Leverage, Financial Distress and the Cross Section of Stock Returns

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Abstract

We document that average returns to stocks are negatively related to book leverage. This relation holds in both raw returns and returns that are risk adjusted using the Fama-French (1993) factors; it appears not to be explained by mispricing. Moreover, the financial distress risk puzzle—that returns are negatively related to default risk—disappears when leverage is accounted for. Differences in accounting measures of performance indicate that the productivity of assets of high leverage firms is less affected by financial distress than that of low leverage firms. This is consistent with the hypothesis that the risk of bearing financial distress costs is priced, and that firms with greatest exposure to these costs rationally avoid leverage. We construct a leverage factor and show that it explains a significant common component of time series variation in returns that is distinct from those explained by the other Fama-French factors. Our results are consistent with the interpretation that book-to-market measures sensitivity to operating rather than financial distress risk, that these risks are distinct, and that both are priced in equity markets.

1. Introduction

Fama and French (1995) document that high book-to-market equity ratios predict poor future earnings, and hypothesize that book-to-market captures exposure to distress risk that is priced in equity returns. However, they find no evidence that the book-to-market factor in returns is related to the book-to-market factor in earnings. Adopting an alternative approach to identify whether book-to-market captures distress risk, several studies examine measures of *financial* distress risk and compare their predictive power for the cross section of returns to that of the book-to-market factor [Dichev (1998), Griffin and Lemmon (2002), Vassalou and Xing (2004) and Campbell, Hilscher and Szilagyi (2005)]. These studies confirm that such measures do predict financial distress for individual firms and are, on average, larger during recessions. However, these measures are not reliable predictors of return premiums, and they do not explain the power of book-to-market in explaining equity returns. In fact, most of the evidence indicates that returns are actually *lower* for firms with high financial distress risk—the so-called "distress risk puzzle."

The measures of distress risk examined in those studies are derived from models of default used in credit markets research, particularly those of Altman (1968), Merton (1974) and Ohlson (1980). The logic justifying their use is that since they capture variation in the probability of *financial* distress, they might also explain variation in whatever distress premium exists in expected stock returns. The occurrence of default alone is not likely to be a separate source of priced systematic risk, however. The market portfolio includes both debt and equity securities of all firms, and is therefore equivalent to a claim on firms' underlying assets. If there is priced risk associated with financial distress, it must be related to (deadweight) *costs* associated with financial distress that impair systematically the value of firms' *assets*. In other words, it is not the risk of default itself, but the risk of sustaining losses in asset value associated with default that is necessary for financial distress risk to be priced.

If firms optimize over financial distress costs in choosing capital structures, those with high costs will rationally avoid debt financing. Since estimates of default probabilities used in credit markets research are positively related to leverage, firms with the highest financial distress costs choose capital structures that yield the lowest default probability estimates. Thus, the cross sectional relation between expected financial distress costs and the estimated probability of default could well be negative.[1] If financial distress risk is priced, expected returns will be negatively related to leverage and a spurious negative relation could therefore exist between returns and default probability estimates. This is a possible explanation for the "distress risk puzzle."

In this paper, we examine the dependence of operating performance and stock returns on firms' leverage choices directly to examine whether financial distress is a priced risk and whether the spurious association descried above explains the puzzle. If firms optimize over financial distress costs in choosing leverage levels, those with low (high) leverage are also those for which financial distress is most (least) costly. Therefore, low leverage firms will fare worse conditional on financial distress than high leverage firms. If financial distress risk is priced, leverage levels will capture firms' sensitivities to such risk, and returns will be negatively related to leverage in the cross section. In addition, the time series of stock returns will contain a common component relating to a financial distress premium.

Our results are consistent with this explanation. There is a strong negative relation between returns and leverage both in raw returns and returns adjusted for risk via the Fama-French three-factor model. We verify that high leverage firms fare better in distress than low leverage firms, and that the "distress risk puzzle" is largely spurious. The "distress risk puzzle" disappears when leverage is included in cross sectional regressions. Using the difference between returns to low and high leverage firms to construct a leverage factor, we find that such a factor explains significant time series

[1] The finding in credit markets research that estimates of the probability of default are negatively correlated with loss given default is also consistent with the perspective that firms choose low levels of leverage if they expect to suffer large losses in asset values in financial distress [see Chava, Stefanescu and Turnbull (2006)].

variation in returns to a majority of the Fama-French 100 portfolios. However, our leverage factor does not displace the book-to-market factor. Our interpretation of the results is that financial distress risk is indeed priced with a return *premium* to stocks of companies with greater financial distress costs, and that leverage and book-to-market factors capture different dimensions of variation in return premiums related to firms' exposure to costs associated with distress.

Our results suggest that the distinction between financial and operating (or asset) distress is important to understanding the relation between equity returns and distress risk. The notion of relative distress described in Fama and French (1995) is one of operating distress, where firms that sustain demand or supply shocks respond by expanding or contracting the scale of their operations (p. 137). Several recent theories take this perspective also [e.g., Berk, Green and Naik (1999), Gomez et.al. (2003), Zhang (2005), Cooper (2006) and Carlson, Fisher and Giammarino (2006)]. In these theories, book-to-market captures the degree to which firm value is derived from assets in place versus growth options. Book-to-market explains returns because it measures shifts in risk as the asset mix changes. In some of these models, investment is irreversible so assets in place are more risky than growth options—assets in place cannot be sold in downturns and are a low cost source of additional capacity in expansions. With irreversible investment, firms with high book-to-market are more risky than firms with low book-to-market.[2]

Capital structure choices and financial distress play no role in these models. The prediction that book-to-market measures risk relates to the operating distress of firms with excess capacity. Our findings are consistent with the interpretation that book-to-market captures operating distress and that leverage captures a separate risk of suffering losses in asset value due to financial distress. The risks of both types of distress are priced in equity markets, and the relative importance of financial versus operating distress risk in explaining stock returns appears to be greatest among small low book-to-market firms—those the models predict are without excess capacity.

[2] Anderson and Garcia-Feijoo (2006) provide evidence consistent with this view by exploring the association between book-to-market and firms' investing activity.

We examine the robustness of our results to controls for several factors already known to affect returns, and compare the explanation of a financial distress risk premium to that of relative mispricing by the market of firms with high versus low leverage. The risk premium explanation holds up to these tests. In addition, we split the sample at January 1980 and examine the pre- and post-1980 periods separately. Fama and French (1995) show that the earnings of all small firms (regardless of book-to-market) drop in the 1980s and remain low throughout the rest of their sample period. This finding suggests that operating distress increased in importance for small firms in the post 1980 period. Our split sample results indicate that the same is true of financial distress. In fact, our full sample results are driven by the post 1980 period. Before 1980, differences in operating performance of low and high leverage firms in distress are much narrower than after 1980, and the return premium associated with low versus high leverage is insignificant before 1980 in both the cross section and time series tests. The coincident widening of the operating performance gap between low and high leverage firms in distress and the appearance of a return premium after 1980 is consistent with the hypothesis that the return premium to low leverage firms is a reward for the risk of sustaining large losses to asset value in financial distress.

In the models of investment irreversibility, book-to-market measures assets in place against *market* value, with the gap between book and market reflecting the extent to which assets are underutilized as business conditions change. In contrast, our measure of leverage is based entirely on book values (book debt to book assets), and therefore represents ex-ante decisions made by firms. In a related study, Penman, Richardson and Tuna (2005) decompose book-to-market into enterprise risk and market leverage components. They also find a negative relation between future return and market leverage. However, their finding is only evident when they control for book-to-market. Ours is present whether or not we control for book-to-market, and appears in both raw returns and returns adjusted for the Fama-French factors. The leverage measure in their decomposition is based on firms' market values. They argue that the return premium to high book-to-market stocks, and the associated effect of leverage on its decomposition, arises from the failure of accounting information to accurately reflect market values. Our leverage measure is based on book values of debt and assets, and its predictive power is more robust. Therefore, it appears that the explanatory power of leverage has more to do with the amount of leverage firms utilize as reflected in accounting numbers (that we hypothesize is negatively related to costs of financial distress) than a failure of accounting numbers to reflect market valuations.

There is an active debate in the capital structure literature as to whether firms' leverage choices are managed toward optimal levels or are a matter of indifference to managers, and simply result from a sequence of isolated decisions to issue or retire debt or equity. These studies examine the time series behavior of leverage for individual firms and report how firms adjust their capital structures to various shocks. Some studies assert that adjustments to shocks are too slow or display cross sectional patterns that are inconsistent with firms targeting optima [e.g., Baker and Wurgler (2002)], while others argue that the slow adjustment reflects adjustment costs that, once accounted for, produce cross sectional patterns in adjustments that are consistent with firms targeting optimal leverage levels [e.g., Hennessy and Whited (2005) and Leary and Roberts (2005)]. We focus on leverage levels rather than adjustments, and find that (i) firms with high (low) financial distress costs maintain low (high) leverage and (ii) exposure to financial distress costs are priced in equity markets. These findings seem to us strong evidence that firms do manage their capital structures toward optima, and also that participants in equity markets are aware that capital structure is a valid indicator of the costs firms face in distress. These findings suggest that capital structure is indeed a matter of concern to managers, and that participants in equity market believe that capital structure is a matter of concern to managers.

Our results have some obvious but important implications for equity pricing. First, discount rates for capital budgeting and security analysis derived from the Fama-French three-factor model will understate risk (and discount rates) for low debt firms relative to high debt firms. This will distort investment decisions in favor of projects or companies with low leverage. In particular, low (high) leverage firms that use three-factor estimates of their own equity cost of capital as a basis for evaluating projects will over invest (under invest). Similarly, equities of firms with low (high) leverage will erroneously appear bargain (premium) priced relative to the present value of cash flow discounted using a rate derived from the Fama-French model. Second, risk adjusted returns computed from the three-factor model will lead to distorted inferences in research if firms in the experiment are concentrated among those with either high or low leverage. Benchmarking with Fama-French will overstate (understate) expected returns and therefore understate (overstate) abnormal returns to low (high) leverage firms. Our estimates indicate that the magnitude of this bias is between 20bp and 30bp per month. Third, the nature of financial distress risk and its importance to equity pricing appears to have changed dramatically over time. This suggests that the choice of horizon for estimating factor sensitivities and risk premiums can have material effects on the conclusions drawn in applications of equity pricing models. The same may be true for estimating models of credit risk and recovery rates in default.

The next section describes the data and the approach we use to examine the relation between returns and leverage. Section 3 presents results and interpretations. Section 4 contains a brief conclusion.

2. Data and Methods

The data consist of monthly prices, returns and other characteristics for all NYSE, AMEX and NASDAQ companies covered by CRSP from 1965 through 2003. Price and returns data are obtained from CRSP, financial information is obtained from Compustat.

We follow the Fama-MacBeth (1973) style regression approach taken by George and Hwang (2004) and Grinblatt and Moskowitz (2004) to measure and compare the returns to different investment strategies. This approach has the advantage of isolating the return to a particular strategy by hedging (zeroing out) the impact of other strategies and other variables known to affect returns.

If an investor forms portfolios of high and low leverage firms and/or high and low distress risk firms every month and holds these portfolios for the next T months, the return earned in a given month t is the equal-weighted average of the returns to T portfolios, each formed in one of the T past months $t\text{-}j$ (for $j=1$ to $j=T$). The contribution of the portfolio formed in month $t\text{-}j$ to the month-t return can be obtained by estimating a cross sectional regression of the form:

$$R_{it} = b_{0jt} + b_{1jt}\, R_{i,t-1} + b_{2jt}\, (book_{i,t-1}/mkt_{i,t-1}) + b_{3jt}\, size_{i,t-1} + b_{4jt}\, 52wkW_{i,t-j} + b_{5jt}\, 52wkL_{i,t-j}$$
$$+ b_{6jt}\, LevH_{i,t-j} + b_{7jt}\, LevL_{i,t-j} + b_{8jt}\, OscH_{i,t-j} + b_{9jt}\, OscL_{i,t-j} + e_{ijt} \quad (1)$$

where R_{it} is the return to stock *i* in month *t*, and $LevH_{i,t-j}$ ($LevL_{i,t-j}$) equals one if stock *i* is among the top (bottom) 20% of stocks in month *t-j* when ranked by the ratio of book value of liabilities to book value of assets.[3] Dummies $OscH_{i,t-j}$ and $OscL_{i,t-j}$ are defined similarly based on a ranking of Ohlson's (1980) O-score constructed using accounting information. Dichev (1998) examines Altman's (1968) Z and Ohlson's O-score as predictors of bankruptcy. Dichev shows that both have good out-of-sample predictive power for bankruptcy. Campbell, et. al. (2005) construct a more sophisticated measure that predicts bankruptcy better, but the asset pricing results using their measure are similar to those using O-score. Since we are also interested in hypotheses concerning mispricing of distress risk, most of our analysis follows Griffin and Lemmon (2002) in focusing on O-score as a predictor of bankruptcy so our results can be compared directly with theirs.

In robustness checks, we replace O-score dummies with dummies based on other variables. Among them is the default risk measure used by Vassolou and Xing (2004), based on Merton (1974), because this measure is the only one among those analyzed to date that appears to produce an equity return premium to default risk. Whited and Wu (2006) document that firms that are more financially constrained utilize leverage less than unconstrained firms. This relation could cause us to find a spurious negative relation between leverage and returns, so we control for this in our tests by replacing O-Score with their financing constraints index in equation (1). Details of the computations of O-score, the Vassolou-Xing measure of default risk, and the Whited-Wu financing constraints index are given in the Appendix.

We include the ratio of the book and market values of equity, $book_{i,t-1}/mkt_{i,t-1}$, equity market capitalization, $size_{i,t-1}$, and previous month return, $R_{i,t-1}$, in the regression to control for the effects of book-to-market and size on returns, and to control for bid-ask bounce. These variables are

[3] The results are similar if long-term debt is used in place of total liabilities. Debt/assets ratio is defined as (data9+data34)/data6 where Compustat data9 is long-term debt, data34 is debt in current liabilities and data6 is total assets.

included as deviations from cross sectional means to facilitate interpretation of the intercept. We control for momentum by including the 52-week high momentum measures identified in George and Hwang (2004). These measures dominate others used in the literature in capturing momentum effects. Their definitions are as follows: $52wkW_{i,t-j}$ ($52wkL_{i,t-j}$) equals one if $P_{i,t-j}/high_{i,t-j}$ is ranked among the top (bottom) 20% of all stocks in month *t-j*, and zero otherwise; where $P_{i,t-j}$ is the price of stock *i* at the end of month *t-j* and $high_{i,t-j}$ is the highest month end price of stock *i* during the 12-month period that ends on the last day of month *t-j*.

All right hand side variables in equation (1) are subscripted *t-1* or *t-j* to emphasize that they are computed using information available prior to when returns on the left hand side are measured to avoid look-ahead bias. We assume that market prices are observable in real time, but accounting variables are observed with a 6-month lag. Thus, $R_{i,t-1}$, $size_{i,t-1}$, and the prices that determine $52wkW_{i,t-j}$ and $52wkL_{i,t-j}$ are based on market values at the end of month *t-1* or *t-j*, respectively. Variables such as $book_{i,t-1}/mkt_{i,t-1}$, the book values of leverage and assets that determine $LevH_{i,t-j}$ and $LevL_{i,t-j}$, and the determinants of O-score are based on the most recent fiscal year end financial statements whose closing date is at least six months prior to the end of month *t-1* or *t-j*, respectively.

Estimates of the coefficient b_{0jt} can be interpreted as the return in month *t* to a "neutral" portfolio that was formed in month *t-j* that has hedged (zeroed out) the effects of deviations from average book-to-market, size, and past return; and also hedged the effects of momentum, leverage and O-score dummies in predicting returns. The sum of coefficient estimates $b_{0jt} + b_{7jt}$ is the month-*t* return to a portfolio formed in month *t-j* that is long low leverage stocks but that has hedged out all other effects. Consequently, b_{7jt} can be viewed as the return in month *t* in excess of b_{0jt} earned by taking a long position *j* months ago in a "pure" low leverage portfolio. The difference $b_{7jt} - b_{6jt}$ is the return in month *t* to a pure zero investment portfolio that is formed by taking long positions in low leverage stocks and shorting an equal dollar amount of high leverage stocks *j* months ago. The remaining coefficients have similar interpretations (see Fama (1976)).

The coefficients in equation (1) are estimated from cross sectional regressions. The *total* month-*t* returns involve portfolios formed over the prior *T* months. For a given measure, the total month-*t* return to pure portfolios can be expressed as sums such as $S_{5t} = \frac{1}{T}\sum_{j=1}^{T} b_{5jt}$ and $S_{6t} = \frac{1}{T}\sum_{j=1}^{T} b_{6jt}$ where the individual coefficients are computed from separate cross sectional regressions for each $j = 1,\ldots,T$. Dividing by T rescales the sums to be monthly returns. The time series means of the month by month estimates of these sums, (e.g., $\bar{S}_5$ and $\bar{S}_6$) and associated *t*-statistics, computed from the temporal distribution of sums, are reported in the tables. Results for a horizon of $T = 12$ months are presented in the tables.

The returns data used in most of the regressions cover the period June 1966 – December 2003, which allows us to construct accounting data from 1965 that are lagged 6 months to avoid look ahead bias. Tests involving the VX index cover January 1971 – December 1999 because the index is available only for those dates. The number of firms in each regression varies by month and is determined by data availability. With each specification, the average numbers of firms that appear in the monthly cross sectional regressions are reported in the tables.

Table 1.0 is a correlation matrix for the indicator variables used in the regressions. *High Leverage* refers to the high leverage dummy *LevH* in equation (1). *Low FC* and *High FC* refer to dummies defined with respect to highest and lowest 20% as ranked by Whited and Wu's (2006) financing constraints index. *Low VX* and *High VX* refer to similar dummies constructed for Vassalou and Xing's (2004) estimate of default risk. Reading from the first two columns, low leverage firms tend to be constrained (an observation also made by Whited and Wu) and have low default risk. High leverage firms tend not to be constrained, and have high default risk. The third and fourth columns indicate that constrained (unconstrained) firms tend to have high (low) default risk. The strongest relations are between leverage and default risk as measured by O-Score with correlations in excess of 0.40. Next are the O-Score and VX dummies, with correlations in excess of 0.30. The weakest are between leverage and financing constraints where three of the four correlations are less than 0.10 in magnitude.

Table 2 reports attributes of the sample firms sorted by O-score and leverage. The panels are constructed as follows. In June of each year, attributes are computed for every firm having sufficient data to compute all attributes in the table. These are ranked independently into quintiles by O-score and into high (20%) medium (60%) and low (20%) categories by leverage; medians are then computed within each cell. The numbers reported in the table are time series averages of the annual medians. The panel labeled Number of Firms per Year provides the distribution of firms across categories. In the outer columns, firms are concentrated in the upper left (low leverage and O-score) and lower right (high leverage and O-score) cells. The panel labeled Market Capitalization indicates that firms with high bankruptcy risk and high debt are larger than those with the same bankruptcy risk but having low debt. Despite this, the last row (unconditional on O-score) indicates that low and high leverage firms do not differ much in median market capitalization. Most of the high debt firms have high O-scores and these are comparable in market capitalization to the low debt firms. Note from the last row of the panel labeled Debt/Assets that the median book leverage ratio for the lowest 20% of firms is very low at 0.02. The median is 0.21 for the middle group and 0.42 for the high group. The remaining panels are discussed below.

3. Results

A. Leverage

We begin by examining whether leverage affects raw returns. Our hypothesis is that the distribution of leverage across firms is an indication of the distribution of exposures of firms' assets to costs of financial distress. If exposure to these costs is priced, then raw equity returns will be negatively related to leverage in the cross section because high distress cost firms avoid debt. Alternatively, if the distribution of leverage across the sample is independent of financial distress costs, or exposure to these costs is not priced, then we expect raw returns to be positively related to leverage. This is because levered equity has greater sensitivity to priced risks than unlevered equity.

The first column of Table 3 indicates that there is a strong and highly significant ***negative*** relation between raw return and leverage. In the first year after forming portfolios of stocks based on leverage (indicated by (1,12) in the column heading), the coefficient on the high leverage indicator is -0.27% per month, and the coefficient on the low leverage indicator is

0.10%. In other words, a zero investment "pure" portfolio consisting of a long position in low leverage stocks and a short position in high leverage stocks that has hedged out the effects of the other variables earns an average annual return of 4.44%. Furthermore, in results that are omitted for brevity, we also examined windows of two to five years after portfolio formation. The average return to the high (low) debt portfolio is consistently lower (higher) than that of the benchmark neutral portfolio in each of those tests.

Regardless of how raw returns are related to leverage, there should be no leverage related abnormal return under a correctly specified asset pricing model. Each coefficient in Table 3 is a time series average of monthly coefficients obtained from cross sectional regressions. In the case of the leverage dummies, the coefficients are average returns to particular portfolios. To compute risk adjusted returns, we estimate the intercept of a time series regression of that portfolio's return on the Fama-French (1993) factor realizations.[4] The intercepts in these regressions are risk adjusted returns to the "pure" portfolios described above that hedge out the effect of the other independent variables. The risk adjusted estimates are reported in Table 3.1 along with their regression *t*-statistics.

Risk adjusted returns to the high (low) leverage portfolio are even more negative (positive) and significant than raw returns. The risk adjusted return to buying a low debt portfolio and selling a high debt portfolio is 6.48% per year. Either the Fama-French three factor model does not accurately capture leverage related risk or investors make mistakes in pricing the impact of leverage on equity values, or both. We attempt to distinguish between these explanations later. First, we examine whether the negative relation between leverage and returns is simply a reflection of default risk or financing constraints.

B. Leverage and Default Risk

Dichev (1998), Griffin and Lemmon (2002) and Campbell et.al. (2005) find that portfolios with higher probabilities of default earn low returns in the period after forming portfolios. We confirm this via regressions. The results are reported in the middle columns of Tables 3 and 3.1. The average risk adjusted return to a zero-investment portfolio that is long high default risk (O-

[4] We are grateful to Ken French for providing the Fama-French factors on his website.

score) firms and short low default risk firms earns -4.20% per year. This seemingly backward result led these authors to conclude that distress risk is not priced, and that high returns to high book-to-market stocks are not attributable to distress risk. Griffin and Lemmon (2002) go on to argue that the low returns associated with a high probability of default are due to the market having mispriced the impact of default on firms with high O-Scores.

Since leverage is a determinant of default risk, leverage and measures of default risk are related (by definition). Referring to the panel labeled Number of Firms per Year in Table 2, high leverage firms tend to be concentrated in the high O-Score group. On average, more than half (i.e., 206 per year) of the firms in the high leverage group are in the highest quintile of default risk. The others are distributed across the remaining quintiles with monotonically decreasing numbers in lower risk quintiles. This is not surprising because debt/assets is one of the determinants of O-score.[5] It is, therefore, natural to ask whether the negative relation between returns and leverage is simply a reflection of the negative relation between returns and default risk. To address this question, we include both leverage and O-Score dummies in our regressions.

The results are reported in the last two columns of Tables 3 and 3.1 In these regressions, the coefficient on the high (low) leverage dummy is the return to a high (low) leverage portfolio in excess of that of a benchmark portfolio that has neither high nor low default risk. A similar interpretation applies to the coefficients of high and low default risk dummies. The results reveal that the negative leverage-return relation remains, while the association between returns and default risk disappears. The distress risk "puzzle" is stronger in risk adjusted than raw returns (Campbell, et.al. (2005) find this also), and it disappears when leverage is included. Thus, the negative relation between returns and default risk appears to be spurious, a consequence of the negative relation between returns and leverage.

[5] Molina (2005) argues that the sensitivity of default probability estimates to leverage is even larger than the weight leverage receives in the computation of O-score and other credit models because the joint determination of default risk and leverage biases toward zero reduced form estimates of the sensitivity of default probability to leverage.

Griffin and Lemmon (2002) show that the negative relation between return and default risk is primarily related to stocks in the bottom 30% of book-to-market. We therefore repeat our tests with the subsample of stocks that rank in the bottom 30% of book-to-market. The results are reported in Tables 4 and 4.1, and are similar to those in Tables 3 and 3.1. There is a negative relation between returns and default risk when leverage is not included, but the relation mostly disappears when leverage is included (in risk adjusted returns, the low O-score dummy is significantly positive in January). As in the entire sample, returns are negatively related to leverage whether default risk is included or not.

In their Table IV, Griffin and Lemmon (2002) report results for the test of LaPorta (1996) described below. Their results suggest that the market systematically over prices high default risk firms. This leads them to conclude that mispricing causes the negative relation between returns and distress risk. To examine this possibility, and whether mispricing explains the leverage-return relation, we examine a subsample of low price (penny) stocks. We expect that if mispricing exists, it should be most severe among these stocks. They are most neglected by institutional investors and have the lowest analyst coverage [see Sias and Starks (1997), Brennen and Hughes (1991), and Hong, Lim and Stein (2000)]. We define low price stocks as those with prices below $2. Results of the analysis of this subsample appear in Tables 5 and 5.1. When leverage is excluded, the negative relation between returns and default risk is indeed stronger in this subsample than in the earlier tables. However, as before, there is a negative relation between returns and leverage; and when leverage is included in the regression, the relation between returns and default risk disappears. Taken together these findings imply that default risk is neither a priced risk beyond that captured by book-to-market and leverage, nor a source of mispricing.

Vassalou and Xing (2004) estimate the probability of bankruptcy using Merton's (1974) model and reach a different conclusion than Dichev (1998), Griffin and Lemmon (2002), and Campbell, et.al. (2005). Vassalou and Xing document a *positive* relation between returns and default risk, and show that this relation is strongest among small firms.[6] Table 6 reports regression results for

[6] Dao and Gao (2006) show that Vassalou and Xing's results are sensitive to bid-ask bounce and illiquidity of small firms' stocks. Including lagged returns in our regressions is a control for this.

raw returns where dummies for the Vassalou-Xing (VX) measure are used in place of O-score.[7] The results indicate that high default probability stocks do earn a return premium as documented by Vassalou and Xing; however, this result is due to returns in January. When January is excluded, the relation between raw returns and the VX measure of default risk disappears. Moreover, including the VX measure in the regression does not eliminate the significance of leverage as a determinant of raw returns.

Table 6.1 reports regressions involving returns adjusted for risk using the Fama-French (1993) three-factor model. The risk adjusted results on the VX measure are opposite to those using raw returns. The middle columns indicate that ***low*** default probability stocks earn a risk adjusted return premium whether January returns are included or not. This finding is consistent with "puzzling" results of Dichev (1998) and Griffin and Lemmon (2002). When the VX and leverage dummies are both included, the low leverage dummy loses its significance and the low VX dummy retains significance outside of January. However, returns to long-short portfolios are significant for leverage (0.38%, t-statistic -3.36) but not for VX (-0.12, t-statistic -1.03).

Taken together, these results and those reported earlier for O-Score indicate that the distress risk "puzzle" is spurious. The explanation is that firms with high default costs have low estimated default probabilities because they rationally avoid taking on debt. In cross sectional regressions, default probability estimates are an inverse proxy for financial distress costs. The true positive relation between returns and financial distress costs therefore appears as a spurious negative relation between returns and estimates of default probabilities.

C. Leverage and Financing Constraints Risk

Whited and Wu (2006) advance a hypothesis analogous to that of the irreversible investment theories mentioned in the introduction. Irreversible investment makes it costly for firms to scale back in bad states, whereas financing constraints make it costly for firms to scale up in good states. Whited and Wu estimate shadow values of financing constraints from a large cross section of firms by fitting time series data to investment Euler equations. They show that equity

[7] We are grateful to Maria Vassalou for making their measures available on her website.

returns are positively related to these estimates in Fama-MacBeth (1973) style regressions that also include size, book-to-market and momentum.

Whited and Wu (2006) model the shadow value of financing constraints as a function of leverage, and firms that they estimate to be most constrained have less leverage than those that are least constrained [see their Table 2]. It is therefore possible that the leverage-return relation documented here arises because differences in leverage proxy for the cost of foregone investment due to financing constraints. To examine this possibility, we construct their financing constraints index for the firms in our sample according to their equation (13)—see Appendix for details. We then proceed as we did with distress risk and examine the returns to high and low leverage portfolios that rank neither high nor low in the cost of financing constraints and are hedged with respect to size, book-to-market and momentum.

Tables 7 and 7.1 report results for raw and risk adjusted returns. In both tables, the negative relation between returns and leverage is unaffected by having controlled for the cost of financing constraints. Thus, differences in leverage in our tests apparently do not proxy for differences in the cost of financing constraints.[8] With one exception, the signs on the financing constraints dummies are either insignificant or opposite to those documented by Whited and Wu, however. The estimates in the middle columns of Tables 7 and 7.1 indicate that firms ranked ***low*** in terms of financing constraints have significantly greater returns than firms ranked in the middle when January is included.

To examine this further, we estimate regressions whose specification matches those run by Whited and Wu in their Table 8, using quarterly data beginning in January 1975 as they did. However, the regressions begin with returns in June 1977 to lag accounting variables as above to avoid look-ahead bias. This specification omits lagged return and includes the ratio of size to book-to-market. These results are presented in Tables 8 and 8.1. The leverage results are somewhat weaker in that only the high leverage dummy is significant in raw returns; though both are significant in risk adjusted returns. Firms that rank high in financing constraints earn greater

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[8] We also estimated these regressions excluding utilities and financial companies as done in Whited and Wu (2006). The results are similar.

returns, consistent with Whited and Wu; but this disappears when January is excluded. In summary, the negative relation between returns and leverage is robust to controlling for financing constraints, using different regression specifications, using raw versus risk adjusted returns, and to whether January is included or not. It seems unlikely that differences in leverage proxy for differences in the cost of financing constraints.

D. Explaining the Relation Between Returns and Leverage

The results so far indicate that the "distress risk puzzle" is a spurious consequence of the negative relation between leverage and returns in the entire sample and in sub-samples where the puzzle is most prominent. Though the results also indicate that mispricing of default risk is not likely to explain the negative relation between leverage and returns, it is possible that the relation is caused by the mispricing based on leverage itself.

To examine the possibility of systematic mispricing based on leverage, we follow an approach based on Chopra et. al. (1992), La Porta (1996), and La Porta et. al. (1997) and also used by Griffin and Lemmon (2002). These studies examine whether low returns to low book-to-market stocks are related to mispricing. They hypothesize that investors mistakenly extrapolate past success of low book-to-market firms into the future, and realize their mistakes when earnings are announced. The implications are that prices are too high, and returns too low, for low book-to-market stocks; and that such stocks have large negative earnings announcement returns that reflect investors' correction of prior over optimism about earnings. Analogous reasoning leads to the prediction that high book-to-market stocks have announcement returns that are greater than those of low book-to-market stocks because investors are not overly optimistic and perhaps are pessimistic about these firms.

This logic could explain the negative relation between returns and leverage as well. If high leverage occurs partially as a result of investors' or lenders' excessive optimism about future earnings prospects, the equity of high leverage firms will be overpriced and returns abnormally low, with downward corrections occurring at earnings announcements. If the negative relation between returns and leverage is due to this sort of mispricing, then it should result in more negative earnings announcement returns for high leverage firms than low leverage firms.

Following La Porta et. al. (1997), we benchmark each earnings announcement return by the return to the firm with median book-to-market in the same size decile as the announcer. Every June, we sort firms independently into five groups by O-score and three groups by book debt/asset ratio (top 30%, middle 40% and bottom 30%), and form portfolios based on these groupings. For each firm, we then compute the average cumulative three day abnormal return over the four quarterly announcement returns following portfolio formation and annualize this number by multiplying by four. Table 9 presents the equally weighted average annualized earnings announcement abnormal returns, and *p*-values for difference in means tests between the high and low leverage groups. The results are not consistent with the mispricing hypothesis. Earnings announcement abnormal returns are either not significantly different, or more positive, for the high leverage firms than the low leverage firms.

This evidence is not consistent with mispricing as an explanation for the negative relation between returns and leverage. We now investigate the explanation that is consistent with rational pricing—that the assets of high leverage firms are impaired less by financial distress than those of low leverage firms and that exposure to costs of financial distress is a priced risk. We begin by examining the association between leverage and how firms fare when facing financial distress.

Referring again to Table 2, we focus now on the panels labeled Return on Assets. The dispersion in return on assets across O-score categories is much smaller for high leverage firms than low leverage firms. For example in the portfolio sorting year (labeled Year 0 in the table), the return on assets for high leverage firms ranges from 6.71% in the next-to-lowest default risk group to 0.85% in the highest default risk group—a difference of 5.86%. The same measure of dispersion for low leverage firms is a striking 30.53% (11.28% minus -19.25%). Low leverage firms can expect to experience a huge reversal of fortunes when at great risk of default, while this is not the case for high leverage firms. This difference between high and low leverage groups mainly reflects the fact that high debt firms fare much better in terms of return on assets when default risk is high than do low debt firms (-19.25% vs. 0.85%). The other two panels titled Return on Assets Year 1 and Year 2 indicate that although the difference between high and low leverage firms diminishes in magnitude, it persists one and two years after firms find themselves at high risk of default. In fact, return on assets continues to be *negative* for low leverage firms two years after classification into the highest default risk group.

The comparisons above show how return on assets *levels* differ between high and low leverage firms across default categories. We also examine the *predictability* of return on assets and return on equity across leverage groups, where predictability is measured relative to the same quarter in the prior year. The more predictable is return on assets (equity) in a given default risk category, the less disruptive is financial distress to the firm's ability to generate value from its assets (for its equity holders). Unlike the other variables in this table, we use quarterly Compustat data. The additional observations increase the precision of the estimates. For each quarter, we estimate the expected return on assets (equity) under the assumption that it follows a seasonal random walk with drift:

$$E[Q_{i,t}] = \delta_i + Q_{i,t-4}\,,$$

where $Q_{i,t}$ is the return on book value of assets of firm i in quarter t.[9] The standard deviations reported in the table are those of the prediction errors. Relative to the ranking month, we use 36 future quarters (with a minimum of ten quarters) to estimate the drift parameter and the standard deviation of the prediction error for each firm. Results are reported in the panels of Table 2 labeled STD of Return on Assets and STD of Return on Equity.

Return on assets of low leverage firms is less predictable than that of high leverage firms for all but the lowest default risk group. This remains true even after adjusting for leverage—the STD of return on *equity* of low leverage firms is greater than that of high leverage firms for all but the lowest default risk group (the high leverage low default risk group contains only one firm per year on average). This difference is especially pronounced for higher default risk groups suggesting that financial distress is more disruptive to low leverage than high leverage firms.

Summarizing, this analysis suggests that the assets of low leverage firms are negatively impacted more by financial distress than those of high leverage firms. If this impact is diversifiable or

[9] ROA is defined as income before extraordinary items (quarterly Compustat data8) divided by total assets (quarterly Compustat data44). ROE is defined as income before extraordinary items divided by stockholders' equity (quarterly Compustat data60).

simply shifts risk between equity and debt, then there should be a positive relation between raw returns and leverage. The earlier tables indicate that raw returns are negatively related to leverage, however, suggesting that leverage measures sensitivity to a priced risk. If this risk is captured by the Fama-French (1993) three factor model, leverage should not explain risk adjusted returns. However, in all the tables, both raw and risk adjusted returns are negatively related to leverage.

To examine whether this set of findings can be reconciled with a rational linear asset pricing framework, we hypothesize that there is a separate "leverage factor" in additional to the three factors specified in the Fama-French model, and that this factor represents compensation for *financial* distress costs beyond the (possibly non-financial, operating) distress premium captured by the book-to-market factor. In the next section, we construct such a factor and examine whether it explains variation in returns that is common across stocks.

E. Leverage Risk Factor

We gauge the whether factors explain *common* (or systematic) variation in returns by their significance in explaining time series variation in returns to the 100 value-weighted Fama-French portfolios.[10] These portfolios are constructed at the end of each June from 1966 to 2003, and are the intersections of 10 portfolios formed on the basis of market equity (size) and 10 portfolios formed on book-to-market equity (BE/ME). The size breakpoints for year *t* are the NYSE market equity deciles at the end of June of year *t*. The BE/ME breakpoints are also NYSE deciles. BE/ME for June of year *t* is book equity for the fiscal year ending in year *t-1* divided by market equity for December of *t-1*.

The first column of Table 10 shows that the three-factor model does well in explaining returns to the *typical* portfolio. The average (median) adjusted R-square is 0.61 (0.80). However, adjusted R-squares are less than 0.30 for a quarter of the portfolios. The low R-squares are attributable mostly to small low book-to-market portfolios. Outside the top three deciles of book-to-market, the adjusted R-squares range from 6% to 27% for portfolios in the smallest size decile. Similarly, in the second smallest decile, the bottom half of the book-to-market portfolios all have R-squares

[10] We also conducted the analysis with equal-weighted portfolios; the results are very similar.

below 34%. The operating distress risk factor, HML, clearly explains common variation in stock returns. It is significant (having a t-statistic of two or more) in 82 of the 100 regressions.

The difference between the coefficients of the low and high leverage dummies in the regression reported in the first column of Table 3 is the return to a zero investment portfolio that is long low leverage stocks and short high leverage stocks that hedge out the influence of the other characteristics in the regressions. This is a natural candidate to mimic the return to a "leverage factor" if such a common factor exists in stock returns. The interpretation of this factor's risk premium is compensation for expected costs of systematic financial distress. If this portfolio is related to a common source of variation in stock returns, it should explain time series variation in returns to a majority of the Fama-French 100 portfolios. Moreover, if HML is a proxy for *financial* distress risk, then its explanatory power should disappear when the leverage factor is added to the time series regressions.

The second column in Panel A of Table 10 shows that the leverage factor is significant in 51 of the regressions. The addition of a leverage factor increases the number of regressions in which HML is significant from 82 to 85. This evidence suggests that both factors explain common components in returns, and the components explained by each factor are distinct. The cross sectional average and median adjusted R-squares are about the same when the leverage factor is included as not, but the R-squares improve among those portfolios where the three-factor model does poorly. With the addition of a leverage factor, all portfolios in the two smallest deciles have adjusted R-squares above 84%.[11]

F. Pre- and Post-1980 Subsamples

[11] To make sure we avoid constructing a factor that is itself just the return to small size and book-to-market stocks, we create the leverage factor with the same regression as in Table 3 except that we exclude the smallest two deciles of both size and book-to-market (i.e. stocks in 20 of the 100 Fama-French portfolios). The results are very similar.

Fama and French (1995) document that the earnings of small firms deteriorated steadily beginning in 1980 and extending through the end of their sample period in 1992. This gives us reason to suspect that the incidence of operating distress across the sample is different in the pre- and post-1980 periods, and suggests the same may be true of financial distress. To examine this, we recompute the panels in Table 2 that describe the performance of firms across distress and leverage categories for the pre- and post-1980 subperiods. These results are presented in Table 11. They indicate that the dramatic difference in accounting measures of performance between low and high leverage firms in distress observed in Table 2 is almost entirely attributable to the post-1980 period (i.e., beginning January, 1980) for all five performance measures.

The numbers in Table 11 indicate that the degree to which assets suffer in distress is less prior to 1980 for low versus high leverage firms. If the leverage effects documented in the regressions thus far are related to financial distress being a priced risk, then leverage should be better at explaining returns after 1980 than before. To examine this, we re-estimate the regressions in Tables 3 and 3.1 by subperiod and the results are reported in Tables 12 and 12.1. The post-1980 period is indeed stronger than the pre-1980 period. The very strong relation in the post-1980 period is driving the significant negative relation between returns and leverage documented earlier for the sample as a whole. In the pre-1980 period, neither leverage nor O-score dummies are significant. This is again consistent with the view that the return-O-score relation for the entire sample is largely spurious, generated through the relation between returns and leverage.

We also re-estimated the time series regressions involving the 100 Fama-French portfolios. The results mirror those of the cross sectional regressions. Statistics on these regressions are reported in Table 10. In the pre-1980 period, the leverage factor is significant in only 19 of the 100 regressions. The leverage factor does not reflect variation that is common to many of the 100 portfolios. This compares with HML, which is significant in 82 regressions in the pre-1980 period. In contrast, leverage is significant in 64 of the portfolios in the post-1980 period (and HML is significant in 79). Thus, HML captures common variation in returns during both subperiods, while the leverage factor captures common variation only in the post-1980 period.

The post-1980 period clearly drives the results of the full sample. These findings indicate that leverage and HML capture separate components of common variation in returns in the post-1980 period. The average risk premium on the leverage factor across portfolios with positive (negative) loadings in the post-1980 period is 0.10% (-0.15%) per month. This is computed by multiplying the cross sectional average positive (negative) loading, 0.17 (-0.26), by the time series average factor realization, 0.57%, in Panel A of Table 13. Comparable figures for the SMB factor are 0.08% (-0.04%), and for the HML factor are 0.16% (-0.16%) per month. These are all smaller than 0.64% for the market factor, for which all loadings are positive. In contrast, risk premiums to the leverage factor during the pre-1980 period are on the order of one basis point per month on average for portfolios with both positive and negative loadings.

Figure 1 displays the difference between the average risk premium associated with the leverage and HML factors for each of the 100 individual Fama-French portfolios. If a factor loading is not significantly different from zero, its risk premium is considered to be zero. The figure shows that financial distress dominates operating distress among small low book-to-market portfolios, and operating distress dominates for portfolios of large high book-to-market stocks.

Our finding that financial distress risk is especially important for small growth stocks is consistent with the idea that tangible assets possessed by large value firms are more marketable and therefore suffer less in financial distress. However, it is also consistent with Hennessy and Whited's (2005) dynamic model of investment and capital structure where the dynamics of firm performance, rather than asset sales in distress, play a prominent role. In their model, the history of a firm's productivity shocks determines its size and level of internal funds. Firms get big as a result of positive productivity shocks that grow assets and also provide internal funds that can be used to finance new investment. Whether firms invest or not depends on whether they have good opportunities (high Tobin's Q). Hennessy and Whited match moments of their model to data, then simulate a panel of firms. When they separate firms into "savers" versus those that have debt outstanding, those utilizing debt have greater debt/assets (obviously), are smaller in terms of total asset value and have better investment opportunities as measured by Tobin's Q than savers. This suggests that debtor firms—those for which financial distress costs are relevant—tend to be smaller firms with lower book-to-market (an inverse proxy for Tobin's Q) than non-debtors. Savers, for which financial distress costs are irrelevant, tend to be larger firms with high book-to-market, have more internal funds, and less productive investment opportunities. Thus, in their model, the firms for which financial distress is most relevant tend to be small and have low book-to-market.

The correlations among the factors during the post-1980 period are reported in Panel B of Table 13. The correlation between the leverage factor LEV and HML is a significant -0.67. The strong negative correlation between these factors indicates that the leverage factor is not a proxy for operating distress risk as captured by HML, and that HML is not a measure of *financial* distress risk. The correlation between the leverage and market factors is a significant 0.34. This means that returns to low leverage stocks (those with the greatest cost of financial distress) are more sensitive to the market than high leverage stocks. In particular, low leverage stocks suffer more than high leverage stocks when equities as a whole are retreating.

4. Conclusion

We document that raw and risk adjusted returns are negatively related to leverage. We show that this relation is responsible for other seemingly anomalous findings concerning the relation between returns and default risk that have heretofore been attributed to the market mispricing financial distress [see Dichev (1998), Griffin and Lemmon (2002), and Campbell, Hilscher and Szilagyi (2005)]. An analysis of operating performance suggests that low leverage firms suffer more in financial distress than high leverage firms. These firms utilize less debt than firms whose operating assets fare better in distress. Thus, the return premium to low leverage firms relative to high leverage firms appears to be compensation for the costs of financial distress.

We construct a "leverage factor" and examine the contribution it makes to explaining time series variation in returns to 100 value weighted portfolios sorted on market capitalization and book-to-market equity relative to the three Fama-French (1993) factors. The leverage factor is significant in the time series regressions of a majority of the Fama-French 100 portfolios, but does not displace the explanatory power of HML. Adding a leverage factor increases adjusted R-squares in time series regressions from less than 10% to over 80% for portfolios of small stocks with low book-to-market ratios.

The ability of leverage and a leverage factor to explain returns is much stronger in the period beginning in 1980 than before. In fact, the post-1980 results drive the results for the 1965-2003 sample overall. If our interpretation is correct that financial distress risk is priced, then the differences between subperiods raises some interesting questions for future research. One possibility is that financial distress costs became more important in economic terms in the 1980s. This could reflect a shift in the types of assets firms deploy (e.g., creativity and information technology rather than labor and machines) or a shift in the way firms use leverage (e.g., using leverage as a substitute for equity as a primary source of financing for large initiatives). Another possibility is that firms simply paid more attention to financial distress costs in formulating their capital structure choices in the 1980s. The fact that the performance of assets and equity in distress is so drastically different in the pre- versus post-1980 periods suggests that the real consequences of financial distress changed, and our results are not simply reflective of managers paying more attention to the costs of distress that were always present. Identifying the link between asset deployment and financial distress costs is beyond our scope and remains for future research.

APPENDIX

O-Score is defined as

$$Oscore = -1.32 - 0.407\log(total\ asset) + 6.03\left(\frac{total\ liability}{total\ asset}\right) - 1.43\left(\frac{working\ capital}{total\ asset}\right)$$

$$+0.076\left(\frac{current\ liability}{current\ asset}\right) - 1.72(1\ if\ \ total\ liablity > total\ asset,\ 0\ otherwise)$$

$$-2.73\left(\frac{net\ income}{total\ asset}\right) - 1.83\left(\frac{funds\ \ from\ operation}{total\ liability}\right)$$

$$+0.285(1\ if\ \ a\ net\ loss\ \ for\ the\ last\ two\ years,\ 0\ otherwise) - 0.521\left(\frac{net\ income_t - net\ income_{t-1}}{|net\ income_t| + |net\ income_{t-1}|}\right)$$

This is the same definition used by Griffin-Lemmon (cf. their footnote 6) and is estimated as model 1 by Ohlson (1980.) The probability of bankruptcy is then obtained as $\frac{1}{1+\exp(-Oscore)}$.

VX Index of default probability is defined as

$$\boldsymbol{VX\ Index = N\left(\frac{\ln(V_A / X) + (\mu - \frac{1}{2}\sigma_A^2)T}{\sigma_A\sqrt{T}}\right)}$$

where N(.) is the cumulative normal distribution function, X and T are the face value and maturity of the firms' debt, $\boldsymbol{V_A}$ is the value of the firm's asset, while $\boldsymbol{\mu}$ and $\boldsymbol{\sigma_A}$ are the instantaneous drift and volatility respectively of a geometric Brownian motion process that governs the market value of the firms' assets. Vasslou and Xing (1994) estimate $\boldsymbol{\mu}$ and $\boldsymbol{\sigma_A}$ iteratively using daily stock prices from the prior year, viewing equity is a call option on firms' assets as in Merton's framework of the past year. We use the indexes that Vassalou and Xing computed and provide on their website.

FC Index is defined as

$$FC\ index = -0.091\, cash\ \ flow - 0.062(1\, if\ \ positive\ dividends\ are\ paid, 0\ otherwise)$$
$$+0.021\left(\frac{total\ long\ term\ debt}{total\ asset}\right) - 0.044\log(total\ asset) + 0.1021(industry\ sales\ growth)$$
$$-0.035(\ sales\ growth)$$

Industry sales growth is equally weighted sales growth of the firms the same three-digit sic code.

This definition is based on equation (13) in Whited and Wu (2006), which is estimated by GMM from an Euler equation. Whited and Wu use quarterly Compustat data for their estimation in order to increase the number of observations hence the precision of the coefficient estimates. We use their estimates and annual Compustat data to create the FC index. We have also done the tests after dividing cash flow and sales growth numbers by four to reflect the fact that Whited and Wu's estimates are from quarterly data. The results are similar.

Compustat data items used in constructing these variables are as follows: current assets (data4), current liabilities (data5),working capital (data179), total asset (data6), netincome (data172), funds from operation (data110), total liability (data 181), dividend (data19+data21)., cash flow (data18+data14), sales (data12).

Table 1
Correlation Matrix

Using monthly data from June 1966 to December 2003, we construct indicator variables for each of the measures described in the text. The *High* and *Low Leverage* variables are dummies for whether individual stocks are in the top and bottom 20% of leverage as measured by book value of total debt to book value of assets prior to the portfolio formation month. *High* and *Low FC Index* are dummies for stocks ranked in the top and bottom 20% by the financial constraints index of Whited and Wu (2006). *High* and *Low O-Score* are dummies for stocks ranked in the top and bottom 20% by Ohlson's (1980) O-Score. *High* and *Low VX Index* are dummies for stocks ranked in the top and bottom 20% by the probability of bankruptcy by the index of Vassalou and Xing (2004). Details of the computations of FC Index, O-Score and VX Index are provided in the Appendix. Numbers reported in the table are time-series averages of cross-sectional correlations.

	Low Leverage	*High Leverage*	*Low FC Index*	*High FC Index*	*Low O-Score*	*High O-Score*	*Low VX Index*	*High VX Index*
Low Leverage	1.000							
High Leverage	-0.250	1.000						
Low FC Index	-0.131	0.022	1.000					
High FC Index	0.092	-0.031	-0.250	1.000				
Low Oscore	0.476	-0.241	0.075	-0.113	1.000			
High Oscore	-0.175	0.412	-0.198	0.268	-0.250	1.000		
Low VX Index	0.256	-0.200	0.184	-0.131	0.344	-0.215	1.000	
High VX Index	-0.126	0.271	-0.113	0.119	-0.157	0.331	-0.254	1.000

Table 2
Company Attributes

Using annual Compustat data from June 1966 to June 2001, firms are independently ranked into three categories based on book value of leverage (debt/assets), and five groups by O-Score. Each panel reports the time-series average of annual medians computed within each leverage-O-Score category. In this table, firms are included in a given year only if there is non-missing data for all attributes listed below. The panel labeled Number of Firms per year reports the time-series average of the number of firms included in the annual median computations.

	Debt/Assets								
	L	**M**	**H**	**L**	**M**	**H**	**L**	**M**	**H**
OScore	O-Score			Debt/Assets			Number of Firms per year		
L	-3.54	-2.97	-4.48	0.01	0.11	0.40	210	165	1
2	-2.14	-2.03	-1.85	0.02	0.18	0.38	80	286	8
3	-1.26	-1.21	-1.19	0.02	0.23	0.38	38	304	37
4	-0.35	-0.40	-0.22	0.02	0.25	0.42	24	228	120
H	1.16	0.88	1.16	0.02	0.26	0.48	23	147	206
all	-2.82	-1.32	0.22	0.02	0.21	0.42	375	1130	372
	Past 12-Month Return (percent)			Past 36-Month Return (percent)			Market Capitalization (Millions)		
L	10.39	11.91	-20.47		50.94	45.73	171.64	513.26	1775.04
2	11.24	12.74	15.10	1775.04	47.89	46.80	46.69	253.44	2308.35
3	8.52	10.31	9.75	34.37	36.47	32.72	33.16	105.77	467.69
4	5.09	5.02	6.83	12.13	20.85	29.10	25.66	43.20	122.39
H	-2.73	-4.63	-0.32	-1.82	-6.97	-2.16	21.29	15.79	23.38
all	9.35	9.42	2.88	37.50	34.93	12.24	84.84	99.65	90.89
	Return on Assets Year 0 (percent)			Return on Assets Year 1 (percent)			Return on Assets Year 2 (percent)		
L	11.28	9.22	1.72	10.00	8.46	4.45	9.46	7.97	8.54
2	6.79	7.01	6.71	6.77	6.65	6.81	6.30	6.46	6.19
3	4.83	5.66	6.00	5.49	5.49	5.60	5.21	5.20	5.49
4	-1.31	3.95	3.73	3.23	4.21	3.71	3.28	4.28	3.78
H	-19.25	-1.98	0.85	-5.17	2.09	2.11	-1.42	2.86	2.68
all	8.88	5.64	3.73	8.17	5.50	3.98	7.68	5.37	4.28
	STD of Return on Assets (percent)			STD of Return on Equity (percent)			Book to Market Equity		
L	1.91	1.39	6.32	2.88	2.64	33.28	0.50	0.58	0.63
2	2.52	1.46	1.22	3.95	4.36	3.81	0.73	0.71	0.54
3	3.18	1.44	1.22	5.42	3.28	4.37	0.71	0.82	0.73
4	4.20	1.87	1.32	12.79	4.25	3.86	0.72	0.91	0.89
H	6.67	3.74	2.42	20.79	10.08	8.69	0.64	0.86	0.84
all	2.40	1.60	1.73	3.72	3.40	5.73	0.57	0.77	0.80

Table 3
Leverage and O-Score
Raw Returns

Each month between June 1966 and December 2003, 12 (j=1,…,12) cross-sectional regressions of the following form are estimated:

$$R_{it} = b_{0jt} + b_{1jt} R_{i,t-1} + b_{2jt} (book_{i,t-1}/mkt_{i,t-1}) + b_{3jt}\, size_{i,t-1} + b_{4jt}\, 52wkW_{i,t-j} + b_{5jt}\, 52wkL_{i,t-j} + b_{6jt}\, LevH_{i,t-j} + b_{7jt}\, LevL_{i,t-j} + b_{8jt}\, OscH_{i,t-j} + b_{9jt}\, OscL_{i,t-j} + e_{ijt}$$

where $R_{i,t}$ and $size_{i,t}$ are the return and the market capitalization of stock i in month t; $52wkW_{i,t-j}$ ($52wkL_{i,t-j}$) is the 52-week high winner (loser) dummy that takes the value of 1 if the 52-week high measure for stock i is ranked in the top (bottom) 20% in month $t-j$, and zero otherwise. The 52-week high measure in month $t-j$ is the ratio of price level in month $t-j$ to the maximum price achieved in months $t-j$-12 to $t-j$. The $(book_{i,t-1}/mkt_{i,t-1})$ variable is computed from the book value of equity in the most recent annual financial statements whose closing date is at least six-months prior to month t, and market value of equity at the end of month $t-1$. The leverage and O-Score dummies are constructed based on highest and lowest 20% rankings by book leverage and O-Score. The accounting variables used to compute book leverage and O-Score are drawn from the most recent annual financial statements whose closing date is at least six-months prior to month t. The coefficient estimates of a given independent variable are averaged over j=1,…,12 for columns labeled (1,12). The numbers reported in the table are the time-series averages of these averages. They are in percent per month. The accompanying t-statistics are calculated from the time series. Nobs is the time-series average number of cross-sectional observations in each monthly regression.

	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded
Intercept	1.38	0.97	1.35	0.96	1.38	0.97
	(5.54)	(4.00)	(5.00)	(3.61)	(5.04)	(3.63)
$R_{i,t-1}$	-6.75	-5.98	-6.28	-5.51	-6.35	-5.58
	(-15.51)	(-14.63)	(-14.77)	(-14.36)	(-15.05)	(-14.69)
Book to Market	0.28	0.31	0.23	0.26	0.25	0.29
	(3.06)	(3.37)	(2.47)	(2.79)	(2.81)	(3.14)
Size	-0.19	-0.07	-0.19	-0.07	-0.18	-0.06
	(-4.50)	(-1.82)	(-4.44)	(-1.83)	(-4.26)	(-1.57)
52 Wk High Loser	-0.21	-0.58	-0.25	-0.61	-0.25	-0.61
	(-1.45)	(-4.38)	(-1.68)	(-4.54)	(-1.68)	(-4.59)
52 Wk High Winner	0.32	0.40	0.36	0.46	0.36	0.46
	(5.95)	(7.67)	(6.29)	(8.34)	(6.44)	(8.60)
Low Leverage	0.10	0.11			0.08	0.11
	(1.54)	(1.70)			(1.26)	(1.60)
High Leverage	-0.27	-0.27			-0.26	-0.22
	(-4.76)	(-4.64)			(-3.52)	(-2.86)
Low O-Score			0.07	0.07	-0.00	-0.01
			(1.20)	(1.12)	(-0.04)	(-0.20)
High O-Score			-0.13	-0.23	-0.01	-0.13
			(-2.10)	(-3.74)	(-0.16)	(-1.59)
Nobs	3228	3228	2617	2617	2617	2617

Table 3.1
Leverage and O-Score
Risk-Adjusted Returns

Each month between June 1966 and December 2003, 12 (j=1,…,12) cross-sectional regressions of the following form are estimated:

$$R_{it} = b_{0jt} + b_{1jt} R_{i,t-1} + b_{2jt} (book_{i,t-1}/mkt_{i,t-1}) + b_{3jt}\, size_{i,t-1} + b_{4jt}\, 52wkW_{i,t-j} + b_{5jt}\, 52wkL_{i,t-j} + b_{6jt}\, LevH_{i,t-j} + b_{7jt}\, LevL_{i,t-j} + b_{8jt}\, OscH_{i,t-j} + b_{9jt}\, OscL_{i,t-j} + e_{ijt}$$

where $R_{i,t}$ and $size_{i,t}$ are the return and the market capitalization of stock i in month t; $52wkW_{i,t-j}$ ($52wkL_{i,t-j}$) is the 52-week high winner (loser) dummy that takes the value of 1 if the 52-week high measure for stock i is ranked in the top (bottom) 20% in month t-j, and zero otherwise. The 52-week high measure in month t-j is the ratio of price level in month t-j to the maximum price achieved in months t-j-12 to t-j. The $(book_{i,t-1}/mkt_{i,t-1})$ variable is computed from the book value of equity in the most recent annual financial statements whose closing date is at least six-months prior to month t, and market value of equity at the end of month t-1. The leverage and O-Score dummies are constructed based on highest and lowest 20% rankings by book leverage and O-Score. The accounting variables used to compute book leverage and O-Score are drawn from the most recent annual financial statements whose closing date is at least six-months prior to month t. The coefficient estimates of a given independent variable are averaged over j=1,…,12 for columns labeled (1,12). To obtain risk-adjusted returns, we further run times series regressions of these averages (one for each average) on the contemporaneous Fama-French factor realizations to hedge out the factor exposure. The numbers reported for risk adjusted returns are intercepts from these time-series regressions. They are in percent per month and their t-statistics are in parentheses. Numbers of observations are the same as in Table 3.

	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded
Intercept	0.08 (1.29)	-0.02 (-0.27)	0.07 (1.14)	-0.02 (-0.37)	0.09 (1.36)	-0.01 (-0.15)
$R_{i,t-1}$	-6.30 (-14.53)	-5.88 (-14.41)	-5.81 (-13.92)	-5.40 (-14.20)	-5.88 (-14.22)	-5.47 (-14.55)
Book to Market	0.23 (3.31)	0.28 (3.96)	0.19 (2.83)	0.23 (3.60)	0.22 (3.35)	0.27 (4.07)
Size	-0.13 (-4.10)	-0.06 (-2.06)	-0.14 (-4.39)	-0.07 (-2.33)	-0.13 (-3.94)	-0.05 (-1.80)
52 Wk High Loser	-0.37 (-2.86)	-0.64 (-5.47)	-0.40 (-3.01)	-0.67 (-5.58)	-0.40 (-3.03)	-0.67 (-5.64)
52 Wk High Winner	0.43 (8.42)	0.47 (9.24)	0.47 (8.82)	0.52 (9.99)	0.47 (8.93)	0.52 (10.18)
Low Leverage	0.23 (3.97)	0.21 (3.55)			0.19 (3.26)	0.20 (3.29)
High Leverage	-0.31 (-5.86)	-0.31 (-5.79)			-0.30 (-4.83)	-0.27 (-4.33)
Low O-Score			0.20 (3.69)	0.17 (3.05)	0.07 (1.32)	0.04 (0.74)
High O-Score			-0.15 (-2.41)	-0.23 (-3.65)	-0.01 (-0.09)	-0.09 (-1.30)

Table 4
Leverage and O-Score
Low Book-to-Market, Raw Returns

Each month between June 1966 and December 2003, 12 (j=1,…,12) cross-sectional regressions of the following form are estimated:

$$R_{it} = b_{0jt} + b_{1jt} R_{i,t-1} + b_{2jt} (book_{i,t-1}/mkt_{i,t-1}) + b_{3jt}\, size_{i,t-1} + b_{4jt}\, 52wkW_{i,t-j} + b_{5jt}\, 52wkL_{i,t-j} + b_{6jt}\, LevH_{i,t-j} + b_{7jt}\, LevL_{i,t-j}$$
$$+ b_{8jt}\, OscH_{i,t-j} + b_{9jt}\, OscL_{i,t-j} + e_{ijt}$$

where $R_{i,t}$ and $size_{i,t}$ are the return and the market capitalization of stock i in month t; $52wkW_{i,t-j}$ ($52wkL_{i,t-j}$) is the 52-week high winner (loser) dummy that takes the value of 1 if the 52-week high measure for stock i is ranked in the top (bottom) 20% in month $t-j$, and zero otherwise. The 52-week high measure in month $t-j$ is the ratio of price level in month $t-j$ to the maximum price achieved in months $t-j$-12 to $t-j$. The $(book_{i,t-1}/mkt_{i,t-1})$ variable is computed from the book value of equity in the most recent annual financial statements whose closing date is at least six-months prior to month t, and market value of equity at the end of month $t-1$. The leverage and O-Score dummies are constructed based on highest and lowest 20% rankings by book leverage and O-Score. The accounting variables used to compute book leverage and O-Score are drawn from the most recent annual financial statements whose closing date is at least six-months prior to month t. The coefficient estimates of a given independent variable are averaged over j=1,…,12 for columns labeled (1,12). The numbers reported in the table are the time-series averages of these averages. They are in percent per month. The accompanying t-statistics are calculated from the time series. Nobs is the time-series average number of cross-sectional observations in each monthly regression. The sample is limited to stocks ranking in the bottom 30% of book-to-market in each month.

	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded
Intercept	0.98	0.59	0.96	0.63	0.97	0.62
	(3.27)	(1.97)	(3.03)	(1.98)	(3.05)	(1.95)
$R_{i,t-1}$	-6.42	-5.80	-6.21	-5.64	-6.24	-5.66
	(-13.57)	(-12.58)	(-13.31)	(-12.77)	(-13.48)	(-12.91)
Book to Market	1.48	1.63	1.59	1.63	1.73	1.77
	(3.36)	(3.59)	(3.40)	(3.37)	(3.84)	(3.82)
Size	-0.16	-0.02	-0.15	-0.02	-0.14	0.00
	(-3.17)	(-0.46)	(-3.08)	(-0.45)	(-2.76)	(-0.10)
52 Wk High Loser	-0.29	-0.62	-0.32	-0.65	-0.32	-0.66
	(-2.03)	(-4.89)	(-2.21)	(-5.04)	(-2.23)	(-5.10)
52 Wk High Winner	0.50	0.55	0.53	0.60	0.52	0.59
	(8.17)	(8.91)	(8.33)	(9.26)	(8.37)	(9.34)
Low Leverage	0.19	0.22			0.14	0.18
	(2.51)	(2.81)			(1.87)	(2.29)
High Leverage	-0.30	-0.24			-0.35	-0.25
	(-3.33)	(-2.65)			(-3.30)	(-2.30)
Low O-Score			0.20	0.17	0.09	0.06
			(2.70)	(2.28)	(1.27)	(0.87)
High O-Score			-0.12	-0.22	0.05	-0.09
			(-1.24)	(-2.39)	(0.44)	(-0.84)
Nobs	945	945	859	859	859	859

Table 4.1
Leverage and O-Score
Low Book-to-Market, Risk-Adjusted Returns

Each month between June 1966 and December 2003, 12 (j=1,…,12) cross-sectional regressions of the following form are estimated:

$$R_{it} = b_{0jt} + b_{1jt} R_{i,t-1} + b_{2jt} (book_{i,t-1}/mkt_{i,t-1}) + b_{3jt}\, size_{i,t-1} + b_{4jt}\, 52wkW_{i,t-j} + b_{5jt}\, 52wkL_{i,t-j} + b_{6jt}\, LevH_{i,t-j} + b_{7jt}\, LevL_{i,t-j}$$
$$+ b_{8jt}\, OscH_{i,t-j} + b_{9jt}\, OscL_{i,t-j} + e_{ijt}$$

where $R_{i,t}$ and $size_{i,t}$ are the return and the market capitalization of stock i in month t; $52wkW_{i,t-j}$ ($52wkL_{i,t-j}$) is the 52-week high winner (loser) dummy that takes the value of 1 if the 52-week high measure for stock i is ranked in the top (bottom) 20% in month $t-j$, and zero otherwise. The 52-week high measure in month $t-j$ is the ratio of price level in month $t-j$ to the maximum price achieved in months $t-j$-12 to $t-j$. The $(book_{i,t-1}/mkt_{i,t-1})$ variable is computed from the book value of equity in the most recent annual financial statements whose closing date is at least six-months prior to month t, and market value of equity at the end of month $t-1$. The leverage and O-Score dummies are constructed based on highest and lowest 20% rankings by book leverage and O-Score. The accounting variables used to compute book leverage and O-Score are drawn from the most recent annual financial statements whose closing date is at least six-months prior to month t. The coefficient estimates of a given independent variable are averaged over j=1,…,12 for columns labeled (1,12). To obtain risk-adjusted returns, we further run times series regressions of these averages (one for each average) on the contemporaneous Fama-French factor realizations to hedge out the factor exposure. The numbers reported for risk adjusted returns are intercepts from these time-series regressions. They are in percent per month and their t-statistics are in parentheses. Numbers of observations are the same as in Table 4. The sample is limited to stocks ranking in the bottom 30% of book-to-market in each month.

	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded
Intercept	-0.19 (-2.17)	-0.32 (-3.93)	-0.18 (-2.10)	-0.27 (-3.33)	-0.18 (-1.90)	-0.28 (-3.27)
$R_{i,t-1}$	-5.99 (-12.66)	-5.66 (-12.31)	-5.76 (-12.44)	-5.48 (-12.45)	-5.78 (-12.61)	-5.49 (-12.60)
Book to Market	1.07 (2.96)	1.25 (3.43)	1.00 (2.76)	1.10 (3.01)	1.19 (3.31)	1.29 (3.57)
Size	-0.07 (-1.91)	0.01 (0.20)	-0.08 (-2.25)	-0.00 (-0.10)	-0.06 (-1.67)	0.02 (0.50)
52 Wk High Loser	-0.42 (-3.18)	-0.66 (-5.58)	-0.44 (-3.31)	-0.69 (-5.69)	-0.45 (-3.33)	-0.69 (-5.75)
52 Wk High Winner	0.59 (9.89)	0.61 (10.00)	0.63 (10.22)	0.66 (10.43)	0.62 (10.25)	0.65 (10.48)
Low Leverage	0.27 (3.67)	0.28 (3.70)			0.19 (2.60)	0.22 (2.96)
High Leverage	-0.36 (-4.44)	-0.31 (-3.83)			-0.42 (-4.17)	-0.33 (-3.33)
Low O-Score			0.29 (3.96)	0.25 (3.36)	0.15 (2.18)	0.11 (1.58)
High O-Score			-0.16 (-1.69)	-0.24 (-2.59)	0.04 (0.40)	-0.06 (-0.56)

Table 5
Leverage and O-Score
Price < $2, Raw Returns

Each month between June 1966 and December 2003, 12 (j=1,…,12) cross-sectional regressions of the following form are estimated:

$$R_{it} = b_{0jt} + b_{1jt} R_{i,t-1} + b_{2jt} (book_{i,t-1}/mkt_{i,t-1}) + b_{3jt}\, size_{i,t-1} + b_{4jt}\, 52wkW_{i,t-j} + b_{5jt}\, 52wkL_{i,t-j} + b_{6jt}\, LevH_{i,t-j} + b_{7jt}\, LevL_{i,t-j} + b_{8jt}\, OscH_{i,t-j} + b_{9jt}\, OscL_{i,t-j} + e_{ijt}$$

where $R_{i,t}$ and $size_{i,t}$ are the return and the market capitalization of stock i in month t; $52wkW_{i,t-j}$ ($52wkL_{i,t-j}$) is the 52-week high winner (loser) dummy that takes the value of 1 if the 52-week high measure for stock i is ranked in the top (bottom) 20% in month $t-j$, and zero otherwise. The 52-week high measure in month $t-j$ is the ratio of price level in month $t-j$ to the maximum price achieved in months $t-j$-12 to $t-j$. The $(book_{i,t-1}/mkt_{i,t-1})$ variable is computed from the book value of equity in the most recent annual financial statements whose closing date is at least six-months prior to month t, and market value of equity at the end of month $t-1$. The leverage and O-Score dummies are constructed based on highest and lowest 20% rankings by book leverage and O-Score. The accounting variables used to compute book leverage and O-Score are drawn from the most recent annual financial statements whose closing date is at least six-months prior to month t. The coefficient estimates of a given independent variable are averaged over j=1,…,12 for columns labeled (1,12). The numbers reported in the table are the time-series averages of these averages. They are in percent per month. The accompanying t-statistics are calculated from the time series. Nobs is the time-series average number of cross-sectional observations in each monthly regression. The sample is limited to stocks with prices below $2 at the end of month $t-1$.

	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded
Intercept	2.89	1.90	3.10	2.09	3.02	2.01
	(6.58)	(4.75)	(6.99)	(5.23)	(6.83)	(5.03)
$R_{i,t-1}$	-8.65	-7.63	-8.55	-7.50	-8.58	-7.54
	(-15.04)	(-15.87)	(-13.33)	(-13.55)	(-13.45)	(-13.71)
Book to Market	-0.26	-0.12	-0.22	-0.05	-0.14	0.03
	(1.35)	(-0.66)	(-1.03)	(-0.25)	(-0.65)	(0.12)
Size	-1.53	-1.43	-1.51	-1.40	-1.48	-1.38
	(-14.17)	(-15.14)	(-12.93)	(-13.99)	(-12.70)	(-13.78)
52 Wk High Loser	-0.01	-0.42	-0.01	-0.41	0.00	-0.41
	(-0.05)	(-2.43)	(-0.06)	(-2.24)	(-0.01)	(-2.27)
52 Wk High Winner	0.34	0.40	0.34	0.38	0.33	0.37
	(1.92)	(2.21)	(1.92)	(2.14)	(1.86)	(2.07)
Low Leverage	0.48	0.53			0.48	0.47
	(2.54)	(2.72)			(1.99)	(1.85)
High Leverage	-0.72	-0.66			-0.82	-0.71
	(-3.92)	(-3.46)			(-3.84)	(-3.21)
Low O-Score			0.43	0.52	0.14	0.25
			(1.58)	(1.84)	(0.47)	(0.82)
High O-Score			-0.59	-0.59	-0.21	-0.25
			(-3.81)	(-3.66)	(-1.21)	(-1.38)
Nobs	360	360	264	264	264	264

Table 5.1
Leverage and O-Score
Price < $2, Risk-Adjusted Returns

Each month between June 1966 and December 2003, 12 (j=1,…,12) cross-sectional regressions of the following form are estimated:

$$R_{it} = b_{0jt} + b_{1jt} R_{i,t-1} + b_{2jt} (book_{i,t-1}/mkt_{i,t-1}) + b_{3jt}\, size_{i,t-1} + b_{4jt}\, 52wkW_{i,t-j} + b_{5jt}\, 52wkL_{i,t-j} + b_{6jt}\, LevH_{i,t-j} + b_{7jt}\, LevL_{i,t-j}$$
$$+ b_{8jt}\, OscH_{i,t-j} + b_{9jt}\, OscL_{i,t-j} + e_{ijt}$$

where $R_{i,t}$ and $size_{i,t}$ are the return and the market capitalization of stock i in month t; $52wkW_{i,t-j}$ ($52wkL_{i,t-j}$) is the 52-week high winner (loser) dummy that takes the value of 1 if the 52-week high measure for stock i is ranked in the top (bottom) 20% in month $t-j$, and zero otherwise. The 52-week high measure in month $t-j$ is the ratio of price level in month $t-j$ to the maximum price achieved in months $t-j$-12 to $t-j$. The $(book_{i,t-1}/mkt_{i,t-1})$ variable is computed from the book value of equity in the most recent annual financial statements whose closing date is at least six-months prior to month t, and market value of equity at the end of month $t-1$. The leverage and O-Score dummies are constructed based on highest and lowest 20% rankings by book leverage and O-Score. The accounting variables used to compute book leverage and O-Score are drawn from the most recent annual financial statements whose closing date is at least six-months prior to month t. The coefficient estimates of a given independent variable are averaged over j=1,…,12 for columns labeled (1,12). To obtain risk-adjusted returns, we further run times series regressions of these averages (one for each average) on the contemporaneous Fama-French factor realizations to hedge out the factor exposure. The numbers reported for risk adjusted returns are intercepts from these time-series regressions. They are in percent per month and their t-statistics are in parentheses. Numbers of observations are the same as in Table 5. The sample is limited to stocks with prices below $2 at the end of month $t-1$.

	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded
Intercept	1.32	0.78	1.51	0.95	1.43	0.86
	(4.70)	(3.20)	(5.16)	(3.86)	(4.90)	(3.49)
$R_{i,t-1}$	-8.10	-7.63	-7.92	-7.48	-7.97	-7.53
	(-13.91)	(-15.51)	(-12.16)	(-13.16)	(-12.30)	(-13.34)
Book to Market	-0.35	-0.19	-0.29	-0.11	-0.20	-0.02
	(-1.87)	(-1.03)	(-1.38)	(-0.52)	(-0.96)	(-0.11)
Size	-1.62	-1.49	-1.61	-1.47	-1.58	-1.44
	(-14.74)	(-15.86)	(-13.48)	(-14.80)	(-13.27)	(-14.53)
52 Wk High Loser	-0.19	-0.51	0.35	0.39	-0.21	-0.53***
	(-1.04)	(-3.11)	(1.89)	(2.13)	(-1.08)	(-3.00)
52 Wk High Winner	0.35*	0.42**	-0.22	-0.54	0.33	0.37
	-1.89	-2.30	(-1.13)	(-2.98)	(1.83)	(2.03)
Low Leverage	0.58	0.59			0.48	0.55
	(2.98)	(2.96)			(1.91)	(2.12)
High Leverage	-0.80	-0.76			-0.87	-0.79
	(-4.44)	(-4.11)			(-4.10)	(-3.65)
Low O-Score			0.59	0.68	0.30	0.35
			(2.07)	(2.35)	(0.98)	(1.11)
High O-Score			-0.67	-0.67	-0.27	-0.29
			(-4.19)	(-4.08)	(-1.52)	(-1.58)

Table 6
Leverage and VX Index of Default Risk
Raw Returns

Each month between January 1971 and December 1999, 12 (j=1,…,12) cross-sectional regressions of the following form are estimated:

$$R_{it} = b_{0jt} + b_{1jt} R_{i,t-1} + b_{2jt} (book_{i,t-1}/mkt_{i,t-1}) + b_{3jt}\, size_{i,t-1} + b_{4jt}\, 52wkW_{i,t-j} + b_{5jt}\, 52wkL_{i,t-j} + b_{6jt}\, LevH_{i,t-j} + b_{7jt}\, LevL_{i,t-j}$$
$$+ b_{8jt}\, VXIndexH_{i,t-j} + b_{9jt}\, VXIndexL_{i,t-j} + e_{ijt}$$

where $R_{i,t}$ and $size_{i,t}$ are the return and the market capitalization of stock i in month t; $52wkW_{i,t-j}$ ($52wkL_{i,t-j}$) is the 52-week high winner (loser) dummy that takes the value of 1 if the 52-week high measure for stock i is ranked in the top (bottom) 20% in month t-j, and zero otherwise. The 52-week high measure in month t-j is the ratio of price level in month t-j to the maximum price achieved in months t-j-12 to t-j. The $(book_{i,t-1}/mkt_{i,t-1})$ variable is computed from the book value of equity in the most recent annual financial statements whose closing date is at least six-months prior to month t, and market value of equity at the end of month t-1. The leverage and VX Index dummies are constructed based on highest and lowest 20% rankings by book leverage and the default probability measure of Vassalou and Xing (2004). The accounting variables used to compute book leverage are drawn from the most recent annual financial statements whose closing date is at least six-months prior to month t. The coefficient estimates of a given independent variable are averaged over j=1,…,12 for columns labeled (1,12). The numbers reported in the table are the time-series averages of these averages. They are in percent per month. The accompanying t-statistics are calculated from the time series. Nobs is the time-series average number of cross-sectional observations in each monthly regression.

	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded
Intercept	1.38	0.97	1.39	0.93	1.45	0.98
	(5.54)	(4.00)	(4.56)	(3.15)	(4.65)	(3.23)
$R_{i,t-1}$	-6.75	-5.98	-6.74	-5.97	-6.89	-6.10
	(-15.51)	(-14.63)	(-14.72)	(-14.77)	(-15.81)	(-16.31)
Book to Market	0.28	0.31	0.37	0.42	0.34	0.40
	(3.06)	(3.37)	(3.20)	(3.53)	(2.93)	(3.26)
Size	-0.19	-0.07	-0.12	-0.01	-0.12	-0.02
	(-4.50)	(-1.82)	(-2.59)	(-0.19)	(-2.84)	(-0.43)
52 Wk High Loser	-0.21	-0.58	-0.44	-0.72	-0.47	-0.74
	(-1.45)	(-4.38)	(-4.11)	(-7.62)	(-4.61)	(-8.49)
52 Wk High Winner	0.32	0.40	0.35	0.43	0.35	0.44
	(5.95)	(7.67)	(6.17)	(8.19)	(6.79)	(8.94)
Low Leverage	0.10	0.11			0.13	0.08
	(1.54)	(1.70)			(1.49)	(0.84)
High Leverage	-0.27	-0.27			-0.30	-0.25
	(-4.76)	(-4.64)			(-4.75)	(-3.88)
Low Default Probability			0.03	0.12	-0.06	0.05
			(0.45)	(1.59)	(-0.67)	(0.60)
High Default Probability			0.23	-0.02	0.36	0.08
			(2.30)	(-0.23)	(3.46)	(0.85)
Nobs	3228	3228	2290	2290	2290	2290

Table 6.1
Leverage and VX Index of Default Risk
Risk-Adjusted Returns

Each month between January 1971 and December 1999, 12 (j=1,…,12) cross-sectional regressions of the following form are estimated:

$$R_{it} = b_{0jt} + b_{1jt} R_{i,t-1} + b_{2jt} (book_{i,t-1}/mkt_{i,t-1}) + b_{3jt}\, size_{i,t-1} + b_{4jt}\, 52wkW_{i,t-j} + b_{5jt}\, 52wkL_{i,t-j} + b_{6jt}\, LevH_{i,t-j} + b_{7jt}\, LevL_{i,t-j}$$
$$+ b_{8jt}\, VXIndexH_{i,t-j} + b_{9jt}\, VXIndexL_{i,t-j} + e_{ijt}$$

where $R_{i,t}$ and $size_{i,t}$ are the return and the market capitalization of stock i in month t; $52wkW_{i,t-j}$ ($52wkL_{i,t-j}$) is the 52-week high winner (loser) dummy that takes the value of 1 if the 52-week high measure for stock i is ranked in the top (bottom) 20% in month $t-j$, and zero otherwise. The 52-week high measure in month $t-j$ is the ratio of price level in month $t-j$ to the maximum price achieved in months $t-j$-12 to $t-j$. The $(book_{i,t-1}/mkt_{i,t-1})$ variable is computed from the book value of equity in the most recent annual financial statements whose closing date is at least six-months prior to month t, and market value of equity at the end of month $t-1$. The leverage and VX Index dummies are constructed based on highest and lowest 20% rankings by book leverage and the default probability measure of Vassalou and Xing (2004). The accounting variables used to compute book leverage are drawn from the most recent annual financial statements whose closing date is at least six-months prior to month t. The coefficient estimates of a given independent variable are averaged over j=1,…,12 for columns labeled (1,12). To obtain risk-adjusted returns, we further run times series regressions of these averages (one for each average) on the contemporaneous Fama-French factor realizations to hedge out the factor exposure. The numbers reported for risk adjusted returns are intercepts from these time-series regressions. They are in percent per month and their t-statistics are in parentheses. Numbers of observations are the same as in Table 3.

	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded
Intercept	0.08 (1.29)	-0.02 (-0.27)	-0.01 (-0.08)	-0.10 (-1.51)	0.10 (1.72)	0.00 (-0.02)
$R_{i,t-1}$	-6.30 (-14.53)	-5.88 (-14.41)	-5.95 (-13.72)	-5.66 (-14.19)	-6.20 (-15.22)	-5.91 (-15.96)
Book to Market	0.23 (3.31)	0.28 (3.96)	0.35 (4.16)	0.42 (4.93)	0.32 (3.80)	0.38 (4.57)
Size	-0.13 (-4.10)	-0.06 (-2.06)	-0.12 (-3.51)	-0.05 (-1.64)	-0.13 (-3.93)	-0.06 (-2.07)
52 Wk High Loser	-0.37 (-2.86)	-0.64 (-5.47)	-0.51 (-5.22)	-0.72 (-8.33)	-0.55 (-5.69)	-0.75 (-8.99)
52 Wk High Winner	0.43 (8.42)	0.47 (9.24)	0.44 (-8.30)	0.47 (-9.32)	0.43 (8.71)	0.46 (9.68)
Low Leverage	0.23 (3.97)	0.21 (3.55)			0.14 (1.77)	0.11 (1.33)
High Leverage	-0.31 (-5.86)	-0.31 (-5.79)			-0.31 (-5.74)	-0.27 (-4.97)
Low Default Probability			0.18 (3.67)	0.20 (4.03)	0.09 (1.65)	0.13 (2.30)
High Default Probability			0.05 (0.55)	-0.11 (-1.17)	0.19 (2.11)	0.02 (0.23)

Table 7
Leverage and FC Index
Raw Returns

Each month between June 1966 and December 2003, 12 (j=1,…,12) cross-sectional regressions of the following form are estimated:

$$R_{it} = b_{0jt} + b_{1jt} R_{i,t-1} + b_{2jt}\,(book_{i,t-1}/mkt_{i,t-1}) + b_{3jt}\,size_{i,t-1} + b_{4jt}\,52wkW_{i,t-j} + b_{5jt}\,52wkL_{i,t-j} + b_{6jt}\,LevH_{i,t-j} + b_{7jt}\,LevL_{i,t-j}$$
$$+ b_{8jt}\,FCIndexH_{i,t-j} + b_{9jt}\,FCIndexL_{i,t-j} + e_{ijt}$$

where $R_{i,t}$ and $size_{i,t}$ are the return and the market capitalization of stock i in month t; $52wkW_{i,t-j}$ ($52wkL_{i,t-j}$) is the 52-week high winner (loser) dummy that takes the value of 1 if the 52-week high measure for stock i is ranked in the top (bottom) 20% in month $t-j$, and zero otherwise. The 52-week high measure in month $t-j$ is the ratio of price level in month $t-j$ to the maximum price achieved in months $t-j$-12 to $t-j$. The $(book_{i,t-1}/mkt_{i,t-1})$ variable is computed from the book value of equity in the most recent annual financial statements whose closing date is at least six-months prior to month t, and market value of equity at the end of month $t-1$. The leverage and FC Index dummies are constructed based on highest and lowest 20% rankings by book leverage and FC Index. The accounting variables used to compute book leverage and FC Index are drawn from the most recent annual financial statements whose closing date is at least six-months prior to month t. The coefficient estimates of a given independent variable are averaged over j=1,…,12 for columns labeled (1,12). The numbers reported in the table are the time-series averages of these averages. They are in percent per month. The accompanying t-statistics are calculated from the time series. Nobs is the time-series average number of cross-sectional observations in each monthly regression.

	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded
Intercept	1.38 (5.54)	0.97 (4.00)	1.23 (4.62)	0.88 (3.35)	1.25 (4.64)	0.90 (3.36)
$R_{i,t-1}$	-6.75 (-15.51)	-5.98 (-14.63)	-6.37 (-15.34)	-5.62 (-14.99)	-6.39 (-15.46)	-5.64 (-15.13)
Book to Market	0.28 (3.06)	0.31 (3.37)	0.20 (2.74)	0.24 (3.49)	0.20 (2.70)	0.24 (3.45)
Size	-0.19 (-4.50)	-0.07 (-1.82)	-0.20 (-4.28)	-0.07 (-1.60)	-0.21 (-4.53)	-0.08 (-1.86)
52 Wk High Loser	-0.21 (-1.45)	-0.58 (-4.38)	0.34 (6.29)	0.43 (8.33)	0.34 (6.37)	0.43 (8.48)
52 Wk High Winner	0.32 (5.95)	0.40 (7.67)	-0.32 (2.03)	-0.68 (-4.78)	-0.31 (-2.02)	-0.68 (-4.83)
Low Leverage	0.10 (1.54)	0.11 (1.70)			0.12 (2.10)	0.15 (2.53)
High Leverage	-0.27 (-4.76)	-0.27 (-4.64)			-0.24 (-4.40)	-0.25 (-4.42)
Low FC Index			0.34 (2.66)	0.20 (1.47)	0.38 (3.11)	0.24 (1.92)
High FC Index			0.18 (1.34)	0.07 (0.54)	0.14 (1.05)	0.03 (0.21)
Nobs	3228	3228	2884	2884	2884	2884

Table 7.1
Leverage and FC Index
Risk-Adjusted Returns

Each month between June 1966 and December 2003, 12 (j=1,…,12) cross-sectional regressions of the following form are estimated:

$$R_{it} = b_{0jt} + b_{1jt} R_{i,t-1} + b_{2jt} (book_{i,t-1}/mkt_{i,t-1}) + b_{3jt}\, size_{i,t-1} + b_{4jt}\, 52wkW_{i,t-j} + b_{5jt}\, 52wkL_{i,t-j} + b_{6jt}\, LevH_{i,t-j} + b_{7jt}\, LevL_{i,t-j}$$
$$+ b_{8jt}\, FCIndexH_{i,t-j} + b_{9jt}\, FCIndexL_{i,t-j} + e_{ijt}$$

where $R_{i,t}$ and $size_{i,t}$ are the return and the market capitalization of stock i in month t; $52wkW_{i,t-j}$ ($52wkL_{i,t-j}$) is the 52-week high winner (loser) dummy that takes the value of 1 if the 52-week high measure for stock i is ranked in the top (bottom) 20% in month $t-j$, and zero otherwise. The 52-week high measure in month $t-j$ is the ratio of price level in month $t-j$ to the maximum price achieved in months $t-j$-12 to $t-j$. The $(book_{i,t-1}/mkt_{i,t-1})$ variable is computed from the book value of equity in the most recent annual financial statements whose closing date is at least six-months prior to month t, and market value of equity at the end of month $t-1$. The leverage and FC Index dummies are constructed based on highest and lowest 20% rankings by book leverage and FC Index. The accounting variables used to compute book leverage and FC Index are drawn from the most recent annual financial statements whose closing date is at least six-months prior to month t. The coefficient estimates of a given independent variable are averaged over j=1,…,12 for columns labeled (1,12). To obtain risk-adjusted returns, we further run times series regressions of these averages (one for each average) on the contemporaneous Fama-French factor realizations to hedge out the factor exposure. The numbers reported for risk adjusted returns are intercepts from these time-series regressions. They are in percent per month and their t-statistics are in parentheses Nobs is the time-series average number of cross-sectional observations in each monthly regression.

	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded
Intercept	0.08	-0.02	-0.01	-0.07	-0.01	-0.06
	(1.29)	(-0.27)	(-0.17)	(-1.20)	(-0.09)	(-1.04)
$R_{i,t-1}$	-6.30	-5.88	-5.93	-5.53	-5.95	-5.56
	(-14.53)	(-14.41)	(-14.71)	(-15.03)	(-14.82)	(-15.16)
Book to Market	0.23	0.28	0.18	0.24	0.19	0.25
	(3.31)	(3.96)	(2.69)	(3.67)	(2.75)	(3.70)
Size	-0.13	-0.06	-0.12	-0.04	-0.14	-0.06
	(-4.10)	(-2.06)	(-3.38)	(-1.28)	(-3.76)	(-1.69)
52 Wk High Loser	-0.37	-0.64	0.44	0.48	0.44	0.48
	(-2.86)	(-5.47)	(8.70)	(9.71)	(8.75)	(9.82)
52 Wk High Winner	0.43	0.47	-0.46	-0.73	-0.46	-0.73
	(8.42)	(9.24)	(-3.38)	(-5.93)	(-3.38)	(-5.98)
Low Leverage	0.23	0.21			0.24	0.24
	(3.97)	(3.55)			(4.58)	(4.33)
High Leverage	-0.31	-0.31			-0.28	-0.29
	(-5.86)	(-5.79)			(-5.45)	(-5.45)
Low FC Index			0.24	0.12	0.30	0.18
			(2.87)	(1.48)	(3.75)	(2.41)
High FC Index			0.29	0.19	0.23	0.13
			(2.57)	(1.77)	(2.06)	(1.23)

Table 8
Leverage and FC Index – WW specification
Raw Returns

Each month between January 1977 and December 2001, 12 (j=1,…,12) cross-sectional regressions of the following form are estimated:

$$R_{it} = b_{0jt} + b_{1jt}(book_{i,t-1}/mkt_{i,t-1}) + b_{2jt}\, size_{i,t-1} + b_{3jt}\,(size_{i,t-1}/(book_{i,t-1}/mkt_{i,t-1})) + b_{4jt}\, 6RetW_{i,t-j} + b_{5jt}\, 6RetL_{i,t-j} + b_{6jt}\, LevH_{i,t-j} + b_{7jt}\, LevL_{i,t-j}$$
$$+ b_{8jt}\, FCIndexH_{i,t-j} + b_{9jt}\, FCIndexL_{i,t-j} + e_{ijt}$$

where $size_{i,t}$ is the market capitalization of stock i in month t; $6RetW_{i,t-j}$ ($6RetL_{i,t-j}$) is the winner (loser) dummy that takes the value of 1 if the past 6-month return for stock i is ranked in the top (bottom) 30% in month $t-j$, and zero otherwise. The $book_{i,t-1}$ and $mkt_{i,t-1}$ variables are computed from the book value of equity in the most recent annual financial statements whose closing date is at least six-months prior to month t, and market value of equity at the end of month $t-1$. The leverage and FC Index dummies are constructed based on highest and lowest 20% rankings by book leverage and FC Index. The accounting variables used to compute book leverage and FC Index are drawn from the most recent annual financial statements whose closing date is at least six-months prior to month t. The coefficient estimates of a given independent variable are averaged over j=1,…,12 for columns labeled (1,12). The numbers reported in the table are the time-series averages of these averages. They are in percent per month. The accompanying t-statistics are calculated from the time series. Nobs is the time-series average number of cross-sectional observations in each monthly regression.

	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded
Intercept	1.45	1.22	1.39	1.14	1.42	1.17
	(5.50)	(4.50)	(5.09)	(4.06)	(5.12)	(4.11)
Book to Market	0.18	0.13	0.16	0.11	0.17	0.12
	(4.39)	(3.41)	(3.97)	(2.85)	(4.27)	(3.18)
Size	0.01	0.02	0.01	0.01	0.01	0.01
	(0.64)	(1.13)	(1.06)	(0.82)	(0.93)	(0.77)
Size/Book to Market	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02
	(-2.43)	(-1.78)	(-1.89)	(-1.33)	(-2.00)	(-1.48)
6 Month Return Loser	-0.12	-0.50	-0.17	-0.49	-0.16	-0.47
	(-0.72)	(-3.92)	(-1.20)	(-4.30)	(-1.11)	(-4.28)
6 Month Return Winner	0.26	0.27	0.22	0.27	0.23	0.28
	(2.36)	(2.26)	(2.30)	(2.65)	(2.37)	(2.75)
Low Leverage	0.16	0.12			0.11	0.13
	(1.78)	(1.25)			(1.44)	(1.69)
High Leverage	-0.24	-0.27			-0.22	-0.26
	(-3.70)	(-3.92)			(-3.48)	(-4.05)
Low Financial Constraint			-0.13	0.06	-0.10	0.10
			(-1.08)	(0.53)	(-0.86)	(0.90)
High Financial Constraint			0.35	0.04	0.33	0.01
			(2.22)	(0.25)	(2.10)	(0.06)

Table 8.1
Leverage and FC Index – WW specification
Risk-Adjusted Returns

Each month between January 1977 and December 2001, 12 (j=1,…,12) cross-sectional regressions of the following form are estimated:

$$R_{it} = b_{0jt} + b_{1jt}(book_{i,t-1}/mkt_{i,t-1}) + b_{2jt}\, size_{i,t-1} + b_{3jt}\,(size_{i,t-1}/(book_{i,t-1}/mkt_{i,t-1})) + b_{4jt}\, 6RetW_{i,t-j} + b_{5jt}\, 6RetL_{i,t-j} + b_{6jt}\, LevH_{i,t-j} + b_{7jt}\, LevL_{i,t-j}$$
$$+ b_{8jt}\, FCIndexH_{i,t-j} + b_{9jt}\, FCIndexL_{i,t-j} + e_{ijt}$$

where $size_{i,t}$ is the market capitalization of stock i in month t; $6RetW_{i,t-j}$ ($6RetL_{i,t-j}$) is the winner (loser) dummy that takes the value of 1 if the past 6-month return for stock i is ranked in the top (bottom) 30% in month $t-j$, and zero otherwise. The $book_{i,t-1}$ and $mkt_{i,t-1}$ variables are computed from the book value of equity in the most recent annual financial statements whose closing date is at least six-months prior to month t, and market value of equity at the end of month $t-1$. The leverage and FC Index dummies are constructed based on highest and lowest 20% rankings by book leverage and FC Index. The accounting variables used to compute book leverage and FC Index are drawn from the most recent annual financial statements whose closing date is at least six-months prior to month t. The coefficient estimates of a given independent variable are averaged over j=1,…,12 for columns labeled (1,12). To obtain risk-adjusted returns, we further run times series regressions of these averages (one for each average) on the contemporaneous Fama-French factor realizations to hedge out the factor exposure. The numbers reported for risk adjusted returns are intercepts from these time-series regressions. They are in percent per month and their t-statistics are in parentheses Nobs is the time-series average number of cross-sectional observations in each monthly regression.

	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded
Intercept	0.02	-0.06	-0.04	-0.13	-0.04	-0.12
	(0.24)	(-0.78)	(-0.41)	(-1.52)	(-0.38)	(-1.28)
Book to Market	0.16	0.13	0.14	0.10	0.16	0.12
	(4.55)	(3.69)	(4.04)	(3.08)	(4.43)	(3.50)
Size	0.02	0.02	0.02	0.01	0.02	0.01
	(1.10)	(1.39)	(1.23)	(1.00)	(1.25)	(1.07)
Size/Book to Market	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01
	(-1.25)	(-0.92)	(-0.80)	(-0.54)	(-0.99)	(-0.76)
6 Month Return Loser	-0.16	-0.50	-0.23	-0.52	-0.21	-0.50
	(-1.12)	(-4.63)	(-1.75)	(-5.13)	(-1.65)	(-5.13)
6 Month Return Winner	0.26	0.28	0.22	0.28	0.22	0.29
	(3.43)	(3.83)	(3.24)	(4.18)	(3.36)	(4.34)
Low Leverage	0.27	0.22			0.21	0.22
	(3.97)	(3.21)			(3.33)	(3.32)
High Leverage	-0.29	-0.31			-0.26	-0.29
	(-5.03)	(-5.23)			(-4.45)	(-5.03)
Low Financial Constraint			-0.12	0.02	-0.07	0.08
			(-1.62)	(0.31)	(-0.92)	(1.09)
High Financial Constraint			0.41	0.14	0.38	0.10
			(2.91)	(1.14)	(2.68)	(0.84)

Table 9
Three-Day Cumulative Abnormal Return around Earnings Announcements for Portfolios Sorted on Debt/AssetS and O-Score

Every June from 1966 to 2002, we sort firms independently into five groups by O-score and three groups by debt/asset ratio (top 30%, middle 40% and bottom 30%), and form portfolios based on these groupings. For each firm, we then compute the average abnormal return over the four quarterly announcement returns following portfolio formation and annualize this number by multiplying by four. Following La Porta et al (1997), we benchmark each earnings announcement return by the firm with median book-to-market in the same size decile as the announcer. The numbers in the table are the equally weighted average annualized earning announcement abnormal (net of benchmark) returns. The column labeled H-L is the difference between the returns to high and low leverage groups, and p-values relate to a test of the null hypothesis that the difference between the mean abnormal returns of high and low leverage groups is zero.

Cumulative Abnormal Returns						**Number of stocks**			
	Debt/Assets						Debt/Assets		
O-Score	L	M	H	H-L	p-value	O-Score	L	M	H
L	-0.62	-0.27	2.79	3.42	0.025	L	417	141	2
2	-0.52	-0.07	0.13	0.64	0.181	2	187	345	47
3	0.19	0.23	0.23	0.03	0.950	3	87	301	165
4	-0.10	-0.12	-0.34	-0.24	0.744	4	56	199	284
H	-0.54	-0.59	-0.30	0.24	0.789	H	41	110	289

Table 10
Comparison of Three and Four Factor Models
Fama-French 100 Portfolios

Two time series regressions are estimated for each of the 100 Fama-French (1993) portfolios using monthly data from the full sample period June 1965 to December 2003, then again using data from each of the two subperiods June 1966 to December 1979 and January 1980 to December 2003. The three-factor model is:

$$R_{it} = b_{0i} + b_{1i}\,MKT_t + b_{2i}\,SMB_t + b_{3i}\,HML_t + e_{it}$$

and the four-factor model is

$$R_{it} = b_{0i} + b_{1i}\,MKT_t + b_{2i}\,SMB_t + b_{3i}\,HML_t + b_{4i}\,LEV_t + e_{it}$$

where R_{it} is the month-*t* excess return to Fama-French portfolio *i*, *MKT*, *SMB* and *HML* are the Fama-French factor realizations, and LEV_t is the leverage factor realization constructed as the difference between the coefficients to the low and high leverage dummies in the month-*t* regression as specified in the first column of Table 3. The first five rows report statistics on the distribution of R-squares across the 100 regressions. The last two rows report the number of regressions in which the loadings on *HML* and/or *LEV* are statistically significant.

	Full Sample		1966 – 1979		1980-2003	
	3 factor	4 factor	3 factor	4 factor	3 factor	4 factor
Adj. R-Squares						
Average	0.61	0.79	0.61	0.82	0.76	0.77
25^{th} %tile	0.27	0.77	0.24	0.83	0.74	0.75
Median	0.80	0.82	0.80	0.85	0.79	0.80
75^{th} %tile	0.83	0.86	0.84	0.88	0.84	0.85
Number of |t-statistics| > 2						
HML	82	85	74	82	89	79
LEV		51		19		64

Table 11
Company Attributes by Subperiod

Using annual Compustat data from June 1966 to June 1980, then again from June 1980 to June 2001, firms are independently ranked into three categories based on book value of leverage (debt/assets), and five groups by O-Score. Each panel reports the time-series average of annual medians computed within each leverage-O-Score category. In this table, firms are included in a given year only if there is non-missing data for all attributes listed below. The panel labeled Number of Firms per year reports the time-series average of the number of firms included in the annual median computations. An entry of n/a indicates an empty cell.

Panel A: 1966 - 1980

	Debt/Assets								
	L	**M**	**H**	**L**	**M**	**H**	**L**	**M**	**H**
OScore	Return on Assets Year 0 (percent)			Return on Assets Year 1 (percent)			Return on Assets Year 2 (percent)		
L	0.12	0.08	0.06	0.12	0.08	n/a.	0.11	0.08	n/a.
2	0.08	0.07	0.06	0.08	0.06	0.07	0.07	0.06	0.06
3	0.07	0.06	0.08	0.07	0.06	0.08	0.07	0.05	0.08
4	0.06	0.05	0.04	0.06	0.05	0.04	0.06	0.05	0.04
H	0.04	0.03	0.02	0.04	0.03	0.03	0.04	0.04	0.03
all	0.10	0.06	0.06	0.10	0.06	0.06	0.09	0.05	0.07
	STD of Return on Assets (percent)			STD of Return on Equity (percent)					
L	0.01	0.01	0.00	0.01	0.01	0.01			
2	0.01	0.01	0.01	0.02	0.06	0.02			
3	0.01	0.01	0.01	0.02	0.02	0.02			
4	0.01	0.01	0.01	0.04	0.02	0.02			
H	0.01	0.02	0.01	0.04	0.04	0.04			
all	0.01	0.01	0.01	0.02	0.02	0.03			

Panel B: 1980 - 2001

	Debt/Assets								
	L	**M**	**H**	**L**	**M**	**H**	**L**	**M**	**H**
OScore	Return on Assets Year 0 (percent)			Return on Assets Year 1 (percent)			Return on Assets Year 2 (percent)		
L	0.11	0.10	0.00	0.09	0.09	0.04	0.09	0.08	0.11
2	0.06	0.07	0.07	0.06	0.07	0.07	0.06	0.06	0.06
3	0.04	0.06	0.05	0.04	0.05	0.04	0.04	0.05	0.04
4	-0.05	0.03	0.04	0.02	0.04	0.04	0.02	0.04	0.03
H	-0.31	-0.04	0.00	-0.10	0.01	0.02	-0.04	0.02	0.02
all	0.08	0.06	0.02	0.07	0.05	0.03	0.07	0.05	0.03
	STD of Return on Assets (percent)			STD of Return on Equity (percent)					
L	0.02	0.02	0.08	0.03	0.03	0.44			
2	0.03	0.02	0.01	0.05	0.03	0.03			
3	0.04	0.02	0.01	0.07	0.04	0.04			
4	0.06	0.02	0.02	0.11	0.06	0.05			
H	0.09	0.05	0.03	0.21	0.13	0.12			
all	0.03	0.02	0.02	0.05	0.04	0.08			

Table 12
Leverage and O-Score by Subperiod
Raw Returns

Each month between June 1966 and December 2003, 12 (j=1,…,12) cross-sectional regressions of the following form are estimated:

$$R_{it} = b_{0jt} + b_{1jt} R_{i,t-1} + b_{2jt} (book_{i,t-1}/mkt_{i,t-1}) + b_{3jt}\, size_{i,t-1} + b_{4jt}\, 52wkW_{i,t-j} + b_{5jt}\, 52wkL_{i,t-j} + b_{6jt}\, LevH_{i,t-j} + b_{7jt}\, LevL_{i,t-j}$$
$$+ b_{8jt}\, OscH_{i,t-j} + b_{9jt}\, OscL_{i,t-j} + e_{ijt}$$

where $R_{i,t}$ and $size_{i,t}$ are the return and the market capitalization of stock i in month t; $52wkW_{i,t-j}$ ($52wkL_{i,t-j}$) is the 52-week high winner (loser) dummy that takes the value of 1 if the 52-week high measure for stock i is ranked in the top (bottom) 20% in month t-j, and zero otherwise. The 52-week high measure in month t-j is the ratio of price level in month t-j to the maximum price achieved in months t-j-12 to t-j. The $(book_{i,t-1}/mkt_{i,t-1})$ variable is computed from the book value of equity in the most recent annual financial statements whose closing date is at least six-months prior to month t, and market value of equity at the end of month t-1. The leverage and O-Score dummies are constructed based on highest and lowest 20% rankings by book leverage and O-Score. The accounting variables used to compute book leverage and O-Score are drawn from the most recent annual financial statements whose closing date is at least six-months prior to month t. The coefficient estimates of a given independent variable are averaged over j=1,…,12 for columns labeled (1,12). The numbers reported in the table are the time-series averages of these averages for each subperiod. They are in percent per month. The accompanying t-statistics are calculated from the time series within subperiods and across the entire sample. Nobs is the time-series average number of cross-sectional observations in each monthly regression. Results for the entire sample period are repeated from Table 3 for ease of comparison.

	Jun 1966 – Dec 1979		**Jan 1980 – Dec 2003**		**Entire Sample**	
	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded
Intercept	1.26	0.65	1.39	1.09	1.38	0.97
	(2.43)	(1.35)	(4.47)	(3.42)	(5.04)	(3.63)
$R_{i,t-1}$	-8.67	-7.72	-4.96	-4.27	-6.35	-5.58
	(-10.94)	(-11.18)	(-10.44)	(-9.79)	(-15.05)	(-14.69)
Book to Market	0.22	0.18	0.36	0.44	0.25	0.29
	(1.39)	(1.09)	(3.30)	(4.18)	(2.81)	(3.14)
Size	-0.20	-0.04	-0.16	-0.06	-0.18	-0.06
	(-2.46)	(-0.58)	(-3.42)	(-1.46)	(-4.26)	(-1.57)
52 Wk High Loser	-0.30	-0.58	-0.20	-0.62	-0.25	-0.61
	(-1.77)	(-4.14)	(-0.92)	(-3.10)	(-1.68)	(-4.59)
52 Wk High Winner	0.17	0.29	0.46	0.55	0.36	0.46
	(1.72)	(3.37)	(6.79)	(8.05)	(6.44)	(8.60)
Low Leverage	-0.05	-0.03	0.17	0.20	0.08	0.11
	(-0.66)	(-0.34)	(1.78)	(1.98)	(1.26)	(1.60)
High Leverage	-0.05	-0.02	-0.39	-0.33	-0.26	-0.22
	(-0.39)	(-0.18)	(-4.27)	(-3.55)	(-3.52)	(-2.86)
Low O-Score	0.10	0.09	-0.05	-0.06	0.00	-0.01
	(1.20)	(1.03)	(-0.81)	(-0.83)	(0.04)	(-0.20)
High O-Score	0.10	0.01	-0.07	-0.21	-0.01	-0.13
	(0.87)	(0.05)	(-0.72)	(-2.03)	(-0.16)	(-1.67)
Nobs	1730	1730	3174	3174	2615	2615

Table 12.1
Leverage and O-Score by Subperiod
Risk-Adjusted Returns

Each month between June 1966 and December 2003, 12 (j=1,…,12) cross-sectional regressions of the following form are estimated:

$$R_{it} = b_{0jt} + b_{1jt}R_{i,t-1} + b_{2jt}(book_{i,t-1}/mkt_{i,t-1}) + b_{3jt}\,size_{i,t-1} + b_{4jt}\,52wkW_{i,t-j} + b_{5jt}\,52wkL_{i,t-j} + b_{6jt}\,LevH_{i,t-j} + b_{7jt}\,LevL_{i,t-j}$$
$$+\, b_{8jt}\,OscH_{i,t-j} + b_{9jt}\,OscL_{i,t-j} + e_{ijt}$$

where $R_{i,t}$ and $size_{i,t}$ are the return and the market capitalization of stock i in month t; $52wkW_{i,t-j}$ ($52wkL_{i,t-j}$) is the 52-week high winner (loser) dummy that takes the value of 1 if the 52-week high measure for stock i is ranked in the top (bottom) 20% in month t-j, and zero otherwise. The 52-week high measure in month t-j is the ratio of price level in month t-j to the maximum price achieved in months t-j-12 to t-j. The $(book_{i,t-1}/mkt_{i,t-1})$ variable is computed from the book value of equity in the most recent annual financial statements whose closing date is at least six-months prior to month t, and market value of equity at the end of month t-1. The leverage and O-Score dummies are constructed based on highest and lowest 20% rankings by book leverage and O-Score. The accounting variables used to compute book leverage and O-Score are drawn from the most recent annual financial statements whose closing date is at least six-months prior to month t. The coefficient estimates of a given independent variable are averaged over j=1,…,12 for columns labeled (1,12). To obtain risk-adjusted returns, we further run times series regressions within each subperiod of these averages (one for each average) on the contemporaneous Fama-French factor realizations to hedge out the factor exposure. The numbers reported for risk adjusted returns are intercepts from these time-series regressions. They are in percent per month and their t-statistics are in parentheses. Numbers of observations are the same as in Table 11. Results for the entire sample period are reproduced from Table 3.1 for ease of comparison.

	Jun 1966 – Dec 1979		**Jan 1980 – Dec 2003**		**Entire Sample**	
	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded	Monthly return (1,12)	Monthly return (1,12) Jan. excluded
Intercept	0.04	0.04	0.10	-0.07	0.09	-0.01
	(0.62)	(0.56)	(0.98)	(-0.79)	(1.36)	(-0.15)
$R_{i,t-1}$	-7.87	-7.73	-4.76	-4.11	-5.88	-5.47
	(-10.78)	(-11.43)	(-10.04)	(-9.59)	(-14.22)	(-14.55)
Book to Market	0.14	0.14	0.33	0.40	0.22	0.27
	(1.40)	(1.49)	(3.81)	(4.78)	(3.35)	(4.07)
Size	-0.06	-0.02	-0.16	-0.07	-0.13	-0.05
	(-1.35)	(-0.42)	(-3.86)	(-2.01)	(-3.94)	(-1.80)
52 Wk High Loser	-0.53	-0.60	-0.35	-0.72	-0.40	-0.67
	(-4.20)	(-5.12)	(-1.74)	(-4.00)	(-3.03)	(-5.64)
52 Wk High Winner	0.30	0.31	0.58	0.66	0.47	0.52
	(3.47)	(3.85)	(8.73)	(10.02)	-(.93)	(10.18)
Low Leverage	0.03	0.01	0.30	0.34	0.19	0.20
	(0.44)	(0.10)	(3.97)	(4.26)	(3.26)	(3.29)
High Leverage	-0.04	-0.04	-0.50	-0.46	-0.30	-0.27
	(-0.39)	(-0.36)	(-6.81)	(-6.26)	(-4.83)	(-4.33)
Low O-Score	0.12	0.09	0.03	0.02	0.07	0.04
	(1.54)	(1.13)	(0.38)	(0.24)	(1.32)	(0.74)
High O-Score	0.05	0.01	0.00	-0.10	-0.01	-0.09
	(0.45)	(0.05)	(0.02)	(-1.05)	(-0.09)	(-1.30)

Table 13
Comparison of Subperiods Four Factor Model
Fama-French 100 Portfolios

Using monthly data from each of two subperiods, June 1965 to December 1970 and January 1980 to December 2003, time series regressions of the following form are estimated for each of the 100 Fama-French (1993) portfolios:

$$R_{it} = b_{0i} + b_{1i}\, MKT_t + b_{2i}\, SMB_t + b_{3i}\, HML_t + b_{4i}\, LEV_t + e_{it}$$

where R_{it} is the month-*t* excess return to Fama-French portfolio *i*, *MKT*, *SMB* and *HML* are the Fama-French market, size and market-to-book factor realizations, and LEV_t is the leverage factor realization constructed as the difference between the coefficients to the low and high leverage dummies in the month-*t* regression as specified in the first column of Table 3. Panel A reports time-series averages of factor realizations, and averages of positive and negative loadings for each subperiod across all 100 portfolios. Numbers in paranthases indicate the number of portfolios for which the loading is significant. Panel B reports correlations among the factors for the January 1980 to December 2003 subperiod, with *p*-values in parentheses.

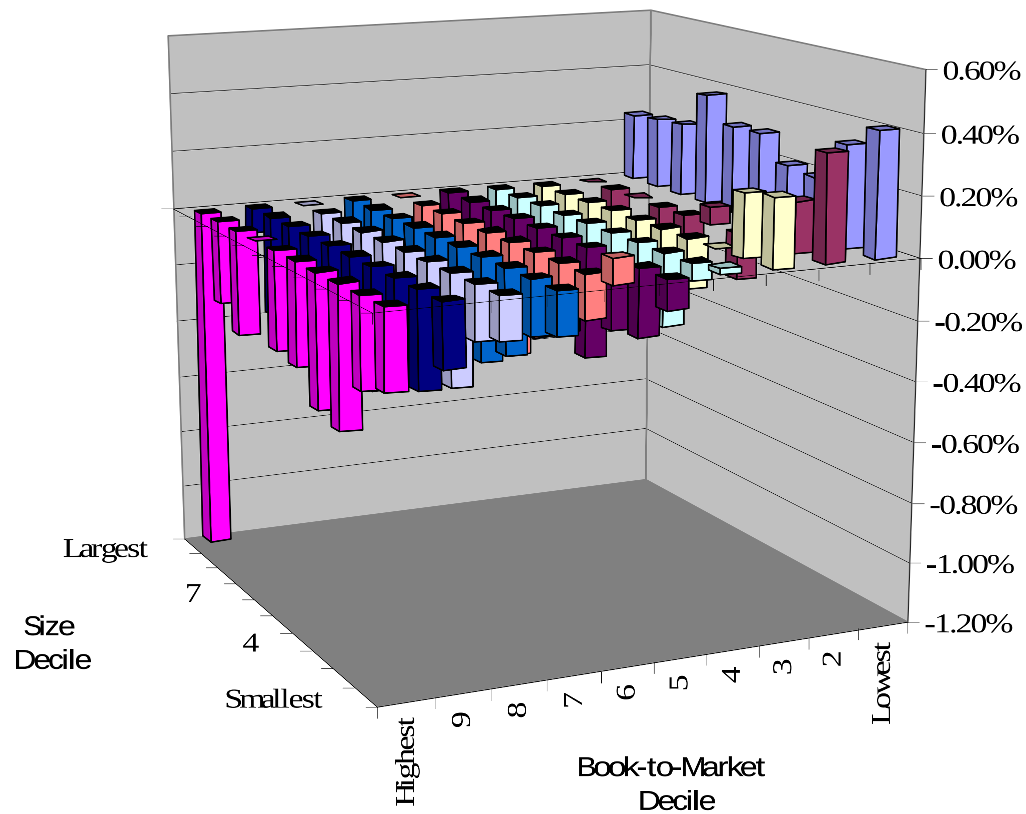
Panel A:

	1966 – 1979			**1980 – 2003**		
Factor	Time-Series Average Realization	Cross-Sectional Ave. Positive Loading	Cross-Sectional Ave. Negative Loading	Time-Series Average Realization	Cross-Sectional Ave. Positive Loading	Cross-Sectional Ave. Negative Loading
MKT	0.12%	1.01 (97)	n.a. (0)	0.61%	1.04 (100)	n.a. (0)
SMB	0.52%	0.69 (83)	-0.25 (7)	0.13%	0.64 (79)	-0.29 (10)
HML	0.46%	0.46 (66)	-0.36 (16)	0.38%	0.42 (66)	-0.42 (13)
LEV	0.07%	0.16 (8)	-0.15 (11)	0.57%	0.17 (11)	-0.26 (53)

Panel B:

	MKT	*SMB*	*HML*	*LEV*
MKT	1			
SMB	0.19 (0.0011)	1		
HML	-0.52 (<.0001)	-0.42 (<.0001)	1	
LEV	0.34 (<.0001)	-0.47 (<.0001)	-0.674 (<0.001)	1

Figure 1
LEV Risk Premium Minus HML Risk Premium



References

Altman, E., 1968 "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy," *Journal of Finance*, 23, 589-609.
.

Anderson, C., and L. Garcia-Feijoo, 2006, "Empirical Evidence on Capital Investment, Growth Options, and Security Returns," *Journal of Finance,* 61, 171-194.

Baker, M. and J. Wurgler, 2002, "Market Timing and Capital Structure," *Journal of Finance,* 57, 1-30.

Berk, J., R. Green and V. Naik, 1999, "Optimal Investment, Growth Options and Security Returns," *Journal of Finance,* 54, 1553-1607.

Brennen, M., and P. Hughes, 1991, "Stock Prices and the Supply of Information," *Journal of Finance*, 46, 1665-1991.

Carlson, M., A. J. Fisher and R. Giammarino, 2006, "Corporate Investment and Asset Price Dynamics: Implications for SEO Event Studies and Long-Run Performance," *Journal of Finance,* 61, 1009-1034.

Campbell, J., J. Hilscher and J. Szilagyi, 2005, "In Search of Distress Risk," Harvard University working paper.

Chava, S., C. Stefanescu and S. Turnbull, 2006, "Modeling Expected Loss with Unobservable Heterogeneity," University of Houston working paper.

Chopra, N., J. Lakonishok and J. Ritter, 1992, "Measuring Abnormal Performance : Do Stocks Overreact?" *Journal of Financial Economics,* 46, 1739-1764.

Cooper, I., 2006, "Asset Pricing Implications of Nonconvex Adjustment Costs and Irreversibility of Investment," *Journal of Finance,* 61, 139-170.

Dichev, I., 1998, "Is the Risk of Bankruptcy a Systematic Risk?" *Journal of Finance*, 53, 1131-1148.
.

Fama, E., 1976, *Foundations of Finance: Portfolio Decisions and Securities Prices,* Basic Books Inc, New York.

Fama, E., and J. MacBeth, 1973, "Risk, Return and Equilibrium: Empirical Tests," *Journal of Political Economy,* 81, 607-636.

Fama, E., and K. R. French, 1993, "Common Risk Factors in the Returns of Stocks and Bonds," *Journal of Financial Economics,* 33, 3-56.

Fama, E., and K. R. French, 1996, “Multifactor Explanation of Asset Pricing Anomalies,” *Journal of Finance*, 51, 55-84.
.

George, T., and C. Y. Hwang, 2004, “The 52-Week High and Momentum Investing,” *Journal of Finance*, 59, 2145-2176.

Gomez, J., L. Kogan and L. Zhang, 2003, “Equilibrium Cross-Section of Returns,” *Journal of Political Economy*, 111, 693-732.

Griffin, J., and M. Lemmon, 2002, “Book-to-Market Equity, Distress Risk, and Stock Returns,” *Journal of Finance*, 57, 2317-2336.

Grinblatt, M., and T. Moskowitz, 2004, “Predicting Stock Price Movements from Past Returns: the Role of Consistency and Tax Loss Selling,” *Journal of Financial Economics*, 71, 541-579.

Hennessy, C. and T. Whited, 2005, “Debt Dynamics,” *Journal of Finance*, 60, 1129-1165.

Hong, H., T. Lim, and J. Stein, 2000, “Bad News Travels Slowly: Size, Analyst Coverage and the Profitability of Momentum Strategies,” *Journal of Finance*, 55, 265-295.

Jegadeesh, N., and S. Titman, 1993, “Returns to Buying Winners and Selling Losers: Implications for Market Efficiency,” *Journal of Finance*, 48, 65-91.

La Porta, R., 1996, “Expectations and the Cross-Section of Stock Returns, “*Journal of Finance,* 51, 1715-1742.

La Porta, R., J. Lakonishok, A. Shleifer, and R. Vishny, 1997, “Good News for Value Stocks: Further Evidence on market Efficiency,” *Journal of Finance*, 52, 859-874.

Leary, M. and M. Roberts, 2005, “Do Firms Rebalance Their Capital Structures?” *Journal of Finance*, 60, 2575-2619.

Merton, R., 1974, “On the Pricing of Corporate Debt: The Risk Structure of Interest Rates,” *Journal of Finance*, 29, 449-470.

Molina, C., 2005, “Are Firms Underleveraged? An Examination of the Effect of Leverage on Default Probabilities,” *Journal of Finance,* 60, 1427-1459.

Ohlson, J., 1980, “Financial Ratios and the Probabilistic Prediction of Bankruptcy,” *Journal of Accounting Research*, 19, 109-131.

Penman, S., S. Richardson, and I. Tuna, 2005, “ The Book-to-Price Effect in Stock Returns: Accounting for Leverage,” Columbia University working paper.

Sais, R. W. and L. T. Starks, “Return Autocorrelation and Institutional Investors,” *Journal of Financial Economics,* 46, 103-131.

Vassalou, M. and Y. Xing, 2004, “Default Risk in Equity Returns,” *Review of Financial Studies,* 24, 831-867.

Whited, T. M. and G. Wu, 2006, “Financial Constraints Risk,” *Review of Financial Studies*, 19, 531-559.

Zhang, L., 2005, “The Value Premium,” *Journal of Finance,* 60, 67-103.

The Cross-Sectionof Expected Stock Returns. EUGENE F. FAMA and KENNETH R. FRENCH*. ABSTRACT.Â We exclude financial firms because the high leverage that is normal for these firms probably does not have the same meaning as for nonfinancial firms, where high leverage more likely indicates distress. The CRSP returns cover NYSE and AMEX stocks until 1973 when NASDAQ returns also come on line. The COMPUSTAT data are for 1962-1989.Â Our asset-pricing tests use the cross-sectional regression approach of Fama and MacBeth (1973). Each month the cross-section of returns on stocks is regressed on variables hypothesized to explain expected returns. Request PDF on ResearchGate | Financial Distress and the Crossâ€section of Equity Returns | We explicitly consider financial leverage in a simple equity valuation model and study the cross-sectional implications of potential shareholder recovery upon resolution of financial distress. Our model is capable of simultaneously explaining lower returns for financially