

Lewellen, Nagel, and Shanken (2010) argue that asset pricing tests are often misleading because apparently strong explanatory power (such as high R^2) provides only weak support for a model. Our tests are (relatively) immune to this critique because we focus on high-minus-low alphas and mean absolute errors from factor regressions as the yardsticks for evaluating factor models. Following Lewellen et al.'s prescription, we also confront the q-factor model with a wide array of testing portfolios. We explore the q-factor model further with ten industry portfolios.

In June of each year t, we assign each NYSE, Amex, and NASDAQ stock to an industry portfolio based on its four-digit SIC code at that time. (We use Compustat SIC codes for the fiscal

[8] Consistent with Wu, Zhang, and Zhang (2010), augmenting the CAPM with the investment factor reduces the high-minus-low alpha to -0.05% ($t = -0.32$) and the m.a.e. to 0.09%. Augmenting the Fama-French model with the investment factor reduces the high-minus-low alpha to -0.14% ($t = -0.93$) and the m.a.e. to 0.10%.

year ending in calendar year $t-1$. If Compustat SIC codes are unavailable, we use CRSP SIC codes for June of year t.) The ten-industry classification is from Kenneth French's Web site. We exclude financial firms from the last industry portfolio ("Other"). Monthly value-weighted returns are computed from July of year t to June of year $t+1$.

From Table 9, the CAPM provides an m.a.e. of 0.19% per month across the ten industry portfolios. Two out of ten industries have significant alphas in the CAPM. The Fama-French model produces a similar m.a.e. of 0.21%, and the Carhart model reduces it slightly to 0.18%. The m.a.e. from the q-factor model is somewhat higher, 0.22%. Three out of ten industries have significant alphas in all three multifactor models, but all four factor models are rejected by the GRS test.

3.2 Two-way Sorted Testing Portfolios

We present factor regressions of two-way portfolios formed on size and momentum, size and book-to-market, as well as investment and ROE. Momentum and the value premium are stronger in small firms than in big firms, a stylized fact that poses a challenge to all the factor models. The investment and ROE portfolios are important because these are constructed directly on the characteristics underlying the q-factor model. To paint a more complete picture, we also present in Appendix C factor regressions of one-way deciles formed on momentum, book-to-market, investment, and ROE. For the most part, the results from two-way portfolios are similar to those from one-way deciles.

Size and Momentum

At the beginning of each month t, we use the NYSE breakpoints to sort all NYSE, Amex, and NASDAQ stocks into quintiles on their prior six-month returns from month $t-2$ to $t-7$, skipping month t–1. Independently, in June of each year t, we also use NYSE breakpoints to sort stocks into quintiles on the market equity at the end of June. We form 25 portfolios each month from taking the intersections of the size and the momentum quintiles, and compute value-weighted portfolio returns for the subsequent six months from month t to t+5. The six-month holding period means that for a given portfolio there exist six sub-portfolios for each month. As such, we take the simple average of value-weighted returns on the six sub-portfolios as the monthly return of the given portfolio.

Table 10 reports large momentum profits. From Panel A, the average winner-minus-loser return varies from 0.51% ($t = 2.31$) to 1.02% per month ($t = 5.46$). The CAPM alphas of the winner-minus-loser quintiles are all significantly positive across the size quintiles. In particular, the small-stock winner-minus-loser quintile earns an alpha of 1.04%, which is more than six standard errors from zreo. Consistent with Fama and French (1996), their three-factor model exacerbates momentum. The small-stock winner-minus-loser quintile earns a Fama-French alpha of 1.22% ($t = 7.20$). The m.a.e. across the 25 testing portfolios is 0.26% in the CAPM and 0.22% in the Fama-French model, and the average magnitude of the winner-minus-loser alphas is 0.74% in the CAPM and 0.90% in the Fama-French model. Both models are strongly rejected by the GRS test.

Including WML into the Fama-French model as in Carhart (1997) improves the performance substantially. The m.a.e. across the 25 portfolios drops from 0.22% per month in the Fama-French model to only 0.11% in the Carhart model, and the average magnitude of the winner-minus-loser alphas drops from 0.90% to only 0.25%. However, three out of five winner-minus-loser quintiles still have significant alphas in the Carhart model. In particular, the small-stock winner-minus-loser has a Carhart alpha of 0.55%, which is more than 4.5 standard errors from zero. In addition, six out of 25 portfolios have significant Carhart alphas. And the model is again rejected by the GRS test.

Table 11 reports the q-factor regressions. The m.a.e. across the 25 size and momentum portfolios is 0.11% per month, which is identical to that in the Carhart model. However, the average magnitude of the winner-minus-loser alphas is 0.19% in the q-factor model, which is lower than 0.25% in the Carhart model. Only one out of five winner-minus-loser alphas is significant, compared with three in the Carhart model. And two out of 25 individual portfolios have significant alphas in the q-factor model, relative to six in the Carhart model. Overall, the performance of the q-factor model seems largely comparable with that of the Carhart model.

The rest of Table 11 shows that the explanatory power of the q-factor model derives exclusively from the ROE factor. The loadings of the winner-minus-loser quintiles on the market, size, and investment factors are all economically small and statistically insignificant from zero. In contrast, losers have large and significantly negative loadings, and winners have large and significantly positive loadings on r_{ROE}. Across the winner-minus-loser quintiles, the ROE factor loadings vary from 0.72 to 0.92, which are all at least 4.5 standard errors from zero. Given the average ROE factor return of 0.60%, these loadings capture momentum profits that range from 0.43% to 0.55%.

Size and Book-to-Market

In June of each year t, we use the NYSE breakpoints to split the NYSE, Amex, and NASDAQ stocks into quintiles on the market equity at the end of June of t. Independently, in June of each year t, we use the NYSE breakpoints to split the NYSE, Amex, and NASDAQ stocks into quintiles on book-to-market equity. Book-to-market equity for June of year t is the book equity for the fiscal year ending in calendar year $t-1$ divided by the market equity at the end of December of $t-1$.[9] Taking intersections, we form 25 size and book-to-market portfolios. Monthly value-weighted portfolio returns are calculated from July of year t to June of $t+1$, and the portfolios are rebalanced at the end of June.

Table 12 reports factor regressions of 25 size and book-to-market portfolios. Value stocks earn higher average returns than growth stocks. The average value-minus-growth return is 1.01% per month ($t = 4.48$) in the smallest size quintile and 0.19% ($t = 0.89$) in the biggest size quintile. The small-stock value-minus-growth quintile has a CAPM alpha of 1.17% ($t = 5.40$), a Fama-French alpha of 0.69% ($t = 5.44$), and a Carhart alpha of 0.69 ($t = 5.50$). In particular, the small-growth portfolio has a Fama-French alpha of -0.54%, which is more than 4.5 standard errors from zero, as well as a Carhart alpha of -0.48%, which is almost four standard errors from zero.[10] Also, 14 out of 25 individual portfolios and four out of five value-minus-growth quintiles have significant alphas in the CAPM. Four out of 25 portfolios and three out of five value-minus-growth quintiles have significant alphas in the Fama-French model. And five out of 25 portfolios and two out of five value-minus-growth quintiles have significant alphas in the Carhart model. The m.a.e. is lowest in the Fama-French model (0.10%), slightly higher in the Carhart model (0.11%), and highest in the CAPM (0.29%). However, all three models are still strongly rejected by the GRS test.

Table 13 shows that the q-factor model's performance seems comparable with that of the Carhart model. The value-minus-growth alpha in the smallest size quintile is 0.58% per month ($t = 2.89$), which has a somewhat smaller magnitude than the Fama-French alpha and the Carhart alpha. The q-factor model does a good job in explaining the small-growth effect. In contrast to the high Fama-French alpha of -0.57%, the q-factor alpha is only -0.25% ($t = -1.46$). However, the small-value portfolio has an alpha of 0.33% ($t = 2.84$) in the q-factor model, in contrast to the Fama-French alpha of only 0.15% ($t = 1.74$). The m.a.e. in the q-factor model is 0.12%, which is comparable with those in the Fama-French model (0.10%) and the Carhart model (0.11%). Four out of 25 individual

[9] Following Davis, Fama, and French (2000), we measure book equity as stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (Compustat annual item TXDITC) if available, minus the book value of preferred stock. Stockholders' equity is the value reported by Compustat (item SEQ), if it is available. If not, we measure stockholders' equity as the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock.

[10] The small-growth anomaly is notoriously difficult to explain. Campbell and Vuolteenaho (2004) show that the small-growth portfolio is particularly risky in their two-beta model, carrying both higher cash flow betas and higher discount rate betas than the small-value portfolio. Their two-beta model fails to explain the small-growth anomaly.

portfolios have significant alphas in the q-factor model, similar to the performance of the Fama-French model. However, only one out of five value-minus-growth quintiles has a significant alpha in the q-factor model, in contrast to three in the Fama-French model and two in the Carhart model.

The rest of Table 13 shows that the q-factor model's explanatory power derives mostly from the investment factor. Value stocks have significantly higher investment factor loadings than growth stocks. The loading spreads, ranging from 1.18 to 1.57, are all more than eight standard errors from zero. Intuitively, growth firms with high valuation ratios have more growth opportunities and invest more than value firms with low valuation ratios (e.g., Liu, Whited, and Zhang (2009)). As such, growth firms have large and negative loadings, and value firms have large and positive loadings on the (low-minus-high) investment factor. In contrast, the value-minus-growth loadings on the market, the size, and the ROE factors are mostly small and insignificant.[11]

$\triangle A/A$ and ROE

We have shown that the q-factor model performs roughly as well as the Carhart model in pricing the size and momentum portfolios and the size and book-to-market portfolios. Both sets of portfolios are constructed directly on characteristics underlying the Carhart model. We also examine how the Carhart model performs, in comparison with the q-factor model, in explaining the 25 $\triangle A/A$ and ROE portfolios, which are constructed directly on characteristics underlying the q-factor model.

In June of each year t, we split NYSE, Amex, and NASDAQ stocks into quintiles using the NYSE breakpoints on $\triangle A/A$ for the fiscal year ending in calendar year $t-1$. Independently, we sort all stocks, each month, into five ROE quintiles based on the NYSE breakpoints of the ranked values of ROE. Earnings and other accounting variables in Compustat quarterly files are used in the sorts in the months immediately after the most recent public earnings announcement dates (Compustat quarterly item RDQ). Taking intersections of the $\triangle A/A$ quintiles and the ROE quintiles, we obtain the 25 portfolios. We calculate value-weighted portfolio returns for the current month, and rebalance the portfolios monthly.

Table 14 shows that the double sort on $\triangle A/A$ and ROE produces large average return spreads. In particular, the high-minus-low ROE quintile in the highest $\triangle A/A$ quintile earns an average return of 0.94% per month, which is more than four standard errors from zero. The low-minus-high

[11] The evidence suggests that the q-factor model performs about as well as the Carhart model in explaining the 25 size and book-to-market portfolios. In Appendix D, we extend this basic finding to additional portfolios formed on valuation ratios, including market leverage, long-term prior returns, and earnings-to-price.

$\triangle A/A$ quintile in the lowest ROE quintile earns an average return of 0.74%, which is more than 3.5 standard errors from zero. Taking the largest spread across the 25 portfolios (between the high-ROE-low-$\triangle A/A$ portfolio and the low-ROE-high-$\triangle A/A$ portfolio) yields 1.22% ($t = 4.69$).

The traditional factor models largely fail to explain these average returns. In the CAPM, 11 out of 25 portfolios, three high-minus-low ROE quintiles, and three low-minus-high $\triangle A/A$ quintiles have significant alphas. In the Fama-French model, 13 individual portfolios, five high-minus-low ROE quintiles, and three low-minus-high $\triangle A/A$ quintiles have significant alphas. In the Carhart model, seven individual portfolios, three high-minus-low ROE quintiles, and three low-minus-high $\triangle A/A$ quintiles have significant alphas. The m.a.e.'s are 0.25%, 0.26%, and 0.18% per month, respectively, across the three models, which are all strongly rejected by the GRS test.

Table 15 shows that the q-factor model does a good job in explaining the 25 $\triangle A/A$ and ROE portfolios. Only one out of 25 individual portfolios, one high-minus-low ROE quintile, and one low-minus-high $\triangle A/A$ quintile have significant alphas. The m.a.e. is only 0.09% per month, and the model is not rejected by the GRS test (p-value = 0.26). In particular, the high-ROE-low-$\triangle A/A$ minus low-ROE-high-$\triangle A/A$ portfolio has a tiny alpha of -0.07%, which is within 0.5 standard errors from zero. In contrast, this alpha is 1.37% ($t = 5.54$) in the CAPM, 1.31% ($t = 5.66$) in the Fama-French model, and 0.93% ($t = 4.09$) in the Carhart model.

The rest of the table shows that, naturally, the ROE factor loadings explain the average returns for the high-minus-low ROE quintiles. The loadings vary from 0.96 to 1.27, which are all more than ten standard errors from zero. Also, the investment factor loadings explain the average returns for the low-minus-high $\triangle A/A$ quintiles. The loadings vary from 1.10 to 1.45, which are all more than seven standard errors from zero. And both factor loadings contribute to the large average return for the high-ROE-low-$\triangle A/A$ minus low-ROE-high-$\triangle A/A$ portfolio.

4 Specification Tests

As noted, the size factor plays only a secondary role in the q-factor model. In this section, we conduct specification tests to quantify the role of the size factor by estimating:

$$r_t^i - r_t^f = a_q^i + b_{MKT}^i \, MKT_t + b_{\triangle A/A}^i \, r_{\triangle A/A,t} + b_{ROE}^i \, r_{ROE,t} + e_t^i. \tag{6}$$

Table 16 shows why we opt to include the size factor in the q-factor model. This table reports the results for the size deciles. In June of each year t, we use the NYSE breakpoints to split the NYSE, Amex, and NASDAQ stocks into deciles on the market equity at the end of June. Monthly value-weighted portfolio returns are calculated from July of year t to June of $t+1$, and the portfolios are rebalanced in June. The table shows no average return spread between the small and the big deciles in the 1972–2011 sample. None of the small-minus-big alphas from the traditional factor models are significant. The m.a.e.'s in the CAPM, the Fama-French model, the Carhart model, and the q-factor model are largely comparable. The GRS test fails to reject the CAPM, but do reject the three multifactor models. Because of the high goodness-of-fit in the multifactor models, even small deviations between predict returns and realized returns are significant.

The last eight rows in Table 16 show that without the size factor, the q-factor model produces a small-minus-big alpha of 0.68% per month ($t = 2.17$). This alpha is higher in magnitude than -0.19% in the Fama-French model and -0.17% in the Carhart model. The m.a.e. is 0.34% without the size factor, and is higher than 0.05% in both the Fama-French model and the Carhart model. Including the size factor as in the benchmark q-factor model fixes these shortcomings. The small-minus-growth alpha drops to 0.04% and the m.a.e. to 0.08%.

In general, the size factor helps reduce the m.a.e. for the q-factor model, especially when size is involved in forming testing portfolios. Panel A of Table 17 uses the 25 size and momentum portfolios as an example. Without the size factor, the m.a.e. increases from 0.11% per month in the benchmark model to 0.31%. Also, the average R^2 across the 25 portfolios drops from 90% with the size factor to 81% without the size factor. Panel B paints a similar picture using the 25 size and book-to-market portfolios. Without the size factor, the m.a.e. increases from 0.12% per month to 0.31%, and the average R^2 decreases from 87% to 78%. The value-minus-growth alphas are not affected. The small-stock value-minus-growth alpha even goes down slightly from 0.58% to 0.52% once we drop the size factor, and is still the only significant value-minus-growth alpha.

Panel C of Table 17 reports the results for the 25 $\triangle A/A$ and ROE portfolios. Because size is not used in forming these portfolios, the q-factor model's performance is largely unaffected by dropping the size factor. The m.a.e. goes up slightly from 0.09% per month to 0.12%, and the average R^2 drops slightly from 80% to 79%. Among zero-cost strategies, only the low-minus-high $\triangle A/A$ alpha in the high-ROE quintile is significant, -0.40%. However, its magnitude falls relative to -0.50% in the benchmark q-factor model. The high-minus-low ROE alpha in the high-$\triangle A/A$ quintile is 0.43% ($t = 2.65$) in the benchmark model, but becomes 0.29% ($t = 1.62$) once we drop the size factor.

Table 18 reports similar results for the one-way deciles. Because size is not used explicitly in forming these portfolios, the q-factor model's performance is again largely unchanged by dropping the size factor. Without going through the details, we can report that the m.a.e.'s and the average R^2s are, for the most part, unaffected by dropping the size factor. The high-minus-low alphas across different sets of deciles are also largely unchanged. In a few cases, dropping the size factor in effect helps the q-factor model. For instance, Panel G shows that without the size factor, the q-factor model produces a high-minus-low alpha of -0.19% per month and an m.a.e. of 0.11% across the accrual deciles. Both are comparable with those from the Carhart model. In contrast, the high-minus-low alpha is -0.39% and the m.a.e. is 0.14% in the benchmark q-factor model.

5 Interpreting the Results

We interpret the q-factor model as a parsimonious summary of the cross-section of average returns, a new workhorse that can be used to estimate expected returns in practice. We first show that our empirical results are consistent with investment-based asset pricing (Section 5.1), but we also entertain alternative interpretations based on common risk factors and mispricing (Section 5.2).

5.1 Interpretation from Investment-based Asset Pricing

Our results are consistent with insights from investment-based asset pricing (e.g., Cochrane (1991), Berk, Green, and Naik (1999), Zhang (2005), and Liu, Whited, and Zhang (2009)).

An Economic Model

We outline a simple two-period model to illustrate the basic intuition. While more complex models provide richer and more subtle predictions, the basic insights from the simple model hold in virtually all of the investment-based theoretical models that we are aware of.

There are two periods, 0 and 1, and heterogeneous firms, indexed by i. Firm i's operating profits are given by $\Pi_{i0}A_{i0}$ in date 0 and $\Pi_{i1}A_{i1}$ in date 1, in which A_{i0} and A_{i1} are the firm's scale of productive assets, and Π_{i0} and Π_{i1} are the firm's ROE in dates 0 and 1, respectively. Firm i starts with assets A_{i0}, invests in date 0, produces in both dates, and exits at the end of date 1 with a liquidation value of $(1-\delta)A_{i1}$, in which δ is the rate of depreciation. Assets evolve according to $A_{i1} = I_{i0} + (1-\delta)A_{i0}$, in which I_{i0} is investment. Investment entails quadratic adjustment costs given by $(a/2)(I_{i0}/A_{i0})^2 A_{i0}$, in which $a > 0$ is a constant parameter.

Firm i has a gross discount rate of r_i, which varies across firms. The firm chooses A_{i1} to maximize the market value at the beginning of date 0:

$$\max_{\{A_{i1}\}} \quad \Pi_{i0}A_{i0} - [A_{i1} - (1-\delta)A_{i0}] - \frac{a}{2}\left[\frac{A_{i1}}{A_{i0}} - (1-\delta)\right]^2 A_{i0} + \frac{1}{r_i}\left[\Pi_{i1}A_{i1} + (1-\delta)A_{i1}\right]. \tag{7}$$

The market value is date 0's free cash flow, $\Pi_{i0}A_{i0} - I_{i0} - (a/2)(I_{i0}/A_{i0})^2 A_{i0}$, plus the discounted value of date 1's free cash flow, $\left[\Pi_{i1}A_{i1} + (1-\delta)A_{i1}\right]/r_i$. With only two dates the firm does not invest in date 1, so date 1's free cash flow equals the sum of operating profits and the liquidation value.

The tradeoff of firm i is between forgoing date 0's free cash flow and obtaining higher free cash flow in date 1. Setting the first-order derivative of equation (2) with respect to A_{i1} to zero yields:

$$r_i = \frac{\Pi_{i1} + 1 - \delta}{1 + a(I_{i0}/A_{i0})}. \tag{8}$$

This optimality condition is intuitive. The numerator in the right-hand side is the marginal benefit of investment, including the marginal product of capital (ROE), Π_{i1}, and the marginal liquidation value of capital, $1-\delta$. The denominator is the marginal cost of investment, including the marginal purchasing cost of investment (unity) and the marginal adjustment cost, $a(I_{i0}/A_{i0})$. Because the marginal benefit of investment is in date 1's dollar terms and the marginal cost of investment is in date 0's dollar terms, the first-order condition says that the marginal benefit of investment discounted to date 0 should equal the marginal cost of investment. Equivalently, the investment return, defined as the ratio of the marginal benefit of investment in date 1 divided by the marginal cost of investment in date 0, should equal the discount rate, as in Cochrane (1991).

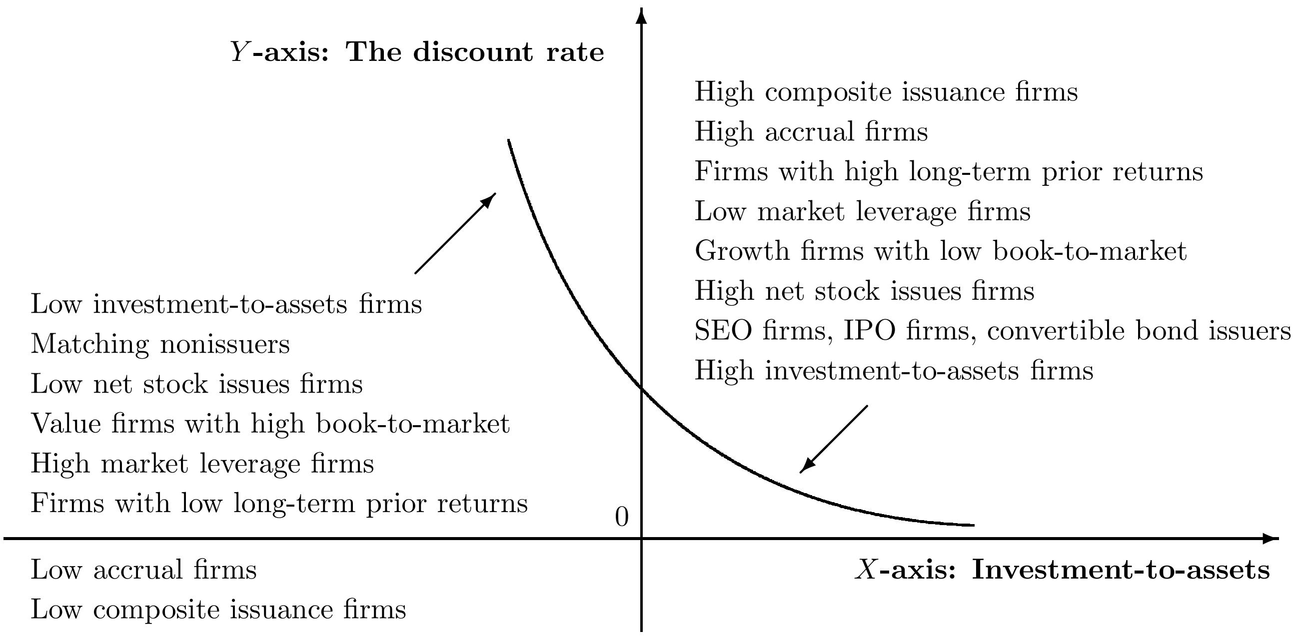
The Investment Factor

We use the first-order condition (8) to interpret the role of the investment factor and the ROE factor in the cross-section of returns. On the investment factor, the equation says that given the expected ROE, the expected return decreases with investment-to-assets. We argue that this investment mechanism is consistent with a wide range of cross-sectional predictability patterns including the negative relations of average returns with net stock issues, composite issuance, accruals, valuation ratios, and long-term prior returns (reversal). Figure 1 illustrates the investment mechanism.

The negative relation between expected returns and investment is intuitive. Firms invest more when their marginal q (the net present value of future cash flows generated from one additional unit of capital) is high. Given expected ROE or cash flows, low discount rates give rise to high marginal

q and high investment, and high discount rates give rise to low marginal q and low investment. This discount rate intuition is probably most transparent in the capital budgeting language of Brealey, Myers, and Allen (2006). In our setting capital is homogeneous, meaning that there is no difference between project-level costs of capital and firm-level costs of capital. Given expected cash flows, high costs of capital imply low net present values of new projects and in turn low investment, and low costs of capital imply high net present values of new projects and in turn high investment.[12]

Figure 1. The Investment Mechanism



The negative investment-expected return relation is conditional on expected ROE. Investment is not disconnected with ROE because more profitable firms tend to invest more than less profitable firms. This conditional relation provides a natural portfolio interpretation of the investment mechanism. Sorting on net stock issues, composite issuance, book-to-market, and other valuation ratios is closer to sorting on investment than sorting on expected ROE. Equivalently, these sorts

[12] The negative investment-discount rate relation has a long tradition in economics. In a world without uncertainty, Fisher (1930) and Fama and Miller (1972, Figure 2.4) show that the interest rate and investment are negatively correlated. Intuitively, the investment demand curve is downward sloping. Extending this insight into a world with uncertainty, Cochrane (1991) and Liu, Whited, and Zhang (2009) demonstrate the negative investment-expected return relation in a dynamic setting with constant returns to scale. Carlson, Fisher, and Giammarino (2004) also predict the negative investment-expected return relation. In their real options model expansion options are riskier than assets in place. Investment converts riskier expansion options into less risky assets in place. As such, high-investment firms are less risky and earn lower expected returns than low-investment firms.

produce wider spreads in investment than in expected ROE. As such, we can interpret the average return spreads generated from these diverse sorts using their common implied sort on investment.

In particular, the negative relation of average returns with equity issues is consistent with the negative investment-expected return relation. The balance-sheet constraint of firms implies that a firm's uses of funds must equal the firm's sources of funds, meaning that, all else equal, issuers must invest more (and earn lower average returns) than nonissuers.[13] Cooper, Gulen, and Schill (2008) document that asset growth predicts future returns with a negative slope and interpret the evidence as investor underreaction to overinvestment. However, asset growth is the most comprehensive measure of investment-to-assets, in which investment is defined as the change in total assets. As such, the asset growth effect seems to be the premiere manifestation of the investment mechanism.

The value premium is also consistent with the negative investment-expected return relation. Investment-to-assets is an increasing function of marginal q (the denominator of equation (8)), and the marginal q equals the average q under constant returns to scale. The average q and market-to-book equity are highly correlated, and are identical without debt financing. As such, value firms with high book-to-market should invest less, and earn higher average returns than growth firms with low book-to-market. In general, firms with high valuation ratios have more growth opportunities, invest more, and earn lower expected returns than firms with low valuation ratios.

We also include market leverage in this category. Fama and French (1992) measure market leverage as the ratio of total assets to the market equity. Empirically, the q-factor model does a good job in explaining the market leverage-expected return relation (see Appendix D). Intuitively, because the market equity is in the denominator, high leverage signals fewer growth opportunities, low investment, and high expected returns, whereas low leverage signals more growth opportunities, high investment, and low expected returns. This investment mechanism differs from the standard leverage effect in corporate finance texts. According to the textbook argument, high leverage means a high proportion of asset risk shared by equity holders, inducing high expected equity returns. This argument implicitly assumes that investment policy is fixed and that asset risk does not vary with investment. In contrast, the investment mechanism allows investment and leverage to be jointly determined. As such, market leverage and investment are negatively correlated, giving rise to a positive relation between market leverage and expected returns.

[13] Lyandres, Sun, and Zhang (2008) show that adding an investment factor to the CAPM and the Fama-French model reduces the magnitude of the underperformance following initial public offerings, seasoned equity offerings, and convertible debt offerings. Lyandres et al. also report the part of Figure 1 that is related to the new issues puzzle.

High valuation ratios often result from a stream of positive shocks on fundamentals, and low valuation ratios from a stream of negative shocks on fundamentals. High valuation ratios of growth firms can manifest as high long-term prior returns, and low valuation ratios of value firms as low long-term prior returns. As such, firms with high long-term prior returns should invest more and earn lower average returns than firms with low long-term prior returns. In all, the investment mechanism also helps explain DeBondt and Thaler's (1985) reversal effect.

The *ROE* Factor

Equation (8) implies that working in parallel with the investment mechanism is the *ROE* mechanism. Given investment-to-assets, firms with high expected *ROE* should earn higher expected returns than firms with low expected *ROE*. Because expected *ROE* is not observable, we use the current *ROE* as the proxy for expected *ROE*. The *ROE*-expected return relation is consistent with momentum, post-earnings-announcement drift, and the financial distress effect.

Why should high expected *ROE* firms earn higher expected returns than low expected *ROE* firms? We explain the intuition in two ways, discounting and capital budgeting. First, the marginal cost of investment in the denominator of the right-hand side of equation (8) equals marginal q, which in turn equals average q or market-to-book. As such, equation (8) says that the expected return is the expected *ROE* divided by market-to-book. Equivalently, the expected return equals the expected cash flow divided by the market equity. This relation is analogous to the Gordon Growth Model. In a two-period world price equals the expected cash flow divided by the discount rate. High expected cash flows relative to low market equity (or high expected *ROE*s relative to low market-to-book) mean high discount rates. And low expected cash flows relative to high market equity (or low expected *ROE*s relative to high market-to-book) mean low discount rates.[14]

From the capital budgeting perspective, equation (8) says that the expected return equals the expected *ROE* divided by an increasing function of investment-to-assets. High expected *ROE* relative to low investment must mean high discount rates. The high discount rates are necessary to offset the high expected *ROE* to induce low net present values of new capital and thus low investment. If the discount rates were not high enough to counteract the high expected *ROE*, firms

[14] This discounting intuition from valuation theory is also noted by Fama and French (2006). Using the residual income model, Fama and French argue that expected stock returns are related to three variables (book-to-market equity, expected profitability, and expected investment). Controlling for book-to-market and expected investment, more profitable firms earn higher expected returns. However, Fama and French do not motivate the *ROE* effect from economic theory or connect the *ROE*-expected return relation to the momentum, earnings, and distress anomalies.

would instead observe high net present values of new capital and thus invest more. Similarly, low expected ROE relative to high investments (such as small-growth firms in the 1990s) must mean low discount rates. If the discount rates were not low enough to counteract the low expected ROE, these firms would instead observe low net present values of new capital and thus invest less.

The ROE-expected return relation has important implications. For any sorts that produce wider spreads in expected ROE than in investment, the average return patterns across the sorted portfolios can be interpreted using the common implied sort on expected ROE. Examples include sorts on momentum, financial distress, and earning surprises. First, momentum sorts should generate an expected ROE spread. Intuitively, shocks to earnings are positively correlated with contemporaneous stock returns. Firms with positive earnings surprises are likely to experience immediate stock price increases, whereas firms with negative earnings surprises are likely to experience immediate stock price decreases. As such, winners with high short-term prior returns should have higher expected ROE and earn higher average returns than losers with low short-term prior returns.

Second, less financially distressed firms are more profitable (with higher expected ROE) and, all else equal, should earn higher average returns than more financially distressed firms. As such, the distress effect is consistent with the positive ROE-expected return relation. Finally, sorting on earnings surprise should generate an expected ROE spread between extreme portfolios. Intuitively, firms that have experienced large positive earnings surprises should be more profitable than firms that have experienced large negative earnings surprises.

A Few Loose Ends

In Section 2, we sort stocks jointly on $\triangle A/A$ and ROE to construct the investment and the ROE factors. The practice is consistent with equation (8), which shows that the investment and the ROE effects are both conditional in nature. Firms will invest a lot when either the ROE of their investment is high, or the cost of capital is low, or both. As such, the negative relation between investment and the cost of capital is conditional on a given level of ROE. Similarly, the positive relation between ROE and the cost of capital is conditional on a given level of investment. Sorting jointly on $\triangle A/A$ and ROE controls for this conditional relation.

Also, the size factor is primarily used to reduce the m.a.e. of the q-factor model across size-sorted portfolios. When size is not involved with constructing the testing portfolios, the performance of the q-factor model is largely unaffected by dropping the size factor (see Section 4). As such, the size factor plays only a secondary role, whereas the investment and the ROE factors are more important.

Finally, equation (8), which is derived from the investment first-order condition, is a nonlinear characteristics-based model. Strictly speaking, the equation does not give rise to a factor model. Nevertheless, we opt to use a linear factor approximation to the nonlinear characteristics model. Stock returns data are available at high frequencies, and are less subject to measurement errors than accounting variables. As such, factor mimicking portfolios often deliver better empirical performance than the underlying economic model itself (e.g., Breeden, Gibbons, and Litzenberger (1989)). Also, estimating the economic model directly involves specification errors in the production and the capital adjustment technologies, and requires a high level of aggregation over the underlying characteristics (e.g., Liu, Whited, and Zhang (2009)). For all these reasons, the q-factor model is more flexible in practice, and can be used to estimate the cost of capital at the firm level.

5.2 Alternative Interpretations

We discuss two alternative interpretations to our empirical results, the common risk factors interpretation as in Fama and French (1993, 1996) and the mispricing interpretation as in, for example, Daniel and Titman (1997). We argue that both alternative interpretations are reasonable, despite representing two polar extremes on the risk-mispricing spectrum. The investment-based interpretation in Section 5.1 seems to provide a healthy balance between the two extremes.

Common Risk Factors

Although we consider the investment, the ROE, and the size factors as common factors, we stop short of claiming common *risk* factors. Fama and French (1993, 1996) argue for the risk-based interpretation of their SMB and HML. Fama and French (1993, p. 4-5) write: "[I]f assets are priced rationally, variables that are related to average returns, such as size and book-to-market equity, must proxy for sensitivity to common (shared and thus undiversifiable) risk factors in returns. The time-series regressions give direct evidence on this issue. In particular, the slopes and R^2 values show whether mimicking portfolios for risk factors related to size and [book-to-market] capture shared variation in stock and bond returns not explained by other factors." Fama and French (1996, p. 57) further claim: "[T]he empirical successes of [the three-factor model] suggest that it is an equilibrium pricing model, a three-factor version of Merton's (1973) intertemporal CAPM (ICAPM) or Ross's (1976) arbitrage pricing theory (APT). In this view, SMB and HML mimic combinations of two underlying risk factors or state variables of special hedging concern to investors."

Consistent with Fama and French (1993, 1996), our time-series regressions provide direct evidence that the investment and the ROE factor loadings capture shared variation in average returns across a wide array of anomaly portfolios. To the extent that the q-factors, constructed on all stocks, represent common sources of variation in stock returns, their loadings proxy for covariances between an individual asset's returns with the factor returns. And covariances are standard measures of risk.

However, we do not pursue the risk factors interpretation for the following reasons. First, Brock (1982) derives the ICAPM and the APT within a general equilibrium production economy. Brock shows that for a common factor to be a risk factor, it must be a source of aggregate shock that affects all firms in the economy, e.g., shocks to total factor productivity, government policy (expenditure and taxation) shocks, and aggregate demand shocks driven by changes of preferences. As such, characteristics-based factors are not the ICAPM or APT risk factors. Firm-specific characteristics, on which the q-factors are based, have no immediate linkages with aggregate shocks that affect the fundamentals of all firms simultaneously. It is well know that ICAPM and APT are silent about the identities of the underlying shocks (state variables). In fact, what shocks drive economic fluctuations is one of the hardest questions in economics (e.g., Cochrane (1994)).

Second, although the investment-based model (see Section 5.1) from which we motivate the investment and the ROE factors is consistent with a risk model, the investment-based model is again silent about what the aggregate shocks are. Lin and Zhang (2012) make this argument in depth. Briefly, the discount rate equation (8), $r_i = (\Pi_{i1} + 1 - \delta)/(1 + aI_{i0}/A_{i0})$, is derived from the investment first-order condition. An equivalent form, $1 + aI_{i0}/A_{i0} = (\Pi_{i1} + 1 - \delta)/r_i$, says that the marginal cost of investment today equals the marginal benefit of investment tomorrow discounted with the discount rate. As such, the net present value of the marginal investment is zero, formalizing the weighted average cost of capital approach to capital budgeting. Different from the consumption (risk) approach that connects the expected return to consumption betas, the investment approach connects the expected return to firm characteristics, such as investment and ROE.

Lin and Zhang (2012) show that in a general equilibrium production economy, the investment first-order condition, $r_i = (\Pi_{i1} + 1 - \delta)/(1 + aI_{i0}/A_{i0})$, and the consumption first-order condition, $E_0[M_1 r_i] = 1$, in which M_1 is a stochastic discount factor, both hold. As such, the (characteristics-based) investment approach and the (covariances-based) consumption approach are not mutually exclusive. Representing two sides of the same coin, the two approaches are internally consistent. However, the crux is that the q-factor model, which is a linear factor representation of

$r_i = (\Pi_{i1}+1-\delta)/(1+aI_{i0}/A_{i0})$, is not a risk model of M_1 on economic ground. Neither is the Fama-French model, contrary to their popular (but contentious) interpretation in the existing literature.

Finally, the evidence is mechanical that the investment and the ROE factor loadings vary in the same direction as the average returns across the anomaly portfolios. The *only* economic substance is that investment and ROE characteristics forecast returns, as predicted by the investment first-order condition. The common variations in average returns that these factors capture are not automatically sources of risk. Despite some differences in statistical properties, on economic ground, time series and cross-sectional regressions are largely equivalent ways of summarizing correlations in the data (e.g., Lin and Zhang (2012)). If a characteristic shows up significant in cross-sectional regressions, its factor mimicking portfolio is likely to show "explanatory" power in time series regressions. If a factor loading shows up significant in time series regressions, its underlying characteristic is likely significant in cross-sectional regressions. Factor loadings are no more primitive than characteristics, and characteristics are no more primitive than loadings in "explaining" expected returns.

Mispricing

Anomalies are often interpreted as mispricing. Jegadeesh and Titman (1993, p. 90) write: "The market underreacts to information about the short-term prospects of firms but overreacts to information about their long-term prospects," and that "investor expectations are systematically biased." Bernard and Thomas (1990, p. 305) interpret the post-earnings-announcement drift as "consistent with a failure of stock prices to reflect fully the implications of current earnings for future earnings." Ritter (1991, p. 3) interprets the long-run performance of initial public offerings as "consistent with an IPO market in which (1) investors are periodically overoptimistic about the earnings potential of young growth companies, and (2) firms take advantage of these 'window of opportunity'." Cooper, Gulen, and Schill (2008) argue that bias in the capitalization of new investments can lead to investment policy distortions, and interpret the investment effect as saying "such potential distortions are present and economically meaningful (p. 1648)." Our empirical results do not rule out any of these mispricing stories. And we accept the possibility of mispricing in the data.

However, we view our investment-based work as weakening the mispricing interpretation to the anomalies. Our results suggest that firms' investment decisions are aligned correctly with the discount rate. Firms invest more when their discount rates are low, and invest less when their discount rates are high, all else equal. More profitable firms must have higher discount rates if these firms do not invest more than less profitable firms. To the extent that this alignment between the discount rate and investment policies manifests itself as many empirical relations between firm characteristics and average returns, the relations per se say *nothing* about investor rationality or irrationality. A low discount rate could result from the sentiment of irrationally optimistic investors or the low market prices of risk demanded by rational investors. The investment first-order condition then connects correctly the low discount rate with high investment and low profitability.

It is often argued that the anomalies are "anomalies" precisely because they cannot be explained by standard risk models. However, it should be noted that the anomalies are "anomalies" in a more fundamental sense that firm characteristics such as investment and earnings are not even present in the standard consumption-based model. The investment approach fills this gaping hole with a single equation (the investment first-order condition). Also, the failure of standard risk models can be due to specification errors in the stochastic discount factor and measurement errors in the risk proxies (see, e.g., the simulation results in Lin and Zhang (2012)). Mispricing is not the only possibility.

6 Conclusion

In his presidential address, Cochrane (2011, p. 1060–1061, original emphasis) writes: "We are going to have to repeat Fama and French's anomaly digestion, but with many more dimensions. We have a lot of questions to answer: First, which characteristics really provide *independent* information about average returns? Which are subsumed by others? Second, does each new anomaly variable also correspond to a new factor formed on those same anomalies?" "Third, how many of these new factors are really important? Can we again account for N independent dimensions of expected returns with $K < N$ factor exposures?" "[T]he world would be much simpler if betas on only a few factors, important in the covariance matrix of returns, accounted for a larger number of mean characteristics."

We agree that the Fama and French (1996) anomaly digestion is obsolete, and we offer an update that is long overdue. Our empirical results provide answers to the important questions raised by Cochrane (2011). First, investment and ROE provide independent information about average returns. Investment largely subsumes book-to-market, net stock issues, accruals, market leverage, long-term prior returns, earnings-to-price, and composite issuance in forecasting returns. ROE largely subsumes short-term prior returns, earnings surprise, and financial distress. And investment and ROE both contribute to the idiosyncratic volatility effect. While the q-factor model is by no means perfect, especially when pricing the total accrual deciles, the new model seems to do a good job in summarizing the current understanding of the cross-section of returns.

Second, our extensive factor regressions show that each anomaly variable also corresponds to a new factor formed on the same variable. In particular, the high-minus-low portfolios often earn significant average returns and alphas from the traditional factor models. However, the evidence is weaker when we form the testing portfolios with the NYSE breakpoints and value-weighted returns than with the NYSE-Amex-NASDAQ breakpoints and equal-weighted returns. Third, we have considered an exhaustive list of about 15 anomaly variables. Among their corresponding factors, we show that the investment and the ROE factors are important. The size factor is also useful, especially when pricing size-related portfolios. As such, the 15 anomalies are not all independent. With four factors, the q-factor model does a good job in summarizing their average return variations.

Our work has important implications for academic research in finance and accounting. The q-factor model can be used as a new workhorse model of expected returns. Any new anomaly variable should be benchmarked against the q-factor model to see if the variable provides any incremental information above and beyond investment and ROE. More important, the vast anomalies literature in empirical finance and capital markets research in accounting should be reevaluated with the new expected-return benchmark provided by the q-factor model. Much work remains to be done.

For example, Agrawal, Jaffe, and Mandelker (1992) document negative abnormal returns for acquiring firms for up to five years following merger announcements. To the extent that acquisition represents an alternative form of capital investment, the investment factor is likely to play a nontrivial role in explaining Agrawal et al.'s evidence. As another example, Michaely, Thaler, and Womack (1995) document that firms that initiate dividends have positive abnormal stock returns for three years after the event, and firms that omit dividends have negative abnormal returns. To the extent that dividend initiation signals strong expected ROE and dividend omission weak expected ROE, the ROE factor is likely to play an important role in explaining Michaely et al.'s evidence.

We emphasize that the q-factor model differs from the Fama-French model (and its extension the Carhart model) in a fundamental way. Our reading of the empirical literature suggests that the Fama-French model, a time series model first proposed in Fama and French (1993), is largely motivated by the empirical success of size and book-to-market in cross-sectional regressions in Fama and French (1992). The Carhart model, which augments the Fama-French model with the momentum factor in Carhart (1997), is a response to the failure of the Fama-French model in explaining momentum, as shown in Fama and French (1996). While Carhart does not offer any economic interpretation for WML, Fama and French (1993, 1996) suggest that HML is a relative distress factor. However, this story has largely been discredited by the literature on the distress effect, which says that more distressed firms earn *lower* average returns than less distress firms, not higher average returns as speculated by Fama and French (e.g., Dichev (1998) and Campbell, Hilscher, and Szilagyi (2008)).

The q-factor model is less subject to the data mining critique than the Fama-French model. Building off a rich theoretical literature on investment-based asset pricing (e.g., Cochrane (1991), Berk, Green, and Naik (1999), and Zhang (2005)), we had arrived at the theoretical proposition that investment and ROE are two key predictors of cross-sectional returns (e.g., Liu, Whited, and Zhang (2009)) before we conducted any factor regressions. The theory offers clear economic intuition why the investment and the ROE factors should work (see Section 5.1). All in all, while the Fama-French model is largely an ad hoc, data mined model, the q-factor model is a product of close interaction between theoretical and empirical research in asset pricing. The clear economic intuition increases the likelihood that the good performance of the q-factor model can persist in the future.

The q-factor model can potentially change the practice of investment management industry. The model can be used to provide expected return estimates for asset allocation, to calculate discount rates for capital budgeting and stock valuation, and to offer empirical benchmarks for evaluating mutual fund performance. Investment companies can also adjust the list of financial products offered to their clients, going beyond traditional styles such as size and book-to-market. The stakes are high.

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Table 1 : Descriptive Statistics of the Size Factor, the Investment Factor, and the *ROE* Factor (1/1972–12/2011, 480 Months)

Size (market equity, ME) is stock price per share times shares outstanding from CRSP. Investment-to-assets ($\triangle A/A$) is annual change in total assets (Compustat annual item AT) divided by lagged total assets. ROE is income before extraordinary items (Compustat quarterly item IBQ) divided by one-quarter-lagged book equity. Book equity is the shareholders' equity, plus balance sheet deferred taxes and investment tax credit (item TXDITCQ) if available, minus the book value of preferred stock. Depending on availability, we use the stockholders' equity (item SEQQ), or common equity (item CEQQ) plus the carrying value of preferred stock (item PSTKQ), or total assets (item ATQ) minus liabilities (item LTQ) in that order as the shareholders' equity. We use redemption value (item PSTKRQ) if available, or carrying value for the book value of preferred stock. In June of each year t, we use the median NYSE size at the end of June to split NYSE, Amex, and NASDAQ stocks into two groups, small and big. Independently, in June of each year t, we also break NYSE, Amex, and NASDAQ stocks into three $\triangle A/A$ groups using the NYSE breakpoints for the low 30%, middle 40%, and high 30% of the ranked $\triangle A/A$ for the fiscal year ending in calendar year $t-1$. Also independently, each month, we sort all stocks into three groups based on the NYSE breakpoints for the low 30%, middle 40%, and the high 30% of the ranked ROE. Earnings and other accounting variables in Compustat quarterly files are used in the sorts in the months immediately after the most recent public earnings announcement dates (item RDQ). Taking intersections of the two size groups, the three $\triangle A/A$ groups, and the three ROE groups, we form 18 size-$\triangle A/A$-ROE portfolios. Monthly value-weighted returns on the 18 portfolios are calculated for the current month, and the portfolios are rebalanced monthly. (The ROE portfolios are rebalanced monthly at the beginning of each month, but the size and the $\triangle A/A$ portfolios are rebalanced annually in each June.) The size factor, r_{ME}, is the difference (small-minus-big), each month, between the average returns on the nine small-ME portfolios and the average returns on the nine big-ME portfolios. The investment factor, $r_{\triangle A/A}$, is the difference (low-minus-high), each month, between the average returns on the six low-$\triangle A/A$ portfolios and the average returns on the six high-$\triangle A/A$ portfolios. And the ROE factor, r_{ROE}, is the difference (high-minus-low), each month, between the average returns on the six high-ROE portfolios and the average returns on the six low-ROE portfolios. The data for the Carhart factors are from Kenneth French's Web site. In Panel A, the t-statistics (in parentheses) are adjusted for heteroscedasticity and autocorrelations. In Panel B, the p-values (in parentheses) test that a given correlation is zero.

Panel A: Descriptive statistics

	Mean	α	β_{MKT}	β_{SMB}	β_{HML}	β_{WML}	R^2
r_{ME}	0.31	0.24	0.17				0.06
	(2.09)	(1.64)	(4.24)				
		0.03	0.02	0.99	0.18		0.93
		(0.92)	(1.61)	(61.46)	(7.43)		
		0.00	0.02	0.99	0.19	0.03	0.94
		(0.06)	(2.34)	(63.30)	(7.67)	(1.93)	
$r_{\triangle A/A}$	0.44	0.51	−0.15				0.13
	(4.73)	(5.62)	(−5.46)				
		0.32	−0.06	−0.02	0.40		0.50
		(4.56)	(−3.43)	(−0.78)	(11.80)		
		0.26	−0.05	−0.02	0.41	0.05	0.52
		(3.64)	(−3.01)	(−0.83)	(11.84)	(2.07)	
r_{ROE}	0.60	0.65	−0.11				0.03
	(4.85)	(5.65)	(−2.34)				
		0.78	−0.09	−0.32	−0.20		0.19
		(6.98)	(−2.08)	(−5.76)	(−2.41)		
		0.52	−0.03	−0.32	−0.10	0.28	0.40
		(4.80)	(−1.03)	(−4.42)	(−1.50)	(6.47)	

Panel B: Correlation matrix (p-values)

	$r_{\triangle A/A}$	r_{ROE}	MKT	SMB	HML	WML
r_{ME}	−0.11	−0.30	0.25	0.95	−0.07	0.01
	(0.02)	(0.00)	(0.00)	(0.00)	(0.14)	(0.87)
$r_{\triangle A/A}$		0.05	−0.36	−0.22	0.69	0.04
		(0.23)	(0.00)	(0.00)	(0.00)	(0.38)
r_{ROE}			−0.19	−0.37	−0.09	0.50
			(0.00)	(0.00)	(0.05)	(0.00)
MKT				0.28	−0.32	−0.14
				(0.00)	(0.00)	(0.00)
SMB					−0.23	0.00
					(0.00)	(0.92)
HML						−0.16
						(0.00)

Table 2 : Factor Regressions for Monthly Percent Excess Returns of Deciles Formed on Foster, Olsen, and Shevlin's (1984) Standardized Unexpected Earnings (SUE) (1/1972–12/2011, 480 Months)

SUE is the change in the most recently announced quarterly earnings per share from its value announced four quarters ago divided by the standard deviation of the change in quarterly earnings over the prior eight quarters (at least six quarters). We rank all NYSE, Amex, and NASDAQ stocks into deciles at the beginning of each month by their most recent past SUE with the NYSE breakpoints. Monthly value-weighted returns on the SUE portfolios are calculated for the current month, and the portfolios are rebalanced monthly. We report mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i\, MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + w^i\, WML_t + \epsilon_t^i$) and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across the testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the Gibbons, Ross, and Shanken (1989) test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. The data on the one-month Treasury bill rate (r^f), the Fama-French factors, and the momentum factor are from Kenneth French's Web site. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	0.35	0.30	0.34	0.27	0.41	0.42	0.61	0.64	0.61	0.78	0.43		
t_{Mean}	1.39	1.23	1.30	1.13	1.81	1.80	2.80	3.00	2.79	3.72	3.39		
α	−0.12	−0.17	−0.14	−0.18	−0.03	−0.02	0.18	0.20	0.19	0.37	0.49	0.16	0.87
β	1.03	1.04	1.06	1.00	0.97	0.96	0.95	0.97	0.95	0.90	−0.12	(0.00)	
t_α	−1.26	−2.09	−1.76	−2.13	−0.41	−0.21	2.33	2.80	2.50	4.97	4.03		
α_{FF}	−0.11	−0.16	−0.14	−0.16	−0.03	−0.01	0.19	0.26	0.20	0.43	0.54	0.17	0.87
b	1.05	1.02	1.03	0.96	0.96	0.97	0.97	0.97	0.95	0.91	−0.13	(0.00)	
s	−0.10	0.06	0.10	0.12	0.04	−0.04	−0.09	−0.10	−0.06	−0.14	−0.04		
h	0.01	−0.04	−0.02	−0.06	−0.02	−0.01	0.01	−0.10	−0.02	−0.08	−0.09		
$t_{\alpha_{FF}}$	−1.15	−1.84	−1.71	−2.02	−0.33	−0.08	2.47	3.65	2.73	5.65	4.26		
α_{CARH}	0.02	−0.07	−0.06	−0.08	−0.01	0.04	0.21	0.16	0.12	0.34	0.32	0.11	0.88
b	1.02	1.00	1.02	0.95	0.96	0.96	0.96	0.99	0.97	0.93	−0.09	(0.02)	
s	−0.10	0.06	0.10	0.12	0.04	−0.04	−0.09	−0.10	−0.06	−0.14	−0.04		
h	−0.04	−0.07	−0.05	−0.09	−0.02	−0.03	0.00	−0.06	0.01	−0.05	−0.01		
w	−0.13	−0.09	−0.09	−0.09	−0.02	−0.04	−0.03	0.11	0.08	0.09	0.22		
$t_{\alpha_{CARH}}$	0.15	−0.82	−0.63	−0.96	−0.12	0.44	2.58	2.20	1.60	4.37	2.43		
α_q	0.06	−0.01	0.06	0.08	0.00	−0.03	0.11	0.02	0.04	0.20	0.14	0.06	0.88
β_{MKT}	1.03	1.00	1.02	0.94	0.97	0.97	0.97	1.01	0.97	0.94	−0.09	(0.41)	
β_{ME}	−0.16	0.03	0.01	0.02	0.01	−0.05	−0.05	−0.04	0.00	−0.05	0.11		
$\beta_{\triangle A/A}$	−0.01	−0.17	−0.12	−0.27	0.03	0.03	0.04	0.09	0.04	0.02	0.02		
β_{ROE}	−0.22	−0.12	−0.21	−0.19	−0.07	0.00	0.10	0.23	0.19	0.27	0.49		
t_{α_q}	0.55	−0.14	0.57	0.81	0.01	−0.29	1.38	0.21	0.49	2.43	0.92		
$t_{\beta_{MKT}}$	32.82	38.00	41.13	34.20	43.91	43.76	45.82	53.24	43.09	36.48	−1.92		
$t_{\beta_{ME}}$	−3.58	0.74	0.31	0.48	0.24	−0.95	−1.39	−1.45	0.00	−1.32	2.04		
$t_{\beta_{\triangle A/A}}$	−0.06	−2.47	−2.01	−3.57	0.49	0.53	0.68	1.53	0.72	0.37	0.23		
$t_{\beta_{ROE}}$	−3.21	−2.53	−4.07	−3.46	−1.71	0.13	1.91	5.92	4.02	7.27	5.78		

Table 3 : Factor Regressions for Monthly Percent Excess Returns of Deciles Formed on Ang, Hodrick, Xing, and Zhang's (2006) Idiosyncratic Volatility ($IVOL$) (1/1972–12/2011, 480 Months)

$IVOL$ is the standard deviation of the residuals from the Fama-French three-factor regression. We form value-weighted deciles each month by using the NYSE breakpoints to sort all NYSE, Amex, and NASDAQ stocks on their $IVOL$ computed with daily returns over the previous month (with a minimum of 15 daily observations). We hold the $IVOL$ deciles for one month, and rebalance the portfolios monthly. The data on the one-month Treasury bill rate (r^f), the Fama-French factors, and the momentum factor are from Kenneth French's Web site. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i\, MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + w^i\, WML_t + \epsilon_t^i$) and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the Gibbons, Ross, and Shanken (1989) test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	0.44	0.63	0.62	0.66	0.55	0.54	0.64	0.55	0.56	−0.10	−0.54		
t_{Mean}	2.52	3.23	3.00	2.88	2.19	2.02	2.23	1.73	1.50	−0.23	−1.51		
α	0.14	0.26	0.21	0.21	0.07	0.03	0.09	−0.04	−0.09	−0.82	−0.95	0.20	0.83
β	0.67	0.81	0.90	0.99	1.06	1.13	1.22	1.31	1.44	1.58	0.91	(0.00)	
t_α	1.44	3.36	2.72	3.00	0.68	0.30	0.98	−0.36	−0.59	−3.90	−3.44		
α_{FF}	0.08	0.25	0.21	0.20	0.04	0.00	0.11	−0.05	−0.07	−0.83	−0.91	0.19	0.87
b	0.75	0.87	0.93	1.03	1.06	1.11	1.17	1.22	1.28	1.34	0.59	(0.00)	
s	−0.24	−0.23	−0.13	−0.16	0.02	0.11	0.16	0.38	0.62	1.00	1.24		
h	0.17	0.07	0.04	0.06	0.05	0.03	−0.09	−0.06	−0.19	−0.21	−0.38		
$t_{\alpha_{FF}}$	1.04	3.48	2.72	2.54	0.45	0.01	1.24	−0.53	−0.57	−5.30	−4.48		
α_{CARH}	0.03	0.20	0.15	0.16	0.07	0.02	0.21	0.03	0.07	−0.55	−0.58	0.15	0.87
b	0.76	0.88	0.95	1.04	1.06	1.11	1.15	1.20	1.25	1.28	0.52	(0.00)	
s	−0.24	−0.23	−0.13	−0.16	0.02	0.11	0.16	0.38	0.62	1.00	1.24		
h	0.19	0.09	0.06	0.08	0.04	0.02	−0.12	−0.09	−0.24	−0.31	−0.49		
w	0.06	0.05	0.06	0.04	−0.03	−0.02	−0.10	−0.09	−0.14	−0.29	−0.35		
$t_{\alpha_{CARH}}$	0.33	2.60	1.75	2.13	0.75	0.21	2.25	0.32	0.52	−3.11	−2.59		
α_q	−0.15	0.05	0.02	0.05	−0.03	−0.02	0.23	0.08	0.21	−0.19	−0.04	0.10	0.88
β_{MKT}	0.77	0.89	0.95	1.04	1.07	1.11	1.15	1.21	1.26	1.29	0.52	(0.02)	
β_{ME}	−0.15	−0.15	−0.06	−0.10	0.02	0.10	0.13	0.32	0.51	0.73	0.88		
$\beta_{\triangle A/A}$	0.38	0.23	0.16	0.15	0.08	−0.01	−0.26	−0.19	−0.45	−0.60	−0.98		
β_{ROE}	0.20	0.20	0.20	0.17	0.07	0.04	−0.05	−0.15	−0.29	−0.76	−0.96		
t_{α_q}	−1.60	0.58	0.18	0.59	−0.30	−0.18	1.92	0.75	1.50	−1.17	−0.19		
$t_{\beta_{MKT}}$	38.54	47.02	48.02	45.12	45.90	43.02	39.37	46.01	39.20	27.83	9.01		
$t_{\beta_{ME}}$	−4.10	−5.29	−1.95	−1.95	0.40	1.65	2.36	5.48	9.58	10.93	9.94		
$t_{\beta_{\triangle A/A}}$	4.20	3.06	2.05	1.92	1.10	−0.11	−2.62	−2.35	−5.25	−4.90	−5.46		
$t_{\beta_{ROE}}$	3.21	4.14	3.49	3.73	1.54	0.88	−0.83	−2.70	−3.79	−6.49	−6.13		

Table 4 : Factor Regressions for Monthly Percent Excess Returns of Deciles Formed on Campbell, Hilscher, and Szilagyi's (2008) Failure Probability (1/1976–12/2011, 432 Months)

We use the NYSE breakpoints to sort all NYSE, Amex, and NASDAQ stocks at the beginning of each month into deciles on the most recent failure probability (see Appendix A for detailed variable definition). Earnings and other accounting variables for a fiscal quarter are used in portfolio sorts in the months immediately after the quarter's public earnings announcement dates (Compustat quarterly item RDQ). Monthly value-weighted returns on the portfolios are calculated for the current month, and the portfolios are rebalanced monthly. The data on the one-month Treasury bill rate (r^f) and the Carhart factors are from Kenneth French's Web site. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i\, MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + w^i\, WML_t + \epsilon_t^i$) and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the Gibbons, Ross, and Shanken (1989) test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	0.69	0.58	0.58	0.62	0.56	0.69	0.62	0.65	0.53	0.11	−0.57		
t_{Mean}	3.00	2.71	2.65	2.76	2.45	2.95	2.22	2.10	1.43	0.22	−1.42		
α	0.20	0.09	0.07	0.09	0.02	0.12	0.01	−0.03	−0.25	−0.84	−1.04	0.17	0.82
β	0.89	0.88	0.91	0.96	0.97	1.02	1.09	1.23	1.41	1.72	0.84	(0.02)	
t_α	1.79	1.13	0.99	1.07	0.24	1.46	0.09	−0.23	−1.58	−3.03	−3.13		
α_{FF}	0.29	0.17	0.10	0.13	0.03	0.05	−0.05	−0.18	−0.40	−1.14	−1.43	0.25	0.84
b	0.85	0.88	0.93	0.97	0.98	1.04	1.10	1.22	1.35	1.60	0.76	(0.00)	
s	−0.01	−0.15	−0.14	−0.12	−0.06	0.04	0.08	0.28	0.50	0.96	0.97		
h	−0.21	−0.10	0.00	−0.03	−0.01	0.13	0.10	0.20	0.11	0.25	0.46		
$t_{\alpha_{FF}}$	2.84	2.17	1.33	1.50	0.45	0.61	−0.47	−1.26	−2.92	−5.18	−5.21		
α_{CARH}	0.08	0.03	0.01	0.08	0.08	0.14	0.16	0.14	−0.03	−0.47	−0.55	0.12	0.88
b	0.89	0.91	0.95	0.98	0.98	1.03	1.06	1.16	1.28	1.48	0.59	(0.05)	
s	−0.04	−0.17	−0.15	−0.12	−0.06	0.05	0.11	0.33	0.55	1.05	1.09		
h	−0.13	−0.05	0.03	−0.02	−0.02	0.10	0.03	0.09	−0.02	0.02	0.15		
w	0.25	0.16	0.10	0.05	−0.06	−0.10	−0.24	−0.36	−0.42	−0.77	−1.02		
$t_{\alpha_{CARH}}$	0.78	0.37	0.10	1.01	1.09	1.60	1.58	1.06	−0.24	−2.53	−2.51		
α_q	−0.01	−0.13	−0.14	−0.04	0.11	0.16	0.24	0.33	0.28	0.01	0.02	0.15	0.87
β_{MKT}	0.89	0.93	0.97	1.00	0.98	1.03	1.06	1.14	1.26	1.46	0.57	(0.01)	
β_{ME}	0.11	−0.05	−0.07	−0.08	−0.09	0.00	−0.02	0.11	0.26	0.54	0.43		
$\beta_{\triangle A/A}$	−0.22	0.09	0.14	0.14	−0.01	0.14	0.04	−0.04	−0.14	−0.12	0.11		
β_{ROE}	0.41	0.29	0.23	0.13	−0.09	−0.16	−0.36	−0.54	−0.78	−1.38	−1.79		
t_{α_q}	−0.09	−1.49	−1.78	−0.49	1.45	1.68	2.16	1.91	2.14	0.04	0.07		
$t_{\beta_{MKT}}$	29.47	47.24	59.12	52.22	46.77	42.97	34.77	28.11	33.32	21.45	6.55		
$t_{\beta_{ME}}$	1.72	−1.32	−2.05	−2.51	−2.88	0.01	−0.44	1.85	3.33	3.09	1.86		
$t_{\beta_{\triangle A/A}}$	−1.62	1.11	2.17	2.47	−0.17	2.12	0.51	−0.31	−1.13	−0.46	0.29		
$t_{\beta_{ROE}}$	5.19	5.64	6.62	2.78	−2.34	−3.28	−5.60	−6.59	−10.21	−7.52	−7.73		

Table 5 : Factor Regressions for Monthly Percent Excess Returns of Deciles Formed on Net Stock Issues (1/1972–12/2011, 480 Months)

We measure net stock issues as the natural log of the ratio of the split-adjusted shares outstanding at the fiscal yearend in $t-1$ divided by the split-adjusted shares outstanding at the fiscal yearend in $t-2$. The split-adjusted shares outstanding is the Compustat shares outstanding (Compustat annual item CSHO) times the Compustat adjustment factor (item ADJEX_C). In June of each year t, we use the NYSE breakpoints to sort NYSE, Amex, and NASDAQ stocks into deciles on the net stock issues for the fiscal year ending in calendar year $t-1$. Because a disproportionately large number of firms have zero net stock issues, we group all the firms with negative net issues into deciles one and two (equal-numbered), and the firms with zero net issues into decile three. We then sort the firms with positive net stock issues into the remaining seven deciles (equal-numbered). Monthly value-weighted portfolio returns are calculated from July of year t to June of year $t+1$, and the portfolios are rebalanced in June. The data on the one-month Treasury bill rate (r^f), the Fama-French factors, and the momentum factor are from Kenneth French's Web site. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i MKT_t + s^i SMB_t + h^i HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i MKT_t + s^i SMB_t + h^i HML_t + w^i WML_t + \epsilon_t^i$) and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i MKT_t + \beta_{ME}^i r_{ME,t} + \beta_{\triangle A/A}^i r_{\triangle A/A,t} + \beta_{ROE}^i r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the Gibbons, Ross, and Shanken (1989) test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	0.88	0.58	0.66	0.55	0.47	0.51	0.70	0.58	0.20	0.20	−0.68		
t_{Mean}	4.07	2.85	3.14	2.50	2.15	2.15	2.88	2.11	0.73	0.75	−4.11		
α	0.47	0.18	0.30	0.14	0.05	0.05	0.24	0.06	−0.31	−0.29	−0.77	0.21	0.83
β	0.91	0.88	0.80	0.89	0.94	1.01	1.02	1.15	1.12	1.09	0.19	(0.00)	
t_α	4.41	2.43	2.56	1.56	0.57	0.61	2.71	0.64	−2.66	−3.09	−4.74		
α_{FF}	0.34	0.18	0.17	0.14	0.04	0.11	0.29	0.20	−0.22	−0.29	−0.62	0.20	0.85
b	0.95	0.92	0.85	0.94	0.95	1.00	0.98	1.07	1.06	1.02	0.08	(0.00)	
s	0.06	−0.16	0.01	−0.19	−0.02	−0.05	0.09	0.05	0.09	0.28	0.22		
h	0.26	0.05	0.26	0.06	0.02	−0.11	−0.12	−0.30	−0.19	−0.08	−0.34		
$t_{\alpha_{FF}}$	3.45	2.48	1.34	1.55	0.48	1.39	3.36	2.33	−2.20	−3.03	−4.06		
α_{CARH}	0.30	0.19	0.16	0.10	0.03	0.08	0.25	0.20	−0.13	−0.27	−0.57	0.17	0.85
b	0.96	0.91	0.85	0.95	0.95	1.00	0.99	1.08	1.04	1.02	0.06	(0.00)	
s	0.06	−0.16	0.01	−0.19	−0.02	−0.05	0.09	0.05	0.09	0.28	0.22		
h	0.28	0.04	0.27	0.07	0.02	−0.11	−0.10	−0.30	−0.23	−0.08	−0.36		
w	0.04	−0.01	0.01	0.03	0.00	0.03	0.04	0.00	−0.10	−0.02	−0.05		
$t_{\alpha_{CARH}}$	3.05	2.59	1.16	1.19	0.40	1.02	2.87	2.12	−1.25	−2.73	−3.68		
α_q	0.21	−0.01	0.05	−0.02	−0.07	0.09	0.26	0.33	0.09	−0.11	−0.32	0.12	0.85
β_{MKT}	0.95	0.95	0.86	0.95	0.96	1.00	0.99	1.08	1.02	0.99	0.04	(0.00)	
β_{ME}	0.10	−0.11	0.04	−0.13	0.01	−0.04	0.10	0.00	0.00	0.24	0.14		
$\beta_{\triangle A/A}$	0.35	0.25	0.40	0.16	0.08	−0.17	−0.11	−0.45	−0.47	−0.31	−0.66		
β_{ROE}	0.10	0.14	0.06	0.18	0.10	0.08	0.02	−0.05	−0.24	−0.13	−0.23		
t_{α_q}	2.04	−0.12	0.36	−0.27	−0.75	1.03	2.56	3.13	0.87	−1.14	−2.10		
$t_{\beta_{MKT}}$	34.19	46.63	26.74	41.88	33.68	47.62	46.40	36.06	36.29	38.99	1.14		
$t_{\beta_{ME}}$	1.80	−3.22	0.56	−3.34	0.28	−1.38	2.56	−0.12	−0.10	6.17	1.79		
$t_{\beta_{\triangle A/A}}$	4.54	5.85	3.36	2.60	1.27	−2.69	−1.50	−6.34	−6.63	−6.09	−6.33		
$t_{\beta_{ROE}}$	1.59	3.65	1.01	4.96	2.43	2.06	0.47	−0.84	−4.69	−4.33	−3.43		

Table 6 : Factor Regressions for Monthly Percent Excess Returns of Deciles Formed on Composite Issuance (1/1972–12/2011, 480 Months)

Composite issuance is the growth rate in the market equity not attributable to the stock return, $\log(ME_t/ME_{t-5}) - r(t-5,t)$. For June of year t, $r(t-5,t)$ is the cumulative log return on the stock from the last trading day of June in year $t-5$ to the last trading day of June in year t, and ME_t is the market equity on the last trading day of June in year t from CRSP. In June of each year t, we use the NYSE breakpoints to sort NYSE, Amex, and NASDAQ stocks into deciles on composite issuance. Monthly value-weighted portfolio returns are calculated from July of year t to June of year $t+1$, and the portfolios are rebalanced in June. The data on the one-month Treasury bill rate (r^f) and the Carhart factors are from Kenneth French's Web site. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i\, MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + w^i\, WML_t + \epsilon_t^i$), and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the Gibbons, Ross, and Shanken (1989) test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	0.69	0.73	0.68	0.39	0.54	0.40	0.51	0.58	0.40	0.11	−0.58		
t_{Mean}	3.64	3.77	3.69	1.87	2.46	1.62	2.05	2.10	1.41	0.38	−2.92		
α	0.36	0.35	0.32	0.00	0.13	−0.06	0.02	0.06	−0.13	−0.43	−0.79	0.19	0.82
β	0.73	0.83	0.79	0.88	0.89	1.03	1.09	1.14	1.18	1.19	0.46	(0.00)	
t_α	3.18	3.85	3.43	−0.05	1.69	−0.67	0.17	0.69	−1.36	−4.32	−4.68		
α_{FF}	0.19	0.28	0.26	−0.06	0.13	0.03	0.15	0.12	−0.04	−0.31	−0.50	0.16	0.85
b	0.83	0.90	0.86	0.95	0.93	1.00	1.02	1.10	1.12	1.10	0.27	(0.00)	
s	−0.12	−0.16	−0.21	−0.21	−0.14	−0.02	0.06	0.07	0.11	0.19	0.31		
h	0.38	0.18	0.17	0.16	0.03	−0.20	−0.29	−0.14	−0.21	−0.28	−0.67		
$t_{\alpha_{FF}}$	1.81	3.15	3.06	−0.74	1.80	0.39	1.60	1.34	−0.46	−3.49	−3.61		
α_{CARH}	0.13	0.27	0.26	−0.09	0.15	0.07	0.14	0.13	0.01	−0.27	−0.40	0.15	0.85
b	0.84	0.90	0.86	0.96	0.92	0.99	1.02	1.10	1.11	1.09	0.24	(0.00)	
s	−0.12	−0.16	−0.21	−0.21	−0.14	−0.02	0.06	0.07	0.11	0.19	0.31		
h	0.40	0.18	0.17	0.17	0.03	−0.21	−0.29	−0.14	−0.23	−0.30	−0.70		
w	0.06	0.02	0.01	0.03	−0.01	−0.03	0.01	0.00	−0.05	−0.04	−0.10		
$t_{\alpha_{CARH}}$	1.23	2.91	2.71	−1.01	1.90	0.75	1.44	1.35	0.08	−2.95	−2.91		
α_q	0.02	0.17	0.02	−0.27	0.03	0.19	0.19	0.14	0.02	−0.19	−0.21	0.12	0.86
β_{MKT}	0.84	0.91	0.89	0.96	0.94	0.98	1.03	1.09	1.11	1.09	0.25	(0.01)	
β_{ME}	−0.08	−0.15	−0.13	−0.11	−0.10	−0.06	0.04	0.09	0.10	0.16	0.24		
$\beta_{\triangle A/A}$	0.63	0.36	0.43	0.26	0.11	−0.38	−0.44	−0.28	−0.36	−0.49	−1.11		
β_{ROE}	0.07	0.04	0.18	0.24	0.11	−0.07	0.07	0.07	0.02	−0.05	−0.11		
t_{α_q}	0.17	1.77	0.21	−3.10	0.34	2.01	1.55	1.46	0.17	−1.87	−1.35		
$t_{\beta_{MKT}}$	30.02	35.89	37.47	35.31	42.91	39.44	35.88	42.55	46.51	42.78	6.76		
$t_{\beta_{ME}}$	−1.80	−3.36	−2.75	−2.87	−2.73	−1.46	0.79	2.18	2.58	4.19	3.52		
$t_{\beta_{\triangle A/A}}$	9.92	5.89	5.60	3.56	1.72	−5.78	−5.58	−5.07	−7.65	−9.28	−14.10		
$t_{\beta_{ROE}}$	1.10	0.87	3.32	4.25	2.07	−1.44	1.47	1.66	0.59	−0.91	−1.38		

Table 7 : Factor Regressions for Monthly Percent Excess Returns of Deciles Formed on Abnormal Corporate Investment (1/1972–12/2011, 480 Months)

We measure abnormal corporate investment (ACI) that applies for the portfolio formation year t, as $ACI_{t-1} \equiv 3CE_{t-1}/(CE_{t-2}+CE_{t-3}+CE_{t-4})-1$, in which CE_{t-1} is capital expenditure (Compustat annual item CAPX) scaled by its sales (item SALE) in year $t-1$. In June of each year t, we use the NYSE breakpoints to sort NYSE, Amex, and NASDAQ stocks into deciles on ACI for the fiscal year ending in calendar year $t-1$. Monthly value-weighted portfolio returns are calculated from July of year t to June of year $t+1$, and the portfolios are rebalanced in June. The data on the one-month Treasury bill rate (r^f), the Fama-French factors, and the momentum factor are from Kenneth French's Web site. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i\, MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + w^i\, WML_t + \epsilon_t^i$), and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the Gibbons, Ross, and Shanken (1989) test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	0.63	0.69	0.61	0.48	0.60	0.37	0.37	0.42	0.60	0.38	−0.26		
t_{Mean}	2.23	2.77	2.62	2.28	2.95	1.75	1.71	1.84	2.56	1.33	−1.57		
α	0.12	0.22	0.14	0.07	0.20	−0.03	−0.05	−0.02	0.14	−0.13	−0.24	0.11	0.85
β	1.14	1.03	1.03	0.91	0.88	0.89	0.92	0.96	1.03	1.12	−0.03	(0.05)	
t_α	0.94	2.38	1.72	0.95	2.46	−0.43	−0.58	−0.21	1.63	−1.17	−1.43		
α_{FF}	0.15	0.30	0.22	0.13	0.20	−0.05	0.00	−0.02	0.18	−0.13	−0.28	0.14	0.87
b	1.03	0.98	1.00	0.91	0.92	0.93	0.95	0.99	1.00	1.08	0.05	(0.00)	
s	0.42	0.09	−0.02	−0.11	−0.16	−0.11	−0.22	−0.12	0.01	0.17	−0.25		
h	−0.17	−0.18	−0.16	−0.09	0.04	0.07	−0.04	0.03	−0.10	−0.04	0.13		
$t_{\alpha_{FF}}$	1.44	3.24	2.81	1.68	2.65	−0.64	−0.02	−0.21	2.20	−1.15	−1.64		
α_{CARH}	0.10	0.31	0.24	0.05	0.21	−0.04	0.04	0.01	0.13	−0.06	−0.16	0.12	0.87
b	1.04	0.98	1.00	0.93	0.92	0.93	0.95	0.99	1.02	1.06	0.02	(0.00)	
s	0.41	0.09	−0.02	−0.11	−0.16	−0.11	−0.22	−0.12	0.01	0.17	−0.25		
h	−0.15	−0.18	−0.17	−0.06	0.04	0.06	−0.05	0.02	−0.08	−0.06	0.09		
w	0.06	−0.01	−0.02	0.08	−0.01	−0.01	−0.04	−0.03	0.06	−0.07	−0.13		
$t_{\alpha_{CARH}}$	0.91	3.11	2.81	0.69	2.64	−0.53	0.43	0.13	1.57	−0.51	−0.91		
α_q	0.13	0.37	0.32	0.02	0.15	−0.16	−0.07	−0.13	0.17	0.02	−0.11	0.15	0.87
β_{MKT}	1.05	0.98	1.00	0.93	0.92	0.94	0.98	1.00	1.00	1.06	0.02	(0.00)	
β_{ME}	0.39	0.06	−0.06	−0.08	−0.16	−0.06	−0.23	−0.07	0.04	0.10	−0.29		
$\beta_{\triangle A/A}$	−0.23	−0.29	−0.28	−0.03	0.10	0.12	0.12	0.09	−0.18	−0.11	0.12		
β_{ROE}	0.02	−0.02	−0.04	0.13	0.05	0.13	0.02	0.12	0.08	−0.18	−0.20		
t_{α_q}	0.90	2.79	3.27	0.23	1.96	−1.83	−0.71	−1.49	1.84	0.22	−0.56		
$t_{\beta_{MKT}}$	31.22	35.74	43.65	43.60	37.81	35.12	41.97	41.61	48.16	35.06	0.35		
$t_{\beta_{ME}}$	9.96	1.49	−1.57	−2.15	−4.47	−1.27	−5.77	−2.02	0.92	2.23	−4.52		
$t_{\beta_{\triangle A/A}}$	−2.10	−2.77	−3.31	−0.50	2.16	1.91	1.95	1.06	−2.56	−1.61	0.80		
$t_{\beta_{ROE}}$	0.36	−0.34	−0.81	4.02	1.28	2.56	0.46	2.21	1.63	−2.94	−2.16		

Table 8 : Factor Regressions for Monthly Percent Excess Returns of Deciles Formed on Total Accruals (1/1972–12/2011, 480 Months)

Following Sloan (1996), we measure total accruals (TAC) as changes in noncash working capital minus depreciation expense scaled by average total assets (Compustat annual item AT) in the prior two years. The noncash working capital is the change in noncash current assets minus the change in current liabilities less short-term debt and taxes payable. Specifically, $TAC \equiv (\triangle CA - \triangle CASH) - (\triangle CL - \triangle STD - \triangle TP) - DP$, in which $\triangle CA$ is the change in current assets (item ACT), $\triangle CASH$ is the change in cash or cash equivalents (item CHE), $\triangle CL$ is the change in current liabilities (item LCT), $\triangle STD$ is the change in debt included in current liabilities (item DLC), $\triangle TP$ is the change in income taxes payable (item TXP), and DP is depreciation and amortization expense (item DP). In June of each year t, we use the NYSE breakpoints to sort NYSE, Amex, and NASDAQ stocks into deciles on total accruals scaled by average total assets for the fiscal year ending in calendar year $t-1$. Monthly value-weighted portfolio returns are calculated from July of year t to June of year $t+1$, and the portfolios are rebalanced in June. The data on the one-month Treasury bill rate (r^f), the Fama-French factors, and the momentum factor are from Kenneth French's Web site. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i\, MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + w^i\, WML_t + \epsilon_t^i$), and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the Gibbons, Ross, and Shanken (1989) test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	0.53	0.53	0.59	0.57	0.54	0.51	0.54	0.39	0.33	0.23	−0.30		
t_{Mean}	1.83	2.19	2.82	2.75	2.44	2.53	2.48	1.71	1.30	0.75	−1.94		
α	0.00	0.07	0.17	0.15	0.13	0.12	0.12	−0.04	−0.17	−0.34	−0.35	0.13	0.85
β	1.16	1.00	0.92	0.92	0.90	0.86	0.93	0.95	1.09	1.27	0.11	(0.01)	
t_α	0.04	0.67	2.35	1.96	1.72	1.61	1.74	−0.44	−1.93	−2.93	−2.27		
α_{FF}	0.09	0.17	0.19	0.14	0.11	0.10	0.19	−0.01	−0.08	−0.20	−0.29	0.13	0.87
b	1.10	0.97	0.93	0.93	0.93	0.89	0.92	0.94	1.05	1.12	0.02	(0.01)	
s	0.06	−0.04	−0.09	−0.03	−0.11	−0.10	−0.10	0.02	0.03	0.37	0.31		
h	−0.19	−0.19	−0.01	0.04	0.08	0.07	−0.11	−0.06	−0.18	−0.37	−0.19		
$t_{\alpha_{FF}}$	0.78	1.76	2.64	1.66	1.38	1.33	2.58	−0.13	−0.98	−2.08	−1.96		
α_{CARH}	0.15	0.15	0.12	0.15	0.14	0.08	0.17	0.00	−0.03	−0.14	−0.29	0.11	0.87
b	1.09	0.98	0.95	0.93	0.93	0.90	0.93	0.94	1.04	1.11	0.02	(0.01)	
s	0.06	−0.04	−0.09	−0.03	−0.11	−0.10	−0.10	0.02	0.03	0.37	0.31		
h	−0.21	−0.18	0.01	0.03	0.07	0.08	−0.10	−0.06	−0.20	−0.39	−0.19		
w	−0.06	0.02	0.07	−0.02	−0.03	0.02	0.02	−0.01	−0.05	−0.06	0.00		
$t_{\alpha_{CARH}}$	1.16	1.50	1.66	1.67	1.61	1.06	2.34	−0.01	−0.35	−1.44	−1.69		
α_q	0.27	0.23	0.22	0.07	0.11	−0.04	0.12	−0.10	−0.10	−0.11	−0.39	0.14	0.87
β_{MKT}	1.11	0.99	0.94	0.95	0.93	0.91	0.93	0.95	1.05	1.11	0.00	(0.01)	
β_{ME}	−0.05	−0.11	−0.11	−0.04	−0.10	−0.05	−0.05	0.05	0.05	0.38	0.42		
$\beta_{\triangle A/A}$	−0.22	−0.13	0.02	0.14	0.10	0.17	−0.14	−0.05	−0.28	−0.77	−0.56		
β_{ROE}	−0.23	−0.10	−0.05	0.03	0.00	0.13	0.13	0.12	0.09	0.12	0.34		
t_{α_q}	1.90	1.83	2.80	0.71	1.25	−0.50	1.60	−1.17	−1.03	−1.11	−2.48		
$t_{\beta_{MKT}}$	28.38	37.55	45.92	34.75	41.62	49.39	41.47	40.04	36.27	41.60	−0.06		
$t_{\beta_{ME}}$	−0.80	−2.20	−3.13	−1.20	−2.58	−1.76	−1.61	1.55	1.21	11.39	6.94		
$t_{\beta_{\triangle A/A}}$	−2.12	−1.05	0.42	1.99	1.75	2.33	−3.23	−0.88	−3.77	−14.70	−5.31		
$t_{\beta_{ROE}}$	−2.39	−1.29	−1.54	0.53	0.04	2.69	2.99	2.82	1.65	2.22	4.16		

Table 9 : Factor Regressions for Monthly Percent Excess Returns of Ten Industry Portfolios (1/1972–12/2011, 480 Months)

The data on the one-month Treasury bill rate (r^f) and the Carhart factors are from Kenneth French's Web site. We assign each NYSE, Amex, and NASDAQ stock to an industry portfolio at the end of June of year t based on its four-digit SIC code at that time. We use Compustat SIC codes for the fiscal year ending in calendar year $t-1$. If Compustat SIC codes are unavailable, we use CRSP SIC codes for June of year t. Monthly value-weighted returns are computed from July of year t to June of year $t+1$. The ten-industry classification is from Kenneth French's Web site. We exclude financial firms from the last industry portfolio ("Other"). We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i\, MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + w^i\, WML_t + \epsilon_t^i$) and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the GRS test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations.

	NoDur	Durbl	Manuf	Enrgy	HiTec	Telcm	Shops	Hlth	Utils	Other	m.a.e.	$\bar{R}^2$
Mean	0.66	0.35	0.54	0.73	0.48	0.50	0.51	0.54	0.49	0.28		
t_{Mean}	3.05	1.11	2.20	2.94	1.47	2.16	1.92	2.37	2.54	1.04		
α	0.31	−0.16	0.07	0.37	−0.09	0.15	0.07	0.17	0.26	−0.22	0.19	0.64
β	0.78	1.13	1.04	0.80	1.27	0.78	0.99	0.80	0.51	1.12	(0.00)	
t_α	2.29	−0.93	0.74	1.94	−0.58	0.94	0.46	1.15	1.63	−2.49		
α_{FF}	0.24	−0.46	−0.02	0.28	0.18	0.14	0.02	0.37	0.06	−0.31	0.21	0.69
b	0.83	1.22	1.08	0.89	1.10	0.83	0.98	0.80	0.64	1.11	(0.00)	
s	−0.10	0.17	−0.02	−0.24	0.22	−0.22	0.12	−0.32	−0.19	0.21		
h	0.17	0.57	0.18	0.24	−0.61	0.06	0.07	−0.32	0.45	0.13		
$t_{\alpha_{FF}}$	1.82	−3.14	−0.25	1.49	1.34	0.92	0.11	2.66	0.40	−3.76		
α_{CARH}	0.24	−0.23	0.00	0.13	0.29	0.22	0.09	0.31	−0.01	−0.29	0.18	0.69
b	0.83	1.17	1.08	0.92	1.08	0.81	0.97	0.81	0.66	1.10	(0.00)	
s	−0.10	0.17	−0.02	−0.24	0.22	−0.22	0.12	−0.32	−0.19	0.21		
h	0.17	0.49	0.18	0.29	−0.65	0.03	0.04	−0.30	0.47	0.13		
w	0.00	−0.24	−0.02	0.16	−0.12	−0.08	−0.08	0.06	0.07	−0.02		
$t_{\alpha_{CARH}}$	1.82	−1.61	−0.06	0.72	2.18	1.29	0.65	2.09	−0.05	−3.35		
α_q	-0.08	-0.32	-0.15	0.09	0.57	0.42	-0.15	-0.04	-0.06	-0.37	0.22	0.69
β_{MKT}	0.86	1.16	1.09	0.91	1.09	0.80	0.99	0.87	0.62	1.11	(0.00)	
β_{ME}	0.02	0.14	0.02	−0.20	0.08	−0.32	0.20	−0.17	−0.12	0.22		
$\beta_{\triangle A/A}$	0.35	0.55	0.24	0.44	−0.94	0.07	0.03	−0.05	0.58	0.13		
β_{ROE}	0.31	−0.24	0.13	0.15	−0.31	−0.37	0.24	0.42	0.07	0.05		
t_{α_q}	−0.60	−1.66	−1.57	0.46	3.53	2.42	−0.99	−0.22	−0.32	−4.19		
$t_{\beta_{MKT}}$	24.30	21.79	48.05	17.40	25.30	20.44	21.51	17.68	17.56	46.73		
$t_{\beta_{ME}}$	0.34	1.35	0.56	−2.49	1.18	−5.70	2.20	−2.47	−1.91	3.81		
$t_{\beta_{\triangle A/A}}$	3.81	3.60	3.16	3.38	−7.90	0.73	0.35	−0.38	4.90	1.92		
$t_{\beta_{ROE}}$	3.93	−2.02	2.12	1.49	−3.44	−4.05	2.85	4.66	0.78	1.29		

Table 10 : Descriptive Statistics for Monthly Percent Excess Returns of 25 Size and Momentum Portfolios (1/1972–12/2011, 480 Months)

At the beginning of month t, we use the NYSE breakpoints to split all NYSE, Amex, and NASDAQ stocks into quintiles based on their prior six-month returns from month $t-2$ to $t-7$ (skipping month $t-1$). Independently, in June of each year t, we use the NYSE breakpoints to split on NYSE, Amex, and NASDAQ stocks into quintiles based on market equity observed at the end of June. Taking intersections, we form 25 size and momentum portfolios, and we calculate value-weighted returns for the portfolios from month t to $t+5$. We report mean percent excess returns, the CAPM alphas (α), the intercepts (α_{FF}) from the Fama-French three-factor regressions, and the intercepts (α_{CARH}) from the Carhart four-factor regressions, as well as t-statistics adjusted for heteroscedasticity and autocorrelations. For each factor model, we report the mean absolute error (m.a.e., the average magnitude of the alphas) across the testing portfolios, the average goodness-of-fit ($\bar{R}^2$) across the testing portfolios, and the p-value (p_{GRS}) from the Gibbons, Ross, and Shanken (1989) test on the null that the alphas of all the portfolios are jointly zero. The data for the one-month Treasury bill rate (r^f) and the Carhart factor are from Kenneth French's Web site.

	Loser	2	3	4	Winner	W−L	Loser	2	3	4	Winner	W−L
	Mean						t_{Mean}					
Small	0.10	0.68	0.79	0.89	1.12	1.02	0.24	2.09	2.60	2.87	2.99	5.46
2	0.16	0.67	0.76	0.78	0.98	0.81	0.44	2.23	2.76	2.84	2.94	4.01
3	0.24	0.61	0.70	0.71	0.90	0.66	0.69	2.21	2.75	2.84	2.91	2.95
4	0.33	0.57	0.63	0.63	0.84	0.51	1.00	2.16	2.69	2.68	2.83	2.31
Big	0.16	0.44	0.39	0.45	0.68	0.52	0.54	2.01	1.97	2.23	2.62	2.35
	α (m.a.e. = 0.26)						t_α ($\bar{R}^2 = 0.78$, $p_{GRS} = 0$)					
Small	−0.50	0.19	0.33	0.41	0.54	1.04	−2.22	1.07	1.94	2.39	2.54	6.10
2	−0.46	0.16	0.27	0.29	0.40	0.86	−2.59	1.10	2.19	2.32	2.51	4.65
3	−0.36	0.12	0.24	0.25	0.35	0.71	−2.13	1.07	2.28	2.46	2.53	3.40
4	−0.25	0.08	0.19	0.17	0.31	0.56	−1.65	0.84	2.02	2.20	2.26	2.67
Big	−0.35	0.02	−0.01	0.05	0.20	0.55	−2.37	0.26	−0.17	0.88	1.83	2.51
	α_{FF} (m.a.e. = 0.22)						$t_{\alpha_{FF}}$ ($\bar{R}^2 = 0.89$, $p_{GRS} = 0$)					
Small	−0.76	−0.09	0.07	0.19	0.45	1.22	−6.25	−1.28	1.10	2.82	3.86	7.20
2	−0.66	−0.08	0.05	0.10	0.37	1.03	−5.74	−0.97	0.84	1.64	3.74	5.79
3	−0.53	−0.09	0.03	0.09	0.36	0.88	−3.86	−1.09	0.34	1.31	3.34	4.32
4	−0.33	−0.07	0.03	0.06	0.36	0.70	−2.35	−0.77	0.31	0.83	2.91	3.25
Big	−0.34	0.03	0.00	0.09	0.34	0.68	−2.26	0.34	−0.07	1.44	3.26	3.05
	α_{CARH} (m.a.e. = 0.11)						$t_{\alpha_{CARH}}$ ($\bar{R}^2 = 0.93$, $p_{GRS} = 0$)					
Small	−0.37	0.03	0.10	0.12	0.18	0.55	−2.82	0.45	1.42	1.70	1.84	4.69
2	−0.19	0.09	0.08	0.03	0.08	0.27	−2.13	1.15	1.25	0.49	0.96	2.25
3	0.03	0.13	0.09	0.00	0.04	0.01	0.31	1.79	1.08	−0.02	0.41	0.08
4	0.22	0.17	0.10	−0.03	0.00	−0.22	2.38	2.00	1.19	−0.35	0.01	−1.97
Big	0.20	0.29	0.07	−0.03	0.02	−0.18	2.08	5.03	1.16	−0.50	0.22	−1.40

Table 11 : Q-factor Regressions for Monthly Percent Excess Returns of 25 Size and Momentum Portfolios (1/1972–12/2011, 480 Months)

At the beginning of month t, we use the NYSE breakpoints to split all NYSE, Amex, and NASDAQ stocks into quintiles based on their prior six-month returns from month $t-2$ to $t-7$ (skipping month $t-1$). Independently, in June of each year t, we use the NYSE breakpoints to split on NYSE, Amex, and NASDAQ stocks into quintiles based on market equity observed at the end of June. Taking intersections, we form 25 size and momentum portfolios, and we calculate value-weighted returns for the portfolios from month t to t+5. We report the q-factor regressions: $r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}. The t-statistics are adjusted for heteroscedasticity and autocorrelations. m.a.e. is the average magnitude of the alphas across the testing portfolios. $\bar{R}^2$ is the average goodness-of-fit across the testing portfolios. p_{GRS} is p-value for the Gibbons, Ross, and Shanken (1989) test on the null that the alphas of all the testing portfolios are jointly zero. The data for the one-month Treasury bill rate (r^f) and the Carhart factor are from Kenneth French's Web site.

	Loser	2	3	4	Winner	W−L	Loser	2	3	4	Winner	W−L
	α_q (m.a.e. = 0.11)						t_{α_q} ($\bar{R}^2 = 0.90$, $p_{GRS} = 0$)					
Small	−0.13	0.12	0.14	0.19	0.41	0.54	−0.72	1.33	1.95	2.34	2.66	2.17
2	−0.11	0.02	0.02	−0.02	0.16	0.28	−0.66	0.23	0.28	−0.27	1.37	1.06
3	0.04	0.03	−0.01	−0.07	0.11	0.07	0.23	0.24	−0.14	−0.98	0.75	0.23
4	0.20	0.05	−0.04	−0.11	0.15	−0.05	1.13	0.44	−0.46	−1.47	0.86	−0.18
Big	0.13	0.16	−0.03	−0.09	0.15	0.03	0.67	1.60	−0.45	−1.37	1.13	0.09
	β_{MKT}						$t_{\beta_{MKT}}$					
Small	1.04	0.92	0.88	0.90	1.04	0.00	24.85	36.72	39.26	40.11	30.79	−0.04
2	1.16	0.99	0.96	0.97	1.10	−0.06	27.00	38.01	52.62	49.32	37.18	−0.89
3	1.15	1.01	0.98	0.98	1.09	−0.06	23.12	34.53	36.04	43.59	30.72	−0.81
4	1.16	1.04	1.00	1.01	1.08	−0.08	22.11	35.82	33.30	48.67	24.62	−1.01
Big	1.07	0.96	0.92	0.94	1.04	−0.03	22.68	37.03	47.68	55.96	31.42	−0.42
	β_{ME}						$t_{\beta_{ME}}$					
Small	0.98	0.93	0.93	0.96	1.19	0.21	15.09	19.83	26.31	37.15	14.74	1.57
2	0.76	0.77	0.75	0.78	0.96	0.21	8.27	11.34	18.21	20.01	16.42	1.49
3	0.50	0.47	0.46	0.53	0.74	0.24	4.51	5.89	6.19	10.58	10.50	1.41
4	0.17	0.19	0.20	0.27	0.53	0.35	1.70	2.48	2.48	7.32	5.03	1.77
Big	−0.26	−0.25	−0.19	−0.13	0.01	0.26	−3.14	−5.59	−5.38	−6.04	0.12	1.96
	$\beta_{\triangle A/A}$						$t_{\beta_{\triangle A/A}}$					
Small	−0.13	0.11	0.15	0.09	−0.27	−0.13	−0.92	1.57	2.70	1.84	−2.59	−0.71
2	−0.18	0.12	0.16	0.13	−0.27	−0.10	−1.31	1.74	3.02	3.09	−3.41	−0.49
3	−0.20	0.16	0.24	0.18	−0.22	−0.02	−1.47	1.95	3.15	3.30	−2.05	−0.09
4	−0.17	0.19	0.29	0.22	−0.25	−0.08	−1.34	2.12	3.52	3.75	−1.95	−0.35
Big	−0.23	0.01	0.07	0.10	−0.24	−0.01	−1.79	0.12	1.67	2.47	−2.40	−0.05
	β_{ROE}						$t_{\beta_{ROE}}$					
Small	−0.82	−0.33	−0.17	−0.09	−0.03	0.79	−7.17	−6.80	−4.54	−2.04	−0.34	5.54
2	−0.67	−0.16	−0.01	0.10	0.23	0.90	−5.98	−2.96	−0.15	2.94	3.28	5.55
3	−0.64	−0.15	0.03	0.16	0.28	0.92	−5.15	−2.25	0.50	4.15	3.75	4.99
4	−0.63	−0.16	0.05	0.16	0.26	0.89	−5.89	−2.40	0.88	3.78	3.23	5.19
Big	−0.45	−0.13	0.04	0.19	0.27	0.72	−4.80	−2.21	1.02	5.78	3.75	4.76

Table 12 : Descriptive Statistics for Monthly Percent Excess Returns of 25 Size and Book-to-Market Portfolios (1/1972–12/2011, 480 Months)

The data for the one-month Treasury bill rate and the Carhart factors are from Kenneth French's Web site. Book equity is stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (Compustat annual item TXDITC) if available, minus the book value of preferred stock. The stockholders' equity is the value reported by Compustat (item SEQ), if it is available. If not, we measure stockholders' equity as the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock. In June of each year t, we use the NYSE breakpoints to split the NYSE, Amex, and NASDAQ stocks into quintiles on market equity at the end of June of t. Independently, in June of each year t, we use the NYSE breakpoints to split the NYSE, Amex, and NASDAQ stocks into quintiles on book-to-market equity. Book-to-market for June of year t is the book equity for the fiscal year ending in calendar year $t-1$ divided by the market equity at the end of December of $t-1$. Taking intersections, we form 25 size and book-to-market portfolios. Monthly value-weighted portfolio returns are calculated from July of year t to June of $t+1$, and the portfolios are rebalanced at the end of June. We report mean percent excess returns, the CAPM alphas (α), the intercepts (α_{FF}) from the Fama-French three-factor regressions, and the intercepts (α_{CARH}) from the Carhart four-factor regressions, as well as t-statistics adjusted for heteroscedasticity and autocorrelations. m.a.e. is the average magnitude of the alphas across the testing portfolios. $\bar{R}^2$ is the average goodness-of-fit across the 25 portfolios. p_{GRS} is p-value for the Gibbons, Ross, and Shanken (1989) test on the null that the alphas of all the testing portfolios are jointly zero.

	Low	2	3	4	High	H−L
	Mean					
Small	0.07	0.69	0.81	0.96	1.08	1.01
2	0.28	0.70	0.83	0.86	0.96	0.68
3	0.36	0.69	0.75	0.73	1.02	0.66
4	0.49	0.56	0.74	0.73	0.84	0.35
Big	0.38	0.51	0.56	0.60	0.56	0.19
	α (m.a.e. = 0.29)					
Small	−0.57	0.13	0.29	0.48	0.59	1.17
2	−0.35	0.15	0.33	0.40	0.48	0.83
3	−0.24	0.17	0.28	0.30	0.57	0.81
4	−0.08	0.07	0.27	0.30	0.41	0.49
Big	−0.07	0.09	0.17	0.25	0.21	0.28
	α_{FF} (m.a.e. = 0.10)					
Small	−0.54	0.00	0.10	0.19	0.15	0.69
2	−0.23	0.03	0.08	0.07	0.03	0.25
3	−0.10	0.03	0.03	−0.02	0.14	0.23
4	0.13	−0.03	0.05	0.01	0.03	−0.10
Big	0.16	0.09	0.12	0.01	−0.15	−0.31
	α_{CARH} (m.a.e. = 0.11)					
Small	−0.48	0.02	0.09	0.19	0.21	0.69
2	−0.19	0.07	0.09	0.11	0.03	0.21
3	−0.05	0.04	0.08	0.00	0.16	0.21
4	0.14	−0.02	0.09	0.04	0.11	−0.03
Big	0.17	0.06	0.10	−0.02	−0.12	−0.30

	Low	2	3	4	High	H−L
	t_{Mean}					
Small	0.17	1.91	2.41	3.03	3.16	4.48
2	0.78	2.19	2.89	3.21	3.16	2.94
3	1.06	2.37	2.89	2.84	3.81	2.76
4	1.60	2.18	2.86	2.97	3.16	1.52
Big	1.60	2.33	2.74	2.91	2.44	0.89
	t_α ($\bar{R}^2 = 0.73$, $p_{GRS} = 0$)					
Small	−2.42	0.62	1.56	2.63	2.90	5.40
2	−1.98	0.98	2.29	2.83	2.55	3.70
3	−1.67	1.38	2.20	2.31	3.32	3.57
4	−0.59	0.65	2.26	2.35	2.59	2.14
Big	−0.76	1.06	1.71	2.08	1.30	1.31
	$t_{\alpha_{FF}}$ ($\bar{R}^2 = 0.89$, $p_{GRS} = 0$)					
Small	−4.74	0.04	1.21	2.74	1.74	5.44
2	−2.82	0.39	1.14	0.93	0.30	2.30
3	−1.28	0.44	0.32	−0.20	1.25	1.76
4	1.59	−0.35	0.49	0.14	0.27	−0.71
Big	2.67	1.04	1.27	0.06	−1.25	−2.29
	$t_{\alpha_{CARH}}$ ($\bar{R}^2 = 0.89$, $p_{GRS} = 0$)					
Small	−3.93	0.24	1.09	2.67	2.30	5.50
2	−2.32	0.93	1.32	1.52	0.29	1.86
3	−0.66	0.51	0.79	−0.02	1.38	1.55
4	1.66	−0.26	0.92	0.34	0.90	−0.19
Big	2.86	0.76	0.99	−0.16	−0.94	−2.04

Table 13 : Q-factor Regressions for Monthly Percent Excess Returns of 25 Size and Book-to-Market Portfolios (1/1972–12/2011, 480 Months)

The data for the one-month Treasury bill rate and the Carhart factors are from Kenneth French's Web site. Book equity is stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (Compustat annual item TXDITC) if available, minus the book value of preferred stock. The stockholders' equity is the value reported by Compustat (item SEQ), if it is available. If not, we measure stockholders' equity as the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock. In June of each year t, we use the NYSE breakpoints to split the NYSE, Amex, and NASDAQ stocks into quintiles on market equity at the end of June of t. Independently, in June of each year t, we use the NYSE breakpoints to split the NYSE, Amex, and NASDAQ stocks into quintiles on book-to-market equity. Book-to-market for June of year t is the book equity for the fiscal year ending in calendar year $t-1$ divided by the market equity at the end of December of $t-1$. Taking intersections, we form 25 size and book-to-market portfolios. Monthly value-weighted portfolio returns are calculated, and the portfolios are rebalanced at the end of June. We report the q-factor regressions: $r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i MKT_t + \beta_{ME}^i r_{ME,t} + \beta_{\triangle A/A}^i r_{\triangle A/A,t} + \beta_{ROE}^i r_{ROE,t} + \epsilon_t^i$. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}. The t-statistics are adjusted for heteroscedasticity and autocorrelations. m.a.e. is the average magnitude of the alphas across the testing portfolios. $\bar{R}^2$ is the average goodness-of-fit across the 25 portfolios. p_{GRS} is p-value for the Gibbons, Ross, and Shanken (1989) test on the null that the alphas of all the testing portfolios are jointly zero.

	Low	2	3	4	High	H−L	Low	2	3	4	High	H−L
	α_q (m.a.e. = 0.12)						t_{α_q} ($\bar{R}^2 = 0.87$, $p_{GRS} = 0$)					
Small	−0.25	0.28	0.29	0.32	0.33	0.58	−1.46	2.25	2.79	4.08	2.84	2.89
2	−0.16	0.08	0.03	0.09	0.08	0.24	−1.31	0.95	0.43	0.86	0.69	1.21
3	−0.03	−0.03	−0.05	−0.02	0.15	0.18	−0.31	−0.31	−0.48	−0.15	1.18	1.09
4	0.15	−0.15	0.01	0.04	0.08	−0.08	1.25	−1.61	0.13	0.33	0.59	−0.38
Big	0.09	−0.05	0.09	0.02	−0.01	−0.10	1.25	−0.56	0.98	0.12	−0.07	−0.54
	β_{MKT}						$t_{\beta_{MKT}}$					
Small	1.10	0.96	0.92	0.88	0.96	−0.15	25.10	27.75	35.43	39.25	27.03	−2.56
2	1.14	1.02	1.01	0.94	1.00	−0.14	32.92	51.42	45.04	43.45	33.88	−2.44
3	1.10	1.05	1.01	0.94	1.01	−0.09	38.45	50.60	33.09	37.85	27.14	−1.63
4	1.10	1.07	1.05	0.98	1.02	−0.08	33.93	42.89	31.28	30.96	26.71	−1.35
Big	0.98	0.98	0.93	0.86	0.89	−0.09	52.66	40.39	30.43	31.70	25.17	−2.05
	β_{ME}						$t_{\beta_{ME}}$					
Small	1.13	1.19	1.09	1.01	0.99	−0.13	16.77	17.02	21.82	36.12	16.12	−1.22
2	0.92	0.93	0.81	0.73	0.86	−0.06	16.54	32.94	15.21	13.68	13.68	−0.63
3	0.72	0.66	0.51	0.43	0.49	−0.23	14.34	16.41	6.75	7.24	5.19	−1.76
4	0.40	0.32	0.25	0.20	0.19	−0.21	6.27	7.26	3.30	3.76	2.32	−1.52
Big	−0.23	−0.09	−0.20	−0.10	−0.12	0.11	−7.93	−2.65	−5.28	−1.65	−2.01	1.43
	$\beta_{\triangle A/A}$						$t_{\beta_{\triangle A/A}}$					
Small	−0.65	−0.34	−0.11	0.17	0.53	1.18	−5.27	−3.81	−1.38	3.09	5.91	8.51
2	−0.76	−0.16	0.24	0.42	0.62	1.37	−9.77	−3.11	3.79	6.18	9.03	10.62
3	−0.77	0.03	0.38	0.54	0.80	1.57	−11.21	0.43	3.45	6.13	8.90	11.73
4	−0.71	0.17	0.39	0.60	0.78	1.49	−8.33	2.38	3.88	5.41	7.30	9.43
Big	−0.40	0.12	0.30	0.61	0.82	1.22	−9.47	2.03	4.93	4.69	6.75	8.42
	β_{ROE}						$t_{\beta_{ROE}}$					
Small	−0.40	−0.40	−0.31	−0.26	−0.37	0.03	−3.29	−4.92	−5.21	−7.61	−7.24	0.26
2	−0.04	−0.09	−0.03	−0.10	−0.18	−0.14	−0.49	−2.21	−0.76	−2.06	−3.06	−1.22
3	0.02	0.04	0.03	−0.09	−0.16	−0.18	0.33	0.83	0.50	−1.33	−2.11	−1.72
4	0.06	0.08	−0.01	−0.14	−0.17	−0.23	0.92	1.55	−0.08	−1.84	−2.14	−1.86
Big	0.15	0.15	−0.04	−0.07	−0.26	−0.41	4.58	3.36	−0.75	−0.86	−3.23	−4.34

Table 14 : Descriptive Statistics for Monthly Percent Excess Returns of 25 $\triangle A/A$ and ROE Portfolios (1/1972–12/2011, 480 Months)

The 25 $\triangle A/A$ and ROE portfolios are the intersections of quintiles formed on $\triangle A/A$ and quintiles formed on ROE. $\triangle A/A$ is annual change in total assets (Compustat annual item AT) divided by lagged total assets. In each June we break NYSE, Amex, and NASDAQ stocks into five $\triangle A/A$ quintiles using the NYSE breakpoints. ROE is income before extraordinary items (Compustat quarterly item IBQ) divided by one-quarter-lagged book equity. Book equity is the shareholders' equity, plus balance sheet deferred taxes and investment tax credit (item TXDITCQ) if available, minus the book value of preferred stock. Depending on availability, we use the stockholders' equity (item SEQQ), or common equity (item CEQQ) plus the carrying value of preferred stock (item PSTKQ), or total assets (item ATQ) minus liabilities (item LTQ) in that order as the shareholders' equity. We use redemption value (item PSTKRQ) if available, or carrying value for the book value of preferred stock. Each month, we sort all stocks into five ROE quintiles based on the NYSE breakpoints of the ranked ROE. Earnings and other accounting variables in Compustat quarterly files are used in the sorts in the months immediately after the most recent public earnings announcement dates (item RDQ). Taking intersections of the $\triangle A/A$ quintiles and the ROE quintiles, we obtain the 25 testing portfolios. The portfolio returns are value-weighted. We report mean percent excess returns, the CAPM alphas (α), the intercepts (α_{FF}) from the Fama-French three-factor regressions, and the intercepts (α_{CARH}) from the Carhart four-factor regressions, as well as t-statistics adjusted for heteroscedasticity and autocorrelations. For each factor model, we report the mean absolute error (m.a.e., the average magnitude of the alphas) across the testing portfolios, the average goodness-of-fit across the 25 portfolios ($\bar{R}^2$), and the p-value (p_{GRS}) for the GRS test on the null that the alphas of all the testing portfolios are jointly zero. The table entries at the intersection of the L−H rows and the H−L columns are for the high-ROE and low-$\triangle A/A$ portfolio minus the low-ROE and high-$\triangle A/A$ portfolio, a zero-investment portfolio with the largest average return spread across the double sorts.

	Low	2	3	4	High	H−L	Low	2	3	4	High	H−L
	Mean						t_{Mean}					
High $\triangle A/A$	−0.29	0.02	0.27	0.45	0.64	0.94	−0.80	0.08	0.88	1.64	2.18	4.36
4	0.16	0.49	0.53	0.49	0.57	0.41	0.53	1.93	2.22	2.03	2.62	1.94
3	0.30	0.25	0.67	0.67	0.59	0.30	1.00	1.07	3.10	3.16	2.69	1.34
2	0.50	0.70	0.52	0.67	0.76	0.26	1.68	3.30	2.52	3.10	3.44	1.13
Low $\triangle A/A$	0.44	0.60	0.88	0.71	0.93	0.48	1.27	2.18	3.58	2.85	3.51	2.09
L−H	0.74	0.58	0.61	0.26	0.28	1.22	3.75	3.28	3.01	1.30	1.38	4.69
	α (m.a.e. = 0.25)						t_{α} ($\bar{R}^2 = 0.73$, $p_{GRS} = 0$)					
High $\triangle A/A$	−0.90	−0.51	−0.26	−0.08	0.10	1.01	−5.09	−4.04	−1.85	−0.63	0.78	4.81
4	−0.34	0.05	0.08	0.03	0.17	0.51	−2.31	0.36	0.67	0.33	1.61	2.52
3	−0.19	−0.16	0.28	0.27	0.20	0.39	−1.19	−1.25	2.41	2.82	1.70	1.88
2	0.02	0.33	0.16	0.30	0.36	0.34	0.13	2.67	1.34	2.36	2.91	1.56
Low $\triangle A/A$	−0.12	0.14	0.45	0.29	0.47	0.58	−0.65	0.94	3.54	2.04	3.14	2.62
L−H	0.78	0.64	0.71	0.36	0.36	1.37	3.92	3.53	3.50	1.87	1.74	5.54
	α_{FF} (m.a.e. = 0.26)						$t_{\alpha_{FF}}$ ($\bar{R}^2 = 0.76$, $p_{GRS} = 0$)					
High $\triangle A/A$	−0.90	−0.49	−0.20	0.06	0.39	1.29	−5.85	−3.79	−1.59	0.53	3.65	6.86
4	−0.46	−0.06	0.01	0.11	0.31	0.77	−3.14	−0.41	0.11	1.13	3.27	4.10
3	−0.42	−0.30	0.14	0.26	0.25	0.67	−2.75	−2.41	1.33	2.74	2.28	3.49
2	−0.18	0.11	0.03	0.22	0.41	0.59	−1.04	0.98	0.30	1.68	3.35	2.73
Low $\triangle A/A$	−0.32	−0.05	0.27	0.14	0.41	0.73	−2.12	−0.38	2.13	0.99	2.81	3.41
L−H	0.58	0.44	0.47	0.08	0.02	1.31	3.31	2.72	2.52	0.41	0.09	5.66
	α_{CARH} (m.a.e. = 0.18)						$t_{\alpha_{CARH}}$ ($\bar{R}^2 = 0.77$, $p_{GRS} = 0$)					
High $\triangle A/A$	−0.66	−0.32	−0.08	0.06	0.30	0.96	−4.52	−2.67	−0.67	0.51	2.58	5.08
4	−0.22	0.07	0.03	0.10	0.18	0.39	−1.41	0.54	0.23	1.06	1.97	2.15
3	−0.23	−0.17	0.15	0.21	0.15	0.37	−1.49	−1.24	1.29	2.19	1.33	1.98
2	0.00	0.16	−0.01	0.18	0.31	0.32	−0.02	1.43	−0.08	1.49	2.58	1.32
Low $\triangle A/A$	−0.09	0.11	0.28	0.10	0.27	0.36	−0.58	0.86	2.13	0.66	1.84	1.68
L−H	0.57	0.43	0.37	0.04	−0.03	0.93	3.07	2.47	1.98	0.21	−0.17	4.09

Table 15 : Q-factor Regressions for Monthly Percent Excess Returns of 25 $\triangle A/A$ and ROE Portfolios (1/1972–12/2011, 480 Months)

$\triangle A/A$ is annual change in total assets (Compustat annual item AT) divided by lagged total assets. ROE is income before extraordinary items (Compustat quarterly item IBQ) divided by one-quarter-lagged book equity. Book equity is the shareholders' equity, plus balance sheet deferred taxes and investment tax credit (item TXDITCQ) if available, minus the book value of preferred stock. Depending on availability, we use the stockholders' equity (item SEQQ), or common equity (item CEQQ) plus the carrying value of preferred stock (item PSTKQ), or total assets (item ATQ) minus liabilities (item LTQ) in that order as the shareholders' equity. We use redemption value (item PSTKRQ) if available, or carrying value for the book value of preferred stock. In June of each year t, we use the NYSE breakpoints to break NYSE, Amex, and NASDAQ stocks into quintiles on $\triangle A/A$ for the fiscal year ending in calendar year $t-1$. Independently, each month, we sort all stocks into ROE quintiles based on the NYSE breakpoints. Earnings and other accounting variables in Compustat quarterly files are used in the sorts in the months immediately after the most recent public earnings announcement dates (item RDQ). Taking the intersections of the $\triangle A/A$ quintiles and the ROE quintiles, we form 25 $\triangle A/A$ and ROE portfolios. We calculate monthly value-weighted portfolio returns. We report the q-factor regressions: $r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i MKT_t + \beta_{ME}^i r_{ME,t} + \beta_{\triangle A/A}^i r_{\triangle A/A,t} + \beta_{ROE}^i r_{ROE,t} + \epsilon_t^i$. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}. The t-statistics are adjusted for heteroscedasticity and autocorrelations. m.a.e. is the average magnitude of the alphas. $\bar{R}^2$ is the average goodness-of-fit across the 25 portfolios. p_{GRS} is the p-value for the GRS test on the null that the alphas of all the 25 testing portfolios are jointly zero.

	Low	2	3	4	High	H−L	Low	2	3	4	High	H−L
	α_q (m.a.e. = 0.09)						t_{α_q} ($\bar{R}^2 = 0.80$, $p_{GRS} = 0.26$)					
High $\triangle A/A$	−0.04	−0.01	0.04	0.07	0.39	0.43	−0.34	−0.08	0.35	0.57	3.00	2.65
4	0.07	0.19	0.10	0.01	0.01	−0.06	0.48	1.30	0.79	0.10	0.08	−0.35
3	−0.03	−0.01	0.03	0.06	−0.11	−0.08	−0.19	−0.07	0.25	0.63	−0.94	−0.45
2	0.12	0.20	−0.17	−0.04	−0.06	−0.18	0.68	1.86	−1.30	−0.28	−0.51	−0.90
Low $\triangle A/A$	0.13	0.08	0.09	−0.11	−0.11	−0.25	1.06	0.65	0.74	−0.75	−0.82	−1.32
L−H	0.18	0.09	0.05	−0.18	−0.50	−0.07	1.06	0.55	0.29	−1.01	−2.84	−0.40
	β_{MKT}						$t_{\beta_{MKT}}$					
High $\triangle A/A$	1.09	1.04	1.05	1.08	1.08	−0.01	22.56	23.21	29.57	41.92	33.73	−0.15
4	1.02	0.92	1.01	1.03	0.94	−0.08	31.02	21.49	30.75	38.09	40.25	−1.90
3	1.05	0.92	0.95	0.93	0.93	−0.11	29.58	24.72	33.54	37.77	32.50	−2.59
2	1.09	0.84	0.88	0.90	1.00	−0.09	33.17	27.53	33.13	24.30	34.79	−2.44
Low $\triangle A/A$	1.13	1.08	1.03	1.01	1.10	−0.03	39.80	38.51	25.74	22.88	36.91	−0.87
L−H	0.04	0.03	−0.02	−0.07	0.02	0.01	0.77	0.62	−0.27	−1.33	0.41	0.18
	β_{ME}						$t_{\beta_{ME}}$					
High $\triangle A/A$	0.31	0.08	0.20	0.14	0.01	−0.30	4.58	0.99	4.16	3.37	0.23	−4.19
4	0.12	0.17	−0.03	−0.13	−0.11	−0.23	1.53	3.57	−0.58	−3.75	−2.69	−2.22
3	0.12	−0.10	−0.03	−0.01	−0.06	−0.17	1.67	−1.61	−0.63	−0.24	−1.30	−2.13
2	−0.01	0.12	−0.03	0.08	−0.12	−0.11	−0.17	2.24	−0.74	0.96	−2.36	−1.96
Low $\triangle A/A$	0.44	0.02	0.11	0.10	0.23	−0.21	8.88	0.35	1.89	1.41	3.77	−3.07
L−H	0.12	−0.06	−0.09	−0.03	0.21	−0.09	1.49	−0.88	−1.25	−0.35	2.56	−0.87
	$\beta_{\triangle A/A}$						$t_{\beta_{\triangle A/A}}$					
High $\triangle A/A$	−0.81	−0.57	−0.58	−0.54	−0.92	−0.11	−8.14	−7.13	−6.73	−7.39	−10.18	−0.91
4	0.00	−0.06	0.06	−0.14	−0.15	−0.15	−0.05	−0.67	0.80	−1.90	−2.26	−1.28
3	0.34	0.26	0.52	0.15	0.13	−0.21	3.13	2.91	6.57	2.62	1.63	−1.95
2	0.61	0.58	0.55	0.46	0.24	−0.37	5.25	7.20	6.48	4.71	3.07	−3.32
Low $\triangle A/A$	0.41	0.60	0.73	0.55	0.53	0.12	6.80	6.32	8.43	4.72	7.21	1.31
L−H	1.22	1.16	1.32	1.10	1.45	1.34	11.43	11.40	11.56	7.21	12.24	10.32
	β_{ROE}						$t_{\beta_{ROE}}$					
High $\triangle A/A$	−0.80	−0.35	−0.09	0.14	0.28	1.08	−9.25	−5.82	−1.45	2.96	5.01	10.46
4	−0.68	−0.24	−0.08	0.19	0.40	1.08	−9.73	−3.86	−1.13	3.73	8.96	14.65
3	−0.56	−0.40	−0.01	0.21	0.39	0.96	−8.68	−4.08	−0.12	4.37	6.06	10.62
2	−0.63	−0.30	0.09	0.13	0.50	1.14	−9.18	−4.92	1.49	2.55	9.46	13.41
Low $\triangle A/A$	−0.87	−0.39	−0.06	0.14	0.40	1.27	−18.04	−5.75	−0.84	1.53	6.31	19.07
L−H	−0.07	−0.04	0.03	0.00	0.12	1.20	−0.68	−0.45	0.33	−0.02	1.48	10.87

Table 16 : Factor Regressions for Monthly Percent Excess Returns of Deciles Formed on Market Equity (1/1972–12/2011, 480 Months)

The data on the one-month Treasury bill rate (r^f) and the Carhart factors are from Kenneth French's Web site. Market equity is stock price per share times shares outstanding from CRSP. In June of each year t, we use the NYSE breakpoints to split the NYSE, Amex, and NASDAQ stocks into deciles on market equity at the end of June of t. Monthly value-weighted portfolio returns are calculated, and the portfolios are rebalanced at the end of June. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i\, MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + w^i\, WML_t + \epsilon_t^i$), the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$), and the q-factor regressions without the size factor ($r_t^i - r_t^f = a_q^i + b_{MKT}^i\, MKT_t + b_{\triangle A/A}^i\, r_{\triangle A/A,t} + b_{ROE}^i\, r_{ROE,t} + e_t^i$). m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the GRS test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Small	2	3	4	5	6	7	8	9	Big	S−B	m.a.e.	$\bar{R}^2$
Mean	0.65	0.66	0.62	0.67	0.67	0.59	0.63	0.58	0.55	0.41	0.24		
t_{Mean}	1.77	1.92	1.96	2.21	2.28	2.19	2.35	2.28	2.32	2.01	0.88		
α	0.12	0.09	0.06	0.13	0.13	0.08	0.12	0.08	0.09	0.00	0.12	0.09	0.83
β	1.16	1.26	1.22	1.21	1.19	1.13	1.12	1.10	1.02	0.91	0.25	(0.71)	
t_α	0.58	0.53	0.45	0.97	1.19	0.88	1.53	1.03	1.61	−0.02	0.49		
α_{FF}	−0.08	−0.07	−0.08	0.01	0.00	−0.01	0.06	0.04	0.07	0.11	−0.19	0.05	0.95
b	0.94	1.05	1.05	1.05	1.06	1.04	1.05	1.04	0.99	0.93	0.01	(0.01)	
s	1.25	1.16	0.96	0.90	0.74	0.54	0.40	0.32	0.15	−0.27	1.53		
h	0.12	0.06	0.07	0.02	0.08	0.06	0.02	0.02	0.01	−0.16	0.28		
$t_{\alpha_{FF}}$	−0.82	−1.18	−1.48	0.20	0.09	−0.11	1.11	0.53	1.22	2.93	−1.72		
α_{CARH}	−0.07	−0.06	−0.09	0.02	0.00	0.02	0.07	0.05	0.06	0.10	−0.17	0.05	0.95
b	0.94	1.05	1.05	1.04	1.06	1.03	1.05	1.04	0.99	0.93	0.01	(0.03)	
s	1.25	1.16	0.96	0.90	0.74	0.54	0.40	0.32	0.15	−0.27	1.53		
h	0.12	0.06	0.07	0.02	0.08	0.05	0.02	0.01	0.01	−0.15	0.27		
w	−0.01	−0.01	0.00	−0.01	0.00	−0.03	0.00	−0.01	0.01	0.01	−0.02		
$t_{\alpha_{CARH}}$	−0.68	−0.96	−1.60	0.38	0.04	0.37	1.12	0.68	1.15	2.45	−1.47		
α_q	0.14	0.09	−0.04	0.07	0.04	0.01	0.08	0.10	0.13	0.10	0.04	0.08	0.95
β_{MKT}	0.93	1.03	1.04	1.04	1.05	1.03	1.05	1.04	0.98	0.94	−0.02	(0.00)	
β_{ME}	1.10	1.05	0.92	0.85	0.71	0.51	0.38	0.28	0.13	−0.28	1.37		
$\beta_{\triangle A/A}$	−0.06	−0.14	−0.10	−0.16	−0.09	−0.04	−0.05	−0.05	−0.04	−0.12	0.06		
β_{ROE}	−0.39	−0.27	−0.09	−0.10	−0.05	−0.04	−0.03	−0.10	−0.07	0.03	−0.42		
t_{α_q}	1.16	1.02	−0.75	1.32	0.70	0.13	1.19	1.33	2.02	2.53	0.35		
$t_{\beta_{MKT}}$	30.24	46.03	67.77	64.42	79.83	60.95	69.50	57.64	56.66	81.33	−0.60		
$t_{\beta_{ME}}$	29.02	35.19	31.56	41.70	30.28	16.11	19.00	8.47	3.53	−17.35	40.51		
$t_{\beta_{\triangle A/A}}$	−0.62	−2.24	−2.87	−4.95	−1.81	−0.95	−1.10	−0.86	−0.75	−4.16	0.88		
$t_{\beta_{ROE}}$	−5.05	−4.74	−2.82	−2.90	−1.55	−1.29	−1.08	−2.97	−2.16	1.62	−6.22		
a_q	0.65	0.57	0.38	0.47	0.37	0.25	0.26	0.23	0.18	−0.02	0.68	0.34	0.85
b_{MKT}	1.07	1.17	1.16	1.15	1.14	1.10	1.10	1.07	1.00	0.91	0.16	(0.00)	
$b_{\triangle A/A}$	−0.10	−0.18	−0.14	−0.19	−0.12	−0.06	−0.07	−0.06	−0.05	−0.11	0.01		
b_{ROE}	−0.74	−0.60	−0.38	−0.37	−0.28	−0.20	−0.15	−0.19	−0.11	0.12	−0.86		
t_{a_q}	2.43	2.50	2.26	2.77	2.67	2.22	2.45	2.11	2.30	−0.37	2.17		
$t_{b_{MKT}}$	17.95	22.37	26.27	26.81	29.52	36.61	47.68	50.03	59.06	52.17	2.26		
$t_{b_{\triangle A/A}}$	−0.62	−1.21	−1.12	−1.45	−0.94	−0.76	−0.78	−0.69	−0.67	−1.97	0.03		
$t_{b_{ROE}}$	−5.31	−5.37	−4.04	−4.31	−3.46	−4.09	−3.30	−3.99	−2.60	3.38	−5.34		

Table 17 : Alphas from Q-factor Regressions without the Size Factor, Monthly Percent Excess Returns of 25 Size and Momentum Portfolios, 25 Size and Book-to-Market Portfolios, and 25 $\triangle A/A$ and ROE Portfolios (1/1972–12/2011, 480 Months)

See the captions of Tables 10, 12, and 14 for the constructions of the 25 size and momentum portfolios, the 25 size and book-to-market portfolios, and the 25 $\triangle A/A$ and ROE portfolios, respectively. We report the alphas from the three-factor version of the q-factor regressions: $r_t^i - r_t^f = a_q^i + b_{MKT}^i\, MKT_t + b_{\triangle A/A}^i\, r_{\triangle A/A,t} + b_{ROE}^i\, r_{ROE,t} + e_t^i$. See the caption of Table 1 for the description of $r_{\triangle A/A}$ and r_{ROE}. The t-statistics are adjusted for heteroscedasticity and autocorrelations. m.a.e. is the average magnitude of the alphas across the testing portfolios. $\bar{R}^2$ is the average goodness-of-fit across a given set of 25 testing portfolios. p_{GRS} is the p-value from the GRS test on the null that the alphas of a given set of 25 portfolios are jointly zero. The data for the one-month Treasury bill rate (r^f), the Fama-French factors, and the momentum factor are from Kenneth French's Web site.

Panel A: 25 size and momentum portfolios

	Loser	2	3	4	Winner	W−L	Loser	2	3	4	Winner	W−L
	a_q (m.a.e. = 0.31)						t_{a_q} ($\bar{R}^2 = 0.81$, $p_{GRS} = 0$)					
Small	0.32	0.55	0.57	0.64	0.96	0.64	1.31	2.90	2.91	2.97	2.89	2.23
2	0.24	0.38	0.37	0.34	0.61	0.38	1.25	2.61	2.77	2.30	2.55	1.26
3	0.28	0.25	0.20	0.17	0.46	0.18	1.41	2.01	1.74	1.50	2.00	0.53
4	0.28	0.14	0.05	0.02	0.39	0.11	1.56	1.18	0.48	0.22	1.54	0.30
Big	0.01	0.04	−0.11	−0.15	0.16	0.15	0.04	0.36	−1.41	−2.29	1.08	0.46

Panel B: 25 size and book-to-market portfolios

	Low	2	3	4	High	H−L	Low	2	3	4	High	H−L
	a_q (m.a.e. = 0.31)						t_{a_q} ($\bar{R}^2 = 0.78$, $p_{GRS} = 0$)					
Small	0.27	0.83	0.79	0.79	0.79	0.52	0.87	2.73	2.89	3.61	3.91	2.31
2	0.27	0.51	0.41	0.42	0.48	0.20	1.21	2.62	2.80	3.08	2.72	1.06
3	0.30	0.28	0.18	0.18	0.38	0.08	1.68	1.83	1.44	1.52	2.52	0.39
4	0.34	0.00	0.13	0.13	0.17	−0.17	1.95	0.03	1.08	1.09	1.21	−0.73
Big	−0.01	−0.09	0.00	−0.03	−0.06	−0.05	−0.17	−0.99	0.00	−0.25	−0.40	−0.27

Panel C: 25 $\triangle A/A$ and ROE portfolios

	Low	2	3	4	High	H−L	Low	2	3	4	High	H−L
	a_q (m.a.e. = 0.12)						t_{a_q} ($\bar{R}^2 = 0.79$, $p_{GRS} = 0.06$)					
High $\triangle A/A$	0.10	0.03	0.14	0.14	0.39	0.29	0.71	0.21	0.99	1.02	3.13	1.62
4	0.12	0.27	0.09	−0.05	−0.04	−0.17	0.85	1.83	0.73	−0.50	−0.41	−0.90
3	0.03	−0.06	0.01	0.05	−0.13	−0.16	0.19	−0.36	0.10	0.58	−1.21	−0.93
2	0.12	0.26	−0.18	0.00	−0.12	−0.24	0.65	2.30	−1.39	−0.02	−0.91	−1.23
Low $\triangle A/A$	0.34	0.09	0.14	−0.06	−0.01	−0.35	2.28	0.72	1.13	−0.43	−0.06	−1.88
L−H	0.24	0.06	0.01	−0.20	−0.40	−0.11	1.35	0.38	0.03	−1.04	−2.03	−0.61

Table 18 : Alphas from Q-factor Regressions without the Size Factor, Monthly Percent Excess Returns of One-way Deciles

See the captions of Tables 2, 3, 4, 5, 6, 7, and 8 for the constructions of the SUE, the IVO, the distress, the net stock issues, the composite issuance, the abnormal corporate investment, and the total accrual deciles, respectively. See the caption of Table 9 for the construction of the ten industry portfolios. We report the alphas from the three-factor version of the q-factor regressions: $r_t^i - r_t^f = a_q^i + b_{MKT}^i\, MKT_t + b_{\triangle A/A}^i\, r_{\triangle A/A,t} + b_{ROE}^i\, r_{ROE,t} + e_t^i$. See the caption of Table 1 for the description of $r_{\triangle A/A}$ and r_{ROE}. The t-statistics are adjusted for heteroscedasticity and autocorrelations. m.a.e. is the average magnitude of the alphas across the testing portfolios. $\bar{R}^2$ is the average goodness-of-fit across a given set of deciles. p_{GRS} (in parentheses) is the p-value from the GRS test on the null that the alphas of a given set of deciles are jointly zero. The data for the one-month Treasury bill rate (r^f) and the Carhart factors are from Kenneth French's Web site. The sample for the failure probability deciles is from January 1976 to December 2011 (432 months). All the other portfolios are from January 1972 to December 2011 (480 months).

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
						Panel A: SUE							
a_q	−0.01	0.00	0.06	0.08	0.01	−0.05	0.09	0.00	0.04	0.18	0.19	0.05	0.88
t_{a_q}	−0.07	0.02	0.64	0.90	0.06	−0.50	1.14	−0.04	0.49	2.16	1.24	(0.61)	
						Panel B: $IVOL$							
a_q	−0.22	−0.02	−0.01	0.00	−0.02	0.03	0.29	0.23	0.45	0.15	0.37	0.14	0.86
t_{a_q}	−2.28	−0.19	−0.12	0.02	−0.18	0.28	2.48	1.99	2.71	0.70	1.35	(0.01)	
						Panel C: Failure probability							
a_q	0.04	−0.16	−0.17	−0.08	0.07	0.16	0.24	0.38	0.40	0.26	0.22	0.20	0.87
t_{a_q}	0.25	−1.82	−2.06	−0.91	0.92	1.69	2.11	2.29	3.00	0.96	0.60	(0.00)	
						Panel D: Net stock issues							
a_q	0.26	−0.06	0.07	−0.08	−0.06	0.07	0.30	0.32	0.09	0.00	−0.25	0.13	0.85
t_{a_q}	2.51	−0.80	0.50	−0.93	−0.68	0.81	2.87	3.17	0.84	0.05	−1.62	(0.00)	
						Panel E: Composite issuance							
a_q	−0.02	0.10	−0.04	−0.32	−0.02	0.16	0.21	0.18	0.06	−0.11	−0.09	0.12	0.85
t_{a_q}	−0.17	0.96	−0.40	−3.65	−0.22	1.68	1.75	1.78	0.63	−1.17	−0.62	(0.01)	
						Panel F: Abnormal corporate investment							
a_q	0.31	0.40	0.29	−0.02	0.08	−0.19	−0.17	−0.16	0.19	0.07	−0.24	0.19	0.86
t_{a_q}	1.84	3.13	3.08	−0.22	0.85	−1.99	−1.63	−1.89	2.03	0.66	−1.22	(0.00)	
						Panel G: Total accruals (scaled by average total assets)							
a_q	0.25	0.18	0.17	0.06	0.06	−0.07	0.10	−0.08	−0.07	0.06	−0.19	0.11	0.86
t_{a_q}	1.75	1.49	2.12	0.56	0.67	−0.82	1.29	−0.91	−0.79	0.54	−1.04	(0.10)	
						Panel H: Industries							
	NoDur	Durbl	Manuf	Enrgy	HiTec	Telcm	Shops	Hlth	Tils	Other			
a_q	−0.07	−0.25	−0.13	0.00	0.61	0.27	−0.06	−0.12	−0.11	−0.27		0.19	0.68
t_{a_q}	−0.54	−1.27	−1.46	0.00	3.82	1.44	−0.38	−0.70	−0.65	−2.79		(0.00)	

A The Definition of Failure Probability

We construct the failure probability (distress) measure following Campbell, Hilscher, and Szilagyi (2008, the third column in Table IV):

$$\text{Distress}(t) \equiv -9.164 - 20.264\, NIMTAAVG_t + 1.416\, TLMTA_t - 7.129\, EXRETAVG_t$$

$$+ 1.411\, SIGMA_t - 0.045\, RSIZE_t - 2.132\, CASHMTA_t + 0.075\, MB_t - 0.058\, PRICE_t \qquad \text{(A.1)}$$

$$NIMTAAVG_{t-1,t-12} \equiv \frac{1-\phi^3}{1-\phi^{12}} \left(NIMTA_{t-1,t-3} + \cdots + \phi^9 NIMTA_{t-10,t-12}\right) \qquad \text{(A.2)}$$

$$EXRETAVG_{t-1,t-12} \equiv \frac{1-\phi}{1-\phi^{12}} \left(EXRET_{t-1} + \cdots + \phi^{11} EXRET_{t-12}\right), \qquad \text{(A.3)}$$

in which $\phi = 2^{-1/3}$. $NIMTA$ is net income (Compustat quarterly item NIQ) divided by the sum of market equity and total liabilities (item LTQ). The moving average $NIMTAAVG$ is designed to capture the idea that a long history of losses is a better predictor of bankruptcy than one large quarterly loss in a single month. $EXRET \equiv \log(1+R_{it}) - \log(1+R_{\text{S\&P500},t})$ is the monthly log excess return on each firm's equity relative to the S&P 500 index. The moving average $EXRETAVG$ is designed to capture the idea that a sustained decline in stock market value is a better predictor of bankruptcy than a sudden stock price decline in a single month.

$TLMTA$ is the ratio of total liabilities (Compustat quarterly item LTQ) divided by the sum of market equity and total liabilities. $SIGMA$ is the annualized three-month rolling sample standard deviation: $\sqrt{\frac{252}{N-1} \sum_{k \in \{t-1,t-2,t-3\}} r_k^2}$, in which k is the index of trading days in months $t-1, t-2$, and $t-3$, r_k^2 is the firm-level daily return, and N is the total number of trading days in the three-month period. $SIGMA$ is treated as missing if there are less than five nonzero observations over the three months in the rolling window. $RSIZE$ is the relative size of each firm measured as the log ratio of its market equity to that of the S&P 500 index. $CASHMTA$, used to capture the liquidity position of the firm, is the ratio of cash and short-term investments (item CHEQ) divided by the sum of market equity and total liabilities. MB is the market-to-book equity, in which book equity is measured in the same way as the denominator of ROE. Following Campbell et al., we add 10% of the difference between market and book equity to the book equity to alleviate measurement issues for extremely small book equity values. For firm-month observations that still have negative book equity after this adjustment, we replace these negative values with \$1 to ensure that the market-to-book ratios for these firms are in the right tail of the distribution. $PRICE$ is each firm's log price per share, truncated above at \$15. We further eliminate stocks with prices less than \$1 at the portfolio formation date. Following Campbell et al., we winsorize the variables in the right-hand side of equation (A.1) at the 5th and 95th percentiles of their pooled distribution across all firm-month observations.

B Alternative Construction of Testing Portfolios

In Section 3, we construct testing portfolios using the NYSE breakpoints and value-weighted returns. As noted, this empirical design alleviates the impact of microcaps and small stocks. However, some prominent papers that first document the anomalies use the NYSE-Amex-NASDAQ breakpoints and equal-weighted returns. In this appendix, we evaluate the performance of difference factor models, using alternative constructions of the testing portfolios. The main finding is that the alternative constructions tend to increase the magnitude of the anomalies. However, the basic result that the q-factor model is competitive with the traditional factor models remains unchanged.

B.1 Post-earnings-announcement Drift, Equal-weighted Six-month Returns

Chan, Jegadeesh, and Lakonishok (1996) use equal-weighted six-month holding-period returns after portfolio formation when constructing the SUE deciles. (Chan et al. also use the NYSE breakpoints.) We redo the tests in Section 3.1 while matching exactly their research design.

Specifically, at the beginning of each month t, we rank all NYSE, Amex, and NASDAQ stocks into deciles by their most recent past SUE with the NYSE breakpoints. Monthly equal-weighted six-month holding-period returns on the SUE deciles are calculated from month t to $t+5$, and the portfolios are rebalanced at the beginning of month $t+1$. Table B.1 shows that equal-weighting returns makes the SUE effect stronger. The high-minus-low SUE decile earns an average return of 0.74% per month, which is more than six standard errors from zero. The CAPM beta and the Fama-French factor loadings are all negative, going in the wrong direction in explaining the average returns. The high-minus-low alpha rises to 0.88% in the Fama-French model, which is more than eight standard errors from zero. The Carhart model helps with a positive WML loading. The high-minus-low alpha drops to 0.60%, which is still more than five standard errors from zero. The q-factor model outperforms the Carhart model in reducing the high-minus-low alpha to 0.36% per month, albeit still significant ($t = 2.80$). However, the m.a.e. is 0.41%, which is larger than 0.34% in the Carhart model. Finally, all the factor models are strongly rejected by the GRS test.

B.2 Idiosyncratic Volatility, the NYSE-Amex-NASDAQ Breakpoints

Ang, Hodrick, Xing, and Zhang (2006) use all NYSE-Amex-NASDAQ breakpoints to form deciles on idiosyncratic volatility. We redo the tests in Section 3.1 using this alternative construction of the $IVOL$ deciles. Table B.2 shows that using the NYSE-Amex-NASDAQ breakpoints makes the $IVOL$ effect stronger. The high-minus-low decile earns an average return of -1.34% per month, which is more than three standard errors from zero. In contrast, this average return is only -0.54% ($t = -1.51$) with the NYSE breakpoints (see Table 3).

The traditional factor models fail to explain the $IVOL$ effect. In the CAPM, four out of ten deciles have significant alphas. The m.a.e. is 0.41% per month. And the high-minus-low decile has an alpha of -1.73%, which is more than 4.5 standard errors from zero. In the Fama-French model, five out of ten deciles have significant alphas. The m.a.e. is also 0.41%. The high-minus-low decile has a Fama-French alpha of -1.77%, which is more than six standard errors from zero. In the Carhart model, four out of ten deciles have significant alphas. The m.a.e. drops to 0.29%. The high-minus-low decile has a Carhart alpha of -1.37%, which is more than four standard errors from zero.

Although outperforming the traditional models, the q-factor model also fails to explain the $IVOL$ effect. Two out of ten deciles have significant alphas. The m.a.e. drops further to 0.18%. All four factor models are strongly rejected by the GRS test. The high-minus-low alpha in the q-factor model is -0.68%, which is slightly more than two standard errors from zero. Although still large, this alpha represents a reduction of 50% in magnitude from the Carhart alpha of -1.37%.

B.3 Financial Distress, the NYSE-Amex-NASDAQ Breakpoints

Campbell, Hilscher, and Szilagyi (2008) use all NYSE-Amex-NASDAQ breakpoints to form deciles on failure probability. We redo the tests in Section 3.1 using this alternative construction of the distress deciles. Table B.3 shows that using the NYSE-Amex-NASDAQ breakpoints makes the distress effect stronger. The high-minus-low decile earns an average return of -0.96% per month, which is slightly more than two standard errors from zero. In contrast, this average return is only -0.57% ($t = -1.42$) with the NYSE breakpoints (see Table 4).

The traditional factor models fail to explain the distress effect. In the CAPM, four out of ten deciles have significant alphas. The m.a.e. is 0.33% per month, and the high-minus-low decile has an alpha of -1.45%, which is more than 3.5 standard errors from zero. In the Fama-French model, six out of ten deciles have significant alphas. The m.a.e. is 0.43%, and the high-minus-low alpha inflates to -1.92%, which is about six standard errors from zero. In the Carhart model, three out of ten deciles have significant alphas. The m.a.e. drops to 0.21%, and the high-minus-low alpha drops to -0.93%, which is more than three standard errors from zero.

The q-factor model again outperforms the traditional factor models. Two out of ten deciles have significant alphas. The m.a.e. drops further to 0.18%. The high-minus-low alpha falls to -0.28%, which is within one standard error of zero. Although still sizable, this alpha represents a reduction of 70% in magnitude from the Carhart alpha of -0.93%.

B.4 Composite Issuance, the NYSE-Amex-NASDAQ Breakpoints, Equal-weighted Returns

Daniel and Titman (2006) document the negative relation between composite issuance and average stock returns using the Fama-MacBeth (1973) cross-sectional regressions. This practice is similar to a portfolio approach with all NYSE-Amex-NASDAQ breakpoints and equal-weighted portfolio returns. Table B.4 reports factor regressions of the composite issuance deciles constructed from this alternative design. Doing so again increases the magnitude of the anomaly. The average return of the high-minus-low decile is -0.74% per month, which is more than three standard errors from zero.

The CAPM produces a large high-minus-low alpha of -0.96% per month ($t = -4.88$) and a large m.a.e. of 0.46%. In the Fama-French model, the HML loading of the high-minus-low decile -0.40, which goes in the right direction in explaining the average return. However, using equal-weighted returns produces a large SMB loading of 0.70, which goes in the wrong direction. As such, the high-minus-low decile has a Fama-French alpha of -0.84%, which is 5.5 standard errors from zero. The m.a.e. is reduced to 0.26%. Relative to the Fama-French model, the Carhart model reduces the high-minus-low alpha in magnitude to -0.64% ($t = -3.79$), but increases the m.a.e. to 0.36%. Both the Fama-French model and the Carhart model are rejected by the GRS test.

The q-factor model reduces the high-minus-low alpha in magnitude further to -0.28% per month, which is within 1.5 standard errors from zero. The m.a.e. is 0.36%, which is the same as that in the Carhart model. As in Table 6, the investment factor continues to help with a loading of -0.75 for the high-minus-low decile, which is more than five standard errors from zero. Using equal-weighted returns also brings the ROE factor to work. The high-minus-low decile has an ROE factor loading of -0.63, which is more than 4.5 standard errors from zero.

B.5 Abnormal Corporate Investment, the NYSE-Amex-NASDAQ Breakpoints, Equal-weighted Returns

We show in Section 3.1 that Titman, Wei, and Xie's (2004) abnormal corporate investment does not produce a significant average return spread with the NYSE breakpoints and value-weighted returns. Table B.5 shows that with the NYSE-Amex-NASDAQ breakpoints and equal-weighting, the high-minus-low decile earns an average return of -0.39% per month, which is more than four standard errors from zero. The high-minus-low alphas are significant in both the CAPM and the Fama-French model, which are in turn rejected by the GRS test.

The q-factor model performs about as well as the Carhart model. The high-minus-low alpha is -0.30% in the q-factor model, which is slightly higher than -0.28% in the Carhart model. The m.a.e. is 0.34% in the q-factor model, which is comparable with 0.33% in the Carhart model. However, both models are still strongly rejected by the GRS test. Also, the m.a.e. is 0.19% in the Fama-French model, which is lower than those from the Carhart model and the q-factor model.

B.6 Total Accruals, the NYSE-Amex-NASDAQ Breakpoints, Equal-weighted Returns

Table B.6 reports the results for the accrual deciles constructed with the NYSE-Amex-NASDAQ breakpoints and equal-weighted returns, as in Sloan (1996). The average return of the high-minus-low decile is -0.78% per month, which is more than five standard errors from zero. This average return is more than doubled in magnitude from -0.30% with the NYSE breakpoints and value-weighted returns. The traditional factor loadings of the high-minus-low decile are all close to zero, giving rise to alphas that are close in magnitude to the average return.

As in the benchmark case with the NYSE breakpoints and value-weighted returns, the q-factor model struggles to explain the accrual effect. The high-minus-low alpha is -0.92% per month, which is almost six standard errors from zero. This alpha is larger in magnitude than the Fama-French alpha of -0.76% and the Carhart alpha of -0.75%. In addition, the m.a.e. is 0.47% in the q-factor model, which is higher than 0.25% in the Fama-French model and 0.38% in the Carhart model. The culprit is again the ROE factor loading. The high-minus-low decile has an ROE factor loading of 0.39, which is almost 4.5 standard errors from zero, going in the wrong direction in explaining the average return. Although going in the right direction, the investment factor loading for the high-minus-low decile is only -0.24.

B.7 Size and Momentum, the NYSE-Amex-NASDAQ Breakpoints, Equal-weighted Returns

Jegadeesh and Titman (1993) use all NYSE-Amex-NASDAQ breakpoints to sort stocks into price momentum portfolios, and equal-weight the portfolio returns. We redo the tests in Section 3.2 using this alternative design. However, when equal-weighting returns, we also follow Jegadeesh and Titman in excluding stocks with price under $5. Including these stocks produces a large and negative January effect, which reduces greatly the magnitude of the equal-weighted momentum profits. (Value-weighting returns as in Section 3.2 is immune to this issue.)

Table B.7 shows that using the NYSE-Amex-NASDAQ breakpoints and equal-weighted returns increases momentum profits by about ten basis points on average. For example, the average winner-minus-loser return across the five size quintiles is 0.80% per month, compared to 0.70% with the NYSE breakpoints and value-weighted returns (see Table 10). The changes in the CAPM alphas and the Fama-French alphas have similar magnitudes.

Focusing on the performance of the q-factor model relative to the Carhart model, we count nine out of 25 individual portfolios and two out of five winner-minus-loser portfolios that have significant alphas in the Carhart model. The m.a.e. is 0.11% per month, and the Carhart model is rejected by the GRS test. In comparison, Table B.8 shows that two out of 25 individual portfolios and one out of five winner-minus-loser portfolios have significant alphas in the q-factor model. The m.a.e. is 0.13% per month, and the model is again rejected by the GRS test. Similar to Table 11, the ROE factor loadings again provide the sole source of explanatory power for the q-factor model.

C Additional One-way Deciles

C.1 Momentum

Table C.1 reports the results for one-way momentum deciles. At the beginning of each month t, we use the NYSE breakpoints to split all NYSE, Amex, and NASDAQ stocks into deciles based on their prior six-month returns from month $t-2$ to $t-7$. Skipping month $t-1$, we calculate monthly value-weighted returns for the portfolios from month t to $t+5$.

From Table C.1, the winner-minus-loser decile earns an average return of 0.87% per month ($t = 3.15$). The CAPM alpha and the Fama-French alpha for the winner-minus-loser decile are 0.93% and 1.13%, respectively, which are both more than 3.5 standard errors from zero. The m.a.e. in the CAPM is 0.17%, and that in the Fama-French model is 0.19%. Both models are strongly rejected by the GRS test. The Carhart model performs extremely well for the one-way momentum deciles. The winner-minus-loser alpha is only 0.05%, which is within 0.5 standard errors of zero. The m.a.e. is only 0.10%, but the model is still rejected by the GRS test.

The q-factor model seems largely comparable with the Carhart model. The winner-minus-loser alpha is 0.23% per month, which is within one standard error of zero. The m.a.e. is 0.09%, but the model is rejected by the GRS test. None of the individual deciles has a significant alpha in the q-factor model, in contrast to three in the Carhart model. The average R^2 in the q-factor model is 89%, which is slightly lower than 94% in the Carhart model.

Table C.2 repeats the exercise but with the momentum deciles formed with the NYSE-Amex-NASDAQ breakpoints and equal-weighted portfolio returns, as in Jegadeesh and Titman (1993). We again exclude stocks with price under \$5. This alternative design increases the average winner-minus-loser return to 1.32% per month, which is more than 5.5 standard errors from zero. The CAPM and the Fama-French model produce alphas of 1.36% and 1.50%, respectively, both of which are more than six standard errors from zero. The Carhart model reduces the winner-minus-loser alpha to 0.56% ($t = 4.15$). The m.a.e. is 0.13%, dropping from 0.29% in the Fama-French model.

The q-factor model again performs similarly as the Carhart model. The winner-minus-loser alpha is 0.61% per month. Although large, this alpha is within 1.8 standard errors from zero. The m.a.e. is 0.11%, which is comparable to 0.13% in the Carhart model. The average R^2 is 93%, which is again comparable to 96% in the Carhart model. Finally, three out of ten deciles have significant alphas in the q-factor model, in contrast to six in the Carhart model.

C.2 Book-to-Market

In June of each year t, we use the NYSE breakpoints to split the NYSE, Amex, and NASDAQ stocks into deciles on book-to-market equity. Book-to-market for June of year t is the book equity for the fiscal year ending in calendar year $t-1$ divided by the market equity at the end of December of $t-1$. Monthly value-weighted portfolio returns are computed from July of year t to June of $t+1$, and the portfolios are rebalanced in June. Book equity is stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (Compustat annual item TXDITC) if available, minus the book value of preferred stock. The stockholders' equity is the value reported by Compustat (item SEQ), if it is available. If not, we measure stockholders' equity as the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock.

Table C.3 shows that the value-minus-growth decile earns an average return of 0.68% per month, which is more than 2.5 standard errors from zero. The value-minus-growth alpha in the CAPM is 0.72% (t = 2.88). The m.a.e. is 0.23%, and the model is rejected by the GRS test. Both the Fama-French model and the Carhart model succeed in explaining the value premium. The value-minus-growth alpha is −0.03% (t = −0.19) and the m.a.e. is 0.07% in both models, which are in turn not rejected by the GRS test. The q-factor model delivers a value-minus-growth alpha of 0.19% per month, which is within one standard error of zero. The m.a.e. is 0.09%, and the model is not rejected by the GRS test (p-value = 0.24). As in the Fama-French model and in the Carhart model, none of the individual deciles has a significant alpha in the q-factor model.

C.3 Investment-to-Assets, $\triangle A/A$

We measure $\triangle A/A$ as annual change in total assets (Compustat annual item AT) divided by lagged total assets. In June of each year t, we use the NYSE breakpoints to split the NYSE, Amex, and NASDAQ stocks into deciles on $\triangle A/A$ for the fiscal year ending in calendar year $t-1$. Monthly value-weighted portfolio returns are computed from July of year t to June of $t+1$, and the portfolios are rebalanced in June. Table C.4 shows that the high-minus-low decile earns an average return of −0.41% per month (t = −2.32). The CAPM alpha is −0.49%, which is more than 2.5 standard errors from zero. The m.a.e. for the CAPM is 0.17%, and the CAPM is rejected by the GRS test.

The Fama-French model explains the investment effect with a high-minus-low alpha of −0.14% per month, which is within one standard error from zero. The Carhart model also does well with a small high-minus-low alpha of −0.07%. The m.a.e. is 0.12% in the Fama-French model and 0.10% in the Carhart model, but both models are still rejected by the GRS test. The q-factor model's performance is largely comparable. The high-minus-low alpha is 0.14% (t = 1.03), and the m.a.e. is 0.09%. However, the model is also rejected by the GRS test.

When documenting the investment effect, Cooper, Gulen, and Schill (2008) use the NYSE-Amex-NASDAQ breakpoints and both equal-weighted and value-weighted returns. Table C.5 uses such breakpoints and equal-weighted returns. The high-minus-low decile earns an average return of −1.49% per month (t = −6.65). All the factor models fail to explain such a large spread. The Carhart model produces a high-minus-low alpha of −1.30%, which is almost six standard errors from zero, and an m.a.e. of 0.43%. The q-factor model produces a high-minus-low alpha of −1.47% (t = −5.89) and an m.a.e. of 0.49%. The reason why all the factor models fail to explain the equal-weighted returns across the investment deciles is that microcaps dominate the equal-weighted investment effect (e.g., Fama and French (2008)). In contrast, all the common factors are based on value-weighted returns, on which the impact of microcaps is negligible.

Using value-weighted returns limits the influence of microcaps. Table C.6 shows that with value-weighted returns, the average return of the high-minus-low decile is only -0.56% per month ($t = -2.80$), dropping from -1.49% with equal-weighted returns. The CAPM continues to fail, but the Fama-French model and the Carhart model explain the value-weighted investment effect. The high-minus-low alphas are -0.29% and -0.23%, respectively, both of which are insignificant. The m.a.e. is 0.13% in the Fama-French model and 0.12% in the Carhart model. The q-factor model reduces the high-minus-low alpha somewhat to -0.16%, which is within one standard error of zero, and the m.a.e. is 0.11%, which is comparable to 0.12% in the Carhart model.

C.4 *ROE*

At the beginning of each month, we sort all stocks into deciles based on the NYSE breakpoints of the ranked values of ROE. Earnings and other accounting variables in Compustat quarterly files are used in the monthly sorts in the months immediately after the most recent public earnings announcement dates (Compustat quarterly item RDQ). We calculate monthly value-weighted portfolio returns for the current month, and the portfolios are rebalanced monthly. The measure of ROE is the same as in Section 2.

Table C.7 shows that high ROE stocks earn higher returns on average than low ROE stocks. The high-minus-low decile earns an average return of 0.81% per month, which is more than three standard errors from zero. The CAPM, the Fama-French model, and the Carhart model all fail to explain the ROE effect, with the high-minus-low alphas of $0.97\%, 1.19\%$, and 0.86%, respectively, which are close to or more than four standard errors from zero. The m.a.e.'s are 0.18%, 0.25%, and 0.16%, respectively, and the models are all rejected by the GRS test.

The q-factor model seems to outperform the traditional factor models. The high-minus-low alpha is only 0.03% per month ($t = 0.25$). The m.a.e. is 0.10%, dropping from 0.16% in the Carhart model. However, the model is still rejected by the GRS test.

D Alternative Value Portfolios

In Section 3.2, we have shown that the q-factor model performs roughly as well as the Fama-French model and the Carhart model in explaining the average returns across the 25 size and book-to-market portfolios. In this appendix, we extend this basic finding to additional testing portfolios, which Fama and French (1996) show that their three-factor model does a good job in explaining.

D.1 Market Leverage

Table D.1 reports the results for the market leverage (A/ME) deciles. We measure A/ME as the ratio of total book assets (Compustat annual item AT) to the market equity (price per share times number of shares outstanding from CRSP). In June of each year t, we use the NYSE breakpoints to sort NYSE, Amex, and NASDAQ stocks into deciles on A/ME, in which A is total assets for the fiscal year ending in calendar year $t-1$ and ME is the market equity at the end of December of $t-1$. Monthly value-weighted portfolio returns are calculated from July of year t to June of year $t+1$, and the portfolios are rebalanced in June. The high-minus-low decile earns an average return of 0.42% per month ($t = 1.78$). The high-minus-low alpha is 0.40% ($t = 1.66$) in the CAPM, which also produces an m.a.e. of 0.21%. The Fama-French model reduces the m.a.e. to 0.11%, but the high-minus-low alpha becomes significantly negative, -0.32% ($t = -2.40$). The Carhart model reduces the m.a.e. further to 0.07%, and the high-minus-low alpha is -0.23%, which is insignificant. In the q-factor model, the m.a.e. is 0.06%, and the high-minus-low alpha is -0.10%. Also, both the CAPM and the Fama-French model are rejected by the GRS test, whereas the Carhart model and the q-factor model are not, with p-values 0.05 and 0.32, respectively.

D.2 Reversal

Table D.2 shows that the q-factor model is again comparable with the Carhart model in explaining the reversal (prior 13–60 month returns) deciles. At the beginning of each month t, we use the NYSE breakpoints to split the NYSE, Amex, and NASDAQ stocks into deciles on the prior returns from month $t-13$ to $t-60$. Monthly value-weighted portfolio returns are computed, and the portfolios are rebalanced monthly. The average return and the alphas for the high-minus-low deciles are all insignificant. The m.a.e. is somewhat high, 0.21% per month in the CAPM, but is largely comparable among the other three models, around 0.11%. Finally, while the CAPM and the Fama-French model are rejected by the GRS test, the Carhart model and the q-factor model are not.

D.3 Earnings-to-Price

Table D.3 reports the results for the earnings-to-price (E/P) deciles. In June of each year t, we use the NYSE breakpoints to split all NYSE, Amex, and NASDAQ stocks into deciles based on E/P, calculated as total earnings before extraordinary items (Compustat annual item IB) for the last fiscal year end in $t-1$ divided by the market equity at the end of December of year $t-1$. Stocks with negative earnings for the last fiscal year end in $t-1$ are excluded. We calculate monthly value-weighted portfolio returns from July of year t to June of $t+1$, and the portfolios are rebalanced in June. Table D.3 shows that high E/P stocks earn higher average returns than low E/P stocks. The average return spread of 0.58% is more than 2.5 standard errors from zero. The CAPM fails to explain the E/P effect. The model is rejected by the GRS test, and the high-minus-low alpha is 0.68% ($t = 2.98$). Both the Fama-French model and the Carhart model do a good job. The high-minus-low alphas are both close to zero, and the GRS test fails to reject the models. The q-factor model also performs well. The high-minus-low alpha is somewhat higher, 0.17%, but is within one standard error of zero. The model is not rejected by the GRS test either. All three multifactor models deliver comparable m.a.e.'s, around 0.10%.

E Annually Rebalanced Testing Portfolios on Earnings Surprise, Idiosyncratic Volatility, Financial Distress, and Momentum

We show that the original earnings surprise, idiosyncratic volatility, financial distress, and momentum anomalies vanish, once we change the rebalancing frequency of the testing portfolios from monthly to annual. We use the breakpoints and weighting schemes of returns following the original papers that document these anomalies, as in Appendix B. As such, the only difference in portfolio construction from Appendix B is that in this appendix, we follow the Fama-French (1993) timing convention in constructing the testing portfolios with annual sorts.

Specifically, in June of each year t, we use the NYSE breakpoints to sort all NYSE, Amex, and NASDAQ stocks into ten deciles based on the ranked values of SUE measured at the fiscal yearend of $t-1$. Monthly equal-weighted returns are calculated from July of year t to June of $t+1$ and the portfolios are rebalanced in June. In June of each year t, we use the NYSE-Amex-NASDAQ breakpoints to sort all stocks into deciles based on the ranked values of $IVOL$ calculated with the information up to December of year $t-1$. Separately, in June of year t, we use the NYSE-Amex-NASDAQ breakpoints to sort all stocks into deciles based on the Campbell, Hilscher, and Szilagyi (2008) failure probability calculated at the fiscal yearend of $t-1$. Monthly value-weighted returns are calculated from July of year t to June of $t+1$, and the portfolios are rebalanced in June. Finally, in June of each year t, we use the NYSE-Amex-NASDAQ breakpoints to sort all stocks into quintiles based on the prior returns from July of year $t-1$ to December of year $t-1$. Independently, we use the NYSE breakpoints to sort all stocks into quintiles based on the market equity at the end of December of year $t-1$. Taking intersections, we obtain 25 size and momentum portfolios. Monthly equal-weighted returns are calculated from July of year t to June of $t+1$, and the portfolios are rebalanced in June. Due to data limitations, we start the sample in July 1972 for the SUE deciles and in July 1976 for the distress deciles. The samples for the $IVOL$ deciles and for the 25 size and momentum portfolios both start in January 1972, as in the case for most testing portfolios studied in the paper.

Table E.1 shows that none of the annually rebalanced portfolios earn significant average returns or CAPM alphas. All of the high-minus-low average returns and CAPM alphas are within 1.5 standard errors of zero. In particular, Panel D shows that winners with high prior returns earn insignificantly lower returns on average than losers with low prior returns. This evidence suggests that momentum profits are short-lived, consistent with Chan, Jegadeesh, and Lakonishok (1996).

Table B.1 : Factor Regressions for Monthly Percent Excess Returns of Deciles Formed on Foster, Olsen, and Shevlin's (1984) Standardized Unexpected Earnings (SUE), Equal-weighted Six-month Holding-period Returns (1/1972–12/2011, 480 Months)

SUE is the change in the most recently announced quarterly earnings per share from its value announced four quarters ago divided by the standard deviation of the change in quarterly earnings over the prior eight quarters (at least six quarters). At the beginning of each month t, we rank all NYSE, Amex, and NASDAQ stocks into deciles by their most recent past SUE with the NYSE breakpoints. Monthly equal-weighted six-month holding-period returns on the SUE portfolios are calculated from month t to $t+5$, and the portfolios are rebalanced monthly. We report mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i\, MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + w^i\, WML_t + \epsilon_t^i$) and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across the testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the Gibbons, Ross, and Shanken (1989) test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. The data on the one-month Treasury bill rate (r^f) and the Carhart factors are from Kenneth French's Web site. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	0.51	0.53	0.69	0.76	0.91	1.04	1.07	1.13	1.13	1.24	0.74		
t_{Mean}	1.47	1.66	2.12	2.35	2.83	3.30	3.49	3.76	3.74	4.20	6.24		
α	−0.03	0.02	0.16	0.24	0.40	0.52	0.56	0.62	0.62	0.73	0.76	0.39	0.75
β	1.18	1.14	1.15	1.15	1.15	1.14	1.13	1.13	1.13	1.13	−0.05	(0.00)	
t_α	−0.16	0.11	1.03	1.53	2.55	3.54	3.97	4.56	4.42	5.46	7.06		
α_{FF}	−0.29	−0.23	−0.09	−0.01	0.14	0.28	0.34	0.45	0.45	0.59	0.88	0.29	0.92
b	1.06	1.03	1.04	1.03	1.04	1.04	1.03	1.01	1.02	1.03	−0.04	(0.00)	
s	0.95	0.90	0.91	0.92	0.89	0.85	0.79	0.77	0.76	0.68	−0.28		
h	0.31	0.30	0.30	0.30	0.31	0.29	0.27	0.17	0.16	0.13	−0.18		
$t_{\alpha_{FF}}$	−2.65	−2.65	−1.08	−0.11	1.76	3.67	4.69	6.76	6.58	7.85	8.29		
α_{CARH}	0.06	0.03	0.14	0.22	0.32	0.42	0.47	0.55	0.52	0.66	0.60	0.34	0.94
b	0.99	0.97	0.99	0.99	1.00	1.01	1.01	0.99	1.01	1.01	0.02	(0.00)	
s	0.95	0.90	0.91	0.92	0.89	0.85	0.79	0.77	0.76	0.68	−0.28		
h	0.19	0.21	0.22	0.22	0.25	0.24	0.22	0.14	0.14	0.11	−0.08		
w	−0.37	−0.28	−0.24	−0.24	−0.19	−0.15	−0.13	−0.10	−0.07	−0.07	0.30		
$t_{\alpha_{CARH}}$	0.46	0.31	1.47	2.17	3.81	5.13	5.95	7.27	6.63	7.83	5.27		
α_q	0.26	0.19	0.26	0.34	0.40	0.49	0.47	0.55	0.51	0.62	0.36	0.41	0.93
β_{MKT}	0.98	0.96	0.99	0.98	1.00	1.00	1.01	1.00	1.01	1.02	0.03	(0.00)	
β_{ME}	0.73	0.73	0.75	0.74	0.75	0.74	0.71	0.70	0.71	0.65	−0.08		
$\beta_{\triangle A/A}$	−0.03	−0.01	0.07	0.09	0.16	0.15	0.17	0.07	0.06	0.03	0.06		
β_{ROE}	−0.69	−0.53	−0.49	−0.50	−0.40	−0.33	−0.25	−0.20	−0.14	−0.08	0.61		
t_{α_q}	1.44	1.26	1.90	2.40	3.57	4.67	4.76	5.59	5.33	5.95	2.80		
$t_{\beta_{MKT}}$	27.30	30.24	34.24	32.92	36.22	38.13	37.65	40.12	43.43	38.27	1.35		
$t_{\beta_{ME}}$	10.28	10.62	10.86	12.07	11.41	12.22	10.94	13.25	15.62	10.14	−2.10		
$t_{\beta_{\triangle A/A}}$	−0.20	−0.04	0.66	0.76	1.80	1.88	2.03	0.95	0.81	0.36	0.77		
$t_{\beta_{ROE}}$	−6.75	−6.27	−6.54	−6.43	−7.09	−6.13	−4.78	−3.57	−2.47	−1.33	8.01		

Table B.2 : Factor Regressions for Monthly Percent Excess Returns of Deciles Formed on Ang, Hodrick, Xing, and Zhang's (2006) Idiosyncratic Volatility ($IVOL$), All NYSE-Amex-NASDAQ Breakpoints (1/1972–12/2011, 480 Months)

$IVOL$ is the standard deviation of the residuals from the Fama-French three-factor regression. We form value-weighted deciles each month by sorting all stocks on their $IVOL$ computed using daily returns over the previous month (with a minimum of 15 daily observations). We use the NYSE-Amex-NASDAQ breakpoints. We hold the $IVOL$ deciles for one month, and rebalance the portfolios monthly. The data on the one-month Treasury bill rate (r^f), the Fama-French factors, and the momentum factor are from Kenneth French's Web site. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i\, MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + w^i\, WML_t + \epsilon_t^i$) and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the Gibbons, Ross, and Shanken (1989) test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	0.51	0.51	0.55	0.55	0.63	0.39	0.39	0.03	−0.22	−0.83	−1.34		
t_{Mean}	2.87	2.52	2.33	2.02	2.05	1.09	1.00	0.08	−0.48	−1.67	−3.13		
α	0.18	0.11	0.08	0.02	0.05	−0.24	−0.28	−0.68	−0.96	−1.54	−1.73	0.41	0.79
β	0.72	0.88	1.05	1.17	1.29	1.39	1.49	1.58	1.62	1.57	0.85	(0.00)	
t_α	2.26	1.76	1.24	0.21	0.43	−1.55	−1.48	−3.39	−3.77	−4.85	−4.72		
α_{FF}	0.17	0.11	0.10	0.06	0.13	−0.16	−0.18	−0.60	−0.95	−1.61	−1.77	0.41	0.86
b	0.78	0.91	1.04	1.11	1.18	1.21	1.27	1.33	1.34	1.29	0.51	(0.00)	
s	−0.23	−0.14	−0.04	0.20	0.34	0.59	0.76	0.89	1.19	1.29	1.51		
h	0.08	0.02	−0.04	−0.13	−0.24	−0.29	−0.39	−0.39	−0.30	−0.17	−0.26		
$t_{\alpha_{FF}}$	2.43	2.00	1.51	0.72	1.37	−1.41	−1.27	−3.87	−5.00	−6.21	−6.20		
α_{CARH}	0.12	0.11	0.14	0.11	0.16	−0.06	−0.01	−0.40	−0.58	−1.25	−1.37	0.29	0.87
b	0.79	0.91	1.04	1.10	1.17	1.19	1.23	1.29	1.26	1.21	0.42	(0.00)	
s	−0.23	−0.14	−0.04	0.20	0.34	0.59	0.76	0.90	1.19	1.29	1.51		
h	0.10	0.03	−0.05	−0.15	−0.25	−0.32	−0.44	−0.45	−0.43	−0.30	−0.40		
w	0.05	0.01	−0.04	−0.05	−0.03	−0.11	−0.18	−0.21	−0.38	−0.37	−0.43		
$t_{\alpha_{CARH}}$	1.65	1.92	1.98	1.34	1.72	−0.50	−0.07	−2.76	−2.72	−4.25	−4.22		
α_q	0.02	0.03	0.13	0.13	0.28	0.14	0.23	−0.07	−0.12	−0.66	−0.68	0.18	0.87
β_{MKT}	0.79	0.92	1.04	1.11	1.17	1.20	1.24	1.29	1.26	1.21	0.42	(0.01)	
β_{ME}	−0.17	−0.11	−0.05	0.16	0.28	0.44	0.58	0.67	0.84	0.86	1.03		
$\beta_{\triangle A/A}$	0.23	0.07	−0.09	−0.25	−0.45	−0.54	−0.73	−0.77	−0.81	−0.59	−0.81		
β_{ROE}	0.13	0.10	0.01	−0.03	−0.11	−0.32	−0.43	−0.58	−0.97	−1.22	−1.35		
t_{α_q}	0.29	0.55	1.59	1.35	2.77	1.09	1.46	−0.47	−0.57	−2.30	−2.08		
$t_{\beta_{MKT}}$	46.50	51.75	41.73	43.37	55.92	40.39	30.25	30.03	21.19	17.90	5.63		
$t_{\beta_{ME}}$	−5.48	−3.70	−0.87	3.51	7.50	8.21	8.10	9.25	9.33	7.65	8.52		
$t_{\beta_{\triangle A/A}}$	3.03	1.21	−1.26	−3.93	−7.00	−6.20	−6.16	−5.84	−5.29	−2.77	−3.10		
$t_{\beta_{ROE}}$	2.54	2.64	0.37	−0.71	−2.08	−4.16	−5.03	−6.17	−6.79	−6.56	−6.09		

Table B.3 : Factor Regressions for Monthly Percent Excess Returns of Deciles Formed on Campbell, Hilscher, and Szilagyi's (2008) Failure Probability, All NYSE-Amex-NASDAQ Breakpoints (1/1976–12/2011, 432 Months)

We use the NYSE-Amex-NASDAQ breakpoints to sort all stocks at the beginning of each month into deciles on the most recent failure probability. (Appendix A contains detailed the variable definition.) Earnings and other accounting variables for a fiscal quarter are used in portfolio sorts in the months immediately after the quarter's public earnings announcement dates (Compustat quarterly item RDQ). Monthly value-weighted returns on the portfolios are calculated for the current month, and the portfolios are rebalanced monthly. The data on the one-month Treasury bill rate (r^f), the Fama-French factors, and the momentum factor are from Kenneth French's Web site. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i MKT_t + s^i SMB_t + h^i HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i MKT_t + s^i SMB_t + h^i HML_t + w^i WML_t + \epsilon_t^i$) and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i MKT_t + \beta_{ME}^i r_{ME,t} + \beta_{\triangle A/A}^i r_{\triangle A/A,t} + \beta_{ROE}^i r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the Gibbons, Ross, and Shanken (1989) test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	0.72	0.55	0.61	0.55	0.61	0.55	0.55	0.41	−0.04	−0.24	−0.96		
t_{Mean}	3.11	2.65	2.81	2.48	2.50	1.89	1.72	1.05	−0.08	−0.42	−2.07		
α	0.22	0.06	0.09	0.01	0.04	−0.11	−0.15	−0.41	−0.97	−1.23	−1.45	0.33	0.79
β	0.89	0.88	0.93	0.97	1.04	1.17	1.27	1.48	1.68	1.77	0.88	(0.00)	
t_α	2.12	0.86	1.42	0.14	0.45	−0.80	−1.00	−1.99	−3.60	−3.53	−3.77		
α_{FF}	0.31	0.14	0.15	0.03	0.04	−0.13	−0.20	−0.50	−1.14	−1.61	−1.92	0.43	0.82
b	0.85	0.88	0.94	0.97	1.03	1.15	1.21	1.36	1.55	1.60	0.75	(0.00)	
s	0.00	−0.13	−0.15	−0.03	0.02	0.15	0.29	0.63	0.77	1.33	1.33		
h	−0.20	−0.12	−0.06	−0.02	−0.02	0.00	−0.02	−0.06	0.06	0.29	0.49		
$t_{\alpha_{FF}}$	3.07	2.09	2.28	0.37	0.50	−0.99	−1.36	−2.79	−4.97	−5.80	−5.96		
α_{CARH}	0.09	0.01	0.10	0.04	0.20	0.12	0.10	−0.09	−0.54	−0.84	−0.93	0.21	0.87
b	0.89	0.90	0.95	0.97	1.00	1.10	1.15	1.28	1.44	1.45	0.56	(0.00)	
s	−0.03	−0.14	−0.16	−0.03	0.04	0.19	0.32	0.69	0.85	1.43	1.46		
h	−0.12	−0.07	−0.05	−0.03	−0.08	−0.09	−0.12	−0.20	−0.15	0.02	0.14		
w	0.25	0.15	0.06	−0.02	−0.18	−0.29	−0.34	−0.47	−0.69	−0.88	−1.14		
$t_{\alpha_{CARH}}$	0.98	0.19	1.56	0.58	2.14	1.05	0.68	−0.59	−3.10	−3.35	−3.29		
α_q	0.02	−0.13	0.00	0.03	0.27	0.28	0.38	0.36	−0.09	−0.26	−0.28	0.18	0.86
β_{MKT}	0.89	0.93	0.97	0.98	1.00	1.10	1.14	1.25	1.42	1.43	0.54	(0.00)	
β_{ME}	0.12	−0.05	−0.11	−0.04	−0.05	0.00	0.09	0.33	0.40	0.82	0.70		
$\beta_{\triangle A/A}$	−0.20	0.05	0.05	0.02	−0.16	−0.14	−0.34	−0.51	−0.36	−0.12	0.08		
β_{ROE}	0.39	0.26	0.15	−0.03	−0.21	−0.46	−0.58	−0.90	−1.19	−1.64	−2.03		
t_{α_q}	0.11	−1.63	0.05	0.38	1.95	1.99	2.48	1.89	−0.33	−0.70	−0.59		
$t_{\beta_{MKT}}$	28.87	46.78	55.44	53.34	38.52	32.68	32.00	26.42	21.43	17.55	5.49		
$t_{\beta_{ME}}$	1.59	−1.48	−3.49	−1.49	−1.04	−0.03	1.23	2.91	2.16	4.34	2.80		
$t_{\beta_{\triangle A/A}}$	−1.44	0.76	0.99	0.46	−1.55	−1.29	−2.13	−2.46	−1.41	−0.39	0.19		
$t_{\beta_{ROE}}$	5.32	6.00	3.98	−0.75	−2.94	−6.57	−7.51	−8.62	−8.04	−6.83	−6.98		

Table B.4 : Factor Regressions for Monthly Percent Excess Returns of Deciles Formed on Composite Issuance, All NYSE-Amex-NASDAQ Breakpoints and Equal-weighted Returns (1/1972–12/2011, 480 Months)

We measure composite issuance as as the growth rate in the market equity not attributable to the stock return, $\log(ME_t/ME_{t-5}) - r(t-5,t)$. For June of year t, $r(t-5,t)$ is the cumulative log return on the stock from the last trading day of June in year $t-5$ to the last trading day of June in year t, and ME_t is the market equity on the last trading day of June in year t from CRSP. In June of each year t, we use the NYSE-Amex-NASDAQ breakpoints to sort all stocks into deciles on composite issuance for the fiscal year ending in calendar year $t-1$. Monthly equal-weighted portfolio returns are calculated from July of year t to June of year $t+1$, and the portfolios are rebalanced in June. The data on the one-month Treasury bill rate (r^f) and the Carhart factors are from Kenneth French's Web site. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i\, MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + w^i\, WML_t + \epsilon_t^i$), and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the Gibbons, Ross, and Shanken (1989) test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	1.06	0.99	0.92	1.01	0.98	1.02	1.06	0.93	0.75	0.32	−0.74		
t_{Mean}	4.42	4.34	3.63	3.71	3.40	3.11	2.96	2.63	2.03	0.78	−3.14		
α	0.67	0.60	0.50	0.56	0.51	0.50	0.49	0.35	0.16	−0.29	−0.96	0.46	0.73
β	0.86	0.86	0.93	0.99	1.04	1.14	1.25	1.27	1.30	1.34	0.48	(0.00)	
t_α	5.45	5.32	4.01	4.30	3.67	3.06	2.69	2.04	0.86	−1.28	−4.88		
α_{FF}	0.35	0.31	0.20	0.29	0.28	0.23	0.25	0.18	0.00	−0.49	−0.84	0.26	0.90
b	0.88	0.88	0.93	0.95	0.96	1.04	1.10	1.11	1.12	1.15	0.27	(0.00)	
s	0.47	0.43	0.54	0.64	0.73	0.88	1.02	0.98	1.04	1.17	0.70		
h	0.53	0.48	0.48	0.40	0.28	0.35	0.25	0.12	0.07	0.13	−0.40		
$t_{\alpha_{FF}}$	4.44	4.74	2.74	4.23	3.78	2.60	2.58	1.77	0.04	−3.16	−5.50		
α_{CARH}	0.44	0.38	0.30	0.39	0.44	0.42	0.43	0.35	0.21	−0.20	−0.64	0.36	0.91
b	0.86	0.87	0.90	0.93	0.92	1.00	1.07	1.08	1.08	1.09	0.22	(0.00)	
s	0.47	0.43	0.54	0.64	0.73	0.88	1.02	0.98	1.04	1.17	0.70		
h	0.50	0.46	0.44	0.36	0.22	0.28	0.19	0.07	0.00	0.03	−0.47		
w	−0.10	−0.07	−0.11	−0.10	−0.17	−0.20	−0.19	−0.18	−0.22	−0.30	−0.21		
$t_{\alpha_{CARH}}$	5.10	5.59	4.15	5.14	5.16	4.38	3.94	3.08	1.96	−1.19	−3.79		
α_q	0.36	0.25	0.20	0.35	0.46	0.46	0.58	0.47	0.37	0.08	−0.28	0.36	0.90
β_{MKT}	0.85	0.87	0.90	0.91	0.93	1.00	1.05	1.08	1.08	1.08	0.23	(0.00)	
β_{ME}	0.44	0.43	0.53	0.61	0.62	0.75	0.87	0.83	0.86	0.91	0.47		
$\beta_{\triangle A/A}$	0.55	0.53	0.44	0.29	0.16	0.20	−0.04	−0.08	−0.16	−0.20	−0.75		
β_{ROE}	−0.13	−0.03	−0.07	−0.13	−0.29	−0.37	−0.42	−0.42	−0.51	−0.76	−0.63		
t_{α_q}	3.39	2.80	1.69	3.25	3.45	3.75	4.26	3.44	2.70	0.42	−1.40		
$t_{\beta_{MKT}}$	26.88	32.90	28.54	37.46	31.38	29.58	29.41	33.98	32.10	23.15	4.56		
$t_{\beta_{ME}}$	5.88	6.57	6.54	11.31	9.32	9.18	11.13	13.35	14.02	11.05	7.34		
$t_{\beta_{\triangle A/A}}$	6.51	7.80	4.63	3.40	1.45	2.09	−0.41	−0.79	−1.63	−1.38	−5.31		
$t_{\beta_{ROE}}$	−1.97	−0.65	−1.14	−2.18	−3.98	−5.51	−5.66	−5.52	−6.38	−6.55	−4.94		

Table B.5 : Factor Regressions for Monthly Percent Excess Returns of Deciles Formed on Abnormal Corporate Investment, All NYSE-Amex-NASDAQ Breakpoints, Equal-weighted Returns (1/1972–12/2011, 480 Months)

We measure abnormal corporate investment (ACI) that applies for the portfolio formation year t, as $ACI_{t-1} \equiv 3CE_{t-1}/(CE_{t-2}+CE_{t-3}+CE_{t-4}) - 1$, in which CE_{t-1} is capital expenditure (Compustat annual item CAPX) scaled by its sales (item SALE) in year $t-1$. In June of each year t, we use the NYSE-Amex-NASDAQ breakpoints to sort all stocks into deciles on ACI for the fiscal year ending in calendar year $t-1$. Monthly equal-weighted portfolio returns are calculated from July of year t to June of year $t+1$, and the portfolios are rebalanced in June. The data on the one-month Treasury bill rate (r^f), the Fama-French factors, and the momentum factor are from Kenneth French's Web site. We report the mean monthly percent excess returns, the CAPM regressions ($r^i_t - r^f_t = \alpha^i + \beta^i MKT_t + \epsilon^i_t$), the Fama-French three-factor regressions ($r^i_t - r^f_t = \alpha^i_{FF} + b^i MKT_t + s^i SMB_t + h^i HML_t + \epsilon^i_t$), the Carhart four-factor regressions ($r^i_t - r^f_t = \alpha^i_{CARH} + b^i MKT_t + s^i SMB_t + h^i HML_t + w^i WML_t + \epsilon^i_t$), and the q-factor regressions ($r^i_t - r^f_t = \alpha^i_q + \beta^i_{MKT} MKT_t + \beta^i_{ME} r_{ME,t} + \beta^i_{\triangle A/A} r_{\triangle A/A,t} + \beta^i_{ROE} r_{ROE,t} + \epsilon^i_t$). m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the Gibbons, Ross, and Shanken (1989) test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. See the caption of Table 1 for the description of $r_{\triangle A/A}$, r_{ROE}, and r_{ME}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	1.08	1.02	0.98	0.97	0.95	0.87	0.89	0.89	0.87	0.69	−0.39		
t_{Mean}	3.01	3.12	3.25	3.38	3.34	3.18	3.23	3.06	2.91	2.12	−4.01		
α	0.55	0.51	0.47	0.48	0.47	0.40	0.40	0.39	0.37	0.18	−0.38	0.42	0.76
β	1.17	1.12	1.11	1.07	1.06	1.04	1.07	1.11	1.12	1.14	−0.03	(0.00)	
t_α	2.78	2.93	3.32	3.54	3.64	3.45	3.48	3.09	2.65	1.08	−4.02		
α_{FF}	0.25	0.22	0.23	0.24	0.22	0.16	0.17	0.16	0.13	−0.06	−0.31	0.19	0.91
b	1.05	1.02	1.03	1.00	1.02	0.99	1.03	1.05	1.03	1.04	−0.01	(0.00)	
s	1.04	0.91	0.79	0.71	0.62	0.62	0.57	0.63	0.76	0.85	−0.20		
h	0.38	0.36	0.30	0.32	0.35	0.33	0.33	0.32	0.31	0.29	−0.09		
$t_{\alpha_{FF}}$	2.06	2.59	3.13	3.35	3.11	2.78	2.39	2.22	1.70	−0.68	−3.30		
α_{CARH}	0.43	0.33	0.42	0.38	0.37	0.28	0.33	0.32	0.29	0.16	−0.28	0.33	0.93
b	1.01	1.00	0.99	0.97	0.99	0.97	1.00	1.02	1.00	0.99	−0.02	(0.00)	
s	1.04	0.91	0.79	0.71	0.62	0.62	0.57	0.63	0.76	0.85	−0.20		
h	0.32	0.32	0.23	0.28	0.30	0.29	0.28	0.26	0.25	0.21	−0.10		
w	−0.20	−0.11	−0.19	−0.14	−0.15	−0.12	−0.16	−0.16	−0.17	−0.23	−0.03		
$t_{\alpha_{CARH}}$	3.10	3.35	5.50	4.66	4.63	5.23	4.59	4.38	3.67	1.52	−2.68		
α_q	0.52	0.36	0.43	0.36	0.34	0.25	0.29	0.27	0.32	0.22	−0.30	0.34	0.92
β_{MKT}	1.01	0.99	0.99	0.97	0.98	0.96	1.00	1.02	0.99	0.99	−0.01	(0.00)	
β_{ME}	0.88	0.81	0.68	0.63	0.56	0.57	0.52	0.57	0.68	0.71	−0.17		
$\beta_{\triangle A/A}$	0.23	0.24	0.14	0.24	0.24	0.23	0.23	0.21	0.12	0.10	−0.13		
β_{ROE}	−0.44	−0.26	−0.29	−0.22	−0.19	−0.16	−0.19	−0.19	−0.27	−0.40	0.03		
t_{α_q}	2.57	2.75	3.30	2.98	3.10	3.08	2.80	2.66	3.06	1.51	−2.49		
$t_{\beta_{MKT}}$	22.55	29.83	31.20	37.49	34.09	38.79	40.51	36.05	34.37	28.56	−0.48		
$t_{\beta_{ME}}$	9.33	9.17	8.19	10.69	7.31	8.68	7.53	7.71	8.85	8.52	−3.70		
$t_{\beta_{\triangle A/A}}$	1.36	2.06	1.28	2.53	2.61	3.26	2.66	2.57	1.34	0.88	−1.46		
$t_{\beta_{ROE}}$	−3.96	−3.70	−4.01	−3.42	−3.28	−3.50	−3.58	−3.21	−4.74	−4.98	0.44		

Table B.6 : Factor Regressions for Monthly Percent Excess Returns of Deciles Formed on Total Accruals, All NYSE-Amex-NASDAQ Breakpoints, Equal-weighted Returns (1/1972–12/2011, 480 Months)

Following Sloan (1996), we measure total accruals (TAC) as changes in noncash working capital minus depreciation expense scaled by average total assets (Compustat annual item AT) in the prior two years. The noncash working capital is the change in noncash current assets minus the change in current liabilities less short-term debt and taxes payable. Specifically, $TAC \equiv (\triangle CA - \triangle CASH) - (\triangle CL - \triangle STD - \triangle TP) - DP$, in which $\triangle CA$ is the change in current assets (item ACT), $\triangle CASH$ is the change in cash or cash equivalents (item CHE), $\triangle CL$ is the change in current liabilities (item LCT), $\triangle STD$ is the change in debt included in current liabilities (item DLC), $\triangle TP$ is the change in income taxes payable (item TXP), and DP is depreciation and amortization expense (item DP). In June of each year t, we use the NYSE-Amex-NASDAQ breakpoints to sort all stocks into deciles on total accruals scaled by average total assets for the fiscal year ending in calendar year $t-1$. Monthly equal-weighted portfolio returns are calculated from July of year t to June of year $t+1$, and the portfolios are rebalanced in June. The data on the one-month Treasury bill rate (r^f), the Fama-French factors, and the momentum factor are from Kenneth French's Web site. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i\, MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + w^i\, WML_t + \epsilon_t^i$), and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the Gibbons, Ross, and Shanken (1989) test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	1.21	0.99	1.12	1.06	0.95	0.90	0.83	0.84	0.80	0.42	−0.78		
t_{Mean}	2.84	2.92	3.56	3.55	3.30	3.13	2.75	2.63	2.39	1.08	−5.31		
α	0.62	0.47	0.62	0.56	0.49	0.43	0.34	0.33	0.26	−0.16	−0.78	0.43	0.71
β	1.30	1.16	1.11	1.09	1.03	1.05	1.09	1.13	1.20	1.29	−0.01	(0.00)	
t_α	2.39	2.59	3.96	3.95	3.55	3.23	2.32	2.17	1.56	−0.77	−5.42		
α_{FF}	0.41	0.23	0.38	0.33	0.25	0.18	0.11	0.13	0.09	−0.35	−0.76	0.25	0.90
b	1.09	1.04	1.02	1.00	0.96	0.98	0.98	1.00	1.04	1.10	0.01	(0.00)	
s	1.24	0.92	0.81	0.77	0.73	0.75	0.85	0.88	0.96	1.12	−0.12		
h	0.12	0.27	0.28	0.29	0.32	0.31	0.26	0.18	0.10	0.11	0.00		
$t_{\alpha_{FF}}$	2.37	2.06	4.30	4.33	3.07	2.78	1.62	1.75	1.12	−2.74	−5.00		
α_{CARH}	0.67	0.44	0.55	0.49	0.40	0.33	0.26	0.28	0.27	−0.08	−0.75	0.38	0.91
b	1.04	0.99	0.98	0.97	0.92	0.95	0.95	0.97	1.00	1.04	0.01	(0.00)	
s	1.24	0.92	0.81	0.77	0.73	0.75	0.85	0.88	0.96	1.12	−0.12		
h	0.03	0.20	0.22	0.24	0.26	0.26	0.21	0.13	0.04	0.02	−0.01		
w	−0.27	−0.22	−0.18	−0.17	−0.16	−0.15	−0.15	−0.16	−0.19	−0.28	−0.02		
$t_{\alpha_{CARH}}$	3.27	3.43	5.34	5.86	4.64	4.62	3.42	3.28	3.14	−0.53	−4.70		
α_q	0.99	0.56	0.63	0.54	0.45	0.39	0.32	0.36	0.37	0.07	−0.92	0.47	0.91
β_{MKT}	1.04	1.00	0.98	0.97	0.92	0.94	0.94	0.97	1.00	1.04	−0.01	(0.00)	
β_{ME}	0.92	0.73	0.66	0.65	0.63	0.64	0.75	0.77	0.83	0.95	0.02		
$\beta_{\triangle A/A}$	−0.09	0.15	0.19	0.21	0.19	0.17	0.05	−0.04	−0.17	−0.33	−0.24		
β_{ROE}	−0.84	−0.52	−0.42	−0.36	−0.32	−0.32	−0.28	−0.30	−0.34	−0.44	0.39		
t_{α_q}	4.14	3.59	5.19	5.14	4.51	4.34	2.97	3.26	2.85	0.31	−5.57		
$t_{\beta_{MKT}}$	20.02	28.48	33.02	38.04	38.48	35.79	39.11	35.34	31.46	22.07	−0.27		
$t_{\beta_{ME}}$	10.29	9.90	11.90	11.49	11.16	12.04	15.30	12.92	12.53	8.83	0.31		
$t_{\beta_{\triangle A/A}}$	−0.53	1.22	2.16	2.68	2.74	2.52	0.56	−0.47	−1.60	−1.86	−2.27		
$t_{\beta_{ROE}}$	−5.85	−6.00	−5.81	−6.43	−6.69	−6.42	−4.86	−4.93	−5.09	−3.74	4.45		

Table B.7 : Descriptive Statistics for Monthly Percent Excess Returns of 25 Size and Momentum Portfolios, All NYSE-Amex-NASDAQ Breakpoints for Momentum, Equal-weighted Returns (1/1972–12/2011, 480 Months)

At the beginning of month t, we use the NYSE-Amex-NASDAQ breakpoints to split all NYSE, Amex, and NASDAQ stocks into quintiles based on their prior six-month returns from month $t-2$ to $t-7$ (skipping month $t-1$). Independently, in June of each year t, we use the NYSE breakpoints to split on NYSE, Amex, and NASDAQ stocks into quintiles based on market equity observed at the end of June. Taking intersections, we form 25 size and momentum portfolios, and we calculate equal-weighted returns for the portfolios from month t to t+5. We report mean percent excess returns, the CAPM alphas (α), the intercepts (α_{FF}) from the Fama-French three-factor regressions, and the intercepts (α_{CARH}) from the Carhart four-factor regressions, as well as t-statistics adjusted for heteroscedasticity and autocorrelations. For each factor model, we report the mean absolute error (m.a.e., the average magnitude of the alphas) across the testing portfolios, the average goodness-of-fit ($\bar{R}^2$) across the testing portfolios, and the p-value (p_{GRS}) from the Gibbons, Ross, and Shanken (1989) test on the null that the alphas of all the portfolios are jointly zero. The data for the one-month Treasury bill rate (r^f) and the Carhart factors are from Kenneth French's Web site.

	Loser	2	3	4	Winner	W−L	Loser	2	3	4	Winner	W−L
	Mean						t_{Mean}					
Small	0.06	0.60	0.79	0.94	1.18	1.13	0.16	2.06	2.86	3.26	3.39	7.08
2	0.10	0.62	0.73	0.81	0.99	0.89	0.28	2.09	2.64	2.92	2.97	4.94
3	0.17	0.59	0.70	0.74	0.95	0.79	0.46	2.07	2.67	2.86	3.01	3.59
4	0.31	0.52	0.64	0.67	0.84	0.54	0.88	1.94	2.69	2.76	2.70	2.25
Big	0.08	0.42	0.45	0.52	0.75	0.68	0.23	1.72	2.13	2.43	2.60	2.71
	α (m.a.e. = 0.26)						t_α ($\bar{R}^2 = 0.78$, $p_{GRS} = 0$)					
Small	−0.48	0.16	0.37	0.49	0.63	1.12	−2.65	0.98	2.35	3.05	3.20	7.46
2	−0.52	0.11	0.24	0.31	0.40	0.92	−2.93	0.75	1.85	2.43	2.45	5.36
3	−0.46	0.09	0.21	0.26	0.38	0.84	−2.49	0.69	2.00	2.48	2.64	4.02
4	−0.31	0.03	0.18	0.19	0.29	0.59	−1.81	0.23	2.00	2.33	1.92	2.61
Big	−0.49	−0.04	0.02	0.09	0.24	0.73	−2.84	−0.50	0.38	1.65	1.77	2.92
	α_{FF} (m.a.e. = 0.22)						$t_{\alpha_{FF}}$ ($\bar{R}^2 = 0.88$, $p_{GRS} = 0$)					
Small	−0.73	−0.10	0.12	0.28	0.54	1.27	−7.18	−1.28	1.69	4.39	5.48	8.51
2	−0.68	−0.12	0.01	0.13	0.37	1.05	−5.49	−1.32	0.18	2.21	3.76	6.02
3	−0.59	−0.12	0.02	0.12	0.38	0.97	−3.67	−1.25	0.21	1.89	3.78	4.61
4	−0.37	−0.12	0.03	0.10	0.35	0.72	−2.27	−1.13	0.42	1.51	2.66	3.04
Big	−0.48	−0.09	−0.02	0.09	0.36	0.84	−2.65	−0.96	−0.24	1.48	2.78	3.28
	α_{CARH} (m.a.e. = 0.11)						$t_{\alpha_{CARH}}$ ($\bar{R}^2 = 0.93$, $p_{GRS} = 0$)					
Small	−0.37	0.04	0.17	0.21	0.31	0.68	−3.96	0.58	2.28	3.21	3.50	7.33
2	−0.20	0.10	0.09	0.08	0.11	0.31	−2.13	1.28	1.27	1.19	1.31	2.95
3	0.05	0.17	0.12	0.03	0.11	0.06	0.41	2.29	1.66	0.52	1.19	0.45
4	0.29	0.18	0.13	0.03	0.02	−0.27	2.43	2.14	1.57	0.34	0.18	−1.95
Big	0.16	0.22	0.09	−0.01	0.03	−0.13	1.30	3.47	1.34	−0.15	0.26	−0.90

Table B.8 : Q-factor Regressions for Monthly Percent Excess Returns of 25 Size and Momentum Portfolios, All NYSE-Amex-NASDAQ Breakpoints for Momentum, Equal-weighted Returns (1/1972–12/2011, 480 Months)

At the beginning of month t, we use the NYSE-Amex-NASDAQ breakpoints to split all NYSE, Amex, and NASDAQ stocks into quintiles based on their prior six-month returns from month $t-2$ to $t-7$ (skipping month $t-1$). Independently, in June of each year t, we use the NYSE breakpoints to split on NYSE, Amex, and NASDAQ stocks into quintiles based on market equity observed at the end of June. Taking intersections, we form 25 size and momentum portfolios, and we calculate equal-weighted returns for the portfolios from month t to t+5. We report the q-factor regressions: $r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$. See Table 1 for the description of $r_{\triangle A/A}$, r_{ROE}, and r_{ME}. The t-statistics are adjusted for heteroscedasticity and autocorrelations. m.a.e. is the average magnitude of the alphas across the testing portfolios. F_{GRS} and p_{GRS} are the test statistic and its p-value from the Gibbons, Ross, and Shanken (1989) test on the null that the alphas of all the testing portfolios are jointly zero. The data for the one-month Treasury bill rate (r^f) and the Carhart factors are from Kenneth French's Web site.

	Loser	2	3	4	Winner	W−L	Loser	2	3	4	Winner	W−L
	α_q (m.a.e. = 0.13)						t_{α_q} ($\bar{R}^2 = 0.89$, $p_{GRS} = 0$)					
Small	−0.30	0.03	0.14	0.24	0.46	0.76	−1.65	0.27	1.39	2.89	3.60	3.49
2	−0.15	0.01	0.00	0.03	0.19	0.34	−0.72	0.11	0.02	0.40	1.66	1.31
3	0.12	0.06	0.02	−0.02	0.19	0.07	0.47	0.46	0.18	−0.22	1.46	0.21
4	0.31	0.07	−0.01	−0.05	0.18	−0.13	1.28	0.53	−0.11	−0.65	1.05	−0.38
Big	0.19	0.08	−0.03	−0.03	0.26	0.08	0.82	0.63	−0.38	−0.59	1.60	0.22
	β_{MKT}						$t_{\beta_{MKT}}$					
Small	0.99	0.85	0.82	0.85	1.01	0.02	24.52	26.94	27.56	32.47	33.77	0.42
2	1.14	1.00	0.98	0.99	1.13	−0.01	26.20	34.94	40.11	43.48	41.52	−0.20
3	1.16	1.03	1.01	1.00	1.12	−0.04	22.42	29.18	33.52	43.44	35.02	−0.57
4	1.19	1.06	1.01	1.03	1.11	−0.09	19.93	28.99	34.94	43.39	26.44	−1.00
Big	1.16	1.03	0.98	0.98	1.07	−0.09	21.14	35.41	49.10	56.67	29.38	−1.15
	β_{ME}						$t_{\beta_{ME}}$					
Small	0.82	0.80	0.82	0.89	1.08	0.26	8.55	10.19	11.55	20.74	21.88	2.19
2	0.74	0.74	0.74	0.80	0.97	0.23	6.11	8.69	10.58	16.47	21.12	1.64
3	0.51	0.48	0.49	0.59	0.77	0.26	3.80	4.53	5.67	12.30	15.04	1.54
4	0.18	0.17	0.24	0.31	0.56	0.39	1.30	1.67	3.11	6.97	6.20	1.76
Big	−0.18	−0.14	−0.07	0.02	0.25	0.43	−1.73	−1.89	−1.38	0.84	2.83	2.35
	$\beta_{\triangle A/A}$						$t_{\beta_{\triangle A/A}}$					
Small	−0.08	0.13	0.18	0.10	−0.20	−0.12	−0.49	1.20	1.96	1.49	−2.21	−0.71
2	−0.31	0.10	0.16	0.10	−0.29	0.02	−1.72	0.99	2.12	2.07	−4.20	0.08
3	−0.46	0.09	0.17	0.09	−0.29	0.16	−2.16	0.84	2.06	1.87	−3.45	0.62
4	−0.34	0.10	0.23	0.12	−0.32	0.02	−1.73	0.94	2.86	2.35	−2.83	0.07
Big	−0.43	0.05	0.11	0.07	−0.39	0.05	−2.60	0.45	1.76	1.83	−3.40	0.18
	β_{ROE}						$t_{\beta_{ROE}}$					
Small	−0.52	−0.21	−0.09	−0.02	0.02	0.55	−5.30	−3.44	−1.74	−0.44	0.26	4.39
2	−0.60	−0.20	−0.02	0.07	0.19	0.79	−5.23	−3.33	−0.49	2.17	2.73	5.49
3	−0.73	−0.21	−0.01	0.14	0.24	0.97	−4.99	−2.73	−0.22	3.63	3.38	5.19
4	−0.76	−0.21	0.03	0.16	0.21	0.97	−5.48	−3.08	0.51	3.77	2.65	5.15
Big	−0.64	−0.17	0.02	0.13	0.17	0.82	−5.76	−2.76	0.51	3.76	2.11	4.94

Table C.1 : Factor Regressions for Monthly Percent Excess Returns of One-way Momentum Deciles (1/1972–12/2011, 480 Months)

At the beginning of each month t, we use the NYSE breakpoints to split all NYSE, Amex, and NASDAQ stocks into deciles based on their prior six-month returns from month $t-2$ to $t-7$. Skipping month $t-1$, we calculate monthly value-weighted returns for the portfolios from month t to $t+5$. We report the mean monthly percent excess returns, the CAPM regressions ($r^i_t - r^f_t = \alpha^i + \beta^i\, MKT_t + \epsilon^i_t$), the Fama-French three-factor regressions ($r^i_t - r^f_t = \alpha^i_{FF} + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + \epsilon^i_t$), the Carhart four-factor regressions ($r^i_t - r^f_t = \alpha^i_{CARH} + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + w^i\, WML_t + \epsilon^i_t$) and the q-factor regressions ($r^i_t - r^f_t = \alpha^i_q + \beta^i_{MKT}\, MKT_t + \beta^i_{ME}\, r_{ME,t} + \beta^i_{\triangle A/A}\, r_{\triangle A/A,t} + \beta^i_{ROE}\, r_{ROE,t} + \epsilon^i_t$). m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the GRS test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. The data on the one-month Treasury bill rate (r^f), the Fama-French factors, and the momentum factor are from Kenneth French's Web site. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Loser	2	3	4	5	6	7	8	9	Winner	W−L	m.a.e.	$\bar{R}^2$
Mean	0.00	0.27	0.43	0.50	0.44	0.45	0.49	0.54	0.64	0.87	0.87		
t_{Mean}	0.00	0.97	1.76	2.25	2.12	2.25	2.39	2.50	2.71	2.74	3.15		
α	−0.61	−0.23	−0.03	0.07	0.03	0.04	0.08	0.12	0.18	0.32	0.93	0.17	0.86
β	1.35	1.09	1.00	0.94	0.92	0.90	0.90	0.93	1.02	1.21	−0.14	(0.00)	
t_α	−3.50	−1.93	−0.30	0.99	0.45	0.85	1.69	1.93	2.34	2.17	3.59		
α_{FF}	−0.68	−0.28	−0.08	0.03	−0.01	0.01	0.06	0.12	0.21	0.44	1.13	0.19	0.88
b	1.28	1.09	1.03	0.98	0.95	0.94	0.93	0.94	1.00	1.07	−0.22	(0.00)	
s	0.41	0.08	−0.02	−0.06	−0.06	−0.08	−0.08	−0.03	0.04	0.37	−0.04		
h	0.06	0.09	0.11	0.10	0.10	0.08	0.06	0.01	−0.07	−0.34	−0.39		
$t_{\alpha_{FF}}$	−4.28	−2.34	−0.90	0.42	−0.22	0.23	1.03	1.79	2.71	3.33	4.42		
α_{CARH}	−0.02	0.17	0.25	0.24	0.11	0.04	−0.01	−0.04	−0.04	0.03	0.05	0.10	0.94
b	1.14	1.00	0.96	0.93	0.93	0.93	0.94	0.98	1.05	1.15	0.01	(0.00)	
s	0.41	0.08	−0.02	−0.06	−0.06	−0.08	−0.08	−0.03	0.04	0.37	−0.04		
h	−0.18	−0.07	−0.01	0.02	0.06	0.07	0.09	0.07	0.02	−0.19	−0.02		
w	−0.70	−0.47	−0.34	−0.22	−0.13	−0.02	0.07	0.17	0.26	0.43	1.13		
$t_{\alpha_{CARH}}$	−0.21	2.41	4.17	4.21	1.73	0.60	−0.17	−0.69	−0.65	0.33	0.44		
α_q	0.01	0.07	0.11	0.11	0.00	−0.07	−0.10	−0.10	−0.04	0.24	0.23	0.09	0.89
β_{MKT}	1.19	1.04	1.00	0.96	0.94	0.94	0.94	0.97	1.03	1.10	−0.09	(0.00)	
β_{ME}	0.16	−0.04	−0.08	−0.08	−0.06	−0.05	−0.02	0.04	0.12	0.43	0.27		
$\beta_{\triangle A/A}$	−0.34	−0.09	0.01	0.07	0.09	0.14	0.16	0.12	0.02	−0.41	−0.06		
β_{ROE}	−0.75	−0.36	−0.20	−0.09	0.00	0.09	0.15	0.23	0.28	0.28	1.03		
t_{α_q}	0.06	0.39	0.94	1.22	−0.06	−1.20	−1.63	−1.54	−0.44	1.31	0.65		
$t_{\beta_{MKT}}$	24.06	25.57	35.66	40.66	42.32	48.78	54.78	54.32	38.53	27.01	−1.10		
$t_{\beta_{ME}}$	1.49	−0.50	−1.22	−1.73	−1.15	−1.27	−0.58	1.62	3.19	4.69	1.44		
$t_{\beta_{\triangle A/A}}$	−2.41	−0.75	0.15	0.93	1.55	3.03	3.95	2.78	0.24	−3.16	−0.26		
$t_{\beta_{ROE}}$	−6.02	−4.11	−2.96	−1.49	0.03	2.48	4.44	6.69	5.11	3.27	5.40		

Table C.2 : Factor Regressions for Monthly Percent Excess Returns of One-way Momentum Deciles, All NYSE-Amex-NASDAQ Breakpoints, Equal-weighted Returns (1/1972–12/2011, 480 Months)

At the beginning of each month t, we use the NYSE-Amex-NASDAQ breakpoints to split all NYSE, Amex, and NASDAQ stocks into deciles based on their prior six-month returns from month $t-2$ to $t-7$. Skipping month $t-1$, we calculate monthly equal-weighted returns for the portfolios from month t to $t+5$. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i\, MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + w^i\, WML_t + \epsilon_t^i$) and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the GRS test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. The data on the one-month Treasury bill rate (r^f), the Fama-French factors, and the momentum factor are from Kenneth French's Web site. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Loser	2	3	4	5	6	7	8	9	Winner	W−L	m.a.e.	$\bar{R}^2$
Mean	−0.17	0.31	0.50	0.62	0.66	0.72	0.73	0.85	0.93	1.15	1.32		
t_{Mean}	−0.44	0.97	1.74	2.30	2.57	2.86	2.88	3.18	3.13	3.16	5.89		
α	−0.81	−0.23	0.01	0.15	0.21	0.27	0.28	0.37	0.41	0.55	1.36	0.33	0.78
β	1.41	1.18	1.08	1.03	1.00	1.00	1.01	1.06	1.14	1.34	−0.08	(0.00)	
t_α	−4.20	−1.61	0.08	1.31	1.86	2.53	2.58	3.25	2.98	2.88	6.37		
α_{FF}	−0.94	−0.41	−0.19	−0.05	0.01	0.09	0.11	0.24	0.33	0.56	1.50	0.29	0.92
b	1.25	1.09	1.02	0.97	0.95	0.93	0.93	0.95	0.99	1.09	−0.16	(0.00)	
s	0.92	0.73	0.65	0.59	0.57	0.59	0.62	0.68	0.81	1.01	0.09		
h	0.05	0.20	0.26	0.28	0.27	0.24	0.19	0.11	−0.02	−0.25	−0.31		
$t_{\alpha_{FF}}$	−6.65	−4.20	−2.32	−0.77	0.11	1.49	2.27	4.72	4.76	4.59	6.89		
α_{CARH}	−0.32	−0.02	0.08	0.12	0.12	0.12	0.07	0.12	0.11	0.23	0.56	0.13	0.96
b	1.12	1.00	0.96	0.94	0.92	0.93	0.94	0.97	1.03	1.16	0.04	(0.00)	
s	0.93	0.73	0.65	0.60	0.57	0.59	0.62	0.68	0.81	1.01	0.09		
h	−0.16	0.06	0.16	0.22	0.23	0.22	0.20	0.15	0.06	−0.14	0.02		
w	−0.65	−0.42	−0.29	−0.19	−0.12	−0.04	0.04	0.12	0.23	0.34	0.99		
$t_{\alpha_{CARH}}$	−2.57	−0.24	1.38	2.07	2.03	2.04	1.35	2.45	1.95	2.42	4.15		
α_q	−0.17	−0.01	0.03	0.05	0.03	0.06	0.03	0.13	0.20	0.44	0.61	0.11	0.93
β_{MKT}	1.15	1.02	0.97	0.94	0.93	0.92	0.93	0.96	1.00	1.12	−0.03	(0.00)	
β_{ME}	0.62	0.57	0.56	0.55	0.55	0.59	0.62	0.69	0.82	1.01	0.39		
$\beta_{\triangle A/A}$	−0.46	−0.11	0.05	0.14	0.17	0.15	0.13	0.06	−0.09	−0.39	0.08		
β_{ROE}	−0.85	−0.46	−0.27	−0.15	−0.06	−0.01	0.05	0.08	0.10	0.11	0.96		
t_{α_q}	−0.64	−0.07	0.19	0.46	0.33	0.81	0.55	2.21	2.33	2.83	1.76		
$t_{\beta_{MKT}}$	23.40	28.87	31.70	35.19	35.75	39.02	44.38	45.34	43.01	33.63	−0.44		
$t_{\beta_{ME}}$	4.70	5.41	5.95	6.79	7.08	9.34	13.40	21.20	22.91	14.14	2.15		
$t_{\beta_{\triangle A/A}}$	−2.01	−0.78	0.49	1.59	2.19	2.44	2.91	1.36	−1.66	−4.20	0.28		
$t_{\beta_{ROE}}$	−5.48	−5.42	−4.15	−3.10	−1.48	−0.22	1.62	2.27	1.78	1.21	5.01		

Table C.3 : Factor Regressions for Monthly Percent Excess Returns of One-way Book-to-Market Deciles (1/1972–12/2011, 480 Months)

Book equity is stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (Compustat annual item TXDITC) if available, minus the book value of preferred stock. The stockholders' equity is the value reported by Compustat (item SEQ), if it is available. If not, we measure stockholders' equity as the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock. In June of each year t, we use the NYSE breakpoints to split the NYSE, Amex, and NASDAQ stocks into deciles on book-to-market equity. Book-to-market for June of year t is the book equity for the fiscal year ending in calendar year $t-1$ divided by the market equity at the end of December of $t-1$. Monthly value-weighted portfolio returns are calculated from July of year t to June of $t+1$, and the portfolios are rebalanced at the end of June. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i MKT_t + s^i SMB_t + h^i HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i MKT_t + s^i SMB_t + h^i HML_t + w^i WML_t + \epsilon_t^i$) and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i MKT_t + \beta_{ME}^i r_{ME,t} + \beta_{\triangle A/A}^i r_{\triangle A/A,t} + \beta_{ROE}^i r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the GRS test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. The data on the one-month Treasury bill rate (r^f), the Fama-French factors, and the momentum factor are from Kenneth French's Web site. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	0.30	0.49	0.54	0.51	0.59	0.66	0.65	0.70	0.73	0.98	0.68		
t_{Mean}	1.15	2.12	2.39	2.09	2.76	3.00	3.02	3.15	3.12	3.54	2.73		
α	−0.18	0.04	0.10	0.05	0.18	0.24	0.26	0.32	0.34	0.54	0.72	0.23	0.80
β	1.06	1.00	0.98	1.00	0.91	0.92	0.85	0.84	0.87	0.96	−0.10	(0.03)	
t_α	−1.75	0.54	1.22	0.59	1.81	2.75	2.41	2.71	2.51	3.03	2.88		
α_{FF}	0.10	0.13	0.12	−0.05	0.09	0.13	0.02	0.03	−0.01	0.07	−0.03	0.07	0.87
b	0.99	0.97	0.97	1.03	0.95	0.95	0.93	0.93	0.96	1.06	0.07	(0.15)	
s	−0.17	−0.02	0.02	0.08	−0.02	0.07	0.11	0.15	0.21	0.41	0.57		
h	−0.53	−0.17	−0.04	0.20	0.20	0.22	0.46	0.56	0.65	0.86	1.39		
$t_{\alpha_{FF}}$	1.54	1.81	1.40	−0.59	0.90	1.44	0.27	0.32	−0.11	0.59	−0.19		
α_{CARH}	0.11	0.13	0.10	−0.07	0.06	0.10	0.04	−0.01	0.03	0.08	−0.03	0.07	0.87
b	0.98	0.97	0.97	1.03	0.96	0.96	0.92	0.93	0.96	1.06	0.07	(0.22)	
s	−0.17	−0.02	0.02	0.08	−0.02	0.07	0.11	0.15	0.21	0.41	0.57		
h	−0.53	−0.17	−0.04	0.20	0.20	0.22	0.45	0.57	0.64	0.86	1.39		
w	−0.01	−0.01	0.01	0.02	0.03	0.03	−0.02	0.04	−0.04	−0.01	0.00		
$t_{\alpha_{CARH}}$	1.63	1.84	1.22	−0.81	0.64	1.16	0.45	−0.09	0.28	0.63	−0.19		
α_q	0.03	−0.03	−0.01	−0.17	−0.02	0.15	0.10	0.03	0.12	0.22	0.19	0.09	0.84
β_{MKT}	1.02	1.00	0.99	1.02	0.96	0.94	0.89	0.89	0.91	1.00	−0.02	(0.24)	
β_{ME}	−0.13	0.02	0.06	0.13	0.00	0.05	0.09	0.17	0.17	0.32	0.44		
$\beta_{\triangle A/A}$	−0.59	−0.09	0.02	0.25	0.36	0.27	0.46	0.60	0.65	0.90	1.49		
β_{ROE}	0.18	0.16	0.13	0.10	0.03	−0.10	−0.15	−0.09	−0.24	−0.33	−0.51		
t_{α_q}	0.38	−0.33	−0.07	−1.84	−0.24	1.67	0.96	0.30	1.07	1.47	0.98		
$t_{\beta_{MKT}}$	48.71	53.76	34.28	36.38	32.13	38.33	33.92	33.17	34.03	27.06	−0.36		
$t_{\beta_{ME}}$	−4.01	0.69	1.78	3.29	−0.05	1.50	1.74	3.25	3.34	4.73	5.11		
$t_{\beta_{\triangle A/A}}$	−12.27	−1.71	0.28	3.33	4.98	4.60	4.62	5.98	7.25	9.52	12.39		
$t_{\beta_{ROE}}$	4.70	3.67	2.69	1.63	0.47	−2.16	−2.05	−1.36	−3.25	−5.12	−5.90		

Table C.4 : Factor Regressions for Monthly Percent Excess Returns of One-way Investment-to-Assets ($\triangle A/A$) Deciles (1/1972–12/2011, 480 Months)

$\triangle A/A$ is annual change in total assets (Compustat annual item AT) divided by lagged total assets. In June of each year t, we use the NYSE breakpoints to split the NYSE, Amex, and NASDAQ stocks into deciles on $\triangle A/A$ for the fiscal year ending in calendar year $t-1$. Monthly value-weighted portfolio returns are calculated from July of year t to June of $t+1$, and the portfolios are rebalanced in June. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i\, MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + w^i\, WML_t + \epsilon_t^i$) and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across the deciles. The numbers (in parentheses) are the p-values for the GRS test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. The data on the one-month Treasury bill rate (r^f) and the Carhart factors are from Kenneth French's Web site. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	0.69	0.72	0.65	0.54	0.52	0.56	0.52	0.51	0.49	0.28	−0.41		
t_{Mean}	2.41	3.13	3.23	2.69	2.59	2.64	2.43	2.24	1.84	0.91	−2.32		
α	0.19	0.29	0.26	0.16	0.14	0.15	0.10	0.06	−0.01	−0.30	−0.49	0.17	0.84
β	1.09	0.95	0.86	0.83	0.85	0.90	0.92	1.00	1.12	1.27	0.18	(0.00)	
t_α	1.53	3.06	2.81	1.91	1.81	1.84	1.37	0.81	−0.12	−2.65	−2.75		
α_{FF}	0.02	0.15	0.14	0.11	0.07	0.10	0.13	0.17	0.19	−0.12	−0.14	0.12	0.87
b	1.08	0.99	0.93	0.86	0.89	0.94	0.96	0.98	1.02	1.15	0.07	(0.00)	
s	0.33	0.09	−0.06	−0.04	−0.05	−0.11	−0.20	−0.09	0.05	0.19	−0.14		
h	0.26	0.26	0.27	0.12	0.14	0.14	−0.01	−0.21	−0.42	−0.40	−0.67		
$t_{\alpha_{FF}}$	0.22	1.74	1.50	1.28	0.99	1.34	1.73	2.46	2.21	−1.39	−0.98		
α_{CARH}	0.00	0.23	0.09	0.11	0.06	0.06	0.08	0.14	0.17	−0.08	−0.07	0.10	0.87
b	1.09	0.97	0.94	0.86	0.89	0.95	0.97	0.98	1.03	1.14	0.05	(0.02)	
s	0.33	0.09	−0.07	−0.04	−0.05	−0.11	−0.20	−0.09	0.05	0.19	−0.14		
h	0.27	0.23	0.29	0.12	0.14	0.15	0.01	−0.20	−0.42	−0.42	−0.69		
w	0.03	−0.08	0.05	0.00	0.01	0.03	0.05	0.04	0.02	−0.05	−0.07		
$t_{\alpha_{CARH}}$	−0.02	2.56	0.92	1.32	0.80	0.83	1.05	1.88	1.97	−0.87	−0.46		
α_q	−0.12	0.04	−0.14	0.03	0.01	−0.06	0.03	0.11	0.36	0.02	0.14	0.09	0.89
β_{MKT}	1.12	1.03	0.97	0.87	0.89	0.96	0.96	0.99	1.01	1.14	0.02	(0.01)	
β_{ME}	0.29	0.04	−0.03	−0.03	−0.04	−0.05	−0.15	−0.05	0.03	0.16	−0.13		
$\beta_{\triangle A/A}$	0.62	0.64	0.66	0.29	0.27	0.26	0.05	−0.31	−0.81	−0.73	−1.35		
β_{ROE}	−0.11	−0.14	0.12	−0.02	0.00	0.14	0.13	0.18	0.05	0.03	0.14		
t_{α_q}	−1.06	0.50	−1.59	0.33	0.08	−0.74	0.33	1.57	3.72	0.24	1.03		
$t_{\beta_{MKT}}$	41.75	45.59	38.03	37.10	41.02	50.35	48.76	44.01	52.01	36.81	0.57		
$t_{\beta_{ME}}$	5.48	1.04	−0.60	−0.47	−1.14	−1.54	−5.36	−1.44	0.64	3.14	−1.93		
$t_{\beta_{\triangle A/A}}$	9.93	12.24	10.25	4.82	5.35	3.86	0.72	−6.44	−10.79	−11.61	−15.01		
$t_{\beta_{ROE}}$	−2.14	−2.96	2.47	−0.40	0.07	2.53	3.05	4.93	1.51	0.59	2.06		

Table C.5 : Factor Regressions for Monthly Percent Excess Returns of One-way Investment-to-Assets ($\triangle A/A$) Deciles, All NYSE-Amex-NASDAQ Breakpoints, Equal-weighted Returns (1/1972–12/2011, 480 Months)

$\triangle A/A$ is annual change in total assets (Compustat annual item AT) divided by lagged total assets. In June of each year t, we use the NYSE-Amex-NASDAQ breakpoints to split stocks into deciles on $\triangle A/A$ for the fiscal year ending in calendar year $t-1$. Monthly equal-weighted portfolio returns are calculated from July of year t to June of $t+1$, and the portfolios are rebalanced in June. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i\, MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + w^i\, WML_t + \epsilon_t^i$) and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across the deciles. The numbers (in parentheses) are the p-values for the GRS test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. The data on the one-month Treasury bill rate (r^f) and the Carhart factors are from Kenneth French's Web site. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	1.53	1.30	1.19	1.05	0.99	0.93	0.82	0.79	0.50	0.04	−1.49		
t_{Mean}	3.18	3.46	3.75	3.72	3.58	3.37	2.90	2.59	1.48	0.11	−6.65		
α	0.94	0.79	0.71	0.59	0.54	0.46	0.33	0.27	−0.06	−0.59	−1.53	0.53	0.71
β	1.31	1.13	1.06	1.00	1.00	1.03	1.07	1.14	1.25	1.41	0.10	(0.00)	
t_α	2.92	3.46	4.20	4.30	4.06	3.63	2.66	2.01	−0.40	−2.96	−6.92		
α_{FF}	0.67	0.50	0.39	0.32	0.27	0.25	0.14	0.10	−0.19	−0.69	−1.35	0.35	0.89
b	1.07	0.98	0.99	0.94	0.95	0.95	0.98	1.03	1.10	1.21	0.14	(0.00)	
s	1.50	1.16	0.83	0.71	0.69	0.69	0.72	0.77	0.85	1.01	−0.49		
h	0.20	0.32	0.45	0.38	0.37	0.26	0.22	0.16	0.06	−0.05	−0.25		
$t_{\alpha_{FF}}$	2.91	3.50	4.17	4.36	4.23	3.74	2.33	1.48	−2.10	−5.03	−6.12		
α_{CARH}	0.95	0.70	0.58	0.46	0.41	0.35	0.25	0.24	0.01	−0.35	−1.30	0.43	0.90
b	1.01	0.94	0.95	0.91	0.92	0.93	0.95	1.00	1.05	1.13	0.13	(0.00)	
s	1.50	1.16	0.83	0.71	0.69	0.69	0.72	0.77	0.85	1.01	−0.49		
h	0.10	0.25	0.38	0.34	0.32	0.23	0.18	0.11	−0.01	−0.17	−0.27		
w	−0.30	−0.21	−0.20	−0.14	−0.14	−0.10	−0.12	−0.15	−0.22	−0.35	−0.06		
$t_{\alpha_{CARH}}$	3.64	4.25	5.07	5.67	5.73	4.86	3.92	3.45	0.15	−2.56	−5.95		
α_q	1.34	0.89	0.62	0.46	0.40	0.36	0.29	0.29	0.13	−0.13	−1.47	0.49	0.90
β_{MKT}	1.02	0.94	0.96	0.92	0.91	0.92	0.94	0.99	1.05	1.13	0.11	(0.00)	
β_{ME}	1.12	0.92	0.68	0.61	0.62	0.62	0.65	0.70	0.73	0.79	−0.33		
$\beta_{\triangle A/A}$	0.05	0.24	0.43	0.38	0.28	0.13	0.00	−0.11	−0.30	−0.58	−0.63		
β_{ROE}	−1.07	−0.68	−0.46	−0.31	−0.23	−0.18	−0.17	−0.20	−0.32	−0.55	0.51		
t_{α_q}	4.61	4.75	4.29	4.53	3.83	3.77	3.42	3.25	0.93	−0.60	−5.89		
$t_{\beta_{MKT}}$	17.64	26.46	28.71	34.82	36.92	42.03	40.41	38.57	32.47	24.73	2.60		
$t_{\beta_{ME}}$	12.57	15.46	8.19	9.74	11.19	13.85	11.68	11.33	8.76	7.37	−2.91		
$t_{\beta_{\triangle A/A}}$	0.27	1.69	3.68	4.43	3.53	1.82	0.01	−1.58	−2.67	−3.36	−3.85		
$t_{\beta_{ROE}}$	−6.88	−6.68	−5.59	−5.64	−4.03	−3.56	−3.78	−4.21	−4.65	−4.75	4.82		

Table C.6 : Factor Regressions for Monthly Percent Excess Returns of One-way Investment-to-Assets ($\triangle A/A$) Deciles, All NYSE-Amex-NASDAQ Breakpoints, Value-weighted Returns (1/1972–12/2011, 480 Months)

$\triangle A/A$ is annual change in total assets (Compustat annual item AT) divided by lagged total assets. In June of each year t, we use the NYSE-Amex-NASDAQ breakpoints to split stocks into deciles on $\triangle A/A$ for the fiscal year ending in calendar year $t-1$. Monthly value-weighted portfolio returns are calculated from July of year t to June of $t+1$, and the portfolios are rebalanced in June. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i MKT_t + s^i SMB_t + h^i HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i MKT_t + s^i SMB_t + h^i HML_t + w^i WML_t + \epsilon_t^i$) and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i MKT_t + \beta_{ME}^i r_{ME,t} + \beta_{\triangle A/A}^i r_{\triangle A/A,t} + \beta_{ROE}^i r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across the deciles. The numbers (in parentheses) are the p-values for the GRS test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. The data on the one-month Treasury bill rate (r^f) and the Carhart factors are from Kenneth French's Web site. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	0.77	0.64	0.75	0.60	0.55	0.52	0.55	0.50	0.46	0.22	−0.56		
t_{Mean}	2.38	2.45	3.43	3.12	2.71	2.48	2.56	1.98	1.60	0.67	−2.80		
α	0.24	0.19	0.33	0.22	0.16	0.11	0.12	0.01	−0.08	−0.38	−0.62	0.19	0.84
β	1.19	1.00	0.93	0.83	0.86	0.91	0.95	1.07	1.19	1.33	0.14	(0.00)	
t_α	1.45	1.54	3.52	2.75	2.36	1.34	1.87	0.13	−0.68	−2.93	−3.09		
α_{FF}	0.09	0.06	0.18	0.15	0.09	0.09	0.18	0.14	0.15	−0.20	−0.29	0.13	0.87
b	1.10	1.02	0.98	0.89	0.90	0.95	0.96	1.00	1.08	1.19	0.10	(0.00)	
s	0.63	0.16	0.06	−0.10	−0.06	−0.15	−0.14	0.05	0.06	0.24	−0.40		
h	0.15	0.23	0.30	0.17	0.17	0.07	−0.09	−0.27	−0.47	−0.42	−0.57		
$t_{\alpha_{FF}}$	0.62	0.48	2.01	1.99	1.42	1.23	2.78	1.75	1.66	−1.86	−1.63		
α_{CARH}	0.07	0.07	0.19	0.17	0.08	0.04	0.17	0.11	0.15	−0.16	−0.23	0.12	0.87
b	1.10	1.02	0.98	0.88	0.91	0.96	0.96	1.01	1.08	1.18	0.08	(0.00)	
s	0.63	0.16	0.06	−0.10	−0.06	−0.15	−0.14	0.05	0.06	0.24	−0.40		
h	0.16	0.23	0.29	0.16	0.17	0.09	−0.08	−0.26	−0.47	−0.43	−0.59		
w	0.02	−0.01	−0.01	−0.02	0.01	0.05	0.01	0.03	0.00	−0.05	−0.07		
$t_{\alpha_{CARH}}$	0.39	0.59	2.05	2.02	1.26	0.55	2.32	1.41	1.61	−1.46	−1.07		
α_q	0.06	−0.10	0.01	−0.04	0.07	−0.08	0.12	0.17	0.38	−0.09	−0.16	0.11	0.88
β_{MKT}	1.13	1.06	1.02	0.92	0.90	0.96	0.96	1.00	1.06	1.19	0.05	(0.00)	
β_{ME}	0.53	0.14	0.04	−0.09	−0.06	−0.09	−0.10	0.06	0.02	0.22	−0.30		
$\beta_{\triangle A/A}$	0.46	0.64	0.68	0.51	0.28	0.18	−0.12	−0.47	−0.91	−0.73	−1.19		
β_{ROE}	−0.28	−0.10	−0.05	0.04	−0.06	0.17	0.14	0.10	0.00	0.05	0.33		
t_{α_q}	0.39	−0.94	0.06	−0.47	1.09	−0.93	1.74	1.82	3.66	−0.81	−0.85		
$t_{\beta_{MKT}}$	23.46	42.77	44.87	45.60	49.90	48.02	54.40	44.04	37.43	39.19	1.05		
$t_{\beta_{ME}}$	6.92	2.95	1.03	−2.73	−2.22	−2.59	−4.09	1.45	0.45	4.64	−3.31		
$t_{\beta_{\triangle A/A}}$	3.95	10.00	12.02	9.72	6.36	2.34	−2.71	−6.97	−12.89	−11.17	−8.80		
$t_{\beta_{ROE}}$	−2.36	−2.15	−0.94	0.76	−1.71	2.78	4.26	1.95	0.11	0.93	2.56		

Table C.7 : Factor Regressions for Monthly Percent Excess Returns of One-way *ROE* Deciles (1/1972–12/2011, 480 Months)

ROE is income before extraordinary items (Compustat quarterly item IBQ) divided by one-quarter-lagged book equity. Book equity is the shareholders' equity, plus balance sheet deferred taxes and investment tax credit (item TXDITCQ) if available, minus the book value of preferred stock. Depending on availability, we use the stockholders' equity (item SEQQ), or common equity (item CEQQ) plus the carrying value of preferred stock (item PSTKQ), or total assets (item ATQ) minus liabilities (item LTQ) in that order as the shareholders' equity. We use redemption value (item PSTKRQ) if available, or carrying value for the book value of preferred stock. At the beginning of each month, we sort all stocks into deciles based on the NYSE breakpoints of the ranked values of *ROE*. Earnings and other accounting variables in Compustat quarterly files are used in the sorts in the months immediately after the most recent public earnings announcement dates (item RDQ). We calculate monthly value-weighted portfolio returns for the current month, and the portfolios are rebalanced monthly. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i MKT_t + s^i SMB_t + h^i HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i MKT_t + s^i SMB_t + h^i HML_t + w^i WML_t + \epsilon_t^i$) and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i MKT_t + \beta_{ME}^i r_{ME,t} + \beta_{\triangle A/A}^i r_{\triangle A/A,t} + \beta_{ROE}^i r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across the deciles. The numbers (in parentheses) are the p-values for the GRS test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. The data on the one-month Treasury bill rate (r^f) and the Carhart factors are from Kenneth French's Web site. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	−0.12	0.31	0.32	0.36	0.55	0.42	0.57	0.50	0.54	0.69	0.81		
t_{Mean}	−0.32	1.07	1.23	1.67	2.65	1.80	2.60	2.26	2.41	2.88	3.08		
α	−0.73	−0.20	−0.14	−0.06	0.14	−0.02	0.13	0.06	0.10	0.24	0.97	0.18	0.84
β	1.34	1.12	1.02	0.92	0.91	0.98	0.97	0.97	0.97	0.99	−0.35	(0.01)	
t_α	−3.93	−1.70	−1.41	−0.63	1.79	−0.26	1.80	0.84	1.37	2.40	3.96		
α_{FF}	−0.78	−0.30	−0.25	−0.15	0.08	−0.06	0.13	0.13	0.22	0.41	1.19	0.25	0.86
b	1.18	1.11	1.03	0.91	0.93	0.98	0.97	0.97	0.95	0.96	−0.22	(0.00)	
s	0.73	0.21	0.15	0.19	0.00	0.07	−0.01	−0.12	−0.13	−0.18	−0.91		
h	−0.07	0.15	0.19	0.14	0.12	0.05	0.00	−0.11	−0.22	−0.30	−0.23		
$t_{\alpha_{FF}}$	−4.73	−2.63	−2.39	−1.61	0.95	−0.69	1.90	1.74	3.42	4.36	5.36		
α_{CARH}	−0.55	−0.08	−0.07	−0.06	0.12	−0.04	0.15	0.08	0.12	0.31	0.86	0.16	0.87
b	1.14	1.07	1.00	0.90	0.93	0.97	0.97	0.98	0.97	0.98	−0.15	(0.00)	
s	0.73	0.21	0.15	0.19	0.00	0.07	−0.01	−0.12	−0.13	−0.18	−0.91		
h	−0.15	0.08	0.12	0.11	0.10	0.05	−0.01	−0.09	−0.19	−0.27	−0.12		
w	−0.24	−0.23	−0.20	−0.10	−0.04	−0.01	−0.02	0.05	0.10	0.11	0.35		
$t_{\alpha_{CARH}}$	−3.46	−0.75	−0.66	−0.64	1.42	−0.51	2.20	1.06	1.75	3.45	3.99		
α_q	0.00	0.21	0.27	0.04	0.14	−0.02	0.09	−0.08	0.07	0.04	0.03	0.10	0.90
β_{MKT}	1.12	1.06	0.97	0.89	0.93	0.98	0.98	1.00	0.97	1.02	−0.10	(0.02)	
β_{ME}	0.37	−0.01	−0.07	0.11	−0.04	0.03	0.00	−0.05	−0.05	−0.04	−0.41		
$\beta_{\triangle A/A}$	−0.32	0.06	0.02	0.10	0.19	0.07	0.01	−0.02	−0.26	−0.21	0.11		
β_{ROE}	−1.01	−0.67	−0.63	−0.27	−0.14	−0.07	0.05	0.24	0.27	0.49	1.51		
t_{α_q}	0.02	2.27	3.14	0.47	1.62	−0.22	1.17	−0.97	0.83	0.42	0.25		
$t_{\beta_{MKT}}$	33.22	42.75	31.04	35.44	39.77	46.98	47.09	54.39	49.86	57.02	−2.75		
$t_{\beta_{ME}}$	6.12	−0.20	−1.22	3.29	−1.28	1.13	−0.14	−1.73	−2.05	−1.24	−6.43		
$t_{\beta_{\triangle A/A}}$	−3.99	0.86	0.34	1.82	3.21	1.12	0.24	−0.29	−4.69	−3.76	1.01		
$t_{\beta_{ROE}}$	−16.84	−17.03	−10.90	−5.76	−2.99	−1.61	1.32	7.44	8.44	12.46	20.78		

Table D.1 : Factor Regressions for Monthly Percent Excess Returns of Deciles Formed on Market Leverage (A/ME) (1/1972–12/2011, 480 Months)

We measure A/ME as the ratio of total book assets (item AT) to the market equity. In June of each year t, we use the NYSE breakpoints to sort NYSE, Amex, and NASDAQ stocks into deciles on A/ME for the fiscal year ending in calendar year $t-1$. Monthly value-weighted portfolio returns are calculated from July of year t to June of year $t+1$, and the portfolios are rebalanced in June. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i\, MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + w^i\, WML_t + \epsilon_t^i$) and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the GRS test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. The data on the one-month Treasury bill rate (r^f), the Fama-French factors, and the momentum factor are from Kenneth French's Web site. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	0.32	0.39	0.54	0.60	0.73	0.54	0.70	0.68	0.73	0.74	0.42		
t_{Mean}	1.24	1.74	2.42	2.79	3.44	2.43	3.38	3.04	2.89	2.43	1.78		
α	−0.16	−0.05	0.10	0.18	0.31	0.12	0.32	0.30	0.32	0.24	0.40	0.21	0.80
β	1.07	0.96	0.97	0.92	0.93	0.91	0.83	0.85	0.91	1.12	0.05	(0.00)	
t_α	−1.54	−0.63	1.18	2.09	3.44	1.18	3.29	2.49	2.22	1.45	1.66		
α_{FF}	0.12	0.05	0.09	0.12	0.21	−0.06	0.13	0.00	−0.06	−0.20	−0.32	0.11	0.87
b	0.98	0.94	0.98	0.95	0.98	0.98	0.90	0.96	1.03	1.21	0.23	(0.00)	
s	−0.10	−0.08	−0.02	0.01	−0.05	0.04	0.03	0.08	0.12	0.40	0.50		
h	−0.55	−0.17	0.01	0.13	0.21	0.37	0.38	0.58	0.73	0.80	1.35		
$t_{\alpha_{FF}}$	1.80	0.65	1.10	1.46	2.63	−0.72	1.69	0.04	−0.62	−1.79	−2.40		
α_{CARH}	0.13	0.07	0.07	0.06	0.17	−0.05	0.05	0.02	0.00	−0.09	−0.23	0.07	0.87
b	0.97	0.94	0.99	0.96	0.99	0.98	0.92	0.95	1.02	1.19	0.21	(0.05)	
s	−0.10	−0.08	−0.02	0.01	−0.05	0.04	0.03	0.08	0.12	0.40	0.50		
h	−0.56	−0.18	0.02	0.15	0.23	0.37	0.40	0.58	0.71	0.76	1.32		
w	−0.01	−0.02	0.02	0.07	0.04	−0.01	0.08	−0.01	−0.07	−0.11	−0.10		
$t_{\alpha_{CARH}}$	1.94	0.89	0.83	0.66	2.06	−0.57	0.71	0.17	0.05	−0.82	−1.68		
α_q	0.10	−0.10	−0.07	0.03	0.06	−0.12	0.09	0.02	0.02	0.01	−0.10	0.06	0.85
β_{MKT}	1.01	0.97	1.00	0.95	0.99	0.97	0.89	0.91	0.98	1.15	0.14	(0.32)	
β_{ME}	−0.09	−0.02	0.03	0.03	0.00	0.07	0.05	0.09	0.10	0.29	0.38		
$\beta_{\triangle A/A}$	−0.65	−0.12	0.11	0.23	0.37	0.49	0.47	0.60	0.73	0.81	1.46		
β_{ROE}	0.13	0.20	0.15	0.04	0.09	−0.03	−0.03	−0.08	−0.16	−0.39	−0.52		
t_{α_q}	1.12	−1.30	−0.77	0.40	0.80	−1.11	1.03	0.20	0.15	0.06	−0.48		
$t_{\beta_{MKT}}$	44.42	40.00	39.07	36.50	35.50	41.32	37.56	25.77	27.67	31.58	2.86		
$t_{\beta_{ME}}$	−2.20	−0.71	0.91	0.89	0.05	1.47	1.20	1.30	1.44	3.28	3.19		
$t_{\beta_{\triangle A/A}}$	−12.46	−2.26	2.01	3.13	5.16	4.49	5.80	6.32	7.26	7.02	10.26		
$t_{\beta_{ROE}}$	3.11	4.77	3.46	0.79	1.85	−0.47	−0.48	−1.00	−2.15	−5.01	−5.48		

Table D.2 : Factor Regressions for Monthly Percent Excess Returns of Deciles Formed on Prior 13–60 Month Returns (Reversal) (1/1972–12/2011, 480 Months)

The data on the one-month Treasury bill rate (r^f) and the Carhart factors are from Kenneth French's Web site. At the beginning of each month t, we use the NYSE breakpoints to split the NYSE, Amex, and NASDAQ stocks into deciles on the prior returns from month $t-13$ to $t-60$. Monthly value-weighted portfolio returns are computed, and the portfolios are rebalanced monthly. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i \, MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i \, MKT_t + s^i \, SMB_t + h^i \, HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i \, MKT_t + s^i \, SMB_t + h^i \, HML_t + w^i \, WML_t + \epsilon_t^i$) and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i \, MKT_t + \beta_{ME}^i \, r_{ME,t} + \beta_{\triangle A/A}^i \, r_{\triangle A/A,t} + \beta_{ROE}^i \, r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across the testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the GRS test on the null that the alphas across the deciles for a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	0.86	0.77	0.83	0.57	0.67	0.63	0.63	0.51	0.43	0.49	−0.37		
t_{Mean}	2.50	3.02	3.54	2.65	3.26	3.02	3.12	2.45	1.74	1.58	−1.46		
α	0.31	0.30	0.40	0.17	0.29	0.24	0.24	0.11	−0.02	−0.07	−0.38	0.21	0.79
β	1.21	1.03	0.94	0.89	0.85	0.86	0.87	0.87	0.99	1.23	0.02	(0.00)	
t_α	1.63	2.17	3.26	1.86	3.08	2.59	2.66	1.20	−0.22	−0.54	−1.50		
α_{FF}	0.01	0.10	0.24	0.01	0.15	0.16	0.21	0.14	0.05	0.18	0.17	0.12	0.83
b	1.14	1.03	0.96	0.92	0.93	0.91	0.92	0.90	1.00	1.14	0.00	(0.03)	
s	0.85	0.37	0.19	0.14	−0.06	−0.09	−0.16	−0.16	−0.16	−0.06	−0.91		
h	0.41	0.32	0.29	0.28	0.30	0.18	0.10	−0.01	−0.10	−0.49	−0.90		
$t_{\alpha_{FF}}$	0.05	0.80	2.19	0.14	1.69	1.82	2.22	1.48	0.50	1.69	0.93		
α_{CARH}	0.15	0.14	0.22	0.03	0.10	0.09	0.14	0.07	−0.01	0.18	0.03	0.11	0.83
b	1.10	1.02	0.97	0.91	0.94	0.92	0.94	0.92	1.01	1.14	0.03	(0.14)	
s	0.85	0.37	0.19	0.14	−0.06	−0.09	−0.16	−0.16	−0.16	−0.06	−0.91		
h	0.36	0.30	0.30	0.28	0.31	0.20	0.12	0.01	−0.08	−0.49	−0.85		
w	−0.15	−0.04	0.02	−0.02	0.05	0.07	0.07	0.07	0.06	0.00	0.15		
$t_{\alpha_{CARH}}$	0.99	1.08	1.88	0.33	1.16	1.02	1.38	0.73	−0.10	1.59	0.15		
α_q	0.28	0.14	0.16	−0.04	0.01	0.03	0.00	−0.05	−0.15	0.17	−0.10	0.10	0.84
β_{MKT}	1.10	1.02	0.97	0.92	0.93	0.91	0.94	0.92	1.02	1.15	0.05	(0.18)	
β_{ME}	0.70	0.31	0.17	0.14	−0.01	−0.03	−0.08	−0.09	−0.07	−0.02	−0.71		
$\beta_{\triangle A/A}$	0.41	0.41	0.43	0.40	0.45	0.27	0.24	0.08	−0.05	−0.72	−1.13		
β_{ROE}	−0.53	−0.20	−0.03	−0.05	0.09	0.12	0.22	0.21	0.26	0.20	0.73		
t_{α_q}	1.95	1.15	1.41	−0.35	0.05	0.31	−0.03	−0.51	−1.63	1.40	−0.54		
$t_{\beta_{MKT}}$	30.46	28.03	31.07	34.10	37.42	33.30	32.67	36.25	41.85	38.24	0.95		
$t_{\beta_{ME}}$	11.30	5.19	3.40	2.81	−0.24	−0.81	−1.84	−2.13	−1.83	−0.39	−8.41		
$t_{\beta_{\triangle A/A}}$	4.74	4.93	4.52	4.28	4.91	3.12	3.35	1.16	−0.74	−10.59	−9.55		
$t_{\beta_{ROE}}$	−8.33	−3.31	−0.39	−0.76	1.47	1.77	3.46	3.99	4.35	3.48	7.15		

Table D.3 : Factor Regressions for Monthly Percent Excess Returns of Deciles Formed on Earnings-to-Price (E/P) (1/1972–12/2011, 480 Months)

The data on the one-month Treasury bill rate (r^f) and the Carhart factors are from Kenneth French's Web site. Earnings-to-price used in the annual sorts in June of year t are total earnings before extraordinary items (Compustat annual item IB) for the last fiscal year end in $t-1$ divided by the market equity at the end of December of year $t-1$. In June of each year t, we use the NYSE breakpoints to split all NYSE, Amex, and NASDAQ stocks into deciles based on E/P. Stocks with negative earnings for the last fiscal year end in $t-1$ are excluded. We calculate monthly value-weighted portfolio returns, and the portfolios are rebalanced annually in June. We report the mean monthly percent excess returns, the CAPM regressions ($r_t^i - r_t^f = \alpha^i + \beta^i\, MKT_t + \epsilon_t^i$), the Fama-French three-factor regressions ($r_t^i - r_t^f = \alpha_{FF}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + \epsilon_t^i$), the Carhart four-factor regressions ($r_t^i - r_t^f = \alpha_{CARH}^i + b^i\, MKT_t + s^i\, SMB_t + h^i\, HML_t + w^i\, WML_t + \epsilon_t^i$) and the q-factor regressions ($r_t^i - r_t^f = \alpha_q^i + \beta_{MKT}^i\, MKT_t + \beta_{ME}^i\, r_{ME,t} + \beta_{\triangle A/A}^i\, r_{\triangle A/A,t} + \beta_{ROE}^i\, r_{ROE,t} + \epsilon_t^i$). m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the GRS test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. See the caption of Table 1 for the description of r_{ME}, $r_{\triangle A/A}$, and r_{ROE}.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
Mean	0.31	0.39	0.52	0.53	0.47	0.62	0.71	0.74	0.72	0.89	0.58		
t_{Mean}	1.02	1.61	2.33	2.60	2.22	2.88	3.49	3.47	3.27	3.40	2.54		
α	−0.24	−0.08	0.10	0.14	0.07	0.23	0.33	0.37	0.34	0.44	0.68	0.23	0.79
β	1.20	1.04	0.92	0.87	0.89	0.86	0.83	0.82	0.84	0.99	−0.22	(0.01)	
t_α	−1.90	−1.05	1.19	1.46	0.66	2.22	3.22	3.26	2.61	3.10	2.98		
α_{FF}	0.06	0.04	0.14	0.15	0.00	0.08	0.18	0.17	0.07	0.09	0.04	0.10	0.83
b	1.08	1.02	0.93	0.89	0.94	0.93	0.91	0.90	0.93	1.08	0.00	(0.22)	
s	0.00	−0.12	−0.10	−0.10	−0.09	−0.02	−0.05	0.00	0.10	0.22	0.22		
h	−0.59	−0.23	−0.06	0.00	0.16	0.30	0.32	0.41	0.52	0.66	1.25		
$t_{\alpha_{FF}}$	0.61	0.63	1.81	1.78	−0.04	0.95	1.94	1.57	0.67	0.76	0.23		
α_{CARH}	0.10	0.03	0.11	0.13	0.00	0.09	0.14	0.15	0.08	0.10	−0.01	0.09	0.84
b	1.07	1.02	0.94	0.89	0.94	0.93	0.92	0.91	0.92	1.08	0.01	(0.42)	
s	0.01	−0.12	−0.10	−0.10	−0.09	−0.02	−0.05	0.00	0.10	0.22	0.22		
h	−0.61	−0.23	−0.05	0.00	0.16	0.30	0.33	0.42	0.52	0.66	1.26		
w	−0.05	0.01	0.04	0.01	−0.01	0.00	0.04	0.02	−0.01	−0.01	0.04		
$t_{\alpha_{CARH}}$	1.10	0.42	1.18	1.58	0.05	0.97	1.47	1.34	0.74	0.82	−0.03		
α_q	0.11	−0.10	−0.14	−0.03	−0.18	−0.04	0.00	0.07	0.15	0.28	0.17	0.11	0.82
β_{MKT}	1.11	1.04	0.96	0.92	0.95	0.93	0.90	0.89	0.88	0.99	−0.12	(0.14)	
β_{ME}	−0.04	−0.04	0.01	−0.04	0.00	0.03	0.04	0.04	0.09	0.21	0.24		
$\beta_{\triangle A/A}$	−0.66	−0.24	0.07	0.15	0.25	0.42	0.43	0.50	0.46	0.37	1.03		
β_{ROE}	−0.01	0.23	0.31	0.16	0.19	0.07	0.16	0.05	−0.11	−0.12	−0.11		
t_{α_q}	0.87	−1.23	−1.57	−0.35	−1.90	−0.38	0.02	0.64	1.21	1.85	0.71		
$t_{\beta_{MKT}}$	35.32	47.99	43.74	36.40	35.78	34.97	34.20	25.93	25.64	21.31	−1.93		
$t_{\beta_{ME}}$	−0.77	−1.24	0.21	−1.14	0.01	0.74	0.70	0.58	1.50	1.97	1.87		
$t_{\beta_{\triangle A/A}}$	−8.45	−4.17	0.89	1.83	2.69	4.96	5.20	5.11	5.01	3.05	5.80		
$t_{\beta_{ROE}}$	−0.11	5.77	5.24	2.82	2.57	1.11	2.39	0.65	−1.31	−1.16	−0.77		

Table E.1 : Descriptive Statistics for Monthly Percent Excess Returns on Annually Rebalanced Deciles Formed on Standardized Unexpected Earnings, Idiosyncratic Volatility, and Campbell, Hilscher, and Szilagyi's (2008) Failure Probability and on Annually Rebalanced 25 Size and Momentum Portfolios

In June of each year t, we use the NYSE breakpoints to sort all NYSE, Amex, and NASDAQ stocks into ten deciles based on SUE at the fiscal year end of $t-1$. Monthly equal-weighted returns are computed from July of year t to June of $t+1$, and the portfolios are rebalanced in June. In June of each year t, we use the NYSE-Amex-NASDAQ breakpoints to sort all stocks into deciles on $IVOL$ calculated with the information up to December of year $t-1$. Separately, in June of year t, we use the NYSE-Amex-NASDAQ breakpoints to sort all stocks into deciles based on the Campbell, Hilscher, and Szilagyi (2008) failure probability calculated at the fiscal yearend of $t-1$. Monthly value-weighted returns are calculated from July of year t to June of $t+1$, and the portfolios are rebalanced in June. In June of each year t, we use the NYSE-Amex-NASDAQ breakpoints to sort all stocks into quintiles based on the prior returns from July of year $t-1$ to December of year $t-1$. Independently, we use the NYSE breakpoints to sort all stocks into quintiles on the market equity at the end of December of year $t-1$. Taking intersections, we obtain 25 size and momentum portfolios. Monthly equal-weighted returns are calculated from July of year t to June of $t+1$, and the portfolios are rebalanced in June. We report average returns and t-statistics in monthly percent and the CAPM regression. m.a.e. is the average magnitude of the alphas across a given set of testing portfolios. The numbers (in parentheses) beneath the m.a.e.'s are the p-values for the GRS test on the null that the alphas across all the deciles from a given factor model are jointly zero. $\bar{R}^2$ is the average goodness-of-fit across the deciles. The t-statistics are adjusted for heteroscedasticity and autocorrelations. The data on one-month Treasury bill and the market factor are from Kenneth French's Web site.

	Low	2	3	4	5	6	7	8	9	High	H−L	m.a.e.	$\bar{R}^2$
	Panel A: Ten SUE deciles (7/1972–12/2011, 474 Months)												
Mean	0.86	0.82	0.89	0.94	0.91	0.92	0.94	0.84	0.93	0.92	0.06		
t_{Mean}	2.57	2.54	2.82	2.91	2.90	2.97	3.15	2.84	3.11	3.16	0.60		
α	0.34	0.31	0.39	0.43	0.41	0.42	0.45	0.35	0.44	0.42	0.08	0.40	0.75
β	1.16	1.13	1.13	1.14	1.12	1.11	1.10	1.11	1.10	1.12	−0.04	(0.03)	
t_α	2.05	2.05	2.55	2.76	2.69	2.88	3.11	2.62	3.11	3.23	0.84		
	Panel B: Ten idiosyncratic volatility deciles (1/1972–12/2011, 480 Months)												
Mean	0.45	0.51	0.46	0.59	0.65	0.61	0.34	0.49	0.35	0.32	−0.13		
t_{Mean}	2.49	2.41	1.89	2.15	2.13	1.80	0.92	1.24	0.76	0.70	−0.36		
α	0.10	0.09	−0.02	0.07	0.08	0.00	−0.32	−0.17	−0.36	−0.35	−0.45	0.16	0.80
β	0.77	0.94	1.07	1.16	1.25	1.35	1.47	1.45	1.56	1.47	0.71	(0.08)	
t_α	1.51	1.63	−0.29	0.80	0.68	0.00	−1.73	−0.92	−1.30	−1.33	−1.47		
	Panel C: Ten failure probability deciles (7/1976–12/2011, 426 Months)												
Mean	0.58	0.48	0.55	0.51	0.63	0.65	0.52	0.84	0.68	0.80	0.22		
t_{Mean}	2.41	2.22	2.54	2.28	2.51	2.43	1.77	2.38	1.65	1.70	0.61		
α	0.06	0.00	0.08	0.00	0.08	0.08	−0.08	0.17	−0.12	0.01	−0.06	0.07	0.80
β	0.98	0.90	0.89	0.97	1.03	1.09	1.13	1.27	1.52	1.51	0.53	(0.51)	
t_α	0.59	0.02	0.99	0.03	0.99	0.65	−0.55	0.93	−0.53	0.03	−0.17		

Panel D: 25 Size and momentum portfolios (1/1972–12/2011, 480 Months)

	Loser	2	3	4	Winner	W−L
	Mean					
Small	0.72	0.87	0.85	0.77	0.55	−0.18
2	0.68	0.72	0.82	0.79	0.49	−0.19
3	0.66	0.67	0.71	0.73	0.63	−0.04
4	0.84	0.64	0.66	0.59	0.56	−0.28
Big	0.67	0.49	0.51	0.49	0.47	−0.20
	α (m.a.e. = 0.17)					
Small	0.18	0.41	0.41	0.31	−0.01	−0.18
2	0.06	0.20	0.33	0.28	−0.12	−0.18
3	0.05	0.16	0.24	0.25	0.01	−0.04
4	0.26	0.13	0.19	0.12	−0.02	−0.28
Big	0.16	0.02	0.08	0.05	−0.06	−0.22

	Loser	2	3	4	Winner	W−L
	t_{Mean}					
Small	1.99	2.86	3.01	2.63	1.58	−1.12
2	1.85	2.35	2.91	2.78	1.42	−1.00
3	1.77	2.29	2.70	2.82	1.85	−0.15
4	2.49	2.27	2.63	2.44	1.72	−1.15
Big	2.17	1.91	2.23	2.23	1.61	−0.76
	t_α ($\bar{R}^2 = 0.75$, $p_{GRS} = 0$)					
Small	0.86	2.43	2.62	2.02	−0.04	−1.14
2	0.30	1.22	2.43	2.16	−0.69	−0.92
3	0.25	1.11	2.01	2.23	0.09	−0.15
4	1.37	1.02	2.01	1.29	−0.15	−1.09
Big	0.84	0.19	0.94	0.79	−0.41	−0.79