Capital Investments and Stock Returns

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Abstract

Firms that spend the most on capital investments relative to their sales or total assets, subsequently achieve negative benchmark-adjusted returns. We consider two hypotheses to explain these returns. The first explanation, that firms artificially increase cash flows to fund investment expenditures, suggests that the negative relation between returns and investment expenditures should be strongest for the most financially constrained firms. The second explanation, that firms that invest a lot tend to be over-investing, suggests that the negative relation between returns and investment expenditures should be strongest for firms with the most financial slack. The evidence tends to support the second explanation. That is, the negative capital investment/return relation is stronger for firms with higher cash flows and lower debt ratios and reverses in the period when firms of this type were subject to hostile takeovers.

Capital Investments and Stock Returns

1. Introduction

There is now substantial research that suggests that a firm's investment expenditures are more closely linked to its cash flows than to its stock prices (see for example, Fazzari, Hubbard and Peterson (1988) and Morck, Shleifer and Vishny (1990)).[1] In other words, firms tend to invest more when they have available cash rather than when their stock prices signal good investment opportunities. A popular explanation for the sensitivity of investment expenditure to cash flow is that most firms are credit constrained, perhaps because of information asymmetries, and hence have a tendency to *underinvest* when they do not have sufficient cash flow. The fact that cash flows provide better predictors of investment expenditures amongst firms that appear to be financially constrained tends to support this explanation. An alternative explanation has to do with managerial agency problems. According to this explanation, managers have an incentive to build empires and hence tend to *overinvest* when they have more than enough cash flow (see Jensen (1986)). The fact that cash flows seem to be important determinants of the investment expenditures of firms that do not appear to be financially constrained (see Kaplan and Zingales (1997) and Cleary (1999)) tends to support this explanation.

In this paper, we attempt to distinguish between the capital constraint/underinvestment explanation and the managerial agency/overinvestment hypotheses by carefully examining the relation between capital expenditures and stock returns. In the absence of managerial agency problems and information asymmetries we would expect to observe a positive relation between investment expenditures and stock returns. The firms with the best opportunities will generally invest the most; so higher investment expenditures should be associated with favorable information and higher stock returns. This is not, however, what we observe. As we show later in this paper, higher levels of capital expenditure are

[1] See Hubbard (1998) for an excellent review of this literature.

generally associated with lower benchmark-adjusted stock returns. Our findings here are quite strong and do not appear to be sensitive to the choice of benchmarks.

The observed negative relation between stock returns and investment expenditures is consistent, however, with empire builders overinvesting as well as constrained firms underinvesting. For example, if there is some uncertainty about whether a firm's managers tend to overinvest, evidence of high investment can generate a negative stock price response because it provides unfavorable evidence about the individuals who manage the firm. Alternatively, when there is underinvestment because of asymmetric information, and new investment is funded with equity issues (or junior debt issues), capital investment expenditures may be associated with negative stock returns for the reasons mentioned in Myers and Majluf (1984). Moreover, higher investment expenditures may make investors skeptical about the quality of the firm's current and past earnings if constrained firms have a tendency to push their cash flows forward to fund current or future investment needs. Specifically, a higher than expected level of investment could lead investors to suspect that past earnings were artificially inflated which could, in turn, lead to a downward revision in a firm's stock price, even if the actual investment expenditures were viewed favorably.

To provide evidence that may allow us to distinguish between these conjectures we examine whether the relation between capital expenditures and stock returns differ over time and across firms. For example, we examine whether the relation is related to the market's perception of the firm's investment opportunities, as measured by Tobin's q. Firms with better investment opportunities may have less of a need to manipulate earnings or cash flows prior to increasing their investment expenditures and may also be less likely to be taking negative NPV investments. These arguments suggest that underperformance should be more pronounced for those firms that have both high capital expenditures and low q's. The magnitude of underperformance may also be related to the past cash flows and the leverage ratios of the firms. One might expect that more constrained firms have a greater incentive to manipulate cash flows, suggesting that highly levered firms with low cash flows will have the most negative post-investment returns. However, the firms with the most slack can more easily make bad investments, which would imply the opposite result.

Our empirical results tend to support the managerial agency theory. In particular, we find that the negative relation between capital expenditures and stock returns is strongest for firms with both high cash flows and low leverage; i.e., those firms that are likely to be the least constrained. In addition, we find that the negative relation between capital expenditures and stock returns is most pronounced in years in which discipline from the market for corporate control is weakest. Indeed, during the hostile takeover wave of the1980s, the relation is actually reversed.

The analysis in this paper is closely related to a series of event studies that examine market reactions to capital investment announcements. The empirical evidence in McConnell and Muscarella (1985) indicates that announcements of increases in planned capital investments are generally associated with significantly positive excess stock returns. In follow-up studies, Blose and Shieh (1997) and Vogt (1997) find a significant positive relation between the magnitude of the stock market reaction to capital investment announcements and the level of new investment. While these studies tend to be inconsistent with our findings of a negative relation between the level of capital expenditures and stock returns, there is also evidence that is consistent with the overinvestment hypothesis. For example, in the area of foreign direct investment, Doukas (1995) finds that average returns associated with foreign investment announcements are substantially higher for value maximizing (i.e., well-managed) firms than for overinvesting (i.e., poorly managed) firms. Chung, Wright, and Chareonwong (1998) show that announcements of increases (decreases) in capital spending positively (negatively) affect the stock prices of firms with valuable investment opportunities, but the opposite relation is found for firms without such opportunities.

For a variety of reasons, the results from these event studies should be interpreted somewhat cautiously. First, the above studies examine only publicly announced investments which induces a bias in their estimates if firms are more likely to publicly announce investments that the capital markets are likely to view favorably. Second, evidence in the initial public offering (IPO) and seasoned equity offering (SEO) literature (Teoh, Welch and Wong (1997, 1998)) suggests that investors generally do not take into account the incentives of management to manipulate earnings (and by extension, cash flows) prior to equity issues. And finally, there is now a growing body of evidence that indicates that market prices initially underreact to information contained in corporate announcements, suggesting that it makes sense to look at the long-term effect of these events.[2]

The analysis in this paper avoids these problems by examining the stock returns of a comprehensive sample that includes all reported capital expenditures (available on COMPUSTAT) and thus avoids the bias that is inherent in an analysis of only publicly reported expenditures. In addition, by looking at stock returns in the years subsequent to capital expenditure increases, we can examine whether the market reacts to the investment changes in a timely manner. Of course, by looking at long-horizon returns, we raise concerns about the possibility that the observed excess returns are simply a manifestation of a faulty benchmark. For this reason, we compute excess returns with both a characteristic-based matching procedure as well as with a factor model.

This paper is also closely related to the literature on the long-term reaction of stock prices to seasoned equity offers (SEOs), (e.g., Loughran and Ritter (1995)). These papers document a negative long-term relation between stock returns and SEOs. Firms that issue equity generally have high capital expenditures, but the reverse is not always true. Adverse selection models, like Myers and Majluf (1984), suggest that the negative stock returns associated with high capital investments should be concentrated in those firms that fund the capital expenditures with SEOs. However, our results indicate that the negative relation between capital expenditures and stock returns is equally strong for firms with and without SEOs.

[2] See Daniel, Hirshleifer and Subrahmanyam (1998) for a summary of this evidence along with a behavioral explanation for the market's underreaction to corporate disclosures.

Our results are also related to the literature on long-term contrarian investment strategies (e.g., DeBondt and Thaler (1985)), which find that stocks that do well over a three to five year period subsequently do poorly. Since the firms with the highest capital expenditures are generally those firms with better than average stock price performance in prior years, it is possible that the evidence that these firms subsequently perform poorly may be due to the DeBondt and Thaler contrarian effect. Our results, however, suggest that this is not the case. Specifically, the capital expenditure effect is still significant after controlling for the contrarian effect, but the contrarian effect is no longer reliably different than zero when we control for the capital expenditure effect.

The remainder of the paper is organized as follows. Section 2 describes the data and Section 3 outlines the methodology. The preliminary findings on the relationship between capital investments and expected returns are presented in Section 4. Section 5 examines the year-to-year pattern of the investment/return relation and Section 6 presents the empirical results regarding different hypotheses. Finally, Section 7 concludes the paper.

2. Data description

The current study considers all domestic, primary stocks listed on the New York Stock Exchange (NYSE), American Stock Exchange (Amex), and Nasdaq stock markets. Closed-end funds, trusts, ADRs, REITs, units of beneficial interest, and other financial institutions are excluded from the analysis. The sample stock returns cover the period from July 1973 to June 1996. The monthly stock returns, monthly stock prices, monthly shares outstanding, and the market capitalization (stock price times the number of shares outstanding) for NYSE/Amex firms and Nasdaq firms are obtained from the Center for Research in Security Prices (CRSP). We use U.S. one-month Treasury bill rates as our risk-free rate. Financial statement data, such as book equity, cash flow, long-term debt, and sales are obtained from COMPUSTAT tapes.

To be included in the tests, a firm must meet the following criteria. First, it should have CRSP stock prices for December of year t-1 and June of t and the COMPUSTAT book equity for year t-1. Second, its annual total net sales should be no less than US$10 million.[3] Third, it should not have negative book equity for the fiscal year ending in calendar year t-1. Moreover, following Fama and French (1992, 1993), firms are not included until they have appeared on COMPUSTAT for two years to avoid the potential survival/selection bias inherent in the way COMPUSTAT adds firms to its tapes (Banz and Breen (1986)).

A firm's market equity (ME) is defined as its price multiplied by the number of shares outstanding, and its market size (SZ) is measured as the ME at the end of June of year t. The book-to-market equity (BM) is computed as the ratio of the book equity (BE) of a firm for the fiscal year ending in calendar year t-1 to the firm's ME at the end of December of t-1. As in Fama and French (1993), we define book equity as the COMPUSTAT book value of stockholders' equity, plus balance-sheet deferred taxes and investment tax credits (if available), minus the book value of the preferred stock. Depending on availability, the redemption, liquidation, or par value (in that order) is used to estimate the value of the preferred stock.

In the results reported in this paper, the measure of capital investment (CI_{t-1}) in the formation year t-1, is calculated as follows:

$$CI_{t-1} = \frac{CE_{t-1}}{(CE_{t-2} + CE_{t-3} + CE_{t-4})/3} - 1,$$

where CE_{t-1} is a firm's capital expenditure (COMPUSTAT data item 128) scaled by its sales for year t-1.[4] We use the last three-year average capital investment to project the firm's formation year's benchmark investment,[5] and interpret firms with high CI as high investors. Using sales as the deflator, we implicitly assume that the benchmark level of capital expenditures will grow proportionately with sales. By this

[3] This is to exclude firms at the early development stage such as biotech or internet firms.

[4] The results without scaling are virtually identical to those reported here.

definition, a CI value of equal to (greater than, less than) zero indicates that the formation year's capital investment is the same as (greater than, less than) the *prior* three years' average. To see how the results are sensitive to the measure of CI, we also use $CE_{t-1} - (CE_{t-2} + CE_{t-3} + CE_{t-4})/3$ as well as $(CE_{t-1} - 1)$ alone to measure CI_{t-1}. In addition, we also use total assets to replace sales as the deflator in all CI measures. The results (not reported here) are basically insensitive to alternative measures of CI.

To ensure that accounting information is known before we use it to explain the stock returns, we match stock returns for the period between July of year t to June of year t+1 to the accounting data of a firm for the fiscal year ending in calendar year t-1. In addition, we do not use negative-BE firms when calculating the breakpoints for BM or when forming the portfolios.

3. Methodology

3.1. Characteristic-based benchmark portfolios

Firms with different levels of investment expenditures are likely to be subject to different types of risk. One might expect that firms that invest the most are the riskiest, since a greater fraction of their value consists of growth options. Alternatively, since the least risky firms have the lowest cost of capital, they may invest the most. In any event, when one compares the returns of firms that invest high and low amounts, it is critical that appropriate benchmarks are chosen.

Our procedure for calculating benchmark-adjusted returns follows the methodology outlined in the Daniel, Grinblatt, Titman, and Wermers (1997) study that developed benchmarks to evaluate mutual fund performance. In particular, we will be controlling for characteristics as well as factor sensitivities. Specifically, we form 125 portfolios that capture three stock characteristics, namely book-to-market equity, size, and momentum, which are significantly related to the cross-sectional variation in returns.[6] To form

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[5] We also use the last five-year average to project the formation year's benchmark capital investment. The results are basically identical to those reported here.
[6] See Fama and French (1992, 1993), Jegadeesh and Titman (1993), and Daniel and Titman (1997).

these portfolios, starting with July of year t, the universe of common stocks is first sorted into quintiles based on each firm's size (SZ) at the end of June of year t according to the breakpoints for the NYSE firms only. Then firms in each SZ quintile are further sorted into quintiles based on their book-to-market ratio (BM) at the end of year t-1. Finally, the firms in each of the 25 SZ/BM portfolios are sorted into quintiles based on their prior-year return (PR1YR, calculated through the end of May of year t),[7] giving us a total of 125 portfolios. The value-weighted returns on benchmark portfolios are calculated from July of year t to June of year t+1. All benchmark portfolios are rebalanced every year.

Once we form these 125 characteristic-based benchmark portfolios, calculating the excess return is straightforward. Each stock, in each year, is assigned to a benchmark portfolio according to its rank based on SZ, BM, and PR1YR. Excess returns of a particular stock are then calculated by subtracting the stock's corresponding benchmark portfolio's returns from the stock's returns. These excess returns are then used to calculate the excess returns of value-weighted test portfolios we form based on the sortings of CI and other variables.

[7] In ranking prior-year returns, we skip the portfolio formation month to reduce the bias from bid-ask bounces and monthly return reversals.

3.2. The Carhart four-factor model

To control for factor risk, these benchmark-adjusted portfolio returns are regressed on the Fama-French three factors and the Carhart momentum factor, which we refer to as the Carhart four-factor model:

$$AR_{p,t} = \alpha_p + \beta_{HML,p} R_{HML,t} + \beta_{SMB,p} R_{SMB,t} + \beta_{Mkt,p}(R_{Mkt,t} - R_{ft}) + \beta_{\mathrm{Pr1}yr,p} R_{\mathrm{Pr1}yr,t} + \varepsilon_{p,t}, \qquad (1)$$

where $AR_{p,t}$ is the benchmark-adjusted return on CI ranked portfolio p, R_{ft} is the risk-free rate, R_{HML}, R_{SMB}, and R_{Mkt} are the three factors suggested by Fama and French (1993, 1996),[8] and R_{Pr1yr} is the return on the PR1YR (high minus low prior-year return, skipping the return in the formation month) momentum portfolio. The momentum factor suggested by Carhart (1997) captures the Jegadeesh and Titman's (1993) one-year momentum in stock returns. For the detailed description of the construction of these factor portfolios, please see Fama and French (1993) and Carhart (1997).

4. Empirical results

4.1. The relationship between returns and capital investments

We form five capital investment (CI) portfolios as follows: Starting with July of year t, we equally divide all stocks into quintiles based on their year t-1 capital investment, CI. The firms remain in these portfolios from July of year t to June of year t+1. From these portfolios, we form a CI-spread portfolio that has a one-dollar *long* position in the two lowest CI portfolios (the 1st and the 2nd) and a one-dollar *short* position in the two highest CI portfolios (the 4th and 5th). The portfolios are rebalanced in each year.

The benchmark-adjusted returns of the CI portfolios are presented in Column 2 of Table 1. The table reveals that except for the lowest CI quintile, the benchmark-adjusted returns monotonically decrease with capital investments. Furthermore, the mean return on the CI-spread portfolio is significantly positive with a

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[8] More specifically, R_{HML} is the return on the HML (*H*igh *M*inus *L*ow) book-to-market portfolio, R_{SMB} is the return on the SMB (*S*mall *M*inus *B*ig) size portfolio, and R_{Mkt} is the return on the market portfolio.

value of 0.168% (t-value = 2.91) per month or 2.02% per year, indicating that firms that invest more realize lower stock returns than firms that invest less after controlling for size, book-to-market equity, and momentum effects.

[Put Table 1 here]

Although our benchmarks control for return differences that arise because of differences in characteristics, the benchmarks do not necessarily control for factor risk. According to the factor-pricing model, the factors should capture the variation in the portfolios' excess returns and, therefore, the intercepts (α_p) in Equation (1) for all characteristic-balanced CI portfolios should be indistinguishable from zero. A non-zero intercept from the regression of returns on a CI-spread portfolio on the Carhart four factors will indicate that the return spread between low and high capital investment portfolios still exists even after taking risks into account.

Regression results from the benchmark-adjusted returns of the CI portfolios on the Carhart four factors are reported in Columns 3-8 of Table 1. The results indicate that three out of five estimated intercepts are reliably different from zero. With the exception of the first quintile, the intercepts are monotonically decreasing with capital investments. In addition, the estimated intercept for the zero-cost CI-spread portfolio is significantly positive, indicating that the high return for low investors is not due to risks associated with the Carhart four factors. After adjusting for stock characteristics and taking into account the Carthart four factors, low CI firms still earn, on average, a return of about 0.192% (t-value = 3.25) per month or 2.3% per year more than high CI firms do. In other words, the Daniel, Grinblatt, Titman, and Wermers' (1997) three-characteristic-based model and the Carhart four-factor model fail to explain the underperformance of high investors.

4.2. The persistence of the negative relationship between capital investment and stock returns

The studies of value/growth stocks and post-event returns such as returns after IPO/SEO events indicate that abnormal returns can persist for up to 5 years. Our results presented in the last row of Table 4 (will be discussed in detail later) reveal that low investors tend to outperform high investors for at least 5 years as well. The returns in year 2 (2.26%), year 3 (1.91%), year 4 (1.85%), year 5 (1.64%) and year 6 (1.05%) are all statistically indistinguishable from the year 1 returns and with the exception of the year 6 returns, are reliably different than zero.[9]

4.3. Effects of new equity-offering activities

Past research documents that companies issuing new equity, either IPOs or SEOs, subsequently realize poor long-run stock price performance (Loughran and Ritter (1995), Cai and Wei (1997) and others). Since these firms tend to invest more after issuing equity, the observed negative capital investment-return relationship may be attributed to these new equity-offering firms. To examine whether this is the case, we reexamine the benchmark-adjusted return differences between high and low investors that have not issued stock in any year from year –5 to year –1.[10]

The results for firms that have not issued new equity in any of the years –5 to –1 are reported in Table 2. The underperformance of high investors relative to low investors remains intact and is slightly stronger. Specifically, the benchmark-adjusted return of 0.186% (t-value=3.34) per month or 2.23% per year as well as the risk-adjusted return of 0.208% (t-value=3.43) per month or 2.50% per year for the CI-spread portfolio are slightly higher than their counterparts reported in Table I. The evidence suggests that the observed negative CI-return relation is not driven by the IPO/SEO effect.[11] In addition, for each of

[9] The average return on the CI-spread portfolio in year 6 is not reported in the table to save space.

[10] Firms with IPOs in either years −1 or −2 are not included, since firms are not included until after they have appeared on the Compustat for two years.

[11] The unreported results indicate that the benchmark-adjusted returns on the CI-spread portfolio formed on the basis of firms that have not issued new equity in any of the past five years also persist for at least five years. Specifically, the returns are 2.49% (t=3.23) for year 1, 2.67% (t=3.11) for year 2, 2.15% (t=2.67) for year 3, 2.26% (t=2.47) for year 4, and 1.71% (t=1.98) for year 5 and the five-year cumulative benchmark-adjusted return is 9.91% (t=3.00). If we exclude

the CI portfolios, the benchmark-adjusted return and the risk-adjusted return are higher for firms that do not raise new equity. This suggests that on average, firms that raise equity subsequently underperform firms that do not issue equity based on either the benchmark-adjusted or risk-adjusted return, which is consistent with previous findings that indicate that stocks underperform following IPOs/SEOs.[12]

[Put Table 2 here]

We also replicate the results for firms that issued equity in either the formation year or in any of the previous five years. The unreported results reveal that for these firms, the return-investment relation is either reversed or flat. That is, firms that invest more either slightly outperform or do not underperform firms that invest less, and this pattern persists for the following five years.[13] This could conceivably be related to the motivation of the IPOs/SEOs. Firms that do not have large investment needs may be more likely to issue new equity when they believe that their stocks are overpriced.

4.4. The relation between the capital investment effect and the contrarian effect

The firms in our sample with high capital expenditures tend to have experienced above average stock returns in the preceding years. Hence, it is possible that the capital investment effect that we have documented is driven by the contrarian effect that was previously documented by De Bondt and Thaler (1985).

To examine this more closely, we independently sort firms into quintiles by both the past 5-year returns of their stock and the level of their capital investment. The returns of the resulting 25 portfolios are reported in Table 3. These returns suggest that there is clearly a capital expenditure effect that is independent of the contrarian effect. There also seems to be a contrarian effect that is independent of the

firms that have issued new equity in the formation year only, the results are virtually identical to those reported here and in Table 2.

[12] Our direct tests on IPO/SEO firms confirm this argument.

[13] We also check the CI measures for IPO/SEO firms versus non-IPO/SEO firms. The results indicate that the CI measures are virtually the same for both groups of firms.

capital expenditures effect but it is not statistically significant. Clearly, the capital investment effect is stronger than the contrarian effect.[14]

[Put Table 3 here]

5. The year-to-year performance of the CI spread strategy

In order to examine the robustness of our results and the riskiness of the CI spread strategy we examine the year-to-year returns of the strategy. Specifically, Table 4 presents the year-by-year performance (from July 1973 to June 1996) of the zero-cost benchmark-adjusted portfolio that has a one-dollar *long* position in low CI stocks and a one-dollar *short* position in high CI stocks. The table reports the performance of the CI-spread portfolio in the first through the fifth year following the formation year as well as the five-year cumulative returns.

[Put Table 4 here]

The results in Table 4 reveal that low investment stocks outperform high investment stocks in about two-thirds of the years. However, the year-by-year returns are strongly positive in each year between 1974 and 1980, they are negative in 1981 and each year between 1984-1989, and are positive in all subsequent years. This pattern of returns holds for CI-spread portfolios formed on the basis of the previous year's CI as well as the CI measured in any of the preceding 4 years. The return pattern is very unlikely to occur purely by chance, and does not appear to be consistent with a risk-based explanation. Indeed, the returns tend to be positive when the market return is negative and when the aggregate economy is doing poorly.

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[14] To check the robustness of our results, (1) we also rank the stocks based on the past 3-year returns instead of the past 5-year returns, and (2) we sort the stocks first based on the past returns and then the CI-measures or the reverse. The unreported results indicate that the return patterns are almost identical to those reported in Table 3. More specifically, there exists a capital investment effect that is independent of the contrarian effect. In addition, the capital investment effect is significant and is stronger than the contrarian effect, which is not significant.

The time-series return pattern is consistent, however, with an agency explanation. The CI-spread returns were very high in the 70s when lax corporate governance and a weak takeover market allowed firms to overinvest. After 1984, firms that tended to overinvest were often taken over or were restructured, which could have lead to abnormal returns of the high capital expenditure firms in the 1984-1989 period. However, because of various impediments to takeovers introduced in the late 1980s, the relation between investment expenditures and returns may have again reversed in the later period.[15]

6. The cross-sectional determinants of the CI spread return relation

The results in the previous section indicate that in the pre- and post-hostile takeover years, there is a strong negative relation between investment expenditures and returns. In this section we examine the cross-sectional determinants of this return relation. Specifically, we will examine how variables that have been shown to influence investment expenditures, Tobin's q, cash flows, and debt ratios, affect the relation between CI and stock returns. Given that the analysis in the previous section suggests that the relation between CI and stock returns is negative only in the pre- and post-hostile takeover years, we will confine our analysis to those years.[16]

[15] In our sample, there are more takeovers in 80s (2.6%) than either the 70s (0.52%) or the 90s (0.88%). In addition, the CI measure is, on average, higher for firms that were eventually taken over than for firms that were not. The CI measure is 0.095 for the merged group versus 0.019 for the non-merged group. These CI measures are the time series averages of the yearly value-weighted CI measures. If a firm is merged in year t, it enters the CI calculation in both year t and year t-1.

[16] The results including all years are qualitatively similar but are slightly weaker than those reported here.

6.1. The relation between Tobin's q and the capital investment-return pattern

In this section, we examine the capital investment-return pattern for firms facing different investment opportunities, as measured by Tobin's q, which we approximate as the ratio of the market value of a firm to its book value. Since firms are likely to make the year t-1's capital investment decisions at the end of year t-2, we use year t-2's book-to-market ratio as a proxy for Tobin's q. We hypothesize that if the negative returns associated with capital expenditures are due to overinvestment, the negative capital investment-return relation will be weaker for high q firms than for low q firms. As we show below, our evidence relating to this issue is very weak and does not support this hypothesis.

To test this hypothesis, we form ten test portfolios based on q ratios and CIs as follows. Starting with July of year t, we place all stocks into two groups according to their year t-2's book-to-market ratio (BM). If a firm's BM is below the median BM of the year, it is designated as part of the high q group; otherwise it is placed in the low q group. Within each q group, stocks are equally divided into quintiles based on their year t-1's CIs in an ascending order. As a result, we have a total of ten portfolios based on the q ratio and CI. The returns of a particular stock are adjusted for its corresponding characteristic-based benchmark portfolio returns. We then calculate each portfolio's value-weighted monthly excess returns from July of year t to June of year t+1, and then reform the portfolios in June of t+1.

We also form two CI-spread portfolios, one for the low q group and another for the high q group. In addition, we form one H-L (*H*igh minus *L*ow) q CI-spread portfolio. The CI-spread portfolio denotes a zero-investment portfolio that has a one-dollar *long* position in the lowest two CI portfolios and a one-dollar *short* position in the highest two CI portfolios for a given q group. The H-L q CI-spread portfolio is the difference in the CI-spread portfolios between the high and low q groups. It has a long position in the high q CI-spread portfolio and a short position in the low q CI-spread portfolio. Forming portfolios in this way allows us to determine whether there is a differential pattern in the CI-return relation for low q and high q firms after controlling for the book-to-market, size and momentum effects. We also regress CI portfolio returns on the Carhart four factors to control for risks.

Table 5 presents the mean excess returns (in percentage) and the regression results for the ten characteristic-adjusted q/CI portfolios and the two zero-cost CI-spread portfolios. The last row of Table 5 provides mean return and regression coefficient estimates along with their t-statistics for the H-L q CI-spread portfolio. The results from the mean excess returns suggest that firms that invest the most generally underperform firms that invest the least for both q groups. The excess return on the CI-spread portfolio for the high q group (return = 0.32%) is slightly higher than that for the low q group (return = 0.222%). However, the formal test indicates that the return difference (i.e., the mean return on H-L q CI-spread portfolio) is insignificantly different from zero with a value of 0.098% (t-value = 0.70). The regression results on the Carhart four-factor model indicate that the intercept for the H-L q CI-spread portfolio is significant at the 0.1 level with a value of 0.257% (t-value = 1.85). This suggests that the risk-adjusted spread between firms that invest the most and firms that invest the least is actually higher for the high q group than for the low q group, which is inconsistent with our investment opportunity hypothesis.

[Put Table 5 here]

6.2. The relation between cash flow levels, debt ratios and the capital investment-return pattern

Jensen (1986) argues that those firms with the highest cash flows and the lowest leverage ratios are the most likely to overinvest.[17] If this is true, then one might expect to observe a stronger CI-return relationship among firms with either high cash flows or low leverage. However, one might expect these firms to be the least constrained, and thus the least likely to manipulate cash flows to meet their investment needs. If this is true, then one might expect to observe a weaker CI-return relationship among firms with either high cash flows or low leverage.

[17] Firms with high cash flows and low leverage tend to invest more than less levered firms with lower cash flows. Lang, Ofek, and Stulz (1996)) argue that this is at least partially due to the fact that existing debt is an impediment to investment.

To test these competing hypotheses, we use the same procedure described in the last subsection. We first form ten portfolios based on cash flow (CF) and CI rankings. Cash flow is measured as operating income before depreciation minus interest expenses, taxes, preferred dividends, and common dividends, and it is scaled by total assets. If a firm's cash flow is below the median cash flow for a particular year, the firm is designated as part of the low cash flow group; otherwise it belongs to the high cash flow group. We also form two CI-spread portfolios for low CF and high CF groups and one H-L CF CI-spread portfolio.

This same procedure is used to determine whether a firm's debt ratio affects the CI-return sensitivity. We form ten portfolios based on debt-to-assets ratio (DA) and capital investment (CI) and then to form two CI-spread portfolios and one H-L DA CI-spread portfolio. The debt/assets ratio is defined as the ratio of long-term debt over the sum of long-term debt plus the market value of firm's equity. If a firm's debt/assets ratio is below the median debt/assets ratio of the year, the firm is designated as part of the low debt group; otherwise it belongs to the high debt group. Returns on portfolios are value-weighted and adjusted for characteristic-based benchmark portfolios' returns. Returns calculated from July of year t to June of year t+1 are matched with a debt/assets ratio for the fiscal year ending in calendar year t-2 to insure that firm managers have the full scope of information about a firm's debt outstanding when making investment decisions.

The results reported in Tables 6 and 7 support for the agency explanation. Table 6 reports the results from the CF portfolios. The mean excess returns for high CF firms are monotonically decreasing with capital investments. The same pattern is found for firms with low cash flows except for the lowest CI quintile. This negative CI-return relation is further confirmed by the test on the CI-spread portfolios. We notice that the mean returns for the two CI-spread portfolios are all positive, indicating that low investors outperform high investors for both CF groups. However, the CI-spread for the high CF group (0.422% per month) is higher than that for the low CF group (0.151% per month). A formal test of the return on the H-

L CI-spread portfolio confirms that the difference is significantly different from zero with a value of 0.271% (t-value=2.17) per month or 3.25% per year. This finding is consistent with the agency explanation that the negative CI-return relation is stronger for high CF firms than for low CF firms.

[Put Table 6 here]

These results are strengthened when we control for risk using the Carhart four-factor model. The intercept for the CI-spread portfolio is higher for high CF group (value = 0.479% per month) than for the low CF group (value = 0.137% per month). A formal test on the intercept of the H-L CI-spread portfolio confirms that the difference is significantly different from zero with a value of 0.342% (t-value=2.72) per month or 4.10% per year.

Table 7 shows the average returns of characteristic-adjusted portfolios based on DA and CI as well as the regression results on the Carhart four factors. The excess returns are monotonically decreasing with the CI measure for both DA groups. The mean returns on the CI-spread portfolios are positive for both DA groups, suggesting that the negative CI-return relation holds for both DA groups. However, the returns on the CI-spread portfolios are higher for low DA firms (0.418% per month or 5.02% per year) than high DA group (0.172% per month or 2.06% per year). A formal test on the H-L DA CI-spread portfolio return shows that the CI-spread difference between high DA and low DA group is significantly different at the 0.1 level with a value of –0.245% (t-value = –1.79) per month or –2.94% per year. This evidence is consistent with the agency explanation that the negative CI-return relation is stronger for low DA group than high DA group.

[Put Table 7 here]

These results are also strengthened when we control for risk using the Carhart four-factor model. The regression intercept of the CI-spread is higher for low DA group (0.512% per month or 5.25% per year) than for the high DA group (0.148% per month or 1.78% per year). A formal test on the H-L DA

CI-spread portfolio indicates that the regression intercept of this portfolio is significantly different from zero with a value of –0.373% (t-value = –2.69) or 4.48% per year.

6.3. The size effect on the capital investment-return relation

Small firms are more likely to be financially constrained and may be less subject to agency problems. Hence, one might expect increased investment expenditures to be viewed favorably since it shows that they have access to capital. However, smaller firms have the greatest incentive to manipulate cash flows to fund increased investment, which would suggest the opposite.

In this subsection we examine the CI-return relation across four different subsamples. The sample is first split into two subsamples according to whether the firms are relatively unconstrained (high cash flow or low leverage) or constrained (low cash flow or high leverage). The sample is then split into firms with market capitalizations that are above and below the median capitalization. Table 8 reports the test results of the size/financial constraint effect on the CI-return relation. Panel A of Table 8 uses cash flow to measure whether the firms are financially constrained and Panel B uses the debt ratio to measure whether the firms are financially constrained.

[Put Table 8 here]

The results indicate that cash flow has a stronger effect on the CI-return relation for large firms than for small firms. This finding is consistent with the agency explanation. However, we do not find that size significantly affects the relation between leverage and the CI-return relation.

7. Conclusion

This paper documents a negative relation between corporate capital investments and future stock returns. Firms that invest more achieve below average stock returns for at least five subsequent years. Our results indicate that the negative investment expenditure/return relation cannot be explained by the risks, the characteristics, or the new equity-offering activities of the firms.

We consider two hypotheses that can potentially explain the negative relation between investment expenditures and stock returns. The first explanation is that financially constrained firms manipulate their cash flows to fund investment expenditures and subsequently perform poorly because the higher cash flow level cannot be sustained. The second explanation is that firms that are not financially constrained have an incentive to overinvest.

The evidence tends to support the second explanation. First, we find that the negative capital investment/return relation reverses in the 1984-1989 period; a period in which firms that over-invested were disciplined by an active takeover market. Second, we find that the negative capital investment/return relation is significantly stronger for firms with higher cash flows and lower debt ratios, which probably have a greater tendency to overinvest. We also find that the relation between cash flow and the negative capital investment/return relation is stronger for large firms, which also supports the overinvestment hypothesis.

There are, of course, other potential explanations for the negative capital investment/return relation that we did not consider in detail. One possibility is that stocks have time varying rates of return and choose to invest more when the expected return on their stock, or in other words their cost of capital, is unusually low. Hence, low future returns are the cause, rather than the effect, of high investment expenditures. Lamont (2000) examined this hypothesis using aggregate nonresidential U.S. investment data and found support for this hypothesis.

To summarize, our results are consistent with the hypothesis that firms that report increased capital expenditures tend to be overinvesting, and that the market tends to underreact to this information. One might conclude that these results should be viewed as further evidence against the efficient markets hypothesis. However, without the benefit of hindsight, an investor would not know, a priori, that firms with high investment expenditures tend to be over-investing, and therefore, would not be able to implement the trading strategy that we evaluate in this paper.

As we mentioned at the outset, the results in this paper have implications for research on the roles of stock prices and cash flows as determinants of corporate investment expenditures. In particular, by establishing a negative relation that runs from investment expenditures to stock returns, our research suggests that regressions that seek to estimate a causal relation running from cash flows and Tobin's q to investment expenditures are likely to be biased. Specifically, we would expect the coefficient of Tobin's q in these regressions to be negatively biased (since investment can reduce q) and the coefficient of cash flow to be positively biased. Moreover, these coefficients would be further biased if firms actively managed their cash flows to meet their investment needs. These are issues that future research on the determinants of corporate investment expenditures should address.

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Table 1
Mean excess returns and regression results for the characteristic-adjusted capital investment portfolio returns on the Carhart four factors: July 1973 to June 1996

This table presents mean excess returns and intercepts from the following time-series regression of the characteristic-adjusted capital investment (CI) portfolio returns on the HML, SMB, excess-Market, and PR1YR portfolio returns:

$$R_{p,t} = \boldsymbol{a}_p + \boldsymbol{b}_{HML,p} R_{HML,t} + \boldsymbol{b}_{SMB,p} R_{SMB,t} + \boldsymbol{b}_{Mkt,p}(R_{Mkt,t} - R_{ft}) + \boldsymbol{b}_{\mathrm{Pr1}yr,p} R_{\mathrm{Pr1}yr,t} + \boldsymbol{e}_{p,t},\ p = 1,...5 .$$

The dependent variables in these regressions are the monthly excess returns on CI portfolios (described below). R_{ft} is the risk-free rate in month t. $R_{HML,t}$ is the return on the HML (*H*igh *M*inus *L*ow) factor portfolio. $R_{SMB,t}$ is the return on the SMB (*S*mall *M*inus *B*ig) size factor portfolio. $R_{Mkt,t}$ is the return on the Mkt (*M*arket) factor portfolio. R_{Pr1yr} is the return on the PR1YR (high minus low prior-year return) momentum portfolio.

To calculate excess returns for CI portfolios, we first construct 125 characteristic-based benchmark portfolios based on size, book-to-market equity, and momentum as follows. At each June of year t, the universe of common stocks are first sorted into quintiles based on each firm's market equity at the end of June of year t according to the breakpoints for the NYSE firms. The firms within each size quintile are further sorted into quintiles based on their book-to-market ratio. Finally, the firms in each of the 25 SZ/BM portfolios are sorted into quintiles based on their preceding twelve-month return (PR1YR, calculated through the end of May), giving us a total of 125 portfolios. The value-weighted returns on portfolios are calculated from July of year t to June of year t+1.

Next, each stock in each year is assigned to a benchmark portfolio according to its SZ, BM, and PR1YR rank. The excess return of a particular stock is then calculated by subtracting the benchmark portfolio's return from the stock's return. The five CI portfolios are formed as follows. At each June of year t, all stocks are equally divided into quintiles based on their values on capital investment in ascending order. Value-weighted portfolio excess returns are calculated from July of year t to June of year t+1. All portfolios are rebalanced for each year.

CI-spread denotes a zero-investment portfolio that has a long position in the low capital investment portfolios and a short position in the high capital investment portfolios. The return series for this portfolio is calculated by subtracting the sum of the returns on the 4th and 5th quintile of CI portfolios from the sum of the returns on the 1st and 2nd quintile of CI portfolios, and then divide by 2.

Portfolio	Characteristic-balanced Portfolios: Mean Excess Return and Regression Coefficients						
CI	Mean	α	β_{HML}	β_{SMB}	β_{Mkt}	β_{MN}	$\overline{R}^2$
Lowest	0.042	-0.012	0.037	0.075	0.030	0.008	0.068
2	0.083**	0.119**	-0.061**	-0.001	-0.022**	0.009	0.053
3	0.055	0.058	0.001	0.002	-0.007	-0.001	0.002
4	-0.083**	-0.103**	0.023*	0.004	0.016*	-0.015	0.031
Highest	-0.127**	-0.173**	0.072**	0.011	0.031**	0.014	0.032
CI-spread	0.168**	0.192**	-0.060**	0.030	-0.020	0.009	0.027
(t-value)	(2.91)	(3.25)	(-2.42)	(1.19)	(-1.37)	(0.26)	

* represents significance at the 0.10 level. ** represents significance at the 0.05 level.

Table 2
Mean excess returns and regression results for the characteristic-adjusted capital investment portfolio returns excluding IPO/SEO firms on the Carhart four factors: July 1973 to June 1996

This table reports the test results on the IPO/SEO effect. Specifically, it reports mean excess returns and intercepts from the following time-series regression of the characteristic-adjusted capital investment (CI) portfolio returns formed on the basis from firms that have not raised new equity in the past five years on the HML, SMB, excess-Market, and PR1YR portfolio returns:

$$R_{p,t} = \boldsymbol{a}_p + \boldsymbol{b}_{HML,p} R_{HML,t} + \boldsymbol{b}_{SMB,p} R_{SMB,t} + \boldsymbol{b}_{Mkt,p} (R_{Mkt,t} - R_{ft}) + \boldsymbol{b}_{\mathrm{Pr1}yr,p} R_{\mathrm{Pr1}yr,t} + \boldsymbol{e}_{p,t},\ p = 1,\ldots 5 .$$

The portfolio formation and the description of four factors are referred to Table 1.

	Characteristic-balanced Portfolios: Mean Excess Return and Regression Coefficients						
CI	Mean	α	β_{HML}	β_{SMB}	β_{Mkt}	β_{MN}	$\overline{R}^2$
Lowest	0.094	0.028	0.048*	0.083**	0.040**	0.010	0.08
2	0.083*	0.124**	-0.064**	-0.004	-0.027*	0.011	0.06
3	0.083**	0.076*	0.012	0.011	-0.001	0.011	0.01
4	-0.072**	-0.103**	0.047**	0.002	0.019**	-0.023	0.06
Highest	-0.123*	-0.161**	0.064**	0.003	0.022	-0.015	0.03
CI-spread	0.186**	0.208**	-0.064**	0.037	-0.013	0.029	0.03
(t-value)	(3.34)	(3.43)	(-2.52)	(1.45)	(-0.90)	(0.83)	

* represents significance at the 0.10 level. ** represents significance at the 0.05 level.

Table 3
The capital investment effect versus the contrarian effect

At end of each June from 1973 to 1996, all stocks in the sample are sorted into five equal groups from small to large based on their past five-year returns (denoted as PR) at the end of June of year *t*. We also separately break all stocks into five equal groups from low to high based on their CI measures at the end of year *t*-1. The 25 portfolios are constructed from the intersections of the five past return and five CI groups. Monthly value-weighted returns (in percent) for each of these 25 portfolios are calculated from July of year *t* to June of year *t*+1. . All portfolios are rebalanced for each year.

Each CI-spread (or PR-spread) is a zero-investment portfolio that has a long position in the low capital investment (past return) portfolios and a short position in the high capital investment (past return) portfolios for a given PR (CI) group. The return series for the CI-spread (PR-spread) portfolio is calculated by subtracting the sum of the returns on the 4th and 5th quintile of CI (PR) portfolios from the sum of the returns on the 1st and 2nd quintile of CI (PR) portfolios, and then divided by 2. Average CI-spread (PR-spread) is the average of these five CI-spreads (PR-spreads).

Panel A reports the raw returns, while Panel B reports the benchmark-adjusted returns described in Table 1.

Panel A: Raw returns

Past 5-year returns	CI measures at the end of year t-1					
	Lowest	2	3	4	Highest	CI-spread
Smallest	1.627	1.360	1.397	1.076	1.187	0.362
2	1.838	1.354	1.386	1.056	1.139	0.499**
3	1.302	1.301	1.268	1.173	1.011	0.210
4	1.432	1.324	1.244	1.223	1.310	0.054
Largest	1.440	1.243	1.227	0.782	0.825	0.538**
PR-spread	0.213	0.073	0.156	0.064	0.095	
Average CI-spread =		0.264**				
Average PR-spread =		0.153				

Panel B: Benchmark-adjusted returns

Past 5-year returns	CI measures at the end of year t-1					
	Lowest	2	3	4	Highest	CI-spread
Smallest	0.310	0.146	0.166	-0.175	-0.002	0.317
2	0.285	-0.000	0.163	-0.055	-0.066	0.202
3	-0.032	0.089	0.072	-0.009	-0.360	0.213
4	0.122	0.097	0.108	0.064	0.065	0.013
Largest	0.075	-0.087	0.189	-0.253	-0.322	0.281*
PR-spread	0.068	0.068	0.016	-0.020	0.094	
Average CI-spread =		0.159**				
Average PR-spread =		0.093				

* represents significance at the 0.10 level. ** represents significance at the 0.05 level.

Table 4
The year-by-year returns on the benchmark-adjusted CI-spread portfolio: 1973 to 1995

This table presents the year-by-year returns on the benchmark-adjusted CI-spread portfolio that has a long position in the lowest two CI groups and a short position in the highest two CI groups (for the detailed portfolio construction, refer to Table I). For each formation period, the table reports the returns (in percentage) on the CI-spread portfolio in years 1, 2, 3, 4 and 5 after formation and the five-year cumulative returns. The last row reports the arithmetic means across periods and the t-statistics are in parentheses.

Formation Year	Return in Year 1	Return in Year 2	Return in Year 3	Return in Year 4	Return in Year 5	Cumulative Return
1973	**-0.95**	9.22	2.65	5.79	8.60	25.32
1974	7.41	3.53	4.88	8.05	5.30	29.17
1975	3.16	5.78	7.95	5.49	6.73	29.12
1976	5.41	7.90	4.97	7.02	1.04	26.34
1977	7.71	3.84	6.43	0.45	**-3.92**	14.51
1978	3.43	5.90	1.29	**-3.67**	0.99	7.95
1979	5.44	0.60	**-1.48**	0.00	1.43	6.00
1980	0.62	**-1.31**	0.28	1.42	**-4.38**	**-3.38**
1981	**-1.56**	0.33	1.55	**-4.34**	**-0.67**	**-4.69**
1982	0.93	1.09	**-4.29**	**-0.70**	**-1.66**	**-4.63**
1983	1.06	**-4.02**	**-0.92**	**-1.58**	**-2.26**	**-7.71**
1984	**-3.95**	**-1.21**	**-1.35**	**-2.03**	**-3.12**	**-11.67**
1985	**-1.08**	**-1.19**	**-1.81**	**-3.24**	**-1.83**	**-9.15**
1986	**-0.75**	**-2.01**	**-3.23**	**-1.58**	5.03	**-2.54**
1987	**-1.19**	**-1.00**	**-2.04**	3.87	1.85	1.50
1988	**-0.94**	**-2.39**	3.76	2.09	1.65	4.17
1989	**-2.57**	3.78	2.18	2.55	6.88	12.81
1990	3.45	1.40	2.23	6.50	5.25	18.83
1991	2.00	2.54	6.62	6.60	4.25	22.00
1992	1.54	6.49	6.42	4.27		
1993	6.52	5.97	4.11			
1994	6.36	4.54				
1995	4.52					
Avg. (t-statistic)	2.02 (2.86)	2.26 (2.88)	1.91 (2.46)	1.85 (2.10)	1.64 (1.81)	8.10 (2.55)

Table 5
Mean excess returns and regression results for the characteristic-adjusted portfolio returns formed on past q ratio and capital investment on the Carhart four factors: July 1973 to June 1996 (excluding those negative CI-spread years)

This table presents mean excess returns and regression estimates from the following time-series regression of the characteristic-adjusted portfolio returns based on past q ratio and capital investment (hence q/CI portfolio) on the HML, SMB, excess-Market, and PR1YR portfolio returns:

$$R_{p,t} = \boldsymbol{a}_p + \boldsymbol{b}_{HML,p} R_{HML,t} + \boldsymbol{b}_{SMB,p} R_{SMB,t} + \boldsymbol{b}_{Mkt,p} (R_{Mkt,t} - R_{ft}) + \boldsymbol{b}_{\Pr 1yr,p} R_{\Pr 1yr,t} + \boldsymbol{e}_{p,t},\ p = 1,\dots 5\ .$$

The dependent variables in these regressions are the monthly excess returns on q/CI portfolios (described below). R_{ft} is the risk-free rate in month t. $R_{HML,t}$ is the return on the HML (*H*igh *M*inus *L*ow) factor portfolio. $R_{SMB,t}$ is the return on the SMB (*S*mall *M*inus *B*ig) size factor portfolio. $R_{Mkt,t}$ is the return on the Mkt (*M*arket) factor portfolio. R_{Pr1yr} is the return on the PR1YR (high minus low prior-year return) momentum portfolio.

Before constructing q/CI portfolios, we first construct 125 characteristic-based benchmark portfolios based on and momentum (See Table I for the construction of the benchmark portfolios). Next, each stock in each year is assigned to a benchmark portfolio according to its SZ, BM, and PR1YR rank. The excess return of a particular stock is then calculated by subtracting the benchmark portfolio's return from the stock's return. This excess return is used when calculating portfolio return.

The q/CI portfolios are formed as follows. At each June of year t, all stocks are assigned to two groups according to their year t-2's book-to-market ratio (BM), which is used to proxy for Tobin's q ratio. If a firm's BM is below the median BM of the year, it is designated to the high q group, otherwise to the low q group. Within each q group, stocks are equally divided into quintiles based on their values on capital investment in ascending order. Value-weighted portfolio excess returns are calculated from July of year t to June of year t+1. All portfolios are rebalanced for each year.

CI-spread denotes a zero-investment portfolio that has a long position in the low capital investment portfolios and a short position in the high capital investment portfolios for a given q group. The return series for this portfolio is calculated by subtracting the sum of the returns on the 4^{th} and 5^{th} quintile of CI portfolios from the sum of the returns on the 1^{st} and 2^{nd} quintile of CI portfolios, and then divided by 2. H-L q CI-spread is the difference in CI-spreads between high and low q groups.

Portfolio		Characteristic-balanced Portfolios: Mean Return and Regression Coefficient						
CI	q	Mean	α	β_{HML}	β_{SMB}	β_{Mkt}	β_{MN}	$\overline{R}^2$
Lowest	Low	0.139	-0.033	-0.034	0.192**	0.071**	-0.029	0.170
	High	0.168	0.143	0.010	0.039	0.006	0.020	0.008
2	Low	0.107	0.116	-0.012	-0.004	0.016	0.041	0.010
	High	0.060	0.120*	-0.048*	0.010	-0.059**	0.028	0.096
3	Low	0.054	0.138*	-0.065**	-0.048	-0.045**	-0.000	0.085
	High	0.073	0.034	0.044*	-0.040	0.038**	-0.073**	0.092
4	Low	-0.082	-0.135*	0.079**	0.115**	-0.011	0.116**	0.100
	High	-0.160	-0.189**	-0.014	0.034	0.009	-0.017	0.031
Highest	Low	-0.116	-0.066	-0.043	-0.063	-0.030	-0.082	0.025
	High	-0.253	-0.347**	0.101**	0.042	0.043*	-0.009	0.065
CI-spread	Low	0.222	0.142	-0.041	0.068	0.064*	-0.011	0.073
	High	0.320	0.399**	-0.062*	-0.014	-0.053*	0.037	0.065
H-L q	Coeff	0.098	0.257*	-0.022	-0.082	-0.117**	0.048	0.115
CI-spread	t-value	(0.70)	(1.85)	(-0.39)	(-1.44)	(-3.36)	(0.61)	

* represents significance at the 0.10 level. ** represents significance at the 0.05 level.

Table 6

Mean excess returns and regression results for the characteristic-adjusted portfolio returns formed on cash flow and capital investment on the Carhart four factors: July 1973 to June 1996 (excluding those negative CI-spread years)

This table presents mean excess returns and regression estimates from the following time-series regression of the characteristic-adjusted portfolio returns based on cash flow and capital investment (hence CF/CI portfolio) on the HML, SMB, excess-Market, and PR1YR portfolio returns:

$$R_{p,t} = \alpha_p + b_{HML,p} R_{HML,t} + b_{SMB,p} R_{SMB,t} + b_{Mkt,p} (R_{Mkt,t} - R_{ft}) + b_{\text{Pr}1yr,p} R_{\text{Pr}1yr,t} + e_{p,t},\ p = 1,\ldots 5\,.$$

The dependent variables in these regressions are the monthly excess returns on CF/CI portfolios (described below). R_{ft} is the risk-free rate in month t. $R_{HML,t}$ is the return on the HML (*H*igh *M*inus *L*ow) factor portfolio. $R_{SMB,t}$ is the return on the SMB (*S*mall *M*inus *B*ig) size factor portfolio. $R_{Mkt,t}$ is the return on the Mkt (*M*arket) factor portfolio. R_{Pr1yr} is the return on the PR1YR (high minus low prior-year return) momentum portfolio.

Before constructing CF/CI portfolios, we first construct 125 characteristic-based benchmark portfolios based on size, book-to-market and momentum (See Table I for the construction of the benchmark portfolios). Next, each stock in each year is assigned to a benchmark portfolio according to its SZ, BM, and PR1YR rank. The excess return of a particular stock is then calculated by subtracting the benchmark portfolio's return from the stock's return. This excess return is used when calculating portfolio return.

The CF/CI portfolios are formed as follows. At each June of year t, all stocks are assigned to two groups according to their value in cash flow in year t-2. CF is measured as operating income before depreciation minus interest expenses, taxes, preferred dividends, and common dividends, and is scaled by total assets. If a firm's CF is above the median CF of the year, it is designated to the high CF group, otherwise to the low CF group. Within each CF group, stocks are equally divided into quintiles based on their values on capital investment in ascending order. Value-weighted portfolio excess returns are calculated from July of year t to June of year t+1. All portfolios are rebalanced for each year.

CI-spread denotes a zero-investment portfolio that has a long position in the low capital investment portfolios and a short position in the high capital investment portfolios for a given CF group. The return series for this portfolio is calculated by subtracting the sum of the returns on the 4^{th} and 5^{th} quintile of CI portfolios from the sum of the returns on the 1^{st} and 2^{nd} quintile of CI portfolios, and then divide by 2. H-L CF CI-spread is the difference in CI-spread between high and low CF groups.

Portfolio		Characteristic-Balanced Portfolios: Mean Excess Return and Regression Coefficient						
CI	CF	Mean	α	β_{HML}	β_{SMB}	β_{Mkt}	β_{MN}	$\overline{R}^2$
Lowest	Low	-0.042	-0.174	-0.038	0.098**	0.107**	-0.016	0.163
	High	0.237**	0.157	0.075*	0.081*	0.009	0.007	0.054
2	Low	0.092	0.094	0.002	-0.018	0.038*	0.058	0.031
	High	0.154**	0.236**	-0.099**	0.003	-0.061**	0.022	0.118
3	Low	0.023	0.032	0.014	0.017	0.004	0.082*	0.018
	High	0.070	0.074	-0.005	-0.041*	-0.003	-0.078**	0.034
4	Low	-0.006	-0.016	-0.022	0.034	0.003	0.020	0.012
	High	-0.164**	-0.238**	0.037	0.064**	0.027	-0.007	0.075
Highest	Low	-0.246**	-0.340**	0.133**	0.037	0.018	-0.044	0.080
	High	-0.289**	-0.327**	0.018	0.021	0.019	-0.018	0.011
CI-spread	Low	0.151	0.137	-0.073*	0.005	0.062**	0.033	0.082
	High	0.422**	0.479**	-0.039	-0.001	-0.049**	0.027	0.036
H-L CF	Coeff	0.271**	0.342**	0.034	-0.006	-0.111**	-0.006	0.092
CI-spread	t-value	(2.17)	(2.72)	(0.67)	(-0.112)	(-3.53)	(-0.09)	

* represents significance at the 0.10 level. ** represents significance at the 0.05 level.

Table 7

Mean excess returns and regression results for the characteristic-adjusted portfolio returns formed on debt-to-assets ratio and capital investment on the Carhart four factors: July 1973 to June 1996 (excluding those negative CI-spread years)

This table presents mean excess returns and regression estimates from the following time-series regression of the characteristic-adjusted portfolio returns based on debt-to-assets ratio and capital investment (hence DA/CI portfolio) on the HML, SMB, excess-Market, and PR1YR portfolio returns:

$$R_{p,t} = \boldsymbol{a}_p + \boldsymbol{b}_{HML,p} R_{HML,t} + \boldsymbol{b}_{SMB,p} R_{SMB,t} + \boldsymbol{b}_{Mkt,p} (R_{Mkt,t} - R_{ft}) + \boldsymbol{b}_{\mathrm{Pr1}yr,p} R_{\mathrm{Pr1}yr,t} + \boldsymbol{e}_{p,t},\ p = 1,\dots 5\ .$$

The dependent variables in these regressions are the monthly excess returns on DA/CI portfolios (described below). R_{ft} is the risk-free rate in month t. $R_{HML,t}$ is the return on the HML (*H*igh *M*inus *L*ow) factor portfolio. $R_{SMB,t}$ is the return on the SMB (*S*mall *M*inus *B*ig) size factor portfolio. $R_{Mkt,t}$ is the return on the Mkt (*M*arket) factor portfolio. R_{Pr1yr} is the return on the PR1YR (high minus low prior-year return) momentum portfolio.

Before constructing DA/CI portfolios, we first construct 125 characteristic-based benchmark portfolios based on size, book-to-market and momentum (See Table IV for the construction of the benchmark portfolios). Next, each stock in each year is assigned to a benchmark portfolio according to its SZ, BM, and PR1YR rank. The excess return of a particular stock is then calculated by subtracting the benchmark portfolio's return f
excess return is used when calculating portfolio return.

The DA/CI portfolios are formed as follows. At each June of year t, all stocks are assigned to two groups according to their value in debt-to-assets ratio DA in year t-2. DA is defined as the ratio of long-term debt over the sum of long-term debt plus the market value of firm's equity. If a firm's DA is above the median DA of the year, it is designated to the high debt group, otherwise to the low debt group. Within each DA group, stocks are equally divided into quintiles based on their values on capital investment in ascending order. Value-weighted portfolio excess returns are calculated from July of year t to June of year t+1. All portfolios are rebalanced for each year.

CI-spread denotes a zero-investment portfolio that has a long position in the low capital investment portfolios and a short position in the high capital investment portfolios for a given DA group. The return series for this portfolio is calculated by subtracting the sum of the returns on the 4th and 5th quintile of CI portfolios from the sum of the returns on the 1st and 2nd quintile of CI portfolios, and then divide by 2. H-L DA CI-spread is the difference in CI-spread between high and low D/A groups.

Portfolio		Characteristic-balanced Portfolios: Mean Return and Regression Coefficient						
CI	DA	Mean	α	β_{HML}	β_{SMB}	β_{Mkt}	β_{MN}	$\overline{R}^2$
Lowest	Low	0.255*	0.262**	-0.062	0.035	-0.009	0.010	0.017
	High	0.160	0.003	0.010	0.131**	0.125**	0.057	0.173
2	Low	0.101	0.184**	-0.088	-0.014	-0.054**	0.023	0.098
	High	0.090	0.040	0.067**	0.049	0.014	0.041	0.035
3	Low	0.069	0.028	0.038	-0.035	0.032**	-0.087**	0.081
	High	0.065	0.132*	-0.022	-0.022	-0.047**	0.037	0.080
4	Low	-0.173**	-0.202**	-0.036	0.030	0.014	-0.033	0.045
	High	-0.036	-0.121	0.085**	0.106**	0.021	0.076*	0.097
Highest	Low	-0.307**	-0.394**	0.065	0.054	0.014	-0.069	0.056
	High	-0.059	-0.132	0.060	0.085**	0.035	0.077	0.051
CI-spread	Low	0.418**	0.521**	-0.089**	-0.031	-0.046	0.068	0.084
	High	0.172*	0.148	-0.034	-0.006	0.042*	-0.027	0.032
H-L DA	Coeff	-0.245*	-0.373**	0.056	0.025	0.088**	-0.095	0.075
CI-spread	t-value	(-1.79)	(-2.69)	(0.10)	(0.45)	(2.51)	(-1.21)	

* represents significance at the 0.10 level. ** represents significance at the 0.05 level.

Table 8
Tests of size effect on the capital investment and return relation: July 1973 to June 1996 (excluding those negative CI-spread years)

This table reports the test results of the size effect on the capital investment and return relation. Firms are first divided equally into two groups based on their cash flows (or debt-to-equity ratios). Within each CF (or DA) group, firms are further divided equally into two groups based on their market capitalizations (SZ) in June. The CI-spread difference is the difference between large and small size groups.

Panel A: Test results on size effect for cash flow

Portfolio		Characteristic-balanced Portfolios: Mean Return and Regression Coefficient						
CI-spread	Size	Mean	α	β_{HML}	β_{SMB}	β_{Mkt}	β_{MN}	$\overline{R}^2$
High CF	Small	0.159	0.142	-0.040	-0.056	0.021	-0.154**	0.045
	Large	0.418**	0.496**	-0.066*	-0.003	-0.067**	0.019	0.066
CI-spread Difference	Coeff.	0.259*	0.354**	-0.026	0.052	-0.088**	0.173**	0.081
	t-value	(1.90)	(2.56)	(-0.46)	(0.92)	(-2.54)	(2.22)	
Low CF	Small	0.192	0.053	-0.073	0.078	0.046	-0.248**	0.160
	Large	0.184*	0.234**	-0.089**	-0.007	0.017	0.090	0.067
CI-spread Difference	Coeff.	-0.008	0.182	-0.016	-0.084	-0.030	0.338**	0.159
	t-value	(-0.05)	(1.11)	(-0.24)	(-1.25)	(-0.72)	(3.64)	

Panel B: Test results on size effect for debt-to-equity ratio

Portfolio		Characteristic-balanced Portfolios: Mean Return and Regression Coefficient						
CI-spread	Size	Mean	α	β_{HML}	β_{SMB}	β_{Mkt}	β_{MN}	$\overline{R}^2$
High DA	Small	0.055	-0.034	-0.060	0.007	0.054	-0.203**	0.098
	Large	0.181*	0.190**	-0.025	-0.020	0.025	0.017	0.016
CI-spread Difference	Coeff.	0.126	0.224	0.035	-0.027	-0.029	0.220**	0.065
	t-value	(0.79)	(1.38)	(0.54)	(-0.40)	(-0.72)	(2.40)	
Low DA	Small	0.254**	0.314**	-0.090*	-0.122**	-0.001	-0.147**	0.057
	Large	0.380**	0.461**	-0.068*	-0.013	-0.040*	0.067	0.061
CI-spread Difference	Coeff.	0.126	0.147	0.022	0.109*	-0.039	0.214**	0.048
	t-value	(0.85)	(0.97)	(0.36)	(1.76)	(-1.02)	(2.50)	

* represents significance at the 0.10 level. ** represents significance at the 0.05 level.