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COSTLY EXTERNAL EQUITY:
IMPLICATIONS FOR ASSET PRICING ANOMALIES

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ABSTRACT

We document that the value, net stock issues, investment, and asset growth anomalies tend to be stronger in financially more constrained firms than in less constrained firms. This effect of financial constraints is distinct from that of financial distress on anomalies. Intuitively, costly external finance makes marginal costs of investment more sensitive to investment in more constrained firms, giving rise to a stronger negative correlation between investment and the discount rate.

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1 Introduction

We study the relation between asset pricing anomalies and financial constraints. Our central finding is that the book-to-market, net stock issues, investment, and asset growth anomalies tend to be stronger in financially more constrained firms than in less constrained firms.

Specifically, using asset size as a measure of costly external finance, we find that the value-weighted average return, CAPM alpha, and Fama-French (1993) alpha of the high-minus-low book-to-market quintile are 1.24%, 1.49%, and 0.86% per month in the small asset size tercile, respectively. In contrast, their counterparts in the big asset size tercile, 0.32%, 0.40%, and −0.35% are more than halved in magnitude. And the differences across the two asset size subsamples are more than four standard errors from zero. The value-weighted average return, CAPM alpha, and Fama-French alpha for the high-minus-low net stock issues quintile also are higher in magnitude in firms with small asset size than in firms with big asset size: −1.02% vs. −0.48%, −1.20% vs. −0.56%, and −0.91% vs. −0.41% per month, respectively. And the differences across the two asset size subsamples are more than 2.8 standard errors from zero.

Using bond ratings to measure costly external finance, we find that in the unconstrained subsample consisting of firms whose bonds are rated, the value-weighted average return, CAPM alpha, and Fama-French (1993) alpha for the high-minus-low investment-to-assets quintile are −0.33%, −0.41%, and −0.14% per month. These estimates are either close to or more than halved in magnitude from their counterparts in the constrained subsample consisting of firms whose bonds are not rated. The differences across the unconstrained and constrained subsamples are all more than 2.8 standard errors from zero. For the value-weighted average return, CAPM alpha, and Fama-French alpha of the high-minus-low asset growth quintile, the differences between the two subsamples with and without bond ratings are −0.40%, −0.34%, and −0.44% per month, respectively, which are all more than 2.4 standard errors from zero.

Previous studies show that the value premium is most significant in firms with high probabilities of financial distress (e.g., Griffin and Lemmon 2002, Vassalou and Xing 2004, Garlappi and Yan 2007). Our work complements this literature because financial constraints and financial distress are different, albeit related, concepts. Financial constraints are frictions that prevent the firm from funding all desired investments (e.g., Lamont, Polk, and Saá-Requejo 2001), while financial distress is situations where cash flow is insufficient to cover current obligations (e.g., Wruck 1990).[1] To disentangle the effect of financial constraints from that of financial distress, we examine the variation in the magnitude of the anomalies across subsamples split jointly by measures of financial constraints and financial distress. We find that financial distress does not subsume financial constraints, but that financial constraints often dominate financial distress in our multivariate tests.

Specifically, the differences in the value-weighted average return, CAPM alpha, and Fama-French (1993) alpha of the high-minus-low book-to-market portfolios across the small and big asset size subsamples are 0.80%, 0.93%, and 1.05% per month, respectively, in the low Ohlson's (1980) O-score subsamples. Their counterparts in the high O-score subsamples are similar: 0.96%, 1.12%, and 1.26% per month, respectively. In contrast, the differences across the high and low O-score subsamples in the small asset size universe are 0.51%, 0.50%, and 0.58% per month ($t = 1.96$, 1.91, and 2.25), but those in the big asset size universe are 0.35%, 0.31%, and 0.37% per month ($t = 1.84$, 1.65, and 1.92), respectively. The evidence suggests that the effect of asset size on the magnitude of the value premium is largely unaffected after we control for the O-score, but that the effect of O-score often becomes insignificant after we control for asset size.

Empirically, there are two possibilities why the anomalies we study tend to be stronger in more constrained firms. First, the spread in a given anomaly variable is wider in more constrained firms (the spread effect). Second, for a given change in an anomaly variable, the magnitude of the corresponding change in the average return is higher in more constrained firms (the slope effect). We

[1] In their studies of financial constraints, both Kaplan and Zingales (1997) and Lamont, Polk, and Saá-Requejo (2001) limit their samples to manufacturing firms with positive real sales growth because "[r]estricting attention to firms with growing sales also helps eliminate distressed firms from the construction of the financial constraints factor, helping ensure that we are measuring constraint and not distress (Lamont et al., p. 532, footnote 1)." Whited and Wu (2006) also only include firms that never have more than two quarters of negative sales growth because they "want to look at firms that face external finance constraints rather than firms that are in financial distress (p. 541)."

find that the spread effect is the only driver for the variation of the net stock issues anomaly, but that both effects are present for the value, investment, and asset growth anomalies.

Finally, we provide an investment-based interpretation of our evidence by incorporating costly external finance into the q-theory framework à la Cochrane (1991). Using a static example, we show analytically why certain anomalies are stronger when external finance is more costly. High investment means higher marginal costs of investment, which in turn mean lower expected returns. More important, in more constrained firms for which external equity is more costly, marginal costs of investment are more sensitive to inceases in investment. As a result, the negative relation between investment and the discount rate is stronger for more constrained firms.

Our work adds to the literature that explores asset pricing implications of financial constraints. Lamont, Polk, and Saá-Requejo (2001) show that more constrained firms earn lower average returns than less constrained firms. Campello and Chen (2005) find that the bonds of more constrained firms earn higher ex ante risk premiums, which also covary with macroeconomic fluctuations. Building on Almeida and Campello (2007), Hahn and Lee (2005) study the effect of debt capacity on stock returns across constrained and unconstrained samples. Whited and Wu (2006) construct an index of financial constraints via structural estimation and find that more constrained firms earn insignificantly higher average returns than less constrained firms. None of these papers examine the impact of financial constraints on the magnitude of anomalies, which is the focus of our study.

Several recent studies in empirical asset pricing share our investment-based perspective in understanding asset pricing dynamics. Cochrane (1996) uses returns on physical investment as factors to price the cross section of returns. Anderson and Garcia-Feijóo (2006) document that investment growth classifies firms into size and book-to-market portfolios. Xing (2008) shows that an investment growth factor defined as the difference in returns between low-investment and high-investment stocks contains information similar to Fama and French's (1993) value factor and can explain the value effect as well as HML. Cooper and Priestley (2008a) show that the output gap, a production based macroeconomic variable, is a stronger predictor of excess stock and bond returns. Cooper and Priestley (2008b) show that systematic risk falls sharply following firm investment and rises after disinvestment and that the negative investment-expected returns relation is driven by risk loading differences between high and low investment firms.

Our story proceeds as follows. Section 2 describes our data and measures of financial constraints. Section 3 documents the relation between the anomalies in question and financial constraints. Section 4 distinguishes the effect of financial constraints from that of financial distress. Section 5 evaluates the relative importance of the spread and the slope effects in driving our results. Section 6 interprets our evidence. Finally, Section 7 concludes.

2 Data and Preliminary Analysis

We obtain financial statement data, such as capital expenditure, cash flow, and debt from Compustat and stock returns data from the Center for Research in Security Prices (CRSP). All domestic common shares trading on NYSE, AMEX, and NASDAQ with accounting and returns data available are included except for financial firms (firms with four-digit SIC codes between 6000 and 6999). In particular, utility firms are included in our sample. Following Fama and French (1993), we also exclude closed-end funds, trusts, ADRs, REITS, and units of beneficial interest. To mitigate backfilling biases, we require firms to be listed on Compustat for two years before using them. We use the U.S. one-month Treasury bill rates as the risk-free rate in computing excess returns. To be included in the sample, a firm must have all the variables required to compute the relevant variables. The sample period is from July 1963 to December 2006.

2.1 Measures of Financial Constraints

We primarily use four measures of financial constraints in our asset pricing tests.

- Asset size. Asset size is defined as book value of total assets (Compustat annual item 6). At the end of June of each year t, we rank firms based on their total assets at the fiscal year ending in t–1. We assign those firms in the bottom tercile of the annual asset size distribution to the more financially constrained subsample and those firms in the top tercile to the less constrained subsample. Asset size is a traditional measure of financial constraints (e.g., Gilchrist and Himmelberg 1995, Erickson and Whited 2000, Almeida and Campello 2007).

- Payout ratio. The payout ratio is defined as the ratio of total distributions including dividends for preferred stocks (Compustat annual item 19), dividends for common stocks (item 21), and share repurchases (item 115) divided by operating income before depreciation (item 13). At the end of June of each year t, we rank firms based on their payout ratios measured at the end of fiscal year $t-1$. We assign those firms in the bottom tercile of the annual payout ratio distribution to the more financially constrained subsample and those firms in the top tercile to the less constrained subsample. The payout ratio also is a traditional measure of financial constraints (e.g., Fazzari, Hubbard, and Peterson 1988, Almeida, Campello, and Weisbach 2004, Almeida and Campello 2007).

- Bond rating. Following Almeida, Campello, and Weisbach (2004) and Almeida and Campello (2007), we retrieve data on firms' bond ratings assigned by Standard & Poor's and categorize those firms that never had their public debt rated during our sample period as financially constrained. Observations from those firms are only assigned to the constrained subsample in years when the firms report positive debt. The financially unconstrained subsample contains those firms whose bonds have been rated during the sample period. This approach has been used extensively in the corporate finance literature (e.g., Whited 1992, Kashyap, Lamont, and Stein 1994, Cummins, Hasset, and Oliner 1999).

- The Whited-Wu (2006, WW) index. Following Whited and Wu, we compute the WW index using Compustat quarterly data as follows:

$$WW = -0.091\,CF - 0.062\,DIVPOS + 0.021\,TLTD - 0.044\,LNTA + 0.102\,ISG - 0.035\,SG \quad (1)$$

in which CF is the ratio of cash flow to total assets, $DIVPOS$ is an indicator that takes the value of one if the firm pays cash dividends, $TLTD$ is the ratio of the long-term debt to total assets, $LNTA$ is the natural log of total assets, ISG is the firm's three-digit industry sales growth, and SG is firm sales growth. All variables are deflated by the replacement cost of total assets as the sum of the replacement value of the capital stock plus the rest of the total assets. We follow Whited (1992) in computing the replacement value of the capital stock. Because of data limitations of the quarterly long-term debt (Compustat quarterly item 51), the sample period for the WW-related tests is from July 1976 to December 2006.

We also have experimented with the Kaplan and Zingales (1997, KZ) index, following Lamont, Polk, and Saá-Requejo (2001) in using the regression coefficients from Kaplan and Zingales to compute the KZ index. We find that the KZ index is only weakly correlated with the other measures. The average cross-sectional Spearman's correlation of the KZ index is only -0.07 with asset size, and is 0.15 with the WW index. This evidence seems consistent with recent papers that cast doubt on the KZ index as a valid measure of financial constraints (e.g., Almeida, Campello, and Weisbach 2004, Whited and Wu 2006, Hennessy and Whited 2007, Hadlock and Pierce 2008). For example, Hadlock and Pierce reestimate Kaplan and Zingales's (1997) ordered logit model on a larger, most recent sample. They find that only two out of five components in the KZ index have signs that are consistent with the index. As such, we do not use the KZ index to measure financial constraints.

To disentangle the effect of financial constraints from that of financial distress, we use two distress measures: (i) O-score from Ohlson (1980) and Griffin and Lemmon (2002),[2] and (ii) failure

[2]Specifically, we follow Griffin and Lemmon (2002, p. 2320) to construct O-score:

$$O = -1.32 - 0.407 \log(\text{Total assets}) + 6.03 \left(\frac{\text{Total liabilities}}{\text{Total assets}}\right) - 1.43 \left(\frac{\text{Working capital}}{\text{Total assets}}\right)$$
$$+ 0.076 \left(\frac{\text{Current liabilities}}{\text{Current assets}}\right) - 1.72\,(1 \text{ if total liabilities } > \text{ total assets, } 0 \text{ if otherwise})$$
$$-2.37 \left(\frac{\text{Net income}}{\text{Total assets}}\right) - 1.83 \left(\frac{\text{Funds from operations}}{\text{Total liabilities}}\right) + 0.285\,(1 \text{ if a net loss for the last two years, } 0 \text{ otherwise})$$
$$-0.521 \left(\frac{\text{Net income}_t - \text{Net income}_{t-1}}{|\text{Net income}_t| + |\text{Net income}_{t-1}|}\right)$$

probability (F-prob) from Campbell, Hilscher, and Szilagyi (2007).[3] Because of the data limitation of total liabilities (Compustat quarterly item 54), the sample period for the F-prob related tests is from July 1976 to December 2006.

Table 1 reports the average cross-sectional Spearman's correlations among measures of financial constraints (and distress). At the end of each year in the sample, we calculate all the pairwise cross-sectional correlations and report their time series averages. All the correlations are significant at the 1% level (we evaluate significance using time series standard errors). The four measures of financial constraints are correlated with each other. The correlations range from -0.94 between asset size and the WW index to 0.47 between asset size and payout ratio. The correlation with the smallest magnitude is -0.21 between payout ratio and bond rating.

The two distress measures, F-prob and O-score, have a correlation of 0.51. Their correlations with measures of financial constraints range from -0.37 between payout ratio and O-score to 0.38 between payout ratio and the WW index. The correlation with the smallest magnitude is 0.16 between F-prob and bond ratings. Thus, it seems necessary to disentangle the effect of financial constraints on the magnitude of anomalies from that of financial distress.

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in which total assets are measured as Compustat annual item 6, total liabilities as item 181, working capital as current assets (item 4) minus current liabilities (item 5), net income as item 172, and funds from operations as item 13.

[3] Specifically, we construct F-prob following Campbell, Hilscher, and Szilagyi (2007, the third column in Table 4):

$$\begin{aligned} F\text{–prob}(t) \quad &= \quad -9.164 - 20.264\, NIMTAAVG_t + 1.416\, TLMTA_t - 7.129\, EXRETAVG_t \\ &+ 1.411\, SIGMA_t - 0.045\, RSIZE_t - 2.132\, CASHMTA_t + 0.075\, MB_t - 0.058\, PRICE_t \end{aligned}$$

$$\begin{aligned} NIMTAAVG_{t-1,t-12} \quad &\equiv \quad \frac{1-\phi^2}{1-\phi^{12}}\left(NIMTA_{t-1,t-3} + \cdots + \phi^9 NIMTA_{t-10,t-12}\right) \\ EXRETAVG_{t-1,t-12} \quad &\equiv \quad \frac{1-\phi}{1-\phi^{12}}\left(EXRET_{t-1} + \cdots + \phi^{11} EXRET_{t-12}\right) \end{aligned}$$

The coefficient $\phi = 2^{-1/3}$, meaning that the weight is halved each quarter. $NIMTA$ is net income (COMPUSTAT quarterly item 69) divided by the sum of market equity and total liabilities (item 54). 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 divided by the sum of market equity and total liabilities. $SIGMA$ is the volatility of each firm's daily stock return over the past three months. $RSIZE$ 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 divided by the sum of market equity and total liabilities. MB is the market-to-book equity. $PRICE$ is the log price per share of the firm.

2.2 Descriptive Statistics of Portfolios Sorted on Anomaly Variables

To provide necessary background for our main tests in Section 3, we report the descriptive statistics of portfolios sorted on anomaly variables.

The book-to-market equity, B/M, is defined as in Fama and French (1993).[4] Following Fama and French (2007), we measure net stock issues, NS, as the the natural log of the ratio of the split-adjusted shares outstanding at the fiscal year-end in $t-1$ divided by the split-adjusted shares outstanding at the fiscal year-end in t–2. The split-adjusted shares outstanding is Compustat shares outstanding (item 25) times the Compustat adjustment factor (item 27). We measure investment-to-assets, I/A, as the change in property, plant, and equipment (Compustat annual item 7) plus change in inventories (item 3) divided by lagged total assets (item 6), as in Lyandres, Sun, and Zhang (2007).[5] Following Cooper, Gulen, and Schill (2008), we measure asset growth, △A/A, as the change in total assets divided by lagged total assets. At the end of June of each year t, we sort stocks into five equal-numbered quintiles on I/A, △A/A, B/M, and NS. Portfolio returns are calculated from July of year t to June of year t+1, and the portfolios are rebalanced in each June.

Table 2 reports average returns in excess of the one-month Treasury bill rates, the CAPM alphas, and the alphas from the Fama-French (1993) three-factor model for all the portfolios. Both equal-weighted and value-weighted results are reported. From Panel A, the high-minus-low B/M portfolio earns an equal-weighted average return of 1.11% per month (t = 6.50) and a value-weighted average return of 0.50% (t = 2.77). The equal-weighted CAPM alpha is 1.31% per month (t = 8.77) and the value-weighted CAPM alpha is 0.60% (t = 3.40). Even the Fama-French model leaves a significant equal-weighted alpha of 0.66% per month (t = 7.29).

[4]Specifically, book value is the Compustat book value of stockholders' equity, plus balance sheet deferred taxes and investment tax credit (if available), minus the book value of preferred stock. Depending on availability, we use redemption, liquidation, or par value (in that order) to estimate the book value of preferred stock. Market equity is price per share times the number of shares outstanding. The B/M ratio used to form portfolios in June of year t is book equity for the fiscal year ending in calendar year $t-1$, divided by market equity at the end of December of year $t-1$. We do not use negative BE firms. Also, only firms with ordinary common equity are included in the tests.

[5]We also have experimented with an alternative measure of investment-to-assets as capital expenditure (item 128) divided by lagged net property, plant, and equipment (item 8). The results are largely similar (not reported).

Panel B shows that high NS stocks earn lower average returns than low NS stocks, consistent with Ritter (1991), Ikenberry, Lakonishok, and Vermalaen (1995), Loughran and Ritter (1995), and Spiess and Affleck-Graves (1995). The high-minus-low quintile earns an equal-weighted average return of -0.70% per month ($t = -4.99$) and a CAPM alpha of -0.86% ($t = -6.86$). The value-weighted average returns and alphas for the high-minus-low NS portfolio are largely similar in magnitude to their equal-weighted counterparts. The Fama-French (1993) model cannot explain the net issues puzzle: The equal-weighted alpha is -0.62% per month ($t = -5.78$) and the value-weighted alpha is -0.44% ($t = -4.13$).

From Panel C, high investment firms earn lower average returns than low investment firms, consistent with Titman, Wei, and Xie (2004), Polk and Sapienza (2007), and Xing (2008). The high-minus-low I/A quintile has an average equal-weighted return of -0.92% per month ($t = -9.21$) and an average value-weighted return of -0.43% ($t = -3.57$). The Fama-French (1993) model helps explain the high-minus-low return by reducing its value-weighted alpha to -0.20% per month ($t = -1.91$), but its equal-weighted alpha remains high: -0.86% ($t = -9.18$).

Panel D shows that firms with high asset growth earn lower average returns than firms with low asset growth, consistent with Cooper, Gulen, and Schill (2008). The high-minus-low $\triangle$A/A portfolio earns an equal-weighted average return of -1.12% per month ($t = -8.60$) and a CAPM alpha of -1.20% ($t = -9.70$). The value-weighted average return and CAPM alpha are -0.36% ($t = -2.43$) and -0.48% per month ($t = -3.35$), respectively. The Fama-French (1993) model reduces the value-weighted alpha to a tiny -0.07% per month, but leaves a significant equal-weighted alpha of -1.01% ($t = -8.16$) unexplained.

3 The Effect of Financial Constraints on Asset Pricing Anomalies

We focus on how the magnitude of the book-to-market, net stock issues, investment, and asset growth anomalies varies with measures of financial constraints.

Our test design is simple. At the end of June of year t, we split the sample into subsamples based on a given measure of financial constraints at the end of fiscal year $t-1$. Within each subsample, we sort stocks into five quintile portfolios based on a given anomaly variable. We then compare the magnitude of the average returns and alphas of the high-minus-low portfolios across extreme subsamples. Initiated by Fazzari, Hubbard, and Peterson (1988), this sample-splitting method based on a priori measures of financial constraints has been used extensively in corporate finance to study the impact of these constraints on firm value and capital investment.

3.1 The Book-to-Market Portfolios

Table 3 reports the variation of the value anomaly across subsamples split by financial constraints measures. From Panel A, the equal-weighted average return, CAPM alpha, and Fama-French (1993) alpha of the high-minus-low B/M portfolio are $1.59\%, 1.83\%$, and 1.34% per month in the small asset size subsample, respectively. In contrast, their counterparts in the big asset size subsample, $0.57\%, 0.65\%$, and -0.06% per month, are less than one-third of their respective magnitudes. Similarly, the value-weighted average return and CAPM alpha of the high-minus-low B/M portfolio are higher in the small asset size subsample than in the big asset size subsample: 1.24% vs. 0.32% and 1.49% vs. 0.40% per month, respectively. The value-weighted Fama-French alpha becomes significantly positive in the small asset size subsample, 0.86% per month ($t = 5.36$), but is significantly negative in the big asset size subsample, -0.35% ($t = -4.18$). Panel A also reports t-statistics, denoted $t(\text{H}-\text{L}|\text{C}-\text{U})$, which test the differences in the average return, the CAPM alpha, and the Fama-French alpha of the high-minus-low portfolios across the small and big asset size subsamples equal zero. These t-statistics show that the differences are highly significant in all cases.

From the equal-weighted results in Panel B, the average return, CAPM alpha, and Fama-French (1993) alpha of the high-minus-low B/M portfolio are more than twice as high in magnitude in the low payout subsample as their counterparts in the high payout subsample: 1.44% vs. 0.60%, 1.65% vs. 0.70%, and 1.00% vs. 0.19% per month, respectively. The value-weighted average return of the high-minus-low portfolio is 0.72% per month ($t=2.83$) in the low payout subsample, which is higher than that in the high payout subsample, 0.23% ($t=1.37$). The value-weighted CAPM alpha also is higher in the most constrained subsample than that in the least constrained subsample: 0.90% ($t=3.66$) vs. 0.31% per month ($t=1.93$). And the differences in the average return, the CAPM alpha, and the Fama-French alpha of the zero-investment portfolio across the low and high payout ratio subsamples are mostly significant.

Panel C of Table 3 shows that the value anomaly is stronger in the constrained firms defined by bond ratings. In the unconstrained subsmple, the equal-weighted average returns, CAPM alpha, and the Fama-French (1993) alpha of the high-minus-low B/M portfolio are 0.80%, 0.97%, and 0.27% per month, respectively. These are lower in magnitude than their counterparts in the constrained subsample, 1.29%, 1.48%, and 0.94% per month, respectively. The value-weighted results are similar. In the unconstrained subsample, the average return and CAPM alpha are 0.34% and 0.44%, which are less than one-half in magnitude of their counterparts in the constrained subsample, 0.89% and 1.07% per month, respectively. The Fama-French alpha is significantly positive in the constrained subsample, but is significantly negative in the unconstrained subsample.

From Panel D of Table 3, the value anomaly is clearly stronger in more financially constrained firms as defined by the Whited-Wu (2006) index. The equal-weighted average return, CAPM alpha, and Fama-French (1993) alpha of the high-minus-low B/M portfolio are 0.51%, 0.67%, and −0.08% per month, respectively, in the low WW subsample. These are much lower in magnitude than their counterparts, 1.76%, 2.09%, and 1.62% per month, respectively, in the high WW subsample. Similarly, the value-weighted average return, CAPM alpha, and Fama-French alpha of the high-minus-low portfolio in the high WW subsample are higher in magnitude than those in the low WW subsample, 0.37% vs. 1.50%, 0.46% vs. 1.85%, and −0.35% vs. 1.25% per month, respectively. In all cases, the differences between the most and the least constrained subsamples are highly significant.

3.2 The Net Stock Issues Portfolios

Table 4 reports the variation of the net stock issues anomaly across subsamples split by financial constraints measures. From Panel A, the equal-weighted average return, CAPM alpha, and Fama-French (1993) alpha of the high-minus-low NS portfolio are $-0.88\%, -1.07\%$, and -0.86% per month in the small asset size subsample, respectively. In contrast, their counterparts in the big asset size subsample are $-0.48\%, -0.59\%$, and -0.43% per month, respectively. And the differences are significant ($t = -2.71, -3.34$, and -2.84, respectively). Similarly, the value-weighted average return, CAPM alpha, and the Fama-French alpha of the high-minus-low portfolio are higher in magnitude in firms with small asset size than in firms with big asset size: -1.02% vs. -0.48%, -1.20% vs. -0.56%, and -0.91% vs. -0.41% per month, respectively. And the differences again are significant.

From the equal-weighted results in Panel B, the average return, the CAPM alpha, and the Fama-French (1993) alpha of the high-minus-low NS portfolio are larger in magnitude in the low payout subsample than in the high payout subsample: -1.08% vs. -0.63%, -1.24% vs. -0.64%, and -0.96% vs. -0.52% per month, respectively. The differences are all significant at the 1% level. The value-weighted average return of the high-minus-low portfolio is -0.75% per month in the low payout subsample, which is higher in magnitude than that in the high payout subsample, -0.51%. And the difference of -0.24% per month is marginally significant ($t = -1.78$). The value-weighted CAPM alpha also is higher in the most constrained subsample: -0.90% vs. -0.50% per month, and the difference is significant ($t = -2.59$). However, the magnitude of the value-weighted Fama-French alpha is similar across the two extreme subsamples.

Panel C of Table 4 shows that, in the unconstrained subsample with bond ratings, the equal-weighted average returns, CAPM alpha, and the Fama-French (1993) alpha of the high-minus-low NS portfolio are $-0.49\%, -0.62\%$, and -0.41% per month, respectively. These are lower in magnitude than their counterparts in the constrained subsample without bond ratings, $-0.83\%, -1.01\%$, and -0.77% per month, respectively. And the differences across the two subsamples are all significant at the 1% level. The value-weighted results are quantitatively similar.

Using the Whited-Wu (2006) index, Panel D shows that the NS anomaly is stronger in more financially constrained firms. The equal-weighted average return, CAPM alpha, and Fama-French (1993) alpha of the high-minus-low NS portfolio are $-0.45\%, -0.62\%$, and -0.45% per month in the low WW subsample, respectively. These are more than halved in magnitude from their counterparts, $-1.09\%, -1.34\%$, and -1.13% per month in the high WW subsample. The differences across the two subsamples again are all significant at the 1% level. Finally, the value-weighted results are quantitatively similar to the equal-weighted results.

3.3 The Investment-to-Assets and the Asset Growth Portfolios

Table 5 reports the variation of the investment anomaly across subsamples split by measures of financial constraints. In general, the equal-weighted results are quantitatively similar to those of the book-to-market and net stock issues portfolios, but the value-weighted results are somewhat weaker.

Panel A shows that the equal-weighted average return, CAPM alpha, and Fama-French (1993) alpha of the high-minus-low I/A portfolio are $-1.11\%, -1.13\%$, and -1.06% per month in the small asset size subsample, respectively. In contrast, their magnitudes are more than halved in the big asset size subsample: $-0.48\%, -0.55\%$, and -0.34% per month, respectively. And the differences in magnitude are more than 3.8 standard errors from zero. The value-weighted average return, CAPM alpha, and Fama-French alpha of the high-minus-low portfolio are higher in magnitude in the most constrained subsample: -0.45% vs. -0.30%, -0.51% vs. -0.37%, and -0.41% vs. -0.08% per month, respectively. However, the differences are all within 1.65 standard errors of zero. From Panels B and D, splitting the sample by payout ratio and the WW index yields quantitatively similar results as those in Panel A from splitting the sample by asset size.

From Panel C, splitting the sample by bond ratings yields larger differences in value-weighted results between the constrained subsample without bond ratings and the unconstrained subsample with bond ratings. In the unconstrained subsample, the value-weighted average return, CAPM alpha, and Fama-French (1993) alpha are -0.33%, -0.41%, and -0.14% per month, which are close to or more than halved in magnitude from their counterparts in the constrained subsample, $-0.64\%, -0.75\%$, and -0.49% per month, respectively. And the differences across the two subsamples are all more than 2.8 standard errors from zero. The equal-weighted results are similar. In particular, the differences in the equal-weighted average return, CAPM alpha, and Fama-French alpha are all more than four standard errors from zero.

From Table 6, the results from the asset growth portfolios are quantitatively similar as those from the investment-to-assets portfolios. The differences in equal-weighted average return, CAPM alpha, and Fama-French (1993) alpha for the high-minus-low asset growth portfolio across extreme subsamples split by financial constraints are all significant at the 1% level. For example, Panel A shows that the equal-weighted average return, CAPM alpha, and Fama-French alpha of the high-minus-low portfolio are $-1.49\%, -1.51\%$, and -1.36% per month, respectively, in the small asset size subsample. These are more than twice the magnitude of those in the big asset size subsample, $-0.58\%, -0.68\%$, and -0.37% per month, respectively. And the differences are all more than four standard errors of zero. However, the value-weighted differences across extreme financial constraints subsamples are significant only when we use bond ratings to split the sample. From Panel A, the differences in the value-weighted average return, CAPM alpha, and Fama-French alpha between the small and big asset size subsamples are $-0.17\%, -0.07\%$, and -0.30% per month, respectively, which are all within 1.4 standard errors of zero. However, Panel C shows that the differences in the value-weighted average return, CAPM alpha, and Fama-French alpha between the subsamples without and with bond ratings are $-0.40\%, -0.34\%$, and -0.44% per month, respectively, which are all more than 2.4 standard errors of zero.

4 Disentangling Financial Constraints from Financial Distress

Griffin and Lemmon (2002) show that, among firms with the highest distress risk as measured by Ohlson's (1980) O-score, the difference in returns between extreme book-to-market portfolios is more than twice as large as that in other firms. We now extend this evidence to net stock issues, investment, and asset growth portfolios and to an alternative distress measure from Campbell, Hilscher, and Szilagyi (2007). More important, we show that although the distress measures affect the anomalies, they do not subsume the effect of financial constraints documented in Section 3.

4.1 Preliminaries: The Impact of Financial Distress

Table 7 reports the variation of the value, net stock issues, investment, and asset growth anomalies across subsamples split by O-score. The test design is the same as in Tables 3 to 6. At the end of June of year t, we split the sample into three equal-numbered subsamples by O-score in fiscal year ending in calendar year $t-1$. Within each subsample, we sort stocks into five quintile portfolios based on a given anomaly variable. The magnitudes of the average returns and alphas of the high-minus-low portfolios are then compared across subsamples.

Panel A of Table 7 confirms Griffin and Lemmon's (2002) finding in our sample from July 1963 to December 2006. The value-weighted average return, CAPM alpha, and Fama-French (1993) alpha are 0.33%, 0.40%, and -0.31% per month in the low O-score (least distressed) subsample, but are 1.27%, 1.36% and 0.56%, respectively, in the high O-score (most distressed) subsample. And the differences across the two subsamples are all more than 3.3 standard errors of zero. The equal-weighted results are largely similar. The remaining panels of the table document the effect of O-score on the magnitude of net stock issues, investment, and asset growth anomalies. In general, the effect is significant in the equal-weighted returns, but insignificant in the value-weighted returns.

Panel A of Table 8 extends Griffin and Lemmon's (2002) evidence using an alternative measure of distress (F-prob) from Campbell, Hilscher, and Szilagyi (2007). The results are largely similar to those in Panel A of Table 7, except that the differences in the value-weighted average return and Fama-French (1993) alpha across the high and low F-prob subsamples are insignificant at the 5% level. From Panels B to D in Table 8, the impact of F-prob on the other three anomalies is largely similar to that of O-score reported in the previous table.

4.2 Financial Constraints vs. Financial Distress

To distinguish the effect of financial constraints from the effect of financial distress, we study the variation in the magnitude of the anomalies across subsamples split jointly by a given measure of financial constraints and a given measure of financial distress. The test design is a natural extension of that underlying Tables 3 to 8. At the end of June of year t, we first split the sample into six subsamples by an independent three-by-two sort on asset size (payout ratio or the WW index) and O-score (or F-prob). We also split the sample into four subsamples by an independent two-by-two sort on bond ratings and O-score (F-prob). (The sort on bond ratings categorizes firms into those with debt outstanding but without a bond rating and those with bond ratings.) All the sorting variables are measured in fiscal year ending in calendar year $t-1$. Within each subsample, firms are sorted into five equal-numbered portfolios on a given anomaly variable. Portfolio returns are computed from July of year t to June of year t+1, and the portfolios are rebalanced at the end of each June. We only report the results for the high-minus-low portfolios to save space. We also report t-statistics that test the differences in the average return, the CAPM alpha, or the Fama-French (1993) alpha across extreme constraints subsamples (and across extreme distress subsamples) equal zero.

Table 9 reports the test results using O-score. The effect of financial constraints on the value premium often dominates that of financial distress. For example, Panel A shows that the differences in the value-weighted average return, CAPM alpha, and Fama-French (1993) alpha of the high-minus-low B/M portfolios across the small and big asset size subsamples are 0.80%, 0.93%, and 1.05% per month (t = 3.31, 3.99, and 4.40), respectively, in the low O-score universe. The corresponding differences in the high O-score universe are quantitatively similar: 0.96%, 1.12%, and 1.26% per month (t = 3.73, 4.54, and 5.09), respectively. This evidence suggests that the effect of asset size on the magnitude of the value premium is unaffected after we control for the O-score.

In contrast, the differences in the value-weighted average return, CAPM alpha, and Fama-French (1993) alpha of the high-minus-low B/M portfolios across the high and low O-score subsamples in the small asset size universe are 0.51%, 0.50%, and 0.58% per month (t = 1.96, 1.91, and 2.25), respectively. The corresponding differences in the big asset size universe are 0.35%, 0.31%, and 0.37% per month (t = 1.84, 1.65, and 1.92), respectively. This evidence suggests that the effect of O-score on the magnitude of the value premium often becomes insignificant after we control for asset size.

Panel B shows that the effect of payout ratio on the value premium is comparable with that of O-score. The equal-weighted differences in the average return, the CAPM alpha, and the Fama-French (1993) alpha of the high-minus-low B/M portfolios between the low and high payout ratio subsamples are significant at the 5% level across the low and high O-score groups. But the value-weighted differences are all within 1.9 standard errors of zero in the low O-score universe. Similarly, the value-weighted differences between high and low O-score subsamples are significant across extreme payout ratio groups, but the equal-weighted differences are all within 1.5 standard errors of zero in the high payout ratio universe.

Panel C of Table 9 shows that the effect of bond ratings on the value premium seems somewhat stronger than the effect of O-score. The differences (both equal-weighted and value-weighted) in the average return, α, and α_{FF} of the high-minus-low B/M portfolios between the constrained and unconstrained subsamples are significant at the 5% level across the different O-score universes. In contrast, the value-weighted differences between the high and low O-score subsamples are all within 1.9 standard errors of zero in the constrained universe without bond ratings.

Panel D reports the strongest evidence on the role of financial constraints: The WW index completely subsumes the effect of O-score on the magnitude of the value premium. For example, the differences in the value-weighted average return, CAPM alpha, and Fama-French (1993) alpha of the high-minus-low B/M portfolios across the high and low WW subsamples are 1.30%, 1.52%, and 1.73% per month (t = 4.51, 5.56, and 5.90), respectively, in the low O-score universe. The corresponding differences in the high O-score universe are largely similar: 1.09%, 1.37%, and 1.49% (t = 3.15, 4.04, and 4.43), respectively. In contrast, the differences in the value-weighted average return, CAPM alpha, and Fama-French alpha of the high-minus-low B/M portfolios across the high and low O-score subsamples in the low WW universe are 0.25%, 0.22%, and 0.27% per month (t = 1.09, 0.95, and 1.04), respectively. The corresponding differences in the high WW universe are 0.04%, 0.07%, and 0.03% that are all within 0.2 standard errors of zero.

Without discussing the details, we also observe from Table 9 that the effect of financial constraints on the magnitude of the new stock issues anomaly dominates the effect of O-score. In fact, after we control for measures of financial constraints, the effect of O-score is insignificant in all cases. In contrast, after we control for O-score, the effects of asset size and payout ratio are sometimes significant, and the effects of bond ratings and the WW index are significant in all specifications. Further, the effect of financial constraints on the magnitude of the investment and asset growth anomalies is largely comparable with the effect of financial distress. Neither subsumes the effect of the other. Depending on empirical specifications, financial constraints sometimes dominate, and are sometimes dominated by, O-score in impacting on the investment and asset growth anomalies.

Table 10 evaluates the robustness of our basic results using the alternative distress measure of F-prob from Campbell, Hilscher, and Szilagyi (2007). Asset size and bond ratings again dominate the distress measure in affecting the magnitude of the value premium. The effect of payout ratio is largely comparable to that of F-prob. And the WW index almost entirely subsumes the effect of F-prob on the value premium. However, unlike Table 9, the four measures of financial constraints do not dominate F-prob in explaining the magnitude of the net stock issues anomaly. Instead, their explanatory power is largely comparable with that of F-prob. A similar pattern also holds for the investment and asset growth portfolios. All in all, the evidence suggests that the effect of financial constraints is distinct from that of financial distress on the magnitude of the anomalies.

5 The Spread Effect vs. the Slope Effect

We have shown that the value, net stock issues, investment, and asset growth anomalies are all stronger in the financially more constrained firms than those in less constrained firms. There are two possibilities for this result. First, the spread in a given anomaly variable is wider in the more constrained subsample (the spread effect). Second, for a given magnitude of change in an anomaly variable, the corresponding change in the average return is higher in the more constrained subsample (the slope effect). We now evaluate the relative importance of these two effects in driving our central finding. To preview the results, we find that both the spread and the slope effects drive the variation in the value, investment, and asset growth anomalies across extreme constraints subsamples. But the spread effect seems to be the only driver for the variation in the net stock issues anomaly.

Table 11 reports the variation in the median anomaly variables in the full sample and across subsamples split by financial constraints measures. In each sample, we sort stocks at the end of each June of year t into five equal-numbered quintiles based on a given anomaly variable at the fiscal year end of $t-1$. We calculate the median anomaly variable for each quintile at year t and report the time series average of the median. From Panel A, the median B/M is 0.23 in the low B/M quintile and 1.70 in the high B/M quintile in the full sample, giving rise to a significant B/M spread of 1.47 ($t = 9.85$). More important, the B/M spread is 1.61 in the small asset size subsample and 1.25 in the big asset size subsample. And the difference of 0.36 is significant ($t = 5.80$). The difference in the B/M spread across the extreme subsamples of financial constraints is 0.48 with the payout ratio, 0.42 with bond ratings, and 0.59 with the WW index. And the differences are all more than 3.9 standard errors of zero.

The rest of Table 11 shows that the spread effect also is at work for the NS, I/A, and $\triangle$A/A portfolios. For example, across the small and big asset size subsamples, the difference in the NS spread is 0.06 ($t = 2.51$), which is about 38% of the NS spread in the full sample (0.16). The difference in the I/A spread is 0.11 ($t = 5.89$), which is about 34% of the I/A spread in the full sample. And the difference in the $\triangle$A/A spread is 0.31 ($t = 8.32$), which is about 55% of the $\triangle$A/A in the full sample.

To quantify the slope effect, Table 12 reports univariate Fama-MacBeth (1973) cross-sectional regressions of monthly percent excess returns on a given anomaly variable in the full sample and subsamples split by measures of financial constraints. From Panel A, the B/M slope is 0.52% per month ($t = 6.74$) in the full sample. The slope increases to 0.81% ($t = 8.11$) in the small asset size subsample and decreases to 0.25% ($t = 3.24$) in the big asset size subsample. Thus, splitting the sample by asset size generates a difference in the B/M slope of 0.56% per month ($t = 5.54$). The results from the other three measures of financial constraints are quantitatively similar.

Panel B shows that the NS slope does not vary much across different constraints subsamples. The NS slope varies from -2.03% per month in the high WW subsample to -1.02% in the low WW subsample. But the difference is insignificant ($t = -1.41$). Further, the magnitude of the NS slope is actually higher in the less constrained firms with big asset size than that in the more constrained firms with small asset size. But the difference is again insignificant.

Panels C and D report more reliable differences in the I/A and $\triangle$A/A slopes across extreme constraints subsamples. For example, the univariate I/A slope is -0.72% per month ($t = -5.11$) in the full sample. The I/A slope varies from -0.45% in the big asset size firms to -0.98% in the small asset size firms. And the difference of -0.53% per month is significant ($t = -2.09$). The univariate $\triangle$A/A slope is -0.80% per month ($t = -8.55$) in the full sample. The $\triangle$A/A slope varies from -0.56% in firms with bond ratings to -0.96% in firms without bond ratings. And the difference of -0.40% per month is almost four standard errors from zero. However, although going in the right direction, the differences in the I/A and $\triangle$A/A slopes are insignificant across the high and low WW subsamples.

6 Discussion

Why does the magnitude of the anomalies vary across subsamples split on measures of financial constraints? We provide an investment-based interpretation. In the q-theory framework, high investment means higher marginal costs of investment, which in turn mean lower discount rate. Our basic insight is that in more constrained firms for which external equity is more costly, marginal costs of investment are more sensitive to changes in investment. As a result, the negative relation between investment and the discount rate is stronger for more constrained firms.

We incorporate costly external equity into the investment-based asset pricing framework à la Cochrane (1991). Firms use capital and a vector of costlessly adjustable inputs to produce a perishable good. Firms choose the levels of these inputs each period to maximize their operating profits, defined as revenues minus the expenditures on these inputs. Taking the operating profits as given, firms then choose optimal investment to maximize their market value.

For simplicity, we only model two periods, t and $t+1$. A firm starts with capital stock, k_t, invests in period t, and produces in both t and $t+1$. The firm exits at the end of period $t+1$ with a liquidation value of $(1-\delta)k_{t+1}$, in which δ is the rate of capital depreciation. Operating profits, $\pi_t = \pi(k_t, x_t)$, depend on capital, k_t, and a vector of exogenous aggregate and firm-specific productivity shocks, x_t. Operating profits exhibit constant returns to scale. Capital evolves as $k_{t+1} = i_t + (1-\delta)k_t$, in which i_t denotes capital investment. To highlight the role played by costly external equity, we assume that investment does not involve adjustment costs of capital.

We model costly external equity à la Kaplan and Zingales (1997) as follows. Define:

$$e_t \equiv \max(0, i_t - \pi(k_t, x_t)) \tag{2}$$

When $e_t > 0$, the firm raises the amount of e_t via external equity. We assume that the firm incurs quadratic financing costs of $(\lambda/2)(e_t/k_t)^2 k_t$. Following Kaplan and Zingales, we use the constant parameter $\lambda > 0$ to capture the degree of financial constraints: A higher λ means that firms are more constrained and a lower λ means that firms are less constrained. The financing-cost function is increasing and convex in e_t, decreasing in k_t, and exhibits constant returns to scale.

Let m_{t+1} be the stochastic discount factor from time t to $t+1$, which is correlated with the aggregate component of x_{t+1}. Firms choose i_{jt} to maximize the market value of equity as follows:

$$\max_{\{i_t\}} \pi(k_t, x_t) - i_t - \frac{\lambda}{2}\left(\frac{e_t}{k_t}\right)^2 k_t + E_t\left[m_{t+1}\left[\pi(k_{t+1}, x_{t+1}) + (1-\delta)k_{t+1}\right]\right] \tag{3}$$

The first part of this expression, $\pi(k_t, x_t) - i_t - (\lambda/2)(e_t/k_t)^2 k_t$, is net cash flow during period

t. Firms use operating profits $\pi(k_t, x_t)$ to invest, which incurs the purchase costs, i_t, and the financing costs, $(\lambda/2)\left(e_t/k_t\right)^2 k_t$. The price of capital is normalized to be one. The second part of equation (3) contains the expected discounted value of the next period cash flow given by the sum of operating profits and the liquidation value of the capital stock.

Optimal investment says that:

$$1 + \lambda\left(\frac{e_t}{k_t}\right) = E_t\left[m_{t+1}\left[\pi_1(k_{t+1}, x_{t+1}) + (1-\delta)\right]\right] \tag{4}$$

in which $\pi_1(k_{t+1}, x_{t+1})$ is the marginal product of capital. The left side of equation (4) is the marginal cost of investment, and the right side is the marginal benefit of investment. To generate one additional unit of capital, k_{t+1}, firms must pay the price of capital and the marginal financing cost, $\lambda(e_t/k_t)$. The next-period marginal benefit of this additional unit of capital includes the marginal product of capital and the marginal liquidation value of capital net of depreciation, $1-\delta$. Discounting this next-period benefit using the pricing kernel m_{t+1} yields the marginal q.

Following Cochrane (1991), we define the investment return as the ratio of the marginal benefit of investment at period $t+1$ divided by the marginal cost of investment at period t:

$$r_{t+1} \equiv \frac{\pi_1(k_{t+1}, x_{t+1}) + (1-\delta)}{1 + \lambda\left(e_t/k_t\right)} \tag{5}$$

Cochrane and Restoy and Rockinger (1994) show that stock returns equal investment returns under constant returns to scale.[6] This equivalence allows us to tie stock returns with firm characteristics.

[6]We define the ex-dividend equity value at period t as $p_t \equiv E_t\left[m_{t+1}\left[\pi(k_{t+1}, x_{t+1}) + (1-\delta)k_{t+1}\right]\right]$. The ex-dividend equity value equals the cum-dividend equity value (the maximum in equation 3) minus the net cash flow over period t. We can define the stock return, r^S_{t+1}, as

$$r^S_{t+1} = \frac{\pi(k_{t+1}, x_{t+1}) + (1-\delta)k_{t+1}}{E_t[m_{t+1}[\pi(k_{t+1}, x_{t+1}) + (1-\delta)k_{t+1}]]}$$

in which the ex-dividend market value of equity in the numerator is zero in this two-period setting. Dividing both the numerator and the denominator of r^S_{t+1} by k_{t+1}, and invoking constant returns to scale yield:

$$r^S_{t+1} = \frac{\pi_1(k_{t+1}, x_{t+1}) + (1-\delta)}{E_t[m_{t+1}[\pi_1(k_{t+1}, x_{t+1}) + (1-\delta)]]} = \frac{\pi_1(k_{t+1}, x_{t+1}) + (1-\delta)}{1 + \lambda(e_t/k_t)} = r_{t+1}$$

The second equality follows from the first-order condition given by equation (4).

Taking conditional expectations of equation (5) and differentiating with respect to i_t/k_t yield:

$$\frac{\partial E_t[r_{t+1}]}{\partial(i_t/k_t)} = -\frac{\lambda(E_t[\pi_1(k_{t+1}, x_{t+1}) + 1 - \delta])}{[1 + \lambda(e_t/k_t)]^2} < 0 \tag{6}$$

The negative sign says that investment and new equity issuance are negatively correlated with the discount rate. The negative relation between investment and the discount rate has been articulated before in the q-theory framework by Cochrane (1991) with adjustment costs of capital. We show that costly external equity with convex financing costs also can explain this negative relation.

Our focus is on how the magnitude of asset pricing anomalies varies with the degree of costly external equity, which is parsimoniously captured by the parameter λ in the model. Differentiating the absolute value of equation (6) with respect to λ, we obtain:

$$\partial \left| \frac{\partial E_t[r_{t+1}]}{\partial(i_t/k_t)} \right| / \partial\lambda = \frac{[1 - \lambda(e_t/k_t)]E_t[\pi_1(k_{t+1}, x_{t+1}) + 1 - \delta]}{[1 + \lambda(e_t/k_t)]^3} \tag{7}$$

which is positive as long as $1 - \lambda(e_t/k_t) > 0$.[7]

Intuitively, higher investment means higher marginal costs of investment, which in turn mean lower expected returns, all else equal. For more constrained firms in which external equity is more costly, marginal costs of investment are more sensitive to increases in investment. The negative relation between investment and the discount rate is therefore stronger for more constrained firms.

It is important to point out that the simple analytical example is only a start to fully explain our evidence. Without capital adjustment costs, the definition of new equity in equation (2) means that the derivative of the discount rate with respect to investment equals its derivative with respect to new equity. Thus, equation (7) also predicts the slope effect for the net stock issues portfolios. This prediction contradicts the evidence reported in Panel B of Table 12. Further, because marginal

[7] This condition is empirically plausible. This point can be demonstrated using back-of-the-envelope calculations. The average investment-to-capital ratio is about 12% per annum, which is about 1% per month. Suppose 50% of the investment is financed by new equity, the average new equity-to-capital ratio is about 0.50% per month. Thus, $1 - \lambda(e_t/k_t) > 0$ holds as long as $\lambda < 200$ in monthly frequency. With an average new equity-to-capital ratio of 0.50%, $\lambda = 200$ means that financing costs are as high as 50% of the proceeds raised from external equity: $[(\lambda/2)(e_t/k_t)^2 k_t]/e_t = (\lambda/2)(e_t/k_t) = (200/2) \times 0.50\% = 50\%$.

q absorbs the effect of financing costs (see equation 4), the model is silent on the slope effect in the book-to-market portfolios documented in Panel A of Table 12. Nevertheless, the example is useful in interpreting the slope effect for the investment and asset growth portfolios. And the mechanism that financing costs increase the magnitude of discount rate-investment sensitivities is likely to be at work in more realistic but complicated models.

7 Conclusion

Our central empirical finding is that the magnitude of the value premium, the net stock issues puzzle, the investment anomaly, and the asset growth anomaly tends to be higher in more financially constrained firms than in less constrained firms. We also show that the effect of financial constraints is distinct from the effect of financial distress on the magnitude of the anomalies. Finally, we provide an investment-based interpretation for the evidence. Intuitively, financial frictions make marginal costs of investment more sensitive to investment in more constrained firms, giving rise to a stronger negative relation between investment and the discount rate.

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Table 1 : Time Series Averages of Pairwise Cross-Sectional Correlations for Measures of Financial Constraints and Financial Distress

This table reports the average cross-sectional Spearman's rank correlations across measures of financial constraints and financial distress. The measures include asset size, payout ratio, bond rating, the Whited-Wu (2004, WW) index, the failure probability (F-prob), and Ohlson's (1980) O-score. The detailed definitions of these measures are provided in Section 2. At the end of each year, we calculate the pairwise cross-sectional Spearman correlations across the measures. The table reports the time series averages of these cross-sectional correlations. The sample period for asset size, payout ratio, bond rating, and the WW index is from 1963 to 2006. And the sample for F-prob and O-score is from 1976 to 2006 because of data limitations.

	Asset size	Payout ratio	Bond rating	WW-index	F-prob	O-score
Asset size	1	0.47	−0.39	−0.94	−0.28	−0.30
Payout ratio		1	−0.21	−0.52	−0.34	−0.37
Bond rating			1	0.39	0.16	0.21
WW-index				1	0.34	0.38
F-prob					1	0.51
O-score						1

Table 2 : Descriptive Statistics of One-Way Quintile Portfolios Sorted on the Book-to-Market, Net Stock Issues, Investment-to-Assets, and Asset Growth in the Full Sample (July 1963–December 2006, 534 Months)

The book-to-market equity (B/M) is defined as in Fama-French (1993). The net stock issues (NS) are defined as the change in the natural logarithms of the number of shares outstanding adjusted for splits to capture the effect of share repurchases and seasoned equity offerings. The investment-to-assets ratio (I/A) is defined as change in gross property, plant, and equipment (Compustat annual item 3) plus change in inventories (item 3) divided by lagged total assets (item 6). Asset growth ($\triangle$A/A) is defined as change in total assets divided by lagged total assets. At the end of each June of year t, firms are categorized into five equal-numbered portfolios based on a given sorting variable. Portfolio returns are computed from July of year t to June of year $t+1$, and the portfolios are rebalanced in each June. Excess return ($r - r_f$) is the difference between portfolio returns and one-month Treasury bill rate. The CAPM alphas (α) and Fama-French alphas (α_{FF}) are the intercepts from regressing portfolio returns on the market factor and the Fama-French (1993) three factors, respectively. We report heteroscedasticity-robust t-statistics of $r - r_f, \alpha$, and α_{FF} for high-minus-low portfolios.

	Equal-weighted			Value-weighted			Equal-weighted			Value-weighted		
Portfolio	$r - r_f$	α	α_{FF}	$r - r_f$	α	α_{FF}	$r - r_f$	α	α_{FF}	$r - r_f$	α	α_{FF}
	Panel A: Book-to-market (B/M)						Panel B: Net share issues (NS)					
Low	0.36	−0.32	−0.21	0.31	−0.22	0.11	1.16	0.68	0.30	0.68	0.24	0.12
2	0.62	0.03	−0.11	0.46	−0.03	−0.04	1.06	0.58	0.19	0.49	0.09	0.01
3	0.86	0.32	0.03	0.49	0.05	−0.08	0.94	0.40	0.14	0.55	0.07	0.12
4	1.07	0.59	0.18	0.63	0.22	−0.13	0.86	0.26	0.09	0.45	−0.10	0.05
High	1.47	0.99	0.46	0.81	0.38	−0.13	0.46	−0.17	−0.31	0.14	−0.40	−0.32
H−L	1.11	1.31	0.66	0.50	0.60	−0.24	−0.70	−0.86	−0.62	−0.55	−0.64	−0.44
t(H−L)	6.50	8.77	7.29	2.77	3.40	−2.61	−4.99	−6.86	−5.78	−4.40	−5.36	−4.13
	Panel C: Investment-to-assets (I/A)						Panel D: Asset growth ($\triangle$A/A)					
Low	1.37	0.82	0.44	0.77	0.26	0.09	1.49	0.92	0.56	0.65	0.15	−0.01
2	1.09	0.56	0.28	0.56	0.09	0.05	1.03	0.55	0.22	0.56	0.14	0.01
3	0.94	0.42	0.18	0.47	0.05	0.07	0.85	0.37	0.10	0.47	0.05	−0.01
4	0.78	0.24	0.00	0.39	−0.11	0.01	0.77	0.23	0.00	0.52	0.02	0.16
High	0.45	−0.16	−0.43	0.34	−0.24	−0.12	0.37	−0.29	−0.45	0.29	−0.33	−0.09
H−L	−0.92	−0.98	−0.86	−0.43	−0.50	−0.20	−1.12	−1.20	−1.01	−0.36	−0.48	−0.07
t(H−L)	−9.21	−10.17	−9.18	−3.57	−4.23	−1.91	−8.60	−9.70	−8.16	−2.43	−3.35	−0.59

Table 3 : The Variation of the Value Anomaly Across Subsamples Split by Asset Size, Payout Ratio, Bond Rating, and Whited-Wu (WW) Index

At the end of June of year t, we first split the sample into three equal-numbered subsamples by asset size (Panel A) and by payout ratio (Panel B), two subsamples by bond ratings (Panel C), and three equal-numbered subsamples by the WW index (Panel D) using accounting variables in fiscal year ending in calendar year $t-1$. In Panels A–C, the sample is from July 1963 to December 2006 (534 months). In Panel D, the sample is from July 1976 to December 2006 (378 months) because of the quarterly data limitation for long-term debt in the construction of the WW index. Asset size is total book assets (Compustat annual item 6). Payout ratio is defined as the sum of dividends and stock repurchase divided by operating income. In Panel C, the constrained subsample contains all the firms with debt outstanding but without a bond rating, and the unconstrained subsample contains all the firms whose bonds are rated. See Section 2 for details of constructing the WW index. Within each subsample, firms are sorted into five equal-numbered portfolios based on book-to-market equity (B/M). The high-minus-low portfolio (H−L B/M) goes long on the high B/M portfolio and short on the low B/M portfolio. Portfolio returns are computed over the period from July of year t to June of year $t+1$. The portfolios are rebalanced at the end of each June. Excess return ($r-r_f$) is the difference between portfolio returns and the one-month Treasury bill rate. The CAPM alphas (α) and Fama-French alphas (α_{FF}) are the intercepts from regressing portfolio returns on the market factor and the three Fama-French factors, respectively. We also report heteroscedasticity-robust t-statistics, t(H−L), testing the average return, α, or α_{FF} of the high-minus-low portfolio equals zero and t-statistics, t(H−L|C−U), testing the difference in the average return, α, or α_{FF} of the H−L portfolios across the two extreme constraints subsamples equals zero.

	Equal-weighted			Value-weighted			Equal-weighted			Value-weighted		
Portfolio	$r-r_f$	α	α_{FF}	$r-r_f$	α	α_{FF}	$r-r_f$	α	α_{FF}	$r-r_f$	α	α_{FF}
	Panel A: Subsamples by asset size						Panel B: Subsamples by payout ratio					
	Small asset size (most constrained)						Low payout ratio (most constrained)					
Low	0.46	−0.25	−0.21	0.06	−0.68	−0.44	0.34	−0.42	−0.33	0.16	−0.63	−0.16
2	0.89	0.25	0.07	0.57	−0.13	−0.09	0.67	−0.04	−0.15	0.34	−0.38	−0.19
3	1.24	0.68	0.37	0.87	0.25	0.14	1.04	0.38	0.10	0.71	0.02	−0.11
4	1.60	1.09	0.71	1.12	0.58	0.31	1.30	0.70	0.30	0.81	0.17	−0.09
High	2.04	1.57	1.13	1.30	0.81	0.42	1.77	1.23	0.66	0.89	0.28	−0.23
H−L B/M	1.59	1.83	1.34	1.24	1.49	0.86	1.44	1.65	1.00	0.72	0.90	−0.08
t(H−L)	7.88	10.56	8.90	5.60	7.58	5.36	7.10	9.17	7.58	2.83	3.66	−0.43
	Big asset size (least constrained)						High payout ratio (least constrained)					
Low	0.37	−0.21	−0.06	0.39	−0.10	0.16	0.53	0.02	0.02	0.43	−0.02	0.17
2	0.47	−0.06	−0.22	0.43	−0.05	−0.09	0.58	0.12	−0.09	0.43	0.01	−0.09
3	0.60	0.12	−0.17	0.49	0.05	−0.09	0.69	0.27	−0.03	0.49	0.08	−0.09
4	0.71	0.26	−0.14	0.58	0.19	−0.15	0.81	0.42	0.02	0.58	0.23	−0.14
High	0.94	0.45	−0.12	0.71	0.30	−0.18	1.13	0.72	0.21	0.66	0.29	−0.21
H−L B/M	0.57	0.65	−0.06	0.32	0.40	−0.35	0.60	0.70	0.19	0.23	0.31	−0.39
t(H−L)	3.73	4.50	−0.88	1.97	2.53	−4.18	4.56	5.81	2.36	1.37	1.93	−3.69
t(H−L|C−U)	5.55	6.95	8.61	4.39	5.49	6.11	4.70	5.56	4.71	1.56	2.07	1.08
	Panel C: Subsamples by bond rating						Panel D: Subsamples by the WW index					
	With bond rating (unconstrained)						Low WW (least constrained)					
Low	0.57	−0.07	0.10	0.34	−0.16	0.15	0.43	−0.29	−0.11	0.45	−0.18	0.15
2	0.72	0.15	0.06	0.48	0.00	0.01	0.64	−0.01	−0.19	0.59	−0.03	−0.02
3	0.86	0.34	0.09	0.51	0.07	−0.07	0.76	0.16	−0.18	0.66	0.09	−0.11
4	0.95	0.49	0.13	0.52	0.12	−0.16	0.80	0.23	−0.21	0.57	0.03	−0.22
High	1.37	0.90	0.37	0.68	0.27	−0.21	0.94	0.38	−0.20	0.82	0.28	−0.20
H−L B/M	0.80	0.97	0.27	0.34	0.44	−0.36	0.51	0.67	−0.08	0.37	0.46	−0.35
t(H−L)	4.69	6.35	3.16	1.90	2.52	−3.80	2.85	3.62	−0.89	1.96	2.33	−2.99
	Without bond rating (constrained)						High WW (most constrained)					
Low	0.27	−0.39	−0.41	−0.02	−0.65	−0.38	0.45	−0.44	−0.40	−0.15	−1.12	−0.92
2	0.63	0.06	−0.20	0.25	−0.28	−0.35	0.93	0.16	0.04	0.64	−0.22	−0.22
3	0.94	0.42	0.04	0.55	0.06	−0.17	1.53	0.85	0.59	1.12	0.34	0.27
4	1.09	0.62	0.17	0.75	0.28	−0.08	1.64	1.04	0.70	1.15	0.46	0.20
High	1.56	1.10	0.53	0.88	0.42	−0.03	2.20	1.65	1.22	1.36	0.73	0.33
H−L B/M	1.29	1.48	0.94	0.89	1.07	0.35	1.76	2.09	1.62	1.50	1.85	1.25
t(H−L)	7.10	9.48	7.78	4.49	5.80	2.79	7.19	10.14	8.79	5.41	7.60	5.98
t(H−L|C−U)	4.45	4.78	6.25	3.84	4.55	4.65	4.44	5.22	5.52	3.43	4.20	3.95

Table 4 : The Variation of the Net Stock Issues Anomaly Across Subsamples Split by Asset Size, Payout Ratio, Bond Rating, and Whited-Wu (WW) Index

At the end of June of year t, we first split the sample into three equal-numbered subsamples by asset size (Panel A) and by payout ratio (Panel B), two subsamples by bond ratings (Panel C), and three equal-numbered subsamples by the WW index (Panel D) using accounting variables in fiscal year ending in calendar year $t-1$. In Panels A–C, the sample is from July 1963 to December 2006 (534 months). In Panel D, the sample is from July 1976 to December 2006 (378 months) because of the quarterly data limitation for long-term debt in the construction of the WW index. Asset size is total book assets (Compustat annual item 6). Payout ratio is defined as the sum of dividends and stock repurchase divided by operating income. In Panel C, the constrained subsample contains all the firms with debt outstanding but without a bond rating, and the unconstrained subsample contains all the firms whose bonds are rated. See Section 2 for details of constructing the WW index. Within each subsample, firms are sorted into five equal-numbered portfolios based on net stock issues (NS). NS is defined as the change in the natural logarithms of the number of shares outstanding adjusted for splits to capture the effect of share repurchases and seasoned equity offerings. The high-minus-low portfolio (H$-$L NS) goes long on the high NS portfolio and short on the low NS portfolio. Portfolio returns are computed over the period from July of year t to June of year $t+1$. The portfolios are rebalanced at the end of each June. Excess return ($r - r_f$) is the difference between portfolio returns and the one-month Treasury bill rate. The CAPM alphas (α) and Fama-French alphas (α_{FF}) are the intercepts from regressing portfolio returns on the market factor and the three Fama-French factors, respectively. We also report heteroscedasticity-robust t-statistics, t(H$-$L), testing the average return, α, or α_{FF} of the high-minus-low portfolio equals zero and t-statistics, t(H$-$L|C$-$U), testing the difference in the average return, α, or α_{FF} of the H$-$L portfolios across the two extreme constraints subsamples equals zero.

	Equal-weighted			Value-weighted			Equal-weighted			Value-weighted		
Portfolio	$r-r_f$	α	α_{FF}	$r-r_f$	α	α_{FF}	$r-r_f$	α	α_{FF}	$r-r_f$	α	α_{FF}
	Panel A: Subsamples by asset size						Panel B: Subsamples by payout ratio					
	Small asset size (most constrained)						Low payout ratio (most constrained)					
Low	1.68	1.19	0.84	0.99	0.44	0.29	1.56	1.00	0.57	0.70	0.10	−0.17
2	1.51	1.00	0.67	0.94	0.36	0.27	1.35	0.74	0.37	0.84	0.20	0.09
3	1.41	0.82	0.52	0.81	0.14	0.15	1.08	0.40	0.17	0.59	−0.12	−0.02
4	1.01	0.39	0.17	0.35	−0.35	−0.28	0.79	0.07	−0.13	0.52	−0.27	0.03
High	0.80	0.12	−0.03	−0.02	−0.76	−0.62	0.49	−0.24	−0.38	−0.05	−0.81	−0.55
H−L NS	−0.88	−1.07	−0.86	−1.02	−1.20	−0.91	−1.08	−1.24	−0.96	−0.75	−0.90	−0.38
t(H−L)	−5.25	−7.16	−6.21	−5.51	−7.13	−5.91	−6.95	−9.00	−7.41	−3.37	−4.23	−1.96
	Big asset size (least constrained)						High payout ratio (least constrained)					
Low	0.79	0.33	0.00	0.67	0.24	0.12	1.10	0.65	0.30	0.74	0.31	0.11
2	0.66	0.21	−0.12	0.39	−0.01	−0.06	0.81	0.40	0.09	0.59	0.17	0.10
3	0.67	0.18	−0.07	0.50	0.04	0.08	0.69	0.27	−0.02	0.41	0.02	−0.01
4	0.69	0.16	−0.04	0.49	−0.03	0.11	0.73	0.29	0.06	0.53	0.08	0.13
High	0.32	−0.26	−0.44	0.19	−0.32	−0.29	0.47	0.01	−0.22	0.23	−0.20	−0.24
H−L NS	−0.48	−0.59	−0.43	−0.48	−0.56	−0.41	−0.63	−0.64	−0.52	−0.51	−0.50	−0.35
t(H−L)	−4.10	−5.29	−4.09	−4.16	−4.85	−3.88	−6.96	−6.91	−5.49	−4.50	−4.36	−3.11
t(H−L|C−U)	−2.71	−3.34	−2.84	−2.96	−3.60	−2.84	−2.08	−3.58	−2.43	−1.78	−2.59	−1.21
	Panel C: Subsamples by bond rating						Panel D: Subsamples by the WW index					
	With bond rating (unconstrained)						Low WW (least constrained)					
Low	1.08	0.60	0.28	0.63	0.20	0.11	0.89	0.34	−0.01	0.81	0.28	0.17
2	1.02	0.56	0.23	0.44	0.03	−0.03	0.74	0.19	−0.17	0.50	−0.04	−0.03
3	0.87	0.34	0.16	0.50	0.02	0.09	0.77	0.17	−0.13	0.56	−0.02	0.04
4	0.92	0.33	0.22	0.45	−0.07	0.09	0.79	0.13	−0.08	0.64	−0.04	0.08
High	0.59	−0.02	−0.13	0.21	−0.31	−0.27	0.44	−0.28	−0.45	0.32	−0.34	−0.27
H−L NS	−0.49	−0.62	−0.41	−0.42	−0.50	−0.37	−0.45	−0.62	−0.45	−0.48	−0.63	−0.44
t(H−L)	−3.63	−4.97	−3.70	−3.38	−4.08	−3.30	−2.81	−4.06	−3.02	−2.98	−3.88	−2.93
	Without bond rating (constrained)						High WW (most constrained)					
Low	1.21	0.75	0.31	0.69	0.25	0.02	1.88	1.33	1.02	1.19	0.53	0.35
2	1.10	0.63	0.19	0.35	−0.11	−0.35	1.63	1.04	0.70	0.77	0.06	−0.14
3	0.94	0.41	0.07	0.51	0.00	−0.03	1.46	0.77	0.53	0.78	−0.05	−0.07
4	0.81	0.23	−0.01	0.36	−0.25	−0.16	1.22	0.44	0.28	0.48	−0.45	−0.36
High	0.38	−0.26	−0.46	−0.33	−1.00	−0.85	0.79	−0.02	−0.11	−0.15	−1.06	−0.94
H−L NS	−0.83	−1.01	−0.77	−1.02	−1.25	−0.87	−1.09	−1.34	−1.13	−1.34	−1.60	−1.29
t(H−L)	−4.99	−6.97	−6.12	−5.01	−6.85	−5.74	−5.47	−7.64	−6.93	−5.79	−7.54	−7.07
t(H−L|C−U)	−2.75	−3.52	−3.16	−3.97	−5.29	−3.61	−3.11	−3.49	−2.59	−3.83	−4.32	−3.69

Table 5 : The Variation of the Investment Anomaly Across Subsamples Split by Asset Size, Payout Ratio, Bond Rating, and the Whited-Wu (WW) Index

In June of each year t, we split the sample into three equal-numbered subsamples by asset size (Panel A) and by payout ratio (Panel B), two subsamples by bond ratings (Panel C), and three equal-numbered subsamples by the WW index (Panel D) using accounting variables in fiscal year ending in calendar year t–1. In Panels A–C, the sample is from July 1963 to December 2006 (534 months). In Panel D, the sample is from July 1976 to December 2006 (378 months) because of the quarterly data limitation for long-term debt in the construction of the WW index. Asset size is total book assets (Compustat annual item 6). Payout ratio is defined as the sum of dividends and stock repurchase divided by operating income. In Panel C, the constrained subsample contains all the firms with debt outstanding but without a bond rating, and the unconstrained subsample contains all the firms whose bonds are rated. See Section 2 for details of constructing the WW index. Within each subsample, firms are sorted into five equal-numbered portfolios based on investment-to-assets (I/A) defined as (change in item 7 + change in item 3)/lagged item 6. The high-minus-low portfolio (H−L I/A) goes long on the high I/A portfolio and short on the low I/A portfolio. Portfolio returns are computed over the period from July of year t to June of year t+1. Excess return ($r - r_f$) is the difference between portfolio returns and the one-month T-bill rate. The CAPM alphas (α) and Fama-French alphas (α_{FF}) are the intercepts from time-series regression of portfolio returns on the market factor and the Fama-French factors, respectively. We also report heteroscedasticity-robust t-statistics, t(H−L), testing the average return, α, or α_{FF} of the high-minus-low portfolio equals zero and t-statistics, t(H−L|C−U), testing the difference in the average return, α, or α_{FF} of the H−L I/A portfolios across the two extreme constraints subsamples equals zero.

	Equal-weighted			Value-weighted			Equal-weighted			Value-weighted		
Portfolio	$r - r_f$	α	α_{FF}	$r - r_f$	α	α_{FF}	$r - r_f$	α	α_{FF}	$r - r_f$	α	α_{FF}
	Panel A: Subsamples by asset size						Panel B: Subsamples by payout ratio					
	Small asset size (most constrained)						Low payout ratio (most constrained)					
Low	1.69	1.13	0.76	0.57	−0.05	−0.15	1.52	0.90	0.47	0.74	0.03	−0.19
2	1.67	1.12	0.84	0.71	0.08	0.06	1.44	0.81	0.50	0.71	0.04	0.04
3	1.42	0.85	0.61	0.70	0.03	0.05	1.14	0.49	0.23	0.73	0.01	0.08
4	1.11	0.53	0.28	0.60	−0.06	0.04	0.89	0.23	0.00	0.39	−0.34	−0.08
High	0.59	0.00	−0.30	0.11	−0.57	−0.55	0.32	−0.37	−0.61	0.18	−0.58	−0.31
H−L I/A	−1.11	−1.13	−1.06	−0.45	−0.51	−0.41	−1.20	−1.27	−1.08	−0.57	−0.61	−0.12
t(H−L)	−7.84	−8.09	−8.09	−2.61	−2.94	−2.37	−7.77	−8.41	−7.40	−2.72	−2.94	−0.62
	Big asset size (least constrained)						High payout ratio (least constrained)					
Low	0.86	0.33	−0.06	0.66	0.19	0.03	1.15	0.68	0.31	0.74	0.28	0.10
2	0.74	0.27	−0.03	0.52	0.08	0.08	0.84	0.40	0.10	0.54	0.09	0.08
3	0.69	0.22	−0.03	0.45	0.03	0.04	0.77	0.35	0.10	0.46	0.07	0.05
4	0.61	0.10	−0.12	0.36	−0.14	−0.02	0.74	0.31	0.05	0.43	0.00	0.03
High	0.38	−0.21	−0.40	0.37	−0.19	−0.05	0.57	0.09	−0.22	0.43	−0.03	−0.02
H−L I/A	−0.48	−0.55	−0.34	−0.30	−0.37	−0.08	−0.58	−0.59	−0.53	−0.31	−0.31	−0.12
t(H−L)	−5.07	−5.85	−3.78	−2.51	−3.17	−0.74	−7.90	−7.97	−7.26	−2.74	−2.70	−1.10
t(H−L|C−U)	−4.10	−3.83	−5.09	−0.76	−0.67	−1.64	−3.88	−4.36	−3.64	−1.16	−1.33	−0.11
	Panel C: Subsamples by bond rating						Panel D: Subsamples by the WW-index					
	With bond rating (unconstrained)						Low WW (least constrained)					
Low	1.34	0.82	0.46	0.71	0.24	0.10	0.87	0.25	−0.14	0.66	0.07	−0.03
2	1.04	0.54	0.31	0.53	0.10	0.09	0.78	0.20	−0.08	0.64	0.08	0.10
3	0.90	0.41	0.21	0.42	0.02	0.03	0.80	0.24	−0.03	0.57	0.03	0.11
4	0.86	0.35	0.17	0.38	−0.09	0.05	0.69	0.08	−0.15	0.47	−0.19	−0.06
High	0.64	0.04	−0.16	0.38	−0.17	−0.04	0.48	−0.21	−0.44	0.40	−0.29	−0.16
H−L I/A	−0.70	−0.78	−0.62	−0.33	−0.41	−0.14	−0.39	−0.46	−0.30	−0.26	−0.36	−0.13
t(H−L)	−6.01	−6.91	−5.61	−2.64	−3.32	−1.22	−3.59	−4.18	−2.64	−1.84	−2.55	−0.92
	Without bond rating (constrained)						High WW (most constrained)					
Low	1.40	0.86	0.45	0.59	0.06	−0.14	1.81	1.12	0.82	0.65	−0.14	−0.29
2	1.19	0.68	0.34	0.55	0.04	−0.07	1.82	1.14	0.91	0.70	−0.13	−0.13
3	0.94	0.43	0.13	0.43	−0.08	−0.10	1.49	0.80	0.62	0.62	−0.25	−0.25
4	0.73	0.19	−0.13	0.26	−0.29	−0.24	1.26	0.58	0.36	0.66	−0.19	−0.13
High	0.29	−0.30	−0.64	−0.05	−0.6[illegible]	−0.64	0.61	−0.08	−0.34	0.22	−0.64	−0.63
H−L I/A	−1.11	−1.16	−1.09	−0.64	−0.75	−0.49	−1.20	−1.20	−1.15	−0.43	−0.50	−0.34
t(H−L)	−10.18	−11.06	−10.33	−4.28	−5.05	−3.52	−7.06	−7.20	−6.90	−1.95	−2.26	−1.54
t(H−L|C−U)	−4.33	−4.08	−5.16	−2.81	−3.10	−3.38	−4.52	−4.14	−4.80	−0.75	−0.63	−0.91

Table 6 : The Variation of the Asset Growth Anomaly Across Subsamples Split by Asset Size, Payout Ratio, Bond Rating, and the Whited-Wu (WW) Index

In June of each year t, we split the sample into three equal-numbered subsamples by asset size (Panel A) and by payout ratio (Panel B), two subsamples by bond ratings (Panel C), and three equal-numbered subsamples by the WW index (Panel D) using accounting variables in fiscal year ending in calendar year $t-1$. In Panels A–C, the sample is from July 1963 to December 2006 (534 months). In Panel D, the sample is from July 1976 to December 2006 (378 months) because of the quarterly data limitation for long-term debt in the construction of the WW index. Asset size is total book assets (Compustat annual item 6). Payout ratio is defined as the sum of dividends and stock repurchase divided by operating income. In Panel C, the constrained subsample contains all the firms with debt outstanding but without a bond rating, and the unconstrained subsample contains all the firms whose bonds are rated. See Section 2 for details of constructing the WW index. Within each subsample, we sort firms into five equal-numbered portfolios based on asset growth ($\triangle$A/A) defined as the change in total assets (item 6) divided by lagged total assets. The high-minus-low portfolio (H−L $\triangle$A/A) goes long on the high $\triangle A/A$ portfolio and short on the low $\triangle$A/A portfolio. Portfolio returns are computed from July of year t to June of year $t+1$. The portfolios are rebalanced at the end of each June. Excess return ($r - r_f$) is the difference between portfolio returns and the one-month Treasury bill rate. The CAPM alphas (α) and Fama-French alphas (α_{FF}) are the intercepts from time-series regression of portfolio returns on the market factor and the three Fama-French factors, respectively. We also report heteroscedasticity-robust t-statistics, t(H−L), testing the average return, α, or α_{FF} of the high-minus-low portfolio equals zero and t-statistics, t(H−L|C−U), testing the difference in the average return, α, or α_{FF} of the H−L portfolios across the two extreme constraints subsamples equals zero.

	Equal-weighted			Value-weighted			Equal-weighted			Value-weighted		
Portfolio	$r-r_f$	α	α_{FF}	$r-r_f$	α	α_{FF}	$r-r_f$	α	α_{FF}	$r-r_f$	α	α_{FF}
	Panel A: Subsamples by asset size						Panel B: Subsamples by payout ratio					
	Small asset size (most constrained)						Low payout ratio (most constrained)					
Low	1.96	1.34	0.98	0.57	−0.12	−0.24	1.81	1.15	0.75	0.97	0.23	0.11
2	1.68	1.16	0.85	0.83	0.23	0.19	1.40	0.80	0.41	0.76	0.09	−0.02
3	1.32	0.80	0.51	0.70	0.10	0.08	1.12	0.51	0.19	0.77	0.10	0.15
4	1.05	0.50	0.24	0.72	0.07	0.10	0.80	0.15	−0.08	0.41	−0.29	−0.12
High	0.47	−0.17	−0.38	0.04	−0.68	−0.57	0.21	−0.52	−0.65	0.15	−0.63	−0.29
H−L $\triangle$A/A	−1.49	−1.51	−1.36	−0.53	−0.56	−0.33	−1.60	−1.68	−1.40	−0.81	−0.86	−0.40
t(H−L)	−8.34	−8.61	−8.07	−2.82	−2.98	−1.85	−8.48	−9.17	−7.94	−3.06	−3.30	−1.52
	Big asset size (least constrained)						High payout ratio (least constrained)					
Low	0.86	0.34	−0.07	0.65	0.20	0.01	1.07	0.61	0.22	0.65	0.22	0.01
2	0.70	0.27	−0.05	0.46	0.07	−0.03	0.77	0.37	0.06	0.56	0.16	0.02
3	0.69	0.24	−0.02	0.45	0.03	−0.04	0.74	0.34	0.06	0.40	0.03	−0.04
4	0.60	0.09	−0.10	0.53	0.05	0.17	0.67	0.25	0.02	0.50	0.08	0.08
High	0.28	−0.34	−0.44	0.29	−0.29	−0.03	0.56	0.06	−0.16	0.42	−0.09	0.08
H−L $\triangle$A/A	−0.58	−0.68	−0.37	−0.36	−0.49	−0.03	−0.51	−0.55	−0.38	−0.23	−0.31	0.07
t(H−L)	−4.89	−6.04	−3.83	−2.34	−3.25	−0.28	−6.84	−7.60	−5.98	−1.63	−2.21	0.60
t(H−L|C−U)	−4.79	−4.40	−5.68	−0.72	−0.30	−1.37	−5.64	−5.91	−5.59	−0.90	−0.84	−0.75
	Panel C: Subsamples by bond rating						Panel D: Subsamples by the WW index					
	With bond rating (unconstrained)						Low WW (least constrained)					
Low	1.32	0.77	0.45	0.63	0.16	0.00	0.89	0.28	−0.15	0.76	0.19	0.00
2	0.92	0.46	0.19	0.51	0.12	0.02	0.83	0.30	−0.07	0.58	0.07	−0.02
3	0.83	0.36	0.13	0.44	0.01	−0.04	0.77	0.22	−0.07	0.65	0.11	0.06
4	0.81	0.27	0.12	0.48	−0.01	0.14	0.75	0.13	−0.09	0.57	−0.06	0.09
High	0.62	−0.05	−0.12	0.31	−0.29	−0.03	0.41	−0.36	−0.45	0.39	−0.36	−0.05
H−L $\triangle$A/A	−0.71	−0.82	−0.57	−0.32	−0.45	−0.03	−0.49	−0.63	−0.31	−0.37	−0.55	−0.05
t(H−L)	−4.92	−6.15	−4.39	−2.08	−3.09	−0.25	−3.53	−4.74	−2.72	−1.88	−2.89	−0.31
	Without bond rating (constrained)						High WW (most constrained)					
Low	1.62	1.05	0.67	0.59	−0.02	−0.16	2.13	1.35	1.12	0.59	−0.31	−0.36
2	1.16	0.68	0.28	0.55	0.08	−0.12	1.93	1.30	1.02	0.99	0.20	0.15
3	0.88	0.41	0.08	0.53	0.08	−0.03	1.49	0.88	0.62	0.94	0.15	0.12
4	0.73	0.20	−0.12	0.33	−0.22	−0.24	1.02	0.39	0.12	0.53	−0.28	−0.35
High	0.12	−0.51	−0.76	−0.14	−0.80	−0.63	0.47	−0.31	−0.47	−0.03	−0.92	−0.83
H−L $\triangle$A/A	−1.50	−1.56	−1.43	−0.72	−0.79	−0.47	−1.66	−1.66	−1.58	−0.61	−0.61	−0.47
t(H−L)	−10.63	−11.44	−10.24	−4.11	−4.55	−2.90	−7.45	−7.76	−7.27	−2.58	−2.65	−1.99
t(H−L|C−U)	−7.23	−6.97	−8.03	−2.62	−2.44	−3.07	−4.26	−3.97	−4.45	−0.45	0.03	−0.71

Table 7 : The Variation of the Value, Net Stock Issues, Investment, and Asset Growth Anomalies Across Subsamples Split by O-score (July 1963–December 2006, 534 Months)

At the end of June of year t, we first split the sample into three equal-numbered subsamples by O-score measured in fiscal year ending in calendar year $t-1$. The definition of O-score is described in Section 2. Within each subsample, firms are sorted into five equal-numbered portfolios based on book-to-market equity (B/M, Panel A), net stock issues (NS, Panel B), investment-to-assets (I/A, Panel C), and asset growth (△A/A, Panel D). The definition of B/M follows that of Fama and French (1993). NS is defined as the change in the natural logarithms of the number of shares outstanding adjusted for splits to capture the effect of share repurchases and seasoned equity offerings. I/A is defined as the change in property, plant, and equipment (Compustat annual item 7) plus the change in inventories (item 3) divided by lagged total assets (item 6). △A/A is defined as the change in total assets (item 6) divided by lagged total assets. Portfolio returns are computed over the period from July of year t to June of year $t+1$. The portfolios are rebalanced at the end of each June. Excess return ($r - r_f$) is the difference between portfolio returns and the one-month Treasury bill rate. The CAPM alphas (α) and Fama-French alphas (α_{FF}) are the intercepts from regressing portfolio returns on the market factor and the three Fama-French factors, respectively. We also report heteroscedasticity-robust t-statistics, t(H−L), testing the average return, α, or α_{FF} of the high-minus-low portfolio equals zero and t-statistics, t(H−L|D−U), testing the difference in the average return, α, or α_{FF} of the H−L portfolios across the two extreme distress subsamples equals zero.

	Equal-weighted			Value-weighted			Equal-weighted			Value-weighted		
Portfolio	$r - r_f$	α	α_{FF}	$r - r_f$	α	α_{FF}	$r - r_f$	α	α_{FF}	$r - r_f$	α	α_{FF}
	Panel A: Book-to-market (B/M) portfolios						Panel B: Net stock issues (NS) portfolios					
	Low O-score (least distressed)						Low O-score (least distressed)					
Low	0.43	−0.20	0.05	0.37	−0.14	0.24	1.03	0.57	0.29	0.71	0.27	0.21
2	0.68	0.11	0.06	0.46	−0.01	0.03	0.79	0.35	0.07	0.40	−0.01	−0.02
3	0.72	0.19	−0.01	0.41	−0.04	−0.09	0.83	0.31	0.17	0.54	0.06	0.19
4	0.94	0.46	0.14	0.51	0.08	−0.07	0.83	0.25	0.22	0.58	0.04	0.28
High	1.15	0.71	0.30	0.70	0.27	−0.07	0.40	−0.25	−0.23	0.17	−0.36	−0.16
H−L	0.72	0.91	0.25	0.33	0.40	−0.31	−0.63	−0.83	−0.52	−0.53	−0.64	−0.37
t(H−L)	4.27	6.07	2.73	1.82	2.29	−2.42	−4.31	−6.76	−5.12	−3.85	−4.74	−3.08
	High O-score (most distressed)						High O-score (most distressed)					
Low	0.45	−0.26	−0.31	−0.01	−0.67	−0.56	1.58	1.07	0.63	0.73	0.22	−0.17
2	0.76	0.14	−0.04	0.28	−0.33	−0.37	1.25	0.72	0.28	0.52	0.03	−0.27
3	1.06	0.50	0.18	0.48	−0.05	−0.31	1.18	0.59	0.29	0.53	−0.07	−0.18
4	1.34	0.81	0.36	0.83	0.33	−0.13	0.93	0.28	0.05	0.50	−0.17	−0.17
High	1.90	1.38	0.77	1.25	0.69	0.00	0.60	−0.07	−0.26	−0.05	−0.70	−0.74
H−L	1.45	1.64	1.08	1.27	1.36	0.56	−0.98	−1.14	−0.89	−0.77	−0.92	−0.57
t(H−L)	7.35	9.18	7.27	5.25	5.76	2.82	−5.53	−6.84	−5.78	−3.56	−4.38	−3.04
t(H−L|D−U)	4.51	4.49	5.26	3.89	3.95	3.38	−2.51	−2.25	−2.55	−1.15	−1.40	−0.98
	Panel C: Investment-to-assets (I/A) portfolios						Panel D: Asset growth (△A/A) portfolios					
	Low O-score (least distressed)						Low O-score (least distressed)					
Low	1.08	0.59	0.35	0.69	0.22	0.16	1.03	0.55	0.25	0.68	0.24	0.10
2	0.89	0.38	0.23	0.59	0.14	0.23	0.88	0.42	0.19	0.44	0.03	0.00
3	0.75	0.24	0.10	0.43	0.01	0.10	0.82	0.32	0.17	0.49	0.06	0.08
4	0.66	0.11	0.01	0.33	−0.19	0.00	0.76	0.21	0.13	0.52	0.01	0.26
High	0.52	−0.09	−0.19	0.39	−0.16	0.04	0.43	−0.25	−0.20	0.33	−0.28	0.10
H−L	−0.56	−0.69	−0.54	−0.31	−0.38	−0.12	−0.60	−0.80	−0.45	−0.34	−0.52	0.00
t(H−L)	−5.24	−7.18	−5.62	−2.23	−2.80	−0.87	−4.32	−6.82	−4.64	−1.83	−3.00	0.00
	High O-score (most distressed)						High O-score (most distressed)					
Low	1.67	1.06	0.61	0.72	0.09	−0.27	1.83	1.17	0.81	0.60	−0.09	−0.26
2	1.51	0.91	0.54	0.74	0.16	−0.10	1.40	0.86	0.55	0.67	0.10	−0.03
3	1.24	0.66	0.38	0.61	0.02	−0.15	1.11	0.60	0.25	0.60	0.11	−0.12
4	1.09	0.50	0.17	0.49	−0.12	−0.21	0.81	0.26	−0.08	0.44	−0.15	−0.25
High	0.37	−0.26	−0.60	0.19	−0.49	−0.55	0.35	−0.30	−0.56	0.02	−0.65	−0.74
H−L	−1.30	−1.32	−1.21	−0.53	−0.58	−0.27	−1.48	−1.47	−1.37	−0.58	−0.57	−0.48
t(H−L)	−8.65	−8.90	−8.45	−2.76	−3.01	−1.44	−8.05	−8.16	−7.67	−2.85	−2.80	−2.27
t(H−L|D−U)	−4.66	−4.21	−4.76	−1.04	−0.93	−0.73	−3.96	−3.31	−5.08	−0.85	−0.17	−1.94

Table 8 : The Variation of the Value, Net Stock Issues, Investment, and Asset Growth Anomalies Across Subsamples Split by Failure Probability (F-prob) (July 1976–December 2006, 378 Months)

At the end of June of year t, we first split the sample into three equal-numbered subsamples by F-prob measured in fiscal year ending in calendar year $t-1$. The definition of F-prob is described in Section 2. Within each subsample, firms are sorted into five equal-numbered portfolios based on book-to-market equity (B/M, Panel A), net stock issues (NS, Panel B), investment-to-assets (I/A, Panel C), and asset growth (△A/A, Panel D). The definition of B/M follows that of Fama and French (1993). NS is defined as the change in the natural logarithms of the number of shares outstanding adjusted for splits to capture the effect of share repurchases and seasoned equity offerings. I/A is defined as the change in property, plant, and equipment (Compustat annual item 7) plus the change in inventories (item 3) divided by lagged total assets (item 6). △A/A is defined as the change in total assets (item 6) divided by lagged total assets. Portfolio returns are computed over the period from July of year t to June of year $t+1$, and the portfolios are rebalanced at the end of each June. Excess return ($r - r_f$) is the difference between portfolio returns and the one-month Treasury bill rate. The CAPM alphas (α) and Fama-French alphas (α_{FF}) are the intercepts from regressing portfolio returns on the market factor and the three Fama-French factors, respectively. We also report heteroscedasticity-robust t-statistics, t(H−L), testing the average return, α, or α_{FF} of the high-minus-low portfolio equals zero and t-statistics, t(H−L\|D−U), testing the difference in the average return, α, or α_{FF} of the H−L portfolios across the two extreme distress subsamples equals zero.

	Equal-weighted			Value-weighted			Equal-weighted			Value-weighted		
Portfolio	$r-r_f$	α	α_{FF}	$r-r_f$	α	α_{FF}	$r-r_f$	α	α_{FF}	$r-r_f$	α	α_{FF}
	Panel A: Book-to-market (B/M) portfolios						Panel B: Net stock issues (NS) portfolios					
	Low F-prob (least distressed)						Low F-prob (least distressed)					
Low	0.45	−0.33	−0.22	0.40	−0.19	0.08	1.04	0.52	0.22	0.82	0.30	0.27
2	0.73	0.04	−0.11	0.62	0.05	0.02	0.86	0.35	−0.03	0.59	0.10	0.00
3	0.84	0.21	−0.09	0.64	0.06	−0.05	0.86	0.25	0.01	0.43	−0.14	−0.14
4	0.88	0.34	−0.05	0.54	0.05	−0.18	0.88	0.19	0.03	0.63	−0.03	0.03
High	1.21	0.72	0.29	0.66	0.21	−0.18	0.52	−0.25	−0.37	0.24	−0.39	−0.36
H−L	0.76	1.05	0.51	0.25	0.41	−0.26	−0.52	−0.78	−0.59	−0.58	−0.69	−0.64
t(H−L)	4.19	6.86	4.68	1.32	2.18	−1.86	−2.93	−5.15	−4.45	−3.84	−4.65	−4.44
	High F-prob (most distressed)						High F-prob (most distressed)					
Low	0.55	−0.36	−0.31	0.25	−0.63	−0.21	1.79	1.18	0.76	1.06	0.34	0.33
2	1.00	0.20	0.04	0.60	−0.25	−0.12	1.62	0.98	0.52	0.79	0.13	−0.16
3	1.38	0.66	0.31	0.97	0.27	−0.01	1.28	0.54	0.27	0.88	0.15	0.11
4	1.51	0.87	0.43	0.85	0.22	−0.23	1.15	0.33	0.13	0.61	−0.32	−0.11
High	1.96	1.38	0.80	1.06	0.41	−0.11	0.64	−0.18	−0.33	−0.02	−0.87	−0.69
H−L	1.42	1.74	1.11	0.81	1.04	0.10	−1.15	−1.35	−1.09	−1.08	−1.22	−1.01
t(H−L)	5.59	7.67	6.44	2.57	3.26	0.42	−5.67	−7.04	−6.33	−3.89	−4.49	−3.55
t(H−L|D−U)	3.61	3.89	3.51	1.88	2.11	1.22	−4.21	−3.91	−3.22	−1.74	−1.86	−1.25
	Panel C: Investment-to-assets (I/A) portfolios						Panel D: Asset growth (△A/A) portfolios					
	Low F-prob (least distressed)						Low F-prob (least distressed)					
Low	1.07	0.48	0.18	0.76	0.18	0.08	1.10	0.50	0.20	0.69	0.14	−0.01
2	0.97	0.37	0.14	0.57	0.04	0.06	0.90	0.38	0.07	0.64	0.16	0.10
3	0.81	0.23	0.00	0.46	−0.05	−0.02	0.87	0.31	0.08	0.52	−0.03	−0.06
4	0.79	0.16	−0.04	0.50	−0.10	−0.05	0.88	0.23	0.04	0.64	0.03	0.21
High	0.52	−0.19	−0.43	0.52	−0.14	−0.15	0.41	−0.37	−0.52	0.31	−0.40	−0.29
H−L	−0.55	−0.67	−0.62	−0.24	−0.31	−0.23	−0.69	−0.87	−0.71	−0.38	−0.54	−0.28
t(H−L)	−4.71	−6.15	−5.57	−1.56	−2.01	−1.50	−5.11	−7.41	−5.96	−2.27	−3.43	−2.02
	High F-prob (most distressed)						High F-prob (most distressed)					
Low	1.78	1.06	0.68	1.18	0.43	0.22	2.09	1.30	0.97	0.75	−0.10	−0.19
2	1.66	0.93	0.59	0.69	−0.02	−0.28	1.73	1.05	0.65	1.16	0.42	0.26
3	1.48	0.77	0.52	0.79	−0.01	0.04	1.42	0.77	0.41	0.95	0.27	0.07
4	1.15	0.44	0.16	0.67	−0.16	0.06	1.02	0.34	0.02	0.54	−0.22	−0.07
High	0.45	−0.31	−0.59	0.19	−0.68	−0.41	0.30	−0.53	−0.66	0.24	−0.65	−0.36
H−L	−1.33	−1.37	−1.27	−0.99	−1.11	−0.63	−1.78	−1.83	−1.63	−0.51	−0.55	−0.16
t(H−L)	−7.35	−7.82	−7.10	−3.28	−3.59	−1.97	−7.79	−8.22	−7.32	−1.83	−1.95	−0.59
t(H−L|D−U)	−4.38	−4.13	−3.92	−2.26	−2.39	−1.17	−5.24	−4.87	−4.95	−0.43	−0.01	0.42

Table 9 : The Variation of the Value, Net Stock Issues, Investment, and Asset Growth Anomalies Across Subsamples Split by Asset Size/Payout Ratio/Bond Rating/the Whited-Wu Index and O-Score

At the end of June of year t, we first split the sample into six subsamples by an independent three-by-two sort on asset size and O-score (Panel A) and on payout ratio and O-score (Panel B) and on the Whited-Wu index and O-score (Panel D). In Panel C, we split the sample into four subsamples by an independent two-by-two sort on bond rating and O-score. The sort on bond rating categorizes firms into two groups: the constrained group that contains all the firms with debt outstanding but without a bond rating, and the unconstrained group that contains all the firms whose bonds are rated. All the sorting variables are measured in fiscal year ending in calendar year $t-1$. The definition of O-score is described in Section 2. Within each subsample, firms are sorted into five equal-numbered portfolios based on book-to-market equity (B/M), net stock issues (NS), investment-to-assets (I/A), and asset growth (△A/A). Portfolio returns are computed over the period from July of year t to June of year t+1. The portfolios are rebalanced at the end of each June. Only the results for the high-minus-low portfolios are reported. Excess return ($r-r_f$) is the difference between portfolio returns and the one-month T-bill rate. The CAPM alphas (α) and Fama-French alphas (α_{FF}) are the intercepts from time-series regression of portfolio returns on the market factor

	Equal-weighted			Value-weighted			Equal-weighted			Value-weighted		
Portfolio	$r-r_f$	α	α_{FF}	$r-r_f$	α	α_{FF}	$r-r_f$	α	α_{FF}	$r-r_f$	α	α_{FF}
	Panel A: Subsamples by asset size and O-score (July 1963–December 2006, 534 Months)											
	Small asset size/low O-score						Small asset size/high O-score					
H−L B/M	1.28	1.53	1.03	1.03	1.27	0.66	1.66	1.87	1.45	1.54	1.77	1.24
H−L NS	−0.80	−1.00	−0.83	−0.75	−0.96	−0.71	−0.97	−1.14	−0.93	−1.12	−1.28	−0.95
H−L I/A	−0.70	−0.80	−0.75	−0.40	−0.47	−0.52	−1.41	−1.39	−1.30	−0.82	−0.85	−0.64
H−L △A/A	−0.83	−1.01	−0.79	−0.44	−0.59	−0.34	−1.71	−1.68	−1.54	−1.08	−1.07	−0.93
	Big asset size/low O-score						Big asset size/high O-score					
H−L B/M	0.42	0.53	−0.18	0.23	0.34	−0.39	0.69	0.76	0.17	0.58	0.65	−0.02
H−L NS	−0.49	−0.62	−0.40	−0.54	−0.61	−0.42	−0.49	−0.57	−0.39	−0.48	−0.56	−0.29
H−L I/A	−0.38	−0.46	−0.25	−0.25	−0.32	−0.05	−0.60	−0.64	−0.48	−0.59	−0.64	−0.38
H−L △A/A	−0.46	−0.60	−0.23	−0.36	−0.50	0.00	−0.69	−0.75	−0.55	−0.53	−0.63	−0.40
	Small-minus-big asset size/low O-score						Small-minus-big asset size/high O-score					
t(H−L B/M)	4.20	5.12	5.98	3.31	3.99	4.40	4.28	5.25	6.23	3.73	4.54	5.09
t(H−L NS)	−1.85	−2.29	−2.47	−0.98	−1.71	−1.36	−2.27	−2.77	−2.60	−2.66	−3.05	−2.63
t(H−L I/A)	−1.89	−2.10	−3.07	−0.55	−0.59	−1.88	−3.82	−3.57	−4.04	−0.97	−0.86	−1.04
t(H−L △A/A)	−1.96	−2.16	−2.97	−0.28	−0.32	−1.28	−4.39	−4.06	−4.59	−2.18	−1.75	−2.11
	Small asset size/high-minus-low O-score						Big asset size/high-minus-low O-score					
t(H−L B/M)	1.78	1.65	1.91	1.96	1.91	2.25	1.84	1.55	2.49	1.84	1.65	1.92
t(H−L NS)	−0.78	−0.65	−0.48	−1.37	−1.21	−0.86	−0.03	0.46	0.07	0.37	0.27	0.75
t(H−L I/A)	−3.43	−3.00	−2.81	−1.48	−1.33	−0.42	−1.53	−1.30	−1.70	−2.03	−1.96	−2.00
t(H−L △A/A)	−3.50	−2.86	−3.42	−2.23	−1.71	−2.09	−1.53	−1.03	−2.17	−0.92	−0.70	−2.23
	Panel B: Subsamples by payout ratio and O-score (July 1963–December 2006, 534 Months)											
	Low payout ratio/low O-score						Low payout ratio/high O-score					
H−L B/M	1.03	1.29	0.55	0.50	0.71	−0.14	1.54	1.73	1.16	1.23	1.37	0.46
H−L NS	−0.87	−1.05	−0.75	−0.65	−0.83	−0.38	−1.12	−1.27	−1.02	−1.06	−1.12	−0.72
H−L I/A	−0.81	−0.95	−0.76	−0.63	−0.71	−0.27	−1.37	−1.39	−1.24	−0.72	−0.75	−0.44
H−L △A/A	−1.08	−1.30	−0.88	−0.59	−0.75	−0.20	−1.58	−1.59	−1.40	−0.84	−0.83	−0.60
	High payout ratio/low O-score						High payout ratio/high O-score					
H−L B/M	0.49	0.61	0.07	0.16	0.24	−0.47	0.68	0.73	0.29	0.63	0.67	0.15
H−L NS	−0.60	−0.65	−0.50	−0.48	−0.49	−0.27	−0.66	−0.62	−0.49	−0.58	−0.53	−0.45
H−L I/A	−0.44	−0.48	−0.43	−0.34	−0.36	−0.20	−0.82	−0.79	−0.73	−0.61	−0.58	−0.44
H−L △A/A	−0.39	−0.45	−0.24	−0.20	−0.26	0.11	−0.71	−0.71	−0.60	−0.38	−0.40	−0.21
	Low-minus-high payout ratio/low O-score						Low-minus-high payout ratio/high O-score					
t(H−L B/M)	3.00	4.01	2.84	1.34	1.87	1.23	4.33	5.31	4.85	2.02	2.47	1.04
t(H−L NS)	−1.57	−2.57	−1.56	−0.63	−1.30	−0.39	−2.17	−3.39	−2.89	−1.69	−2.15	−0.97
t(H−L I/A)	−2.16	−2.93	−1.98	−1.10	−1.27	−0.25	−2.70	−3.06	−2.45	−0.36	−0.62	0.00
t(H−L △A/A)	−3.95	−5.06	−3.82	−1.47	−1.82	−1.11	−4.04	−4.16	−3.64	−1.47	−1.40	−1.28
	Low payout ratio/high-minus-low O-score						High payout ratio/high-minus-low O-score					
t(H−L B/M)	2.61	2.27	3.22	2.33	2.13	1.84	1.29	0.83	1.47	2.45	2.23	3.18
t(H−L NS)	−1.35	−1.19	−1.46	−1.30	−0.96	−1.06	−0.47	0.25	0.08	−0.58	−0.25	−0.97
t(H−L I/A)	−2.85	−2.39	−2.56	−0.26	−0.15	−0.54	−2.53	−2.11	−2.01	−1.25	−0.99	−1.08
t(H−L △A/A)	−1.99	−1.27	−2.35	−0.73	−0.23	−1.25	−2.46	−2.03	−2.79	−0.98	−0.73	−1.68

and the three Fama-French factors, respectively. We also report heteroscedasticity-consistent t-statistics that test the differences in the average return, α, or α_{FF} of the various H−L portfolios across extreme constraints subsamples and extreme distress subsamples equal zero. In Panel D, the sample starts from July 1976 because of data limitations of the quarterly long-term debt in the construction of the WW index.

Portfolio	Equal-weighted $r-r_f$	α	α_{FF}	Value-weighted $r-r_f$	α	α_{FF}	Equal-weighted $r-r_f$	α	α_{FF}	Value-weighted $r-r_f$	α	α_{FF}
	Panel C: Subsamples by bond rating and O-score (July 1963–December 2006, 534 Months)											
	With bond rating/low O-score						With bond rating/high O-score					
H−L B/M	0.64	0.82	0.11	0.25	0.37	−0.39	0.99	1.16	0.52	0.68	0.78	0.01
H−L NS	−0.52	−0.66	−0.40	−0.43	−0.49	−0.28	−0.60	−0.69	−0.42	−0.52	−0.57	−0.39
H−L I/A	−0.42	−0.53	−0.34	−0.32	−0.40	−0.14	−1.07	−1.10	−0.96	−0.52	−0.56	−0.22
H−L △A/A	−0.45	−0.62	−0.28	−0.34	−0.50	0.00	−1.04	−1.06	−0.97	−0.39	−0.41	−0.29
	Without bond rating/low O-score						Without bond rating/high O-score					
H−L B/M	1.05	1.26	0.74	0.81	1.01	0.30	1.41	1.60	1.07	1.24	1.45	0.70
H−L NS	−0.81	−1.01	−0.73	−1.06	−1.28	−0.91	−0.99	−1.17	−0.94	−1.28	−1.48	−1.06
H−L I/A	−0.76	−0.87	−0.78	−0.63	−0.78	−0.49	−1.23	−1.25	−1.19	−0.64	−0.71	−0.54
H−L △A/A	−0.99	−1.17	−0.89	−0.71	−0.89	−0.41	−1.63	−1.62	−1.56	−1.09	−1.10	−0.89
	Without-minus-with bond rating/low O-score						Without-minus-with bond rating/high O-score					
t(H−L B/M)	3.38	3.75	5.27	3.46	4.02	4.18	2.66	2.84	3.64	2.49	3.07	2.92
t(H−L NS)	−2.73	−3.48	−3.22	−3.46	−4.58	−3.59	−2.31	−2.95	−3.10	−3.47	−4.35	−3.13
t(H−L I/A)	−3.23	−3.28	−4.21	−1.86	−2.21	−2.05	−0.97	−0.91	−1.44	−0.58	−0.71	−1.45
t(H−L △A/A)	−5.09	−5.23	−5.71	−2.13	−2.17	−2.19	−3.40	−3.30	−3.42	−3.12	−3.14	−2.53
	With bond rating/high-minus-low O-score						Without bond rating/high-minus-low O-score					
t(H−L B/M)	2.11	2.14	2.59	2.17	2.13	1.97	2.24	2.16	2.06	1.85	1.89	1.68
t(H−L NS)	−0.56	−0.17	−0.15	−0.58	−0.54	−0.69	−1.22	−1.07	−1.33	−0.98	−0.86	−0.65
t(H−L I/A)	−3.85	−3.46	−4.00	−1.07	−0.87	−0.46	−3.23	−2.71	−3.01	−0.06	0.27	−0.26
t(H−L △A/A)	−2.54	−1.98	−3.28	−0.22	0.41	−1.42	−3.32	−2.61	−4.07	−1.43	−0.82	−1.88
	Panel D: Subsamples by the WW index and O-score (July 1976–December 2006, 378 Months)											
	Low WW/low O-score						Low WW/high O-score					
H−L B/M	0.35	0.51	−0.24	0.24	0.33	−0.41	0.47	0.58	−0.01	0.49	0.55	−0.14
H−L NS	−0.40	−0.60	−0.38	−0.40	−0.54	−0.33	−0.60	−0.71	−0.52	−0.63	−0.77	−0.50
H−L I/A	−0.26	−0.35	−0.19	−0.22	−0.30	−0.11	−0.68	−0.71	−0.62	−0.66	−0.76	−0.57
H−L △A/A	−0.36	−0.56	−0.19	−0.46	−0.66	−0.12	−0.66	−0.73	−0.56	−0.59	−0.75	−0.52
	High WW/low O-score						High WW/high O-score					
H−L B/M	1.52	1.85	1.45	1.54	1.85	1.32	1.84	2.16	1.69	1.58	1.92	1.35
H−L NS	−0.96	−1.22	−1.08	−1.17	−1.44	−1.27	−1.26	−1.50	−1.23	−1.46	−1.73	−1.26
H−L I/A	−0.76	−0.87	−0.84	−0.39	− 0.49	−0.53	−1.44	−1.41	−1.36	−0.71	−0.77	−0.54
H−L △A/A	−1.11	−1.33	−1.24	−0.88	−1.04	−1.08	−1.73	−1.70	−1.62	−0.68	−0.65	−0.48
	High-minus-low WW/low O-score						High-minus-low WW/high O-score					
t(H−L B/M)	4.78	5.71	7.28	4.51	5.56	5.90	5.08	6.30	6.71	3.15	4.04	4.43
t(H−L NS)	−2.72	−3.02	−3.27	−2.56	−3.12	−3.09	−2.57	−3.19	−2.74	−2.98	−3.49	−2.67
t(H−L I/A)	−2.65	−2.67	−3.23	−0.54	−0.54	−1.26	−3.27	−3.00	−3.17	−0.17	−0.03	0.09
t(H−L △A/A)	−3.25	−3.29	−4.59	−1.17	−1.02	−2.79	−3.78	−3.47	−3.94	−0.26	0.27	0.14
	Low WW/high-minus-low O-score						High WW/high-minus-low O-score					
t(H−L B/M)	0.76	0.42	1.31	1.09	0.95	1.04	1.28	1.33	1.00	0.13	0.20	0.09
t(H−L NS)	−1.31	−0.76	−0.88	−1.18	−1.18	−0.77	−1.11	−1.07	−0.58	−0.88	−0.86	0.03
t(H−L I/A)	−2.66	−2.29	−2.67	−2.16	−2.15	−2.16	−2.95	−2.43	−2.25	−0.89	−0.78	−0.02
t(H−L △A/A)	−1.73	−0.99	−2.20	−0.58	−0.39	−1.70	−2.03	−1.28	−1.34	0.55	1.07	1.69

Table 10 : The Variation of the Value, Net Stock Issues, Investment, and Asset Growth Anomalies Across Subsamples Split by Asset Size/Payout Ratio/Bond Rating/the Whited-Wu Index and Failure Probability (F-prob) (July 1976–December 2006, 378 Months)

At the end of June of year t, we first split the sample into six subsamples by an independent three-by-two sort on asset size and F-probability (Panel A) and on payout ratio and F-probability (Panel B) and on the Whited-Wu index and F-probability (Panel D). In Panel C, we split the sample into four subsamples by an independent two-by-two sort on bond rating and F-probability. The sort on bond rating categorizes firms into two groups: the constrained group that contains all the firms with debt outstanding but without a bond rating, and the unconstrained group that contains all the firms whose bonds are rated. All the sorting variables are measured in fiscal year ending in calendar year $t-1$. The definition of F-probability is described in Section 2. Within each subsample, firms are sorted into five equal-numbered portfolios based on book-to-market equity (B/M), net stock issues (NS), investment-to-assets (I/A), and asset growth (△A/A). Portfolio returns are computed over the period from July of year t to June of year $t+1$.

	Equal-weighted			Value-weighted			Equal-weighted			Value-weighted		
Portfolio	$r-r_f$	α	α_{FF}	$r-r_f$	α	α_{FF}	$r-r_f$	α	α_{FF}	$r-r_f$	α	α_{FF}
	Panel A: Subsamples by asset size and F-prob											
	Small asset size/low F-prob						Small asset size/high F-prob					
H−L B/M	1.26	1.61	1.28	1.14	1.51	1.02	1.92	2.26	1.78	1.52	1.89	1.36
H−L NS	−0.53	−0.85	−0.67	−0.91	−1.24	−0.98	−1.25	−1.47	−1.26	−1.49	−1.69	−1.34
H−L I/A	−0.66	−0.74	−0.75	−0.41	−0.50	−0.50	−1.49	−1.46	−1.31	−0.54	−0.55	−0.34
H−L △A/A	−1.18	−1.28	−1.26	−0.60	−0.66	−0.55	−1.87	−1.86	−1.60	−0.66	−0.64	−0.41
	Big asset size/low F-prob						Big asset size/high F-prob					
H−L B/M	0.34	0.52	−0.08	0.13	0.28	−0.40	0.65	0.85	0.03	0.61	0.83	−0.12
H−L NS	−0.47	−0.63	−0.49	−0.56	−0.67	−0.54	−0.50	−0.67	−0.47	−0.53	−0.65	−0.49
H−L I/A	−0.32	−0.43	−0.31	−0.19	−0.26	−0.13	−0.66	−0.72	−0.50	−0.68	−0.80	−0.38
H−L △A/A	−0.37	−0.57	−0.34	−0.36	−0.54	−0.17	−0.88	−0.99	−0.58	−0.43	−0.64	−0.05
	Small-minus-big asset size/low F-prob						Small-minus-big asset size/high F-prob					
t(H−L B/M)	3.72	4.60	5.51	3.33	4.25	4.65	4.40	5.07	6.45	2.69	3.18	4.70
t(H−L NS)	−0.30	−1.08	−0.83	−1.19	−2.00	−1.51	−2.80	−3.07	−2.94	−2.90	−3.20	−2.38
t(H−L I/A)	−1.72	−1.55	−2.20	−0.73	−0.84	−1.23	−2.89	−2.61	−3.02	0.38	0.68	0.12
t(H−L △A/A)	−3.14	−2.83	−3.72	−0.71	−0.38	−1.18	−3.08	−2.72	−3.52	−0.61	0.00	−1.01
	Small asset size/high-minus-low F-prob						Big asset size/high-minus-low F-prob					
t(H−L B/M)	2.59	2.65	1.95	1.28	1.29	1.12	1.61	1.73	0.58	2.13	2.33	1.20
t(H−L NS)	−2.51	−2.22	−2.07	−1.79	−1.42	−1.08	−0.24	−0.32	0.16	0.18	0.11	0.23
t(H−L I/A)	−2.82	−2.49	−2.00	−0.37	−0.13	0.43	−2.31	−1.94	−1.19	−1.92	−2.08	−0.95
t(H−L △A/A)	−2.16	−1.89	−1.16	−0.15	0.06	0.35	−3.08	−2.67	−1.54	−0.26	−0.42	0.47
	Panel B: Subsamples by payout ratio and F-prob											
	Low payout ratio/low F-prob						Low payout ratio/high F-prob					
H−L B/M	1.13	1.48	0.84	0.53	0.77	−0.05	1.49	1.83	1.18	0.73	1.10	0.04
H−L NS	−0.57	−0.89	−0.56	−0.92	−1.17	−0.78	−1.27	−1.51	−1.20	−1.03	−1.30	−0.72
H−L I/A	−1.02	−1.16	−1.01	−0.72	−0.77	−0.58	−1.49	−1.54	−1.35	−0.63	−0.79	−0.13
H−L △A/A	−1.29	−1.47	−1.27	−1.05	−1.13	−0.83	−1.81	−1.88	−1.57	−0.53	−0.62	−0.11
	High payout ratio/low F-prob						High payout ratio/high F-prob					
H−L B/M	0.41	0.60	0.16	0.10	0.24	−0.41	0.92	1.10	0.62	0.65	0.87	0.02
H−L NS	−0.54	−0.54	−0.47	−0.37	−0.37	−0.28	−0.74	−0.77	−0.64	−0.68	−0.69	−0.35
H−L I/A	−0.33	−0.36	−0.35	−0.24	−0.25	−0.13	−0.99	−0.97	−0.88	−0.73	−0.75	−0.45
H−L △A/A	−0.29	−0.38	−0.24	−0.15	−0.22	0.13	−0.94	−0.98	−0.76	−0.51	−0.65	−0.07
	Low-minus-high payout ratio/low F-prob						Low-minus-high payout ratio/high F-prob					
t(H−L B/M)	3.29	4.15	3.09	1.38	1.73	1.13	2.51	3.25	2.50	0.22	0.66	0.06
t(H−L NS)	−0.14	−1.70	−0.47	−1.75	−2.76	−1.63	−2.17	−3.22	−2.45	−1.00	−1.87	−1.07
t(H−L I/A)	−3.48	−4.19	−3.34	−1.50	−1.62	−1.39	−2.11	−2.48	−1.92	0.28	−0.13	0.91
t(H−L △A/A)	−4.58	−5.22	−4.89	−2.70	−2.77	−2.73	−3.31	−3.47	−3.03	−0.07	0.07	−0.10
	Low payout ratio/high-minus-low F-prob						High payout ratio/high-minus-low F-prob					
t(H−L B/M)	1.56	1.53	1.51	0.56	0.93	0.23	3.25	3.21	2.69	1.95	2.22	1.41
t(H−L NS)	−2.93	−2.67	−2.69	−0.34	−0.40	0.16	−1.34	−1.47	−1.08	−1.18	−1.18	−0.21
t(H−L I/A)	−2.10	−1.80	−1.55	0.24	−0.07	1.28	−4.40	−4.08	−3.47	−1.71	−1.71	−1.07
t(H−L △A/A)	−2.22	−1.85	−1.35	1.39	1.34	1.96	−4.41	−4.14	−3.49	−1.28	−1.50	−0.69

Only the results for the high-minus-low portfolios are reported. Excess return ($r - r_f$) is the difference between portfolio returns and the one-month T-bill rate. The CAPM alphas (α) and Fama-French alphas (α_{FF}) are the intercepts from regressing portfolio returns on the market factor and the three Fama-French factors, respectively. We also report heteroscedasticity-consistent t-statistics that test the differences in the average return, α, or α_{FF} of the various H−L portfolios across extreme constraints subsamples and extreme distress subsamples equal zero.

Portfolio	Equal-weighted			Value-weighted			Equal-weighted			Value-weighted		
	$r - r_f$	α	α_{FF}	$r - r_f$	α	α_{FF}	$r - r_f$	α	α_{FF}	$r - r_f$	α	α_{FF}
	Panel C: Subsamples by bond rating and F-prob											
	With bond rating/low F-prob						With bond rating/high F-prob					
H−L B/M	0.60	0.86	0.25	0.15	0.30	−0.43	1.03	1.35	0.64	0.59	0.84	−0.19
H−L NS	−0.43	−0.62	−0.48	−0.57	−0.66	−0.58	−0.77	−0.93	−0.71	−0.54	−0.66	−0.47
H−L I/A	−0.34	−0.47	−0.37	−0.17	−0.23	−0.09	−1.14	−1.16	−1.03	−0.77	−0.89	−0.46
H−L △A/A	−0.42	−0.60	−0.42	−0.23	−0.39	−0.03	−1.25	−1.34	−1.09	−0.53	−0.67	−0.32
	Without bond rating/low F-prob						Without bond rating/high F-prob					
H−L B/M	1.00	1.31	0.84	0.66	0.92	0.41	1.48	1.80	1.21	1.30	1.69	0.69
H−L NS	−0.66	−0.93	−0.69	−1.03	−1.29	−1.00	−1.05	−1.29	−1.02	−1.35	−1.71	−1.18
H−L I/A	−0.83	−0.93	−0.95	−0.67	−0.84	−0.75	−1.38	−1.43	−1.35	−1.15	−1.28	−0.87
H−L △A/A	−1.06	−1.23	−1.09	−0.78	−1.03	−0.74	−1.85	−1.88	−1.78	−1.13	−1.20	−0.79
	Without-minus-with bond rating/low F-prob						Without-minus-with bond rating/high F-prob					
t(H−L B/M)	2.83	3.10	3.94	2.53	3.19	4.03	2.57	2.58	3.08	2.51	2.88	2.75
t(H−L NS)	−1.81	−2.46	−1.72	−2.13	−2.98	−1.90	−1.56	−2.07	−1.67	−2.56	−3.46	−2.21
t(H−L I/A)	−3.91	−3.75	−4.61	−2.48	−3.10	−3.03	−1.39	−1.51	−1.87	−1.41	−1.39	−1.45
t(H−L △A/A)	−5.09	−5.07	−5.15	−2.38	−2.83	−3.08	−3.15	−2.90	−3.91	−2.08	−1.88	−1.60
	With bond rating/high-minus-low F-prob						Without bond rating/high-minus-low F-prob					
t(H−L B/M)	2.34	2.63	2.26	1.83	2.26	1.00	2.84	3.03	2.23	2.26	2.65	0.94
t(H−L NS)	−2.38	−2.10	−1.60	0.14	0.04	0.50	−2.36	−2.23	−1.93	−1.08	−1.38	−0.64
t(H−L I/A)	−4.31	−3.91	−3.95	−2.42	−2.60	−1.45	−3.26	−3.05	−2.55	−1.74	−1.57	−0.44
t(H−L △A/A)	−3.82	−3.51	−3.57	−1.06	−1.03	−1.08	−3.95	−3.51	−3.77	−1.18	−0.60	−0.15
	Panel D: Subsamples by the WW index and F-prob											
	Low WW/low F-prob						Low WW/high F-prob					
H−L B/M	0.35	0.48	−0.16	0.19	0.22	−0.43	0.62	0.79	−0.02	0.51	0.66	−0.34
H−L NS	−0.49	−0.67	−0.52	−0.55	−0.68	−0.53	−0.49	−0.66	−0.47	−0.45	−0.56	−0.37
H−L I/A	−0.28	−0.37	−0.25	−0.13	−0.21	−0.09	−0.64	−0.70	−0.55	−0.67	−0.76	−0.42
H−L △A/A	−0.31	−0.48	−0.24	−0.38	−0.53	−0.15	−0.74	−0.86	−0.50	−0.45	−0.66	−0.14
	High WW/low F-prob						High WW/high F-prob					
H−L B/M	1.39	1.72	1.27	1.18	1.49	0.87	1.86	2.18	1.70	1.71	2.06	1.46
H−L NS	−0.65	−0.96	−0.75	−0.58	−0.90	−0.66	−1.30	−1.53	−1.29	−1.52	−1.73	−1.33
H−L I/A	−0.90	−0.98	−0.95	−0.34	−0.48	−0.31	−1.38	−1.37	−1.32	−0.67	−0.73	−0.61
H−L △A/A	−1.40	−1.49	−1.45	−0.58	−0.61	−0.47	−1.80	−1.81	−1.68	−0.85	−0.88	−0.67
	High-minus-low WW/low F-prob						High-minus-low WW/high F-prob					
t(H−L B/M)	4.37	5.60	6.48	2.97	4.07	3.96	4.49	5.21	6.15	3.39	3.94	5.00
t(H−L NS)	−0.74	−1.39	−1.13	−0.07	−0.69	−0.38	−3.28	−3.55	−3.21	−3.34	−3.75	−2.95
t(H−L I/A)	−3.03	−2.95	−3.23	−0.65	−0.87	−0.65	−3.08	−2.77	−3.23	−0.02	0.08	−0.60
t(H−L △A/A)	−4.18	−4.00	−4.66	−0.57	−0.22	−0.91	−3.58	−3.21	−4.28	−1.06	−0.58	−1.46
	Low WW/high-minus-low F-prob						High WW/high-minus-low F-prob					
t(H−L B/M)	1.47	1.79	0.76	1.24	1.70	0.33	1.96	1.94	1.75	1.64	1.75	1.68
t(H−L NS)	−0.01	0.03	0.29	0.46	0.52	0.66	−2.67	−2.38	−2.14	−2.82	−2.53	−1.93
t(H−L I/A)	−2.30	−2.07	−1.79	−2.00	−2.03	−1.19	−1.91	−1.61	−1.49	−0.92	−0.70	−0.81
t(H−L △A/A)	−2.68	−2.44	−1.65	−0.28	−0.52	0.04	−1.49	−1.22	−0.84	−0.74	−0.75	−0.51

Table 11 : The Variation of the Median Anomaly Variables in the Full Sample and Across Subsamples Split by Asset Size, Payout Ratio, Bond Rating, and the Whited-Wu (2006, WW) Index

Book-to-market equity (B/M) is defined as in Fama-French (1993). Net stock issues (NS) are the change in the natural logarithms of the number of shares outstanding adjusted for splits to capture the effect of share repurchases and seasoned equity offerings. Investment-to-assets (I/A) is the change in gross property, plant, and equipment (Compustat annual item 3) plus the change in inventories (item 3) divided by lagged total assets (item 6). Asset growth ($\triangle$A/A) is the change in total assets divided by lagged total assets. In the column denoted "All," we sort firms at the end of each June of year t into five equal-numbered quintiles based on a given anomaly variable measured at the fiscal year ending in calendar year $t-1$. We also split the full sample into three equal-numbered subsamples by asset size, by payout ratio, and by the WW index, as well as two subsamples by bond ratings using accounting variables in the fiscal year ending in calendar year $t-1$. In the columns involving bond ratings, the constrained subsample contains all the firms with debt outstanding but without a bond rating, and the unconstrained subsample contains all the firms whose bonds are rated. The sample is from 1963 to 2006 except for tests related to the WW index that use the sample from 1976 to 2006. (The quarterly data of long-term debt required in the construction of the WW index is available only after 1976.) Asset size is total book assets (Compustat annual item 6). Payout ratio is defined as the sum of dividends and stock repurchase divided by operating income. See Section 2 for details of constructing the WW index. Within each subsample, we sort firms into five equal-numbered portfolios based on a given anomaly variable. We calculate the median anomaly variables for each quintile portfolio at year t and report the time series averages of the median anomaly variable. We also report t-statistics, denoted t(H−L), which test the differences in the median anomaly variables across the extreme quintiles equal zero, and t-statistics, denoted t(H−L|C−U), which test the differences in the spread in the anomaly variables across extreme subsamples split by measures of financial constraints equal zero. The t-statistics are adjusted for heteroscedasticity and autocorrelations.

	All	Asset size		Payout ratio		Bond rating		The WW index	
		Small	Big	Low	High	With	Without	Low	High
Panel A: Book-to-market (B/M) portfolios									
Low B/M	0.23	0.17	0.29	0.18	0.29	0.24	0.26	0.29	0.20
2	0.47	0.39	0.53	0.40	0.55	0.46	0.53	0.51	0.44
3	0.72	0.65	0.74	0.66	0.78	0.69	0.81	0.72	0.73
4	1.03	1.00	0.98	1.04	1.02	0.96	1.17	0.97	1.13
High B/M	1.70	1.78	1.54	1.91	1.55	1.50	1.93	1.48	1.98
H−L B/M	1.47	1.61	1.25	1.73	1.25	1.26	1.68	1.19	1.78
t(H−L)	9.85	9.55	10.42	8.01	12.26	10.53	11.17	12.85	9.19
t(H−L|C−U)			5.80		3.94		7.92		5.37
Panel B: Net stock issues (NS) portfolios									
Low NS	−0.02	−0.01	−0.02	0.00	−0.04	−0.02	−0.01	−0.02	−0.01
2	0.00	0.00	0.00	0.00	−0.01	0.00	0.00	0.00	0.00
3	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.01
4	0.02	0.03	0.02	0.04	0.01	0.02	0.02	0.02	0.04
High NS	0.14	0.18	0.11	0.20	0.07	0.13	0.15	0.12	0.21
H−L NS	0.16	0.19	0.13	0.20	0.11	0.15	0.16	0.14	0.22
t(H−L)	6.23	5.17	8.36	6.83	9.57	7.23	5.89	10.59	5.73
t(H−L|C−U)			2.51		3.44		0.94		2.53
Panel C: Investment-to-assets (I/A) portfolios									
Low I/A	−0.04	−0.08	−0.01	−0.07	−0.02	−0.03	−0.05	−0.01	−0.09
2	0.03	0.01	0.04	0.02	0.03	0.04	0.02	0.04	0.01
3	0.07	0.06	0.08	0.07	0.06	0.07	0.07	0.07	0.05
4	0.13	0.12	0.12	0.15	0.10	0.12	0.13	0.12	0.12
High I/A	0.28	0.30	0.25	0.36	0.19	0.27	0.30	0.25	0.29
H−L I/A	0.32	0.37	0.26	0.43	0.22	0.29	0.35	0.26	0.38
t(H−L)	21.78	18.09	18.66	15.46	33.80	23.50	22.79	15.80	13.91
t(H−L|C−U)			5.89		8.53		9.25		4.58
Panel D: Asset growth ($\triangle$A/A) portfolios									
Low $\triangle$A/A	−0.10	−0.19	−0.03	−0.17	−0.05	−0.07	−0.12	−0.04	−0.22
2	0.02	−0.03	0.04	−0.02	0.02	0.03	0.00	0.04	−0.06
3	0.08	0.06	0.09	0.09	0.07	0.09	0.08	0.09	0.04
4	0.17	0.18	0.15	0.23	0.12	0.17	0.18	0.17	0.17
High $\triangle$A/A	0.46	0.53	0.38	0.67	0.26	0.44	0.49	0.41	0.55
H−L $\triangle$A/A	0.56	0.72	0.41	0.84	0.31	0.51	0.61	0.44	0.78
t(H−L)	8.10	10.57	6.40	10.41	10.86	7.26	9.84	6.90	11.95
t(H−L|C−U)			8.32		9.71		8.39		7.41

Table 12 : Cross-Sectional Regressions of Monthly Percent Excess Returns on Anomaly Variables in the Full Samples and Subsamples Split by Measures of Financial Constraints

Book-to-market equity (B/M) is defined as in Fama-French (1993). Net stock issues (NS) are the change in the natural logarithms of the number of shares outstanding adjusted for splits to capture the effect of share repurchases and seasoned equity offerings. Investment-to-assets (I/A) is the change in gross property, plant, and equipment (Compustat annual item 3) plus the change in inventories (item 3) divided by lagged total assets (item 6). Asset growth ($\triangle$A/A) is the change in total assets divided by lagged total assets. We report univariate Fama-MacBeth (1973) cross-sectional regressions of monthly percent excess returns from July of year t to June of year t+1 on a given anomaly variable measured at the fiscal year ending in calendar year $t-1$. We report the cross-sectional regressions both in the full sample and in the subsamples split by measures of financial constraints. Specifically, we split the full sample into three equal-numbered subsamples by asset size, by payout ratio, and by the Whited-Wu (2006, WW) index, as well as two subsamples by bond ratings using accounting variables in the fiscal year ending in calendar year $t-1$. When bond ratings are used in splitting the sample, the constrained subsample contains all the firms with debt outstanding but without a bond rating, and the unconstrained subsample contains all the firms whose bonds are rated. The sample period is from 1963 to 2006 except for tests related to the WW index that use the sample from 1976 to 2006. (The quarterly data of long-term debt required in the construction of the WW index is available only after 1976.) Asset size is total book assets (Compustat annual item 6). Payout ratio is defined as the sum of dividends and stock repurchase divided by operating income. See Section 2 for details of constructing the WW index. We report the time series averages of the intercepts (int.), slopes, their Fama-MacBeth t-statistics, and cross-sectional R^2s (in percent). We also report t-statistics that test the differences in the slopes of anomaly variables across extreme subsamples split by measures of financial constraints equal zero.

		Panel A			Panel B			Panel C			Panel D		
		int.	B/M	R^2	int.	NS	R^2	int.	I/A	R^2	int.	$\triangle$A/A	R^2
Full sample	Ave.	0.51	0.52	0.51	0.96	−1.63	0.17	0.96	−0.72	0.17	1.00	−0.80	0.20
	t	1.76	6.74		3.64	−6.16		3.60	−5.11		3.79	−8.55	
Small asset size	Ave.	0.70	0.81	0.48	1.29	−1.22	0.11	1.25	−0.98	0.06	1.28	−0.95	0.10
	t	1.92	8.11		3.91	−3.63		3.74	−5.63		3.83	−8.95	
Big asset size	Ave.	0.44	0.25	0.90	0.73	−1.71	0.32	0.73	−0.45	0.81	0.77	−0.61	0.53
	t	1.91	3.24		3.33	−5.58		3.35	−2.41		3.59	−4.72	
Small-minus-big	t		5.54			1.21			−2.09			−2.23	
Low payout ratio	Ave.	0.59	0.64	0.46	1.11	−1.46	0.11	1.09	−0.90	0.13	1.13	−0.91	0.17
	t	1.58	7.31		3.18	−4.72		3.09	−5.04		3.22	−8.28	
High payout ratio	Ave.	0.56	0.29	0.57	0.83	−1.70	0.22	0.84	−0.37	0.41	0.86	−0.54	0.17
	t	2.62	4.18		4.19	−5.44		4.26	−2.25		4.37	−4.92	
Low-minus-high	t		4.48			0.61			−2.43			−2.96	
With bond rating	Ave.	0.66	0.37	0.63	0.98	−1.46	0.21	0.98	−0.48	0.35	1.02	−0.56	0.28
	t	2.42	4.46		4.04	−4.60		3.99	−2.67		4.18	−4.80	
Without bond rating	Ave.	0.39	0.63	0.50	0.94	−1.74	0.18	0.94	−0.90	0.12	0.99	−0.96	0.18
	t	1.24	7.88		3.31	−5.88		3.25	−6.11		3.44	−9.80	
Without-minus-with	t		4.66			−0.86			−2.51			−3.96	
Low WW	Ave.	0.59	0.26	0.91	0.87	−1.02	0.44	0.92	−0.71	0.26	0.91	−0.27	0.57
	t	2.17	2.61		3.43	−2.33		3.65	−3.58		3.72	−0.83	
High WW	Ave.	0.94	0.72	0.64	1.50	−2.03	0.23	1.45	−0.90	0.17	1.48	−1.05	0.25
	t	2.11	5.59		3.87	−3.40		3.65	−3.43		3.72	−4.33	
High-minus-low	t		3.09			−1.41			−0.63			−1.65	