The Book-to-Price Effect in Stock Returns: Accounting for Leverage*

Stephen H. Penman
George O. May Professor of Accounting
Columbia University - Department of Accounting
3022 Broadway
New York, NY 10027
Ph: 212-854-9151
shp38@columbia.edu

Scott A. Richardson
Assistant Professor of Accounting
1314 Steinberg Hall – Dietrich Hall
Wharton School
University of Pennsylvania, PA, 19104-6365
Ph: 215 898 2063
scottric@wharton.upenn.edu

İrem Tuna
Assistant Professor of Accounting
1312 Steinberg Hall – Dietrich Hall
Wharton School
University of Pennsylvania, PA, 19104-6365
Ph: 215 898 6769
tunaai@wharton.upenn.edu

January 2005

*Preliminary

The Book-to-Price Effect in Stock Returns: Accounting for Leverage

Abstract: We utilize a decomposition of book-to-price (B/P) to understand what drives the positive association between B/P and future stock returns. Given market efficiency, the difference between book value and market value of equity is an accounting construct. Given a particular accounting for net debt, B/P can be decomposed into an enterprise book-to-price (that potentially reflects operating risk) and a financial leverage component (that reflects financial risk), with the differences between the book value and the price of equity attributable to the operating component. Under this accounting, the book-to-price ratio for net debt is unity and the standard measure of "market" leverage – net debt relative to the market value of equity – is economic leverage. The enterprise book-to-price ratio is positively related to subsequent stock returns but, conditional upon the enterprise book-to-price, the financial leverage component is negatively associated with future stock returns. While it is difficult to attribute the result for the enterprise book-to-price to a reward for risk or a mispricing of risk, the result for financial leverage is seemingly perverse: Finance theory rather unambiguously predicts that, given operating risk, investors should be further rewarded for taking on financial risk. We find the opposite. The findings survive under controls for size, estimated beta, and default risk that may be priced in equities. They also survive after a consideration of the accounting for debt under distress, that is, conditions where the book-to-price ratio for debt may not be unity and conditions to which the B/P effect has been attributed in previous research.

The Book-to-Price Effect in Stock Returns: Accounting for Leverage

Fama and French (1992) observe that book-to-price ratios (B/P) are positively correlated with subsequent stock returns, a relation that has come to be known as the book-to-price effect. In response to this empirical regularity, they specify an asset pricing model, in Fama and French (1993, 1996), that includes risk factors identified with B/P, CAPM beta, and the market value of equity (size). The nomination of B/P as a loading on a risk factor is tentative, not only because it is based on empirical analysis rather than theory, but also because the empirical observation can be attributed to market mispricing rather than the pricing of risk; as Fama (1970 and 1998) explains, the interpretation of the B/P effect as rational pricing of risk (market efficiency) or abnormal returns to mispricing (market inefficiency) cannot be resolved without the specification of a model of expected returns.[1]

Researchers have not yet agreed upon such a model. However, one aspect of asset pricing is agreed upon. An elementary notion in finance views equity risk (and expected returns to equity) as determined by operating risk arising from firms' business operations (otherwise called firm risk, enterprise risk, business risk, or asset risk) and financing risk arising from borrowing that leverages equity investment in business operations. While research has not yet identified credible measures of operating risk that are consistent with theory and robustly supported by the data, there is little disagreement about the appropriate measure of leverage and the returns associated with it. Given operating risk, average returns are increasing in leverage, with leverage measured as the market value of debt to the market value of equity (so-called market leverage). The relationship is formalized in Modigliani and Miller (1958), but the notion that borrowing

[1] A number of papers have challenged the Fama and French interpretation of book-to-price as a risk factor. See, for example, Lakonishok, Schleifer and Vishny (1994), Daniel and Titman (1997).

adds risk and return is such a common sense one that any observation to the contrary would be deemed to be anomalous. In this paper we decompose B/P into a component that pertains to operations – and potentially to operating risk – and a leverage component that pertains to financing risk, and bring this elementary notion to bear on the interpretation of the B/P effect.

The difference between the price and book value of equity, P – B, is not affected by leverage if debt is measured at market value on the balance sheet (which in most cases is a reasonable approximation); the difference between price and book value is due rather to the pricing of business operations, and thus any risk indicated by the difference is due to operating risk. However, the ratio, B/P, is affected by both operating and financing activities (we show), and investing in stocks on the basis of their B/P ratios involves buying both operating and financing risk if indeed risk is the explanation of the B/P effect.

The paper decomposes the B/P ratio into components that pertain to operations and leverage. The first – the book value of net operating assets divided by their market value – serves as a proxy for operating risk under the risk explanation of the B/P effect. The second – net debt divided by the market value of equity – is the generally accepted measure of leverage if debt on the balance sheet is measured at market value and market prices are efficient. We find that the operating component is positively related to subsequent stock returns, consistent with both risk and abnormal return explanations. However, given the operating component, the leverage component does not add to average returns. Indeed, leverage is negatively associated with returns, a result that is evident for both high and low B/P ratios. This finding violates a basic understanding of how leverage should be priced, and points to a mispricing of leverage and, by implication, a mispricing of firms' operations.

The paper is motivated by the observation that, given market efficiency, the B/P ratio is intrinsically an accounting phenomenon; that is, on first order, B/P is determined by how accountants measure book value rather than risk. If all assets and liabilities were accounted for using unbiased mark-to-market or "fair value" accounting, B/P ratios would be equal to unity for all levels of risk, (and the B/P ratio could not indicate risk). A pure investment fund where "net asset value" typically equals market value is a case in point, for accountants apply mark-to-market accounting to these funds. Both a risky hedge fund and a money market fund have the same B/P, irrespective of their risk. For most other firms, accountants do not mark the net assets involved with operations to market. The application of historical cost accounting, exacerbated by the application of conservative accounting, introduces a difference between price and book value.[2] Be that as it may, it must be that, if the B/P affect is due to risk, that risk is captured by the application of the accounting. Accordingly, accounting explanations must be brought to the examination of the B/P effect.[3] This paper brings the accounting for financing activities -- where carrying values approximate market value -- to the investigation of the B/P effect.

1. B/P Ratios and Leverage

Balance sheets report assets and liabilities employed in operations and assets and liabilities involved in financing activities. The B/P ratio applies a valuation multiple to the balance sheet

[2] Typically "historical cost" accounting results in price being greater than book value, with more conservative accounting yielding lower B/P ratios. However, in cases where accountants fail, as required under GAAP, to impair (write-off) assets whose value has declined below their carrying values, the accounting can produce higher B/P ratios.

[3] Our perspective thus differs from Fama and French (2004) who apply comparative statics to the residual income model to conclude that B/P, given expected profitability and growth, B/P indicates the discount rate in the residual income formula. But profitability and growth -- accounting constructs that differ under mark-to-market accounting and historical cost accounting, for example – may vary with the discount rate. Indeed, Nissim and Penman (2003), using a residual income framework, indicate that both profitability and growth are related to interest rates. To pursue the example of the investment fund market to market, the expected accounting rate of return varies with risk (for a hedge fund rather than a money market fund, for example).

and thus to both the operating and financing components on the balance sheet. However, the multiple differs for the two types of activities.

The following restates the balance sheet to distinguish operating and financing assets and liabilities:

Balance Sheet

Operations	Financing
OA	FL
OL	FA
	ND
	B
NOA	**ND + B**

The book value of operations is net operating assets (NOA), the difference between assets involved in operations (OA) and liabilities involved in operations (OL). This number is sometimes referred to as the book value of the firm or enterprise book value. The book value of net debt (ND) is the difference between financing liabilities arising from borrowing, (FL) and financial assets (FA) that store excess cash in interest bearing deposits and securities ("cash"). The balance sheet accounting equation equates the book value of equity (B) to the difference between net operating assets and net debt: B = NOA – ND. Net debt can be negative if debt owned is greater than debt owed; that is, the firm is a net creditor rather than a net debtor. Indeed net operating assets can be negative (though rarely) if operating liabilities (trade liabilities such as accounts payable and accrued expense liabilities) are in excess of operating assets (such as inventory, plant and equipment, and recorded goodwill).

Corresponding to the balance sheet equation, the equity price (P) is equal to the difference between the price of the operations (enterprise value) and the price of the net debt:

$$P = P^{NOA} - P^{ND}$$

(This of course recognizes that the market value of the firm is equal to the market value of the equity plus the market value of the net debt.) Accordingly, the difference between equity price and book value is

$$P - B = P^{NOA} - NOA - (P^{ND} - ND).$$

If net debt is carried on the balance sheet at market value, then the difference between the price of equity and book value of equity is due solely to the difference between the price of the operations and the book value of the operations where accountants typically measure net assets at amortized historical cost rather than their market value:

$$P - B = P^{NOA} - NOA$$

The book value of net debt typically approximates its market value. Under FASB Statement No.115, many debt assets are required to be marked to market (though only in the last ten years). Debt liabilities are typically close to market value unless borrowing rates have changed significantly. Supplemental disclosures of the market value of debt, required in the footnotes under FASB Statement No.107, are indeed usually close to carrying values. The approximation is assumed in the application of discounted cash flow methods of valuation, where it is convention to take the book value of debt as its market value (and subtract that book value from the discounted cash-flow valuation for the firm in calculating equity value). For fixed-rate debt, the approximation is suspect if interest rates or credit quality have changed significantly. Our empirical analysis may be affected, so in Section 4 we address this issue.[4]

While the difference between price and book value may not be affected by leverage, the ratio of book value to price, B/P is:

[4] The formulation implicitly assumes that operating and financing activities are separable (they do not generate value jointly), as is standard. Contingent (off-balance) liabilities typically have zero value assigned on the balance sheet, but these usually concern operations. The debt of financial firms (that add value on the spread between borrowing and lending rates) may not be at market value, but our analysis excludes these firms.

$$\frac{B}{P} = \frac{NOA}{P} - \frac{ND}{P}$$

$$= \frac{P^{NOA}}{P} \bullet \frac{NOA}{P^{NOA}} - \frac{ND}{P}$$

If ND is measured at market value, $\frac{P^{NOA}}{P} - \frac{ND}{P} = 1$, so

$$\frac{B}{P} = \left[1 + \frac{ND}{P}\right] * \frac{NOA}{P^{NOA}} - \frac{ND}{P}.$$

Rearranging,

$$\frac{B}{P} = \frac{NOA}{P^{NOA}} + \frac{ND}{P}\left(\frac{NOA}{P^{NOA}} - 1\right) \quad (1)$$

That is, the B/P ratio is a weighted average of the enterprise book-to-price ratio, $\frac{NOA}{P^{NOA}}$ and the book-to-price ratio for financing activities (which is unity), and this weighted average can be expressed in the form of a leveraging equation (1). In buying a unit of B/P, one is buying the unlevered, enterprise B/P, $\frac{NOA}{P^{NOA}}$ (that is due to price being different from book value) along with some leverage (that does not affect the difference between price and book). Effectively one is buying an enterprise B/P and levering the position. So, if expected stock returns associated with the B/P effect are rewards for risk, those rewards are associated with operating risk as measured by $\frac{NOA}{P^{NOA}}$, the first component of (1), and/or additional financial risk determined by "market leverage," $\frac{ND}{P}$ in the second component of (1).

Equation (1) instructs that leverage introduces a non-linear relationship between the (levered) B/P and the enterprise book-to-price. If the enterprise book-to-price ratio is greater than 1.0, the B/P ratio increases in leverage, and the B/P ratio is higher than the enterprise book-to-price if leverage is positive ($ND > 0$), but lower if leverage is negative ($ND < 0$). If the enterprise book-to-price ratio is less than 1.0, the B/P ratio decreases in leverage, and the B/P ratio is lower than the enterprise book-to-price ratio if leverage is positive, but higher if leverage is negative. Accordingly, if one buys a share with B/P > 1.0, one might be buying a share with a relatively high enterprise book-to-price and low (or negative) leverage, or one with a relative low enterprise book-to-price and high leverage. And if one buys a share with B/P < 1.0, one might be buying a share with a relatively high enterprise book-to-price and high leverage or a relatively low enterprise book-to-price with low (or negative) leverage. Indeed, in buying a share with B/P > 1.0 (that Fama and French 1992 report typically yields a higher return in the data), one might be buying a share where enterprise book value is actually less than enterprise price, but leverage is negative. In buying a share with relatively low B/P < 1.0 (that typically yields a lower return in the data), one might be buying a share where enterprise book value is actually greater than enterprise price, but leverage is negative. In short, the analysis begs the question as to the extent to which the B/P effect is a leverage effect or an effect associated with the difference between price and book value due to the accounting for operations.

The formulation articulates the conjecture in Fama and French (1992) that B/P absorbs leverage. In a sense, this is so, but the subtleties of the relationship between B/P and leverage are brought to the fore. Most importantly, the analysis stresses that differences between price and book value do not arise from leverage, and in attributing expected stock returns to differences between price and book, one must distinguish the leverage effect in the B/P ratio from that attributable to the measurement of net assets used in operations.

With respect to attributing the B/P effect to risk or mispricing, the leveraging equation also insists that, for positive net debt, any mispricing of operations in the enterprise book-to-price ratio is levered in the B/P ratio. An underpricing such that the enterprise book-to-price ratio is greater than unity results in an even higher B/P, and an overpricing with the enterprise book-to-price ratio less than unity results in an even lower B/P. A B/P screen is therefore a trading strategy that is particularly effective in identifying mispriced stocks.

Clearly, the size of the enterprise B/P ratio and the amount of leverage purchased with cross-sectionally high or low B/P ratios depends on the correlations between the two in the cross section. We document these correlations in Section 2. If stock returns are explained by a difference between price and book, they should be explained by the enterprise book-to-price, that is, the B/P ratio stripped of the leverage component (that does not involve a difference between price and book value). If the enterprise book-to-price ratio measures operating risk, its relationship with subsequent returns should be positive. Further, if for a given level of enterprise book-to-price, the investor adds the leverage component of B/P, the leverage should add to the expected return if the market is pricing operating risk and financing risk appropriately. We test these predictions in Section 3.

2. Relationships Between Levered and Unlevered B/P Ratios, Market Leverage and Stock Returns

2.1 Data and Calculation of Variables

We obtained our data from two sources. Our financial statement data is from COMPUSTAT and stock returns are from CRSP. Our sample includes all firm-year observations, excluding the financial services industry (SIC codes in 6000-6999), with available data for 1962-2001.

We require the following data items to be available for a firm-year to be included in our analysis: total assets (Compustat data item #6), income before extra-ordinary items (Compustat data item #18), common shares outstanding (Compustat data item #25), book value of common equity (Compustat data item #60), and stock price at the end of the fiscal year (Compustat data item #199). Other variables are set equal to zero if they are missing, but our results are not sensitive to this treatment.[5]

Our variable calculations follow Nissim and Penman (2001). B/P is the book to price ratio, calculated as the ratio of book value of common equity (B) to the market value of common equity (P). B is Compustat's common equity (Compustat data item #60) plus any preferred treasury stock (Compustat data item #227) less any preferred dividends in arrears (Compustat data item #242,), and is measured at the end of the fiscal year. P is the number of common shares outstanding (Compustat data item #25) multiplied by the stock price at the end of the fiscal period (Compustat data item #199). The adjustment for preferred treasury stock and preferred dividends in arrears is necessary to ensure a clean distinction between common equity (to which the price, P applies) and all other financing, but excluding this adjustment does not affect our results.

For the measure of financial leverage, $\frac{ND}{P}$, ND is the difference between financial liabilities (FL) and financial assets (FA). FL is the sum of long term debt (Compustat data item #9), debt in current liabilities (Compustat data item #34), carrying value of preferred stock (Compustat data item #130), preferred dividends in arrears (Compustat data item #242), less preferred treasury stock (Compustat data item #227). FA is cash and short-term investments (Compustat data item #1).[6]

[5] In particular, results were similar when 0.4% of the sample was removed because long-term debt (Compustat item # 9) was not available.

[6] Even though some interest-bearing securities (that might be considered as "excess cash") are included in Compustat Item #32, Investment and Advances-Other, we cannot include these in FA due to data limitations. This COMPUSTAT data item also includes equity securities that are usually part of operations, along with various other items such as long-term receivables. Many (available-for-sale) equity securities are marked to market so, in unreported analyses, we have also measured FA including Compustat Item #32. The results are similar.

The enterprise book-to-price ratio, $\frac{NOA}{P^{NOA}}$, is measured as the ratio of the book value of net operating assets (NOA) to the market value of net operating assets (P^{NOA}). NOA is the sum of book value of common equity and net debt (ND), both as defined above, by the balance sheet identity. Similarly, P^{NOA}, the market value of net operating assets, is the sum of ND and P as defined above.[7]

Firms with negative values for NOA and P^{NOA} are included in our portfolio level analyses but are excluded from our regression analyses. To minimize the influence of outliers, we also delete the extreme percentiles of the following variables in the regression analysis: B/P, ND/P, NOA/P^{NOA}, $B/P - NOA/P^{NOA}$. This yields 132,678 observations for the portfolio analysis and 120,753 observations for the regression analysis.

2.2 Basic Correlations

Panel A of Table 1 reports buy-and-hold returns for 13 portfolios formed by ranking firms each year, 1962-2001 on their (levered) B/P ratios.[8] Returns are size-adjusted to abstract from the so-called "size effect," and include delisting returns. Results using market-adjusted returns are similar. The top (unnumbered) portfolio contains firms with negative book values. Portfolios 1 – 10 are decile groups for firms with positive book values, with the extreme deciles split into two to identify the top and bottom 5 percent, in portfolios 1a and 10b. Returns cover the 12-month period beginning four months after fiscal-year end when accounting data for most firms have

---

[7] Strictly, NOA = B + ND + minority interest and P^{NOA} = P + ND + value of minority interest. The book value of minority interest typically is not carried at market value, so our calculations of NOA and P^{NOA} include minority interest. This is appropriate if minority interest is not carried at market value for we wish ND to contain items whose carrying values are at market value.

[8] The cut-offs for determining portfolios were the deciles from the ranking in the previous year (to avoid any look-ahead bias).

been published.[9] The return numbers in the table are means over those for each year in the sample period.

The difference in returns over portfolios in Panel A confirms the B/P effect. The Panel also shows that (levered) B/P is highly correlated with unlevered, enterprise book-to-price, $\frac{NOA}{P^{NOA}}$; a ranking of B/P is indeed a ranking on the difference between price and book value that pertains to the operating activities. The spread on the enterprise book-to-price is however, smaller than that for B/P; for all non-central portfolios, mean $\frac{NOA}{P^{NOA}}$ is closer to unity than the corresponding B/P. Leverage is the explanation, by construction in leveraging equation (1), for it is clear that high B/P have considerably higher leverage, $\frac{ND}{P}$ than low B/P. In buying a high B/P, one is typically buying a high $\frac{NOA}{P^{NOA}}$ but one is also buying leverage risk. Indeed, the means of B/P - $\frac{NOA}{P^{NOA}}$ in the last column in Panel A, explained by the last term in (1), explicitly make the point.

Panel B of Table 1 documents mean returns associated with different levels of enterprise book-to-price. The first three groups contain firms with negative net operating assets, negative enterprise prices, or both. These firms typically have low B/P (and low leverage) but yield

[9] For firms that are delisted during our future return window, we calculate the remaining return by first applying CRSP's delisting return and then reinvesting any remaining proceeds in the size matched portfolio (where size is measured as market capitalization at the start of the return cumulation period). This mitigates concerns with potential survivorship biases. Firms that are delisted for poor performance (delisting codes 500 and 520-584) frequently have missing delisting returns (see Shumway 1997). We control for this potential bias by applying delisting returns of –100% in such cases. Our results are qualitatively similar if we make no such adjustment. We have replicated our analyses using twelve-month buy-hold returns that start *six* months after the end of the year (i.e. for a December year end firm, our return interval would start on July 1 of the following year). This caters to cases where annual financial reports may not have been published within four months. Our results are virtually identical with this more conservative return window.

relatively high returns, inconsistent with the general tenor of the B/P effect. (The high returns associated with negative enterprise prices are consistent with the common wisdom among fundamental investors that a firm with a stock price less than its net cash is a good "buy".) For firms with positive enterprise prices and book values, it is clear that $\frac{NOA}{P^{NOA}}$ ranks returns in the direction consistent with a book-to-price effect. However, with the exception of extremely high $\frac{NOA}{P^{NOA}}$ in portfolio 10b where leverage is somewhat lower, the returns are also identified with leverage, for leverage is positively correlated with $\frac{NOA}{P^{NOA}}$.

Panel C of Table 1 reports returns to leverage, $\frac{ND}{P}$. Strikingly, there is not a strong association between leverage and average returns, contravening the notion that financing risk should be rewarded with higher return. High leverage portfolios (8 - 10b) have higher returns than portfolios with low but positive leverage (3 - 7), although the differences are not striking, but firms with negative leverage (holding considerable cash) have higher returns than highly levered firms. Mean (size-adjusted) returns for portfolios 8 – 10b are negative, even though these portfolios exhibit high leverage and high enterprise book-to price, both purportedly risk factors that should be rewarded with higher return.

Finally, Panel D of Table 1 reports mean returns associated with the difference between the levered and enterprise book-to-price ratios, B/P - $\frac{NOA}{P^{NOA}}$, that is, the amount by which B/P differs from $\frac{NOA}{P^{NOA}}$ because of leverage, given by the last term in the equation (1). This difference ranks B/P and also ranks returns. However, the difference is not strongly correlated with $\frac{NOA}{P^{NOA}}$ (also evident in Panel B), a correlation that one would expect if the returns ranked here are explained by differences between price and book value rather than leverage. $\frac{NOA}{P^{NOA}}$ is higher for portfolios 10a and 10b, but so is leverage.

We estimate the incremental returns associated with each component of the leveraging equation (1) in the next section. Correlations between the components of course come into play. Some of those correlations are evident in Table 1. As a prelude to the next section, Table 2 provides a complete set of Spearman and Pearson correlation coefficients between B/P, $\frac{NOA}{P^{NOA}}$, $\frac{ND}{P}$, and the leverage component of the B/P ratio, B/P - $\frac{NOA}{P^{NOA}}$. Estimated beta, size [measured as ln(market value of equity)], and both raw and size-adjusted returns are also included. The correlations are reported for $\frac{NOA}{P^{NOA}}$ greater than or equal to one (Panel A) and less than one (Panel B), as dictated by the equation (1). For Spearman correlations we use the full sample of raw data (i.e., no treatment for outliers) consisting of 132,678 firm-year observations. For Pearson correlations we use the reduced sample of 122,371 firm-year observations after truncating outliers (as described in section 2.1). The reported correlations are means of annual correlation coefficients with t-statistics based on the time series variation of these annual estimates.

While the leveraging equation deterministically gives the relationship between B/P and leverage, $\frac{ND}{P}$ for a given firm, the relationship between the two in the cross section depends on the correlation between $\frac{NOA}{P^{NOA}}$ and leverage. For $\frac{NOA}{P^{NOA}} \geq 1$ the correlation between B/P and leverage positive -- 0.263 Spearman correlation and 0.315 for the Pearson -- as equation (1) suggests, but the negative correlation between $\frac{NOA}{P^{NOA}}$ and leverage means that that leverage effect is smaller the higher is $\frac{NOA}{P^{NOA}}$. Accordingly the correlation between B/P and B/P - $\frac{NOA}{P^{NOA}}$ is high while that between $\frac{NOA}{P^{NOA}}$ and B/P - $\frac{NOA}{P^{NOA}}$ is low. While equation (1) indicates that leverage reduces the B/P ratio relative to the enterprise book-to-price ratio if the enterprise ratio is less than one, the rank correlation between B/P and leverage for $\frac{NOA}{P^{NOA}} < 1$ is positive (0.127 Spearman and 0.108 Pearson). This is explained by the positive correlation between $\frac{NOA}{P^{NOA}}$ and leverage. Overall in Table 2, the correlations between B/P and B/P - $\frac{NOA}{P^{NOA}}$ indicate that, because of the interaction between $\frac{NOA}{P^{NOA}}$ and $\frac{ND}{P}$ in the leveraging equation (1), the more extreme the B/P, high or low, the more the B/P is explained by leverage.[10]

3. Decomposing Book-to-price and Leverage Effects in Stock Returns

3.1 Decomposing Returns

The notion that stock returns reward operating and financing risk can be formalized in a way that incorporates the leverage measure, $\frac{ND}{P}$. By the cash conservation equation, $d = FCF - F$ in every period, where d is (net) dividends to shareholders, FCF is free cash flow from operations

[10] Fama and French (1992) and Rajan and Zingales (1995) report positive correlations between B/P and leverage (variously measured), but without conditioning on the enterprise book-to-price ratio.

and F is (net) cash paid to net debtholders. Accordingly, if net debt is measured at market value such that $P = P^{NOA} - ND$, the expected stock return for period t+1is

$$E\left[P_{t+1} + d_{t+1} - P_t\right] = E\left[(P_{t+1}^{NOA} + FCF_{t+1} - P_t^{NOA}) - (ND_{t+1} + F_{t+1} - ND_t\right]$$

That is, the expected return to equity is equal to the expected return for operations (the enterprise return) minus the expected return to the net debt holders. The expected equity rate of return is thus given by

$$E\left[\frac{P_{t+1} + d_{t+1} - P_t}{P_t}\right] = \frac{P_t^{NOA}}{P_t} E\left[\frac{P_{t+1}^{NOA} + FCF_{t+1} - P_t^{NOA}}{P_t^{NOA}}\right] - \frac{ND_t}{P_t} E\left[\frac{ND_{t+1} + F_{t+1} - ND_t}{ND_t}\right]$$

That is, as $\frac{P_t^{NOA}}{P_t} - \frac{ND_t}{P_t} = 1$, the expected equity return is a weighted average of the expected return to operations and the expected return to net debt.[11] Denoting rates of return for equity, the enterprise, and debt as R, R^{NOA}, and R^{ND}, respectively, it follows that leverage adds to expected equity returns, as follows:

$$E\left[R_{t+1}\right] = E\left[R_{t+1}^{NOA}\right] + \frac{ND_t}{P_t} E\left[R_{t+1}^{NOA} - R_{t+1}^{ND}\right] \qquad (2)$$

This formulation is, of course, the standard WACC formula, but the derivation is replicated here to show that this weighted average can be expressed as a leveraging equation (2) similar in form to (1) (which is a statement that B/P is a weighted average of the enterprise book-to-price ratio and the book-to-price ratio of unity for net debt).

3.2 Stock Returns and the Decomposition of the B/P Ratio

Pairing the equity return equation (2) with the B/P leveraging equation (1), it is clear that, if B/P is a risk measure that indicates expected equity returns, it imbeds operating risk, indicated by

[11] Note that, given the effective interest accounting method for net debt, cash flows to debt holders, F, reduce the book value of net debt dollar for dollar; thus $E[ND_{t+1} + F_{t+1}]$ and the expected return to debt is not affected by cash flows to debt holders.

$\frac{NOA_t}{P_t^{NOA}}$, that pertains to $E\left[R_{t+1}^{NOA}\right]$, and a leverage component, $\frac{ND_t}{P_t} \times \left[\frac{NOA_t}{P_t^{NOA}} - 1\right]$ that pertains to the return premium for financing risk, $\frac{ND_t}{P_t} \times E\left[R_{t+1}^{NOA} - R_{t+1}^{ND}\right]$. Stock rates of return and B/P ratios are denominated in the same beginning-of-period price. We examine how decomposed book values, denominated in price, explain forward stock returns.

With the pretense that enterprise book-to-price is a risk factor we specify a regression equation,

$$R_{t+1} = \alpha + \lambda_1 \frac{NOA_t}{P_t^{NOA}} + \lambda_2 \frac{ND_t}{P_t} + \cdots + \varepsilon_t$$

where the ellipsis indicate omitted, unidentified firm characteristics other than $\frac{NOA}{P^{NOA}}$ that load on factors that pertain to operating risk. One can imagine a well-specified model that includes these characteristics but, in absence of a credible asset pricing model, inclusion of such characteristics – with perhaps the exception of beta – is arbitrary. Indeed, the inclusion of $\frac{NOA}{P^{NOA}}$ is speculation. In contrast, inclusion of leverage is justified by leveraging equation (2).

Given the risk explanation for the B/P effect, λ_1 and λ_2 are predicted to be positive. Table 3 reports results from estimating annual cross-sectional raw return-regression equations that include $\frac{NOA}{P^{NOA}}$ and $\frac{ND}{P}$, along with other measures that appear in popular empirical pricing models. Regressions exclude firms with negative net operating assets and negative enterprise prices (for which mean returns are reported in Table 1).[12] Independent variables are truncated at the 1st and 99th percentile, but results are not particularly sensitive to this cutoff. Estimates are

[12] Results in Table 3 are similar for size-adjusted returns.

made for each year in the sample period with means over years reported in the table, along with t-statistics (in parentheses) estimated from the time-series of coefficients. Results are reported for the full sample in Panel A and for $\frac{NOA}{P^{NOA}}$ greater than or equal to and less than one in Panels B and C. The B/P effect is confirmed by regression I. When $\frac{NOA}{P^{NOA}}$ is alone in regression II, it yields a positive mean coefficient, consistent with a risk explanation but also consistent with market mispricing. When leverage, $\frac{ND}{P}$ is alone in regression III, the mean estimated coefficient is not significantly different from zero in all three panels and negative in Panels B and C. This is surprising, given leverage adds to expected return, but could be explained by a negative correlation between leverage and operating risk. Indeed, for $\frac{NOA}{P^{NOA}} > 1$, leverage and $\frac{NOA}{P^{NOA}}$ are negatively correlated in Table 2. However, for $\frac{NOA}{P^{NOA}} < 1$, the two are positively correlated, yet leverage does not explain cross-sectional differences in returns.

This result is striking. Further, with both $\frac{NOA}{P^{NOA}}$ and $\frac{ND}{P}$ in regression V (and hence a control for supposed operating risk), the coefficient on the leverage variable is negative in all three panels and significantly less than zero in Panels A and C after partitioning on $\frac{NOA}{P^{NOA}}$ less than unity.[13] Regression VII splits net debt into financial liabilities (FL) and financial assets (FA) and reports that, again contrary to expectation, the coefficient of financial liabilities (debt) is negative, while that on financial asset is positive (in all three panels). $\frac{FA}{P}$ has the appearance of a

[13] Results are similar with the natural logarithm of the two variables in the regression.

risk measure, like $\frac{NOA}{P^{NOA}}$, but contrary to intuition. The results after including the difference between the levered B/P and the enterprise book-to-price in regression VI add to the mystery. For all firms pooled in Panel A, this leverage component of B/P is positively correlated with returns, after controlling for $\frac{NOA}{P^{NOA}}$ in the regression. This has the appearance of a reward to leverage. However, for $\frac{NOA}{P^{NOA}} > 1$, the difference between B/P and $\frac{NOA}{P^{NOA}}$ is increasing in leverage, by equation (1), but the coefficient on the difference is not significantly different from zero. As the difference is determined by a multiplicative interaction between $\frac{NOA}{P^{NOA}}$ and $\frac{ND}{P}$, one would expect a positive return association if this interaction were between two risk factors. For $\frac{NOA}{P^{NOA}} < 1$, the difference is decreasing in leverage but the coefficient is positive. Leveraging equation (1) indicates that any B/P effect in returns is, in part, a reward to leverage as well as an effect associated with the difference between price and book value.

These results indicate that the leverage portion of the B/P ratio is not priced according to standard precepts. The result contradicts a basic understanding in finance, expressed in leveraging equation (2): given operating risk, leverage adds to expected returns. The result could be due to leverage being correlated with unidentified characteristics that load on (unidentified) risk factors. The results for regression VIII in Table 3, with beta and ln(Size) in the regression, do not support this: The coefficient on leverage is still negative.[14] But, of course, we have not

[14] Bhandari (1988) reports a positive relationship between return and debt-to-equity price in cross-sectional regressions that include beta and size, estimated from 1948-81. However, the positive association is largely observed in years prior to 1966, not in the years that also cover our sample period. This calls into question whether our results (or his) are period specific. Ang and Chen (2004) find that the B/P effect is not evident prior to 1960, but beta does explain returns.

identified all operating risk factors.[15] Note, however, the results in Table 3 are also observed within industries identified using the Fama and French (1997) industry classification scheme. In unreported analyses we repeated the regression analysis in table 3 averaging coefficients across the 1,068 industry-year groupings and find very similar results. To the extent that operating risk is similar within industries, our results are thus not sensitive to this measure of operating risk.

For an investigation of possible nonlinearities, Panel A of Table 4 reports mean returns for portfolios formed on joint realizations of $\frac{NOA}{P^{NOA}}$ and $\frac{ND}{P}$. The returns here are size-adjusted, to subtract any size effects. Within each of the ten $\frac{NOA}{P^{NOA}}$ portfolios formed in Panel B of Table 1, stocks are assigned each year to five portfolios from a ranking on $\frac{ND}{P}$. The book-to-enterprise price effect is evident within each leverage quintile, but it is the returns over the leverage quintiles that we are most interested in. For all $\frac{NOA}{P^{NOA}}$ portfolios, the $\frac{ND}{P}$ quintile numbers rank returns inversely and almost always monitonically. Mean differences between returns for the highest and lowest leverage quintile portfolios are negative, with t-statistics less than –2.00, except for portfolio 10 with the highest enterprise book-to-price ratios. Even adjusting for multiple comparisons in interpreting the t-statistics in the table, it appears that the inverse leverage effect in returns is evident over almost the full range of enterprise book-to-price ratios. The mean (size-adjusted) return from investing long in the portfolio representing the lowest leverage quintile within $\frac{NOA}{P^{NOA}}$ portfolio 10 and shorting the highest leverage quintile with in

[15] The result could also be due to a long run of positive outcomes for highly levered firms during the sample period, such as higher unanticipated inflation.

$\frac{NOA}{P^{NOA}}$ portfolio 1 is 23.2%. This is considerably greater than the mean 12.7% return from investing long and short in the highest and lowest $\frac{NOA}{P^{NOA}}$ portfolios (portfolios 10 and 1 in Panel B of Table 1), as a t-statistic of 3.95 on the comparison of the two returns indicates.

Panel B of Table 4 repeats the portfolio formation procedure, but now with stocks grouped, within each $\frac{NOA}{P^{NOA}}$ portfolio, into five portfolios from a ranking on (levered) B/P rather than leverage. By leveraging equation (1), leverage yields a higher B/P for a given $\frac{NOA}{P^{NOA}} > 1$ (portfolios 8 – 10), and thus one expects a higher return, the higher the B/P, as a reward to leverage. Correspondingly, for $\frac{NOA}{P^{NOA}} < 1$ (portfolios 1 – 7) leverage yields a lower B/P for a given $\frac{NOA}{P^{NOA}}$, thus one expects a higher return, the lower the B/P. However, the mean (size-adjusted) return differences between the high and low B/P portfolios are not significantly different from zero for portfolios 8 – 10 in Panel B and positive for portfolios 1 – 7. The B/P effect in stock returns indeed includes a leverage effect, but in a seemingly perverse way. Leveraging equation (1) suggests that, if the returns reflect reward to operating and financing risk, a relatively high return should be associated with the portfolio containing the highest $\frac{NOA}{P^{NOA}}$ and the highest B/P (where the leverage is highest), and a relatively low return with the portfolio containing the lowest $\frac{NOA}{P^{NOA}}$ and highest B/P (where leverage is lowest). However, the difference between returns for high and low $\frac{NOA}{P^{NOA}}$ portfolios within the high B/P portfolio is only 3.6% (with a t-statistic of 0.74) while the corresponding return within the low B/P portfolio is 21.4% (with a t-statistic of 5.70). Indeed, the differences in returns between high and low $\frac{NOA}{P^{NOA}}$ portfolios are decreasing over B/P groups rather than increasing. The observations modify the Fama and French view that B/P effect subsumes leverage effects and shows that, to the extent that is the case, the form is different from what one usually has in mind.

Finally, Panel C of Table 4 shows that, by first ranking on (levered) B/P and then (within B/P portfolios) on leverage, returns to investing on the basis of B/P improve by identifying the leverage component of B/P. However, one earns a discount for leverage, not a premium: The higher the amount of leverage purchased within each B/P portfolio, the lower the return.[16]

In sum, while Panel C of Table 1 indicates that market leverage has a low correlation with stock returns in the cross section (unconditionally), there is significant correlation conditional upon and orthogonal to the enterprise book-to-price ratio. However, this correlation is negative. The explanation that the leverage loads negatively on an unidentified risk factor must be entertained, as must the conjecture that leverage corrects for measurement error in the enterprise book-to-price as a proxy for firm's exposure to common returns. One could also conceive of leverage as a risk attribute. But such an explanation requires leverage to load inversely on an unidentified factor such that, when the factor loading is low, leverage is high and vice versa. These explanations seem a little implausible. Alternatively, one can attribute the leverage result to market inefficiency, the alternative explanation for the B/P effect. Market price, in the denominator of $\frac{NOA}{P^{NOA}}$ also denominates the "market" leverage measure, $\frac{ND}{P}$. If the

[16] In each panel of Table 4, the ranking in the second stage (to form the five quintiles) will involve a sorting on the first-stage ranking variable if the two ranking variables are correlated within portfolios. Accordingly, returns over the five quintiles could, in part, reflect returns to the first ranking variable. The Table 3 results do not suggest this is a serious problem, as there we control for these correlations in a multiple regression framework. To check, however, we repeated the analysis by subtracting, from each stock's size-adjusted return, the mean size-adjusted return on a portfolio of which the stock was a member, formed from the first ranking variable divided into 50 equal-sized portfolios. Results were similar.

market misprices enterprise book values, it also renders a measure of market leverage such that high (low) leverage overstates (understates) actual leverage, causing high (low) measured leverage to be associated with lower (higher) stock returns than one would expect given intrinsic financing risk.[17] The result is consistent with evidence that almost any accounting number denominated in price – earnings, EBIT, sales, book value, enterprise net assets – predicts stock returns. We return to the issue in Section 4.

3.3 A Parallel Investigation Separating Net Debt from Price

With the suggestion that the leverage result may be due to the denomination in inefficient prices, Table 5 investigates net debt with a control for price. The price of equity -- commonly referred to as size -- is a variable, beside B/P that robustly predicts stock returns. Regression I in Table 5 (using all firms in the cross section) shows that the size effect is (weakly) supported in our data. Size (ln(P)), like B/P, can be broken down into an unlevered component and a leverage component: $P = P^{NOA} - ND$ (if net debt is carried at market value). Accordingly, regression II in Table 5 includes enterprise value, $\ln(P^{NOA})$ and ln(ND). This separates net debt from price, but also seems to us to be a more natural way to specify size and to evaluate the size effect: Size is determined by the enterprise and netting in debt that (in theory) is associated with higher expected returns confounds the size effect (that is a negative relationship with returns).

With the unlevering of size, the size effect is clearly still evident in the results for regression II, indeed emphatically. However, the mean coefficient on net debt – without the deflation by price – is now positive, indicating a premium for financing risk: Firm size – pertaining to operations -- yields a return premium (inversely), but levering firm value with debt

[17] In an investigation of returns around changes in leverage from exchanges of debt and equity, Korteweg (2004) infers that the reward to leverage in the market is too low and documents a profitable trading strategy involving firms with extreme leverage.

adds an additional premium to the equity return, consistent with leveraging equation (2). In untabulated analysis, the finding does not change when estimated beta is added to the regression (and the mean coefficient on beta is not significantly different from zero). The return to size, of course, could be a reward to risk but also due to inefficient prices. Notwithstanding, delinking net debt from (possibly inefficient) prices yields a result consistent with theory.

Introducing ln(NOA) and $\frac{NOA}{P^{NOA}}$ in regressions III and IV in Table 5 flips the sign on net debt: Given enterprise price, adding enterprise book value further predicts returns and results in a negative conditional correlation between leverage and returns, as in Tables 3 and 4. So it is apparent that the negative coefficients on $\frac{ND}{P}$ in Table 3 are evident after conditioning on the book value of operations relative to price.

In sum, equity price is the difference between the price of operations and the price of net debt. Net debt, as measured, is positively correlated with returns after controlling for the price of operations, as theory suggests. However, holding constant net operating assets relative to the price of operations, stock returns are decreasing in leverage. This seemingly odd finding requires explanation, and we explore those explanations further in Section 4. However, we first investigate whether the positive relationship between leverage and returns, predicted by theory, is evident in the fundamentals.

3.4 A Parallel Investigation with Fundamental Rates of Return

This section shows that book rate of returns are increasing in leverage, both in theory and the data. The one-year-ahead book rate of return on equity, the accounting equivalent to the stock rate of return, is $ROCE_{t+1} = \frac{Earn_{t+1}}{B_t}$, that is earnings relative to the book value of equity.

Earnings is income from operations (enterprise income) less net interest (interest expense minus interest income) from net debt: $Earn = OI - i$. As B = NOA – ND, it follows that,

$$E[ROCE_{t+1}] = E\left[\frac{Earn_{t+1}}{B_t}\right] = E\left[\frac{OI_{t+1} - i_{t+1}}{NOA_t - ND_t}\right]$$

$$= \frac{NOA_t}{B_t} E\left[\frac{OI_{t+1}}{NOA_t}\right] - \frac{ND_t}{B_t} E\left[\frac{i_{t+1}}{ND_t}\right]$$

$$= E[RNOA_{t+1}] + \frac{ND_t}{B_t} E[RNOA_{t+1} - NBC_{t+1}] \qquad (3)$$

This leveraging equation is of the same form as leveraging equation (2) and indeed (1).[18] The expected book rate of return is equal to the expected enterprise return, $RNOA_{t+1} = OI_{t+1}/NOA_t$ plus a premium for leverage given by the amount of book leverage, $\frac{ND_t}{B_t}$ and the expected spread between $RNOA_{t+1}$ and the net borrowing cost, $NBC_{t+1} = i_{t+1}/ND_t$.

Unlike stock rates of return, past book rates of return forecast future book rates of return (see Freeman, Ohlson and Penman 1982 and Fama and French 2000): $RNOA_t$ forecasts one-year-ahead $RNOA_{t+1}$. Given this forecast, equation (3) says that leverage should additionally forecast one-year-ahead $ROCE_{t+1}$. We estimated the following cross-sectional regression separately for firms with $RNOA_t \geq NBC_t$ and firms with $RNOA_t < NBC_t$.[19]

$$ROCE_{t+1} = a + b_1 RNOA_t + b_2 \frac{ND_t}{B_t} + e_t$$

[18] The equation requires a slight modification where there is a minority interest, but the adjustment is typically small. See Penman (2004, p. 359).

[19] ROCE is before extraordinary and special items. RNOA and NBC are calculated with an allocation of taxes between operating income and net interest. Net interest in the NBC calculation is interest expense minus interest income on financial assets, multiplied by (1 – tax rate), plus preferred dividends. Interest income on financial assets (not readily identifiable on Compustat) was calculated by applying the t-bill rate to the average cash and cash equivalents (Compustat #1) for the relevant year. The tax rate was set as the Federal rate for the year plus a state tax rate of 2%.

When $ROCE_{t+1}$ is regressed on book leverage, $\frac{ND_t}{B_t}$ alone, with all firms pooled, the mean coefficient on leverage is negative (-0.022 with a t-statistic of -4.97). However, just as $\frac{NOA}{P^{NOA}}$ and $\frac{ND}{P}$ are negatively correlated in the cross section for $\frac{NOA}{P^{NOA}} \geq 1$, so are $RNOA_t$ and $\frac{ND_t}{B_t}$. Controlling for $RNOA_t$ in the regression, the mean coefficient on $\frac{ND_t}{B_t}$ is reliably positive for firms with $RNOA_t \geq NBC_t$ (0.023 with a t-statistic of 8.10), in contrast to the coefficient on $\frac{ND_t}{P_t}$ with the control for $\frac{NOA}{P^{NOA}}$ in stock return regression III in Table 3. Further, the mean coefficient on $\frac{ND_t}{B_t}$ is negative (-0.040 with a t-statistic of -7.87) for firms where $RNOA_t < NBC_t$, appropriate for the case of unfavorable leverage.[20]

In short, the relationship between book leverage and book return on equity is as prescribed: After controlling for operating profitability, leverage adds to expected returns, provided the leverage is favorable. In contrast, the relationship between market leverage and the stock return is perverse (if enterprise book-to-price is a risk factor): after controlling for a risk factor to do with operations, leverage reduces expected stock returns.

4. Accounting for Leverage

It is common to measure financial leverage as the book value of debt relative to the market value of equity. The measure assumes that net debt is carried on the balance sheet at its value and, of course, that market prices are efficient estimates of the value of equity. Our attribution of the

[20] The coefficients on RNOA are positive, with t-statistics in excess of 12.0.

difference between price and book value to operating rather than financing aspects of the balance sheet maintains this assumption, as do the derivations of leveraging equations (1) and (2). In the empirical analysis, the calculation of $P^{NOA} = P + ND$ also invokes the assumption. The book value of debt always equals its value at origination; however, for fixed-rate debt, market value moves away from book value if the required return on the debt changes, due to changes in interest rates, changes in credit risk, or changes in the price of credit risk.

At issue, of course, is an explanation for why leverage, as measured as $\frac{ND}{P}$, is negatively correlated with returns. That negative correlation could be induced, either by mismeasurement of ND (the numerator) or inefficient prices (in the denominator). The negative correlation is conditional upon enterprise book-to-price, $\frac{NOA}{P^{NOA}}$, calculated as $\frac{NOA}{P+ND}$. If, for a given level of $\frac{NOA}{P^{NOA}}$, ND is too high, the enterprise book-to-price is understated. Accordingly, if $\frac{NOA}{P^{NOA}}$ is a risk characteristic, $\frac{ND}{P}$ should identify that mismeasurement and thus, conditional upon $\frac{NOA}{P^{NOA}}$, be positively correlated with returns (and similarly for cases where ND is too low). This is not what we find. If, on the other hand, ND is a reasonable approximation to the value of debt and prices are inefficient (so that $\frac{NOA}{P^{NOA}}$ predicts abnormal returns), one can entertain the notion that, for a given $\frac{NOA}{P^{NOA}}$, ND denominated in price also predicts abnormal returns: $\frac{NOA}{P^{NOA}}$ predicts returns but if, in addition, ND is low relative to price, future abnormal returns are predicted.

Thus both the conjecture that the measure, $\frac{ND}{P}$ mismeasures the value of net debt and the conjecture that that price misvalues the equity, point to a market inefficiency explanation for the results, for those results are certainly inconsistent with the theory of the pricing of leverage if ND appropriately measures the value of debt and prices are efficient.

However, one cannot not rule out the possibility that $\frac{ND}{P}$, as measured, proxies for risk in a seemingly perverse way. Default risk, if priced, has bearing on the interpretation of $\frac{ND}{P}$ as market leverage: ND is likely to overstate the value of debt in the case of high default risk because the debt has not been marked down to market. Indeed, Fama and French attribute the pricing of high B/P firms to a distress factor that could well reduce the value of a firm's outstanding debt below its book value. Accordingly we investigate the relationship between $\frac{ND}{P}$ and default risk and how they jointly predict returns. But first, we ask whether changes in interest rates (that also move the value of debt away from its book value) affect our results.

4.1 Measured Market Leverage and Interest Rates

To examine the robustness of results over periods with varying interest rates, we identified each year in the sample period, 1962-2001 as a high, medium, or low interest rate period, with 13 or 14 years for each group. Interest rates are those on the ten-year Treasury note, as reported on the Federal Reserve Bank web site. We then repeated the analysis in Table 3 for each period.

The conditional, negative coefficient on market leverage was observed in all three interest-rate regimes. For example, for the full sample, the mean estimated coefficients (and t-statistics) on enterprise book-to-price in regression V in Table 3 were 0.103 (3.05), 0.103 (3.88), and 0.156 (3.70) for the high, medium and low interest rate periods, respectively, while those on $\frac{ND}{P}$ were -.016 (-2.38), -.015 (-1.26), and -0.042 (-1.68). (The t-statistics are based on only 13 or 14 observations.) For regression VIII in Table 3 (with controls for size and beta), the respective coefficients on $\frac{ND}{P}$ were –0.146 (-2.43), -0.016 (-1.57), and –0.042 (-1.96). In both cases, the t-statistics are based on only 13 or 14 observations. While there is some suggestion that the correlation is more strongly negative in low interest rate period, our basic finding appears robust to interest rate regime.[21]

4.2 Measured Market Leverage and Default Risk

Our results, thus far, do not suggest default risk as a missing factor in our accounting for leverage. To the contrary, the $\frac{ND}{P}$ measure, while possibly misstating market leverage, will incorporate default risk: If default risk is priced in equities, $\frac{ND}{P}$ increases as equity prices decline (to price the risk), so a higher measure should indicate higher expected returns, opposite to what we observe. The Pearson correlation between the Altman (1968) Z-score, transformed into an estimate of the probability of bankruptcy, and $\frac{ND}{P}$ in our data is 0.539, and much the same for $\frac{NOA}{P^{NOA}} > 1$ and $\frac{NOA}{P^{NOA}} < 1$. Griffin and Lemmon (2002) also find that market leverage is positively correlated with Ohlson (1980) O-scores that also measure the likelihood of bankruptcy. If default risk is priced to yield higher returns and is associated primarily with high book-to-price firms, our results cannot be explained by a failure to account for default risk. First, the observed correlation between leverage and returns applies to all levels of book-to-price, and the correlation with returns is negative while that with default scores is presumably positive.

Previous research, however, gives some pause. Griffin and Lemmon (2002) document that default risk is not confined to high B/P firms: More firms in the top O-score quintile in the

[21] The analysis is not entirely satisfactory. Differences between the book value and market value of debt are induced by changes in interest rates after the date that debt is booked, not levels of interest rates. However, with the data sources at hand, one cannot identify the date at which debt is booked.

cross section have low B/P rather than high B/P. Dichev (1998) also reports low correlation between B/P and both O-Scores and Altman Z-scores. Accordingly, distress may be associated with the full range of book-to-price ratios over which our negative market leverage effect is observed. So, given that bankruptcy probability scores and $\frac{ND}{P}$ are positively correlated, then the negative association between $\frac{ND}{P}$ and returns in Table 4 – over the full range of enterprise book-to-price – might be explained if there were a negative correlation between default risk and returns (whatever the reason). Some evidence does point to a negative correlation. Fama and French (2004) report a negative correlation between bankruptcy risk and returns, and Campbell, Hilscher and Szilagyi (2004) find that high distress stocks earn lower returns. Piotroski (2000) finds that, within high B/P stocks, those with lower financial health, as measured, earn lower returns while Mohanram (2005) finds that within low B/P stocks, those with weak growth attributes earn lower returns. The measures of distress or health in some of these studies are ad hoc, and indeed the evidence regarding the correlation with returns is mixed. Dichev (1998) reports that both high and low O-scores are associated with relatively low returns, suggesting that default risk is not a systematic risk factor. Griffin and Lemmon (2002) report a negative correlation between O-scores and returns within low B/P stocks, but a (slight) positive correlation within high B/P stocks. Vassalou and Xing (2004), using Black-Scholes-Merton (BSM) indicators of default probability, insist that default risk is systematically (and positively) priced.[22] Finally, Ng (2005) reports that Altman Z-scores, O-Scores and BSM indicators are positively correlated with returns, after controlling for size and B/P. Most pertinent to our results

[22] The Black-Scholes-Merton measure potentially uses more information than the O-score and Z-score measures that are limited to accounting information. However it is based on equity prices, introducing some concern if inefficient prices are conjectured.

is the finding in both Griffin and Lemmon and Vassalou and Xing that particularly high returns are associated with a combination of high B/P and high default probability, yet our results in Table 4 indicate that, although $\frac{ND}{P}$ is strongly correlated with default scores, high returns are associated with high B/P and low $\frac{ND}{P}$ (and particularly low returns with low B/P high $\frac{ND}{P}$).

Clearly, there is some sorting out to do. The first regression in Table 6 (labeled regression 0) shows that, in our sample, returns are positively related to default risk, Pr(Z), measured by Altman's Z-score transformed into a probability, for the full sample (Panel A) and for cases where $\frac{NOA}{P^{NOA}} \geq 1$ (Panel B) and $\frac{NOA}{P^{NOA}} < 1$ (Panel C).[23] However, the correlation is not strong. One cannot be sure of the interpretation of this finding – risk or abnormal return – but the remainder of the table reports that the results of regressions in Table 3 survive with a control for the default measure. In particular, $\frac{NOA}{P^{NOA}}$ is positively correlated with returns and, conditional upon $\frac{NOA}{P^{NOA}}$, market leverage (as measured) is negatively correlated. If the default measure captures risk that is priced in equity, the leverage result is not due to omission of this risk factor. Nor is it due to error in $\frac{NOA}{P^{NOA}}$ or $\frac{ND}{P}$ proxying for a risk attribute captured by the default measure. If the return to the default measure is due to mispricing, $\frac{ND}{P}$ further predicts returns.

[23] The Z-score is converted to a probability estimate as follows: $Pr(Z) = e^Z/(1+e^Z)$. See Hillegeist, et al. (2004). We repeated the analysis using Ohlson O-scores, but results varied with the coefficient estimates we used. Results were similar to those here using the updated Ohlson model coefficients in Begley, Ming and Watts (1996). However, there was little association with returns when we used the Ohlson model coefficients updated by Hillegeist, et. al. (2004). The estimates from later years involve look-ahead bias when imposed on our data for earlier years. The results with respect for leverage were similar when we applied the original Altman coefficient estimates rather than the Hillegeist, et. al. estimates, although the Pr(Z) measure was no longer significant.

Indeed, most of the coefficients on Pr(Z) are no longer significant while those on $\frac{ND}{P}$ for regression III, compared with Table 3, are more so: Controlling for default risk, the correlation between returns and leverage is even more pronounced.[24] Earlier research documenting a negative correlation between default risk and returns may be due to a positive correlation between default scores and leverage.

Table 7 repeats regressions in Table 5 with the addition of the default score. The significant, positive coefficients on the default score now survive with variables from Table 5 included. It is clear from the regression II result in Table 7 that the default score captures much of the information in the amount of debt, ln(ND) for which a positive mean coefficient was observed in Table 5. That coefficient is now reliably negative: Given enterprise size, $\ln(P^{NOA})$ and default risk, the amount of debt is negatively related to returns. Again, the seemingly anomalous result for leverage survives in regressions III and IV that introduce net operating assets.

Table 8 repeats selected regressions in Table 3 after partitioning firms on the probability of default implied by Z-scores. This partitioning serves two purposes. First, Griffin and Lemmon (2002) and Vassalou and Xing (2004) indicate that the B/P effect in returns is most pronounced in the top two quintiles of firms ranked on default scores, begging the question as to whether our results are particular to those groups. Second, the partitioning selects firms into groups where ND is more or less likely to deviate from the value of debt and thus $\frac{ND}{P}$ is more suspect as a measure of financial leverage -- with the high default probability quintile isolating firms where

[24] There are only 278 fewer firms in Table 6 than in Table 3 (because Pr(Z) could not be calculated for some firms), so the two tables are comparable.

the book value of debt is likely to be higher than the its value. Only the results for regressions I, V and VIII in Table 3 are reported, and only for the full sample, but the results from other regressions in Table 3 also survive under the partitioning. In Panel A, the B/P effect is evident for all Pr(Z) quintiles. This, however, appears to be due to the leverage component of B/P. In Panels B and C, enterprise book-to-price reliably predicts returns, given leverage, in the top three default risk quintiles. With a control for size and beta in Panel C, $\frac{ND}{P}$ is reliably negatively correlated with returns for all five quintiles, although the coefficients are not significantly different for the top two quintiles in Panel B. In any case, the negative leverage result survives in cases where ND is likely to be well measured, that is, in the low default probability quintiles.

The book value of debt deviates from its market value when default risk changes after the origination of the debt. Panel D of Table 8 repeats the regression analysis in Panel C, but now with quintiles formed from ranking firms on changes in default probability rather than the level, and the default score added as a variable. Without information about the date of the origination of debt, one cannot be sure about the period over which to measure this change; we use the change in Pr(Z) over the prior three years for all firms. With the requirement of three years of prior data, the number of firm-years in now reduced to 75,577. The coefficients on $\frac{ND}{P}$ are negative for all quintiles. There is little indication that the negative conditional correlation between $\frac{ND}{P}$ and returns differ in cases where firms' credit quality had changed (in the extreme quintiles). Although the coefficient for the central quintile (III) is somewhat higher (less negative), they are negative in both extremes even though one (V) indicates deteriorating credit quality and the other (I) improving credit quality. Accordingly, possible mismeasurement of the value of debt and financial leverage does no appear to be determining the results. Similar results were observed when quintiles were based in changes in Pr(Z) over one year rather than three.

4.3 Some Robustness Checks

For the return analysis (in all parts of the paper), firms with varying fiscal year ends were included in the sample for any calendar year. However, results were similar when we used only those 74,106 firm-year observations for firms with fiscal years ending December 31 of each year. Results were also similar when future returns were calculated for the twelve months beginning six months after fiscal-year end, that is, for the following July 1 to June 30 if the firm had a December fiscal-year end. We also excluded January month returns from the twelve month buy-hold return (e.g., Bhandari, 1988) and find our results are robust to excluding these returns. Finally, results differed little with returns calculated for the following twelve months after that for the returns used in the paper, that is, using two-year-ahead returns.

5. Conclusion

A straightforward leveraging equation decomposes the book-to-price ratio (B/P) into a component that pertains to business operations – the enterprise book-to-price ratio -- and a component that pertains to net debt involved in financing activities. Net debt on the balance sheet typically approximates its market value, so the net debt component has a book-to-price ratio of one and does not contribute to the difference between the price the book value of equity. Further, net debt-to-equity price measures market leverage. Net assets involved in operations are, on the other hand, not typically carried at market value on the balance sheet, so the enterprise book-to-price ratio differs from unity.

With this insight, the paper has explored how the two components relate to subsequent stock returns which their composite, B/P forecasts. The enterprise book-to-price ratio is positively related to returns, affirming that it is the difference between price and book value, not leverage, that accounts for the B/P effect. This observation accords with the view that the enterprise book-to-price ratio is a firm characteristic that loads on a risk factor, but is also consistent with the mispricing of book values. In absence of a well-specified asset pricing model, the issue cannot be sorted out. However, finance theory is quite definite that adding financing leverage to operating risk should be rewarded with higher return. Rather we find that, conditional upon the enterprise book-to-price ratio, market leverage is negatively correlated with subsequent returns. Accordingly, while investing on the basis of B/P should yield additional return (as a reward for the leverage risk) over that indicated by the difference between price and book value, that return is in fact less.

The seemingly perverse result persists with controls for size and estimated beta. Further, the result persists under conditions where net debt may not be appropriately measured on the balance sheet (and thus its book-to-price ratio may not be unity and market leverage may be mismeasured). This investigation also reveals that the effect we have identified is not primarily associated with distressed debt, nor with cases of high book-to-market firms under distress. Further, the results are not due to market leverage being correlated with default risk that might be priced in equities.

While we cannot rule out that market leverage may load on some unrecognized operating risk factor – in a strange way – or may just be due to sample specific realizations (in the last half of the twentieth century), the results do point to mispricing. We tend to this conclusion because, while the pricing of (operating) risk is not well understood, there is a certain imperative that shareholders should be rewarded for taking on financing risk. To claim that the results challenge this core principle of finance, with the pretense that market prices are efficient, seems, to us, to be overreaching. The results fit the pattern that any “good” aspect of the firm yields higher return, while a “bad” yields lower returns. So, just as more earnings-to-price, sales-to-price, cash flow-to-price, cash flow-to-accruals, assets-to-price earns higher returns (to mention just a few of the so-called anomalies), so does less net debt-to-price.

REFERENCES

Altman, E., 1968. Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. Journal of Finance, 23, 589-609.

Ang, A., and J. Chen, 2004. CAPM over the long run:1926-2001. Working paper, Columbia University.

Begley. J., J. Ming, and S. Watts, 1996. An empirical analysis of Altman's and Ohlson's models. Review of Accounting Studies, 1, 267-284.

Bhandari L. C., 1988. Debt/equity ratio and expected common stock returns: Empirical evidence. Journal of Finance, 43, 507-528.

Campbell, J. Y., J. Hilscher, and J. Szilagyi, 2004. In search of distress risk. Working paper, Harvard University.

Daniel, K., and S. Titman, 1997. Evidence on the characteristics of cross sectional variation in stock returns. Journal of Finance, 52, 1-33.

Dichev, I., 1998. Is the risk of bankruptcy a systematic risk? Journal of Finance, 53, 1131-1148.

Fama, E. F., 1970. Efficient capital markets: A review of theory and empirical work. Journal of Finance, 25, 383-417.

Fama E. F., 1998. Market efficiency, long-term returns and behavioral finance. Journal of Financial Economics, 49, 283-306.

Fama, E. F., and K. French, 1992. The cross-section of expected returns. Journal of Finance, 47, 427-465.

Fama, E. F., and K. French, 1993. Common risk factors in the returns of stocks and bonds. Journal of Financial Economics, 33, 3-56.

Fama, E. F., and K. French, 1996. Multi-factor explanations of asset pricing anomalies. Journal of Finance, 51, 55-84.

Fama, E. F., and K. French, 1997. Industry costs of equity. Journal of Financial Economics, 43, 153-193.

Fama, E. F., and K. French, 2000. Forecasting profitability and earnings. Journal of Business, 73, 161-175.

Fama, E. F., and K. French, 2004. Profitability, growth and average returns. Working paper, University of Chicago.

Fama, E. F., and J. D. Macbeth, 1973. Risk, return and equilibrium – empirical tests. The Journal of Political Economy 81, 607-636.

Freeman R. N., J. A. Ohlson and S. H. Penman, 1982. Book rate of return and prediction of earnings changes: an empirical investigation. Journal of Accounting Research, 20, 639-653.

Griffin, J., and M. Lemmon, 2002. Book-to-market equity, distress risk, and stock returns. Journal of Finance, 57, 2317-2336.

Hillegeist, S. A., E. K. Keating, D. P. Cram and K. G. Lundstedt, 2004. Assessing the probability of bankruptcy. Review of Accounting Studies, 9, 5-34.

Korteweg, A., 2004. Financial leverage and expected stock returns: Evidence from pure exchange offers. Working paper, University of Chicago.

Lakonishok, J., A. Shleifer, and R. Vishny, 1994. Contrarian investment, extrapolation, and risk. Journal of Finance, 50, 185-224.

Modigliani F., and M. Miller, 1958. The cost of capital, corporation finance and the theory of investment. American Economic Review, 48, 261-297.

Mohanram, P., 2005. Separating winners from losers among low book-to-market stocks using financial statement analysis. Review of Accounting Studies 10, forthcoming.

Ng, J., 2005. Distress risk information in accruals. Working paper, The Wharton School, University of Pennsylvania.

Nissim, D., and S. H. Penman, 2001. Ratio analysis and equity valuation: From research to practice. Review of Accounting Studies 6, 109-154.

Nissim, D., and S. H. Penman, 2003. Financial statement analysis of leverage and how it informs about profitability and price-to-book ratios. Review of Accounting Studies 8, 531-560.

Ohlson, J., 1980. Financial ratios and the probabilistic prediction of bankruptcy. Journal of Accounting Research, 19, 109-131.

Penman, S. H., 2004. Financial statement analysis and security valuation. 2nd Ed. McGraw Hill.

Piotroski, J., 2000. Value investing: The use of historical financial statement information to separate winners from losers. Journal of Accounting Research, 39, 1-41.

Rajan, R. G., and L. Zingales, 1995. What do we know about capital structure? Some evidence from international data. Journal of Finance, 50, 1421-1460.

Shumway, T., 1997. The delisting bias in CRSP data. Journal of Finance, 52, 327-340.

Vassalou, M., and Y. Xing, 2004. Default risk in equity returns. Journal of Finance, 59, 831-868.

Table 1
The B/P Effect.
This table examines the future size-adjusted returns for portfolios formed on B/P and B/P components for the period 1962-2001. The sample covers 132,678 firm years with available data on *Compustat* and *CRSP*. This table reports results without any winsorization or truncation of the data.

Panel A: B/P and Future Returns

Portfolio	N	Mean B/P	Mean Values for each Portfolio			
			Future Returns	NOA/P^{NOA}	ND/P	B/P - NOA/P^{NOA}
Neg.	3344	-2.230	-0.046	0.394	4.432	-2.440
1a	7074	0.094	-0.128	0.175	0.218	-0.070
1b	6748	0.188	-0.062	0.237	0.159	-0.039
2	13105	0.287	-0.043	0.327	0.174	-0.033
3	13085	0.404	-0.031	0.440	0.223	-0.032
4	12665	0.510	-0.007	0.552	0.301	-0.008
5	12595	0.615	0.013	0.673	0.382	-0.041
6	12613	0.741	0.010	0.768	0.478	-0.023
7	12101	0.878	0.024	0.884	0.594	0.011
8	12337	1.055	0.028	1.028	0.702	0.051
9	12790	1.351	0.043	1.290	0.841	0.193
10a	6508	1.724	0.061	2.480	1.138	-0.444
10b	7713	3.739	0.048	3.013	2.693	1.918

Panel B: NOA/P^{NOA} and Future Returns

Portfolio	N	Mean NOA/P^{NOA}	Mean Values for each Portfolio			
			Future Returns	B/P	ND/P	B/P - NOA/P^{NOA}
NOA and $P^{NOA} < 0$	303	.	0.116	0.004	-3.068	-2.690
NOA < 0	1781	.	0.042	-1.348	0.200	-0.581
$P^{NOA} < 0$	742	.	0.201	2.813	-1.686	18.489
1a	7154	0.078	-0.095	0.068	0.014	-0.009
1b	6823	0.177	-0.056	0.188	-0.006	0.011
2	13264	0.294	-0.031	0.258	0.087	-0.036
3	13123	0.435	-0.023	0.358	0.278	-0.077
4	12729	0.544	-0.015	0.428	0.422	-0.116
5	12471	0.665	0.004	0.555	0.598	-0.109
6	12615	0.778	-0.002	0.666	0.933	-0.112
7	12488	0.885	0.006	0.835	1.095	-0.049
8	12256	1.003	0.015	1.063	1.402	0.059
9	12661	1.161	0.024	1.399	1.539	0.238
10a	6810	1.392	0.053	1.853	1.280	0.461
10b	7457	4.275	0.064	3.209	0.714	-1.066

Panel C: ND/P and Future Returns

Portfolio	N	Mean ND/P	Mean Values for each Portfolio			
			Future Returns	B/P	NOA/P^{NOA}	B/P - NOA/P^{NOA}
1a	7218	-0.732	0.105	1.250	4.036	-0.362
1b	6853	-0.246	0.050	0.752	0.706	0.078
2	13452	-0.119	0.008	0.542	0.495	0.065
3	13436	-0.026	-0.035	0.474	0.460	0.025
4	13269	0.051	-0.031	0.506	0.519	-0.006
5	12792	0.147	-0.023	0.604	0.636	-0.027
6	12913	0.277	-0.010	0.717	0.754	-0.034
7	13014	0.464	0.001	0.823	0.851	-0.025
8	12814	0.755	-0.002	0.941	0.937	0.008
9	12922	1.237	-0.004	1.061	1.000	0.065
10a	6609	2.022	-0.006	1.097	1.056	0.088
10b	7385	6.741	-0.013	1.732	1.067	0.676

Panel D: B/P - NOA/P^{NOA} and Future Returns

Portfolio	N	Mean B/P - NOA/P^{NOA}	Mean Values for each Portfolio			
			Future Returns	B/P	NOA/P^{NOA}	ND/P
1a	6837	-3.950	0.004	-0.358	3.676	2.819
1b	6662	-0.267	-0.039	0.508	0.780	0.926
2	13364	-0.156	-0.032	0.541	0.698	0.588
3	13126	-0.094	-0.026	0.584	0.679	0.432
4	13264	-0.052	-0.021	0.618	0.672	0.303
5	12825	-0.018	-0.007	0.677	0.696	0.236
6	12914	0.012	-0.012	0.700	0.692	0.188
7	13050	0.049	-0.004	0.693	0.650	0.209
8	13195	0.108	0.003	0.746	0.650	0.316
9	13070	0.228	0.022	0.953	0.748	0.536
10a	6662	0.436	0.054	1.344	0.964	1.044
10b	7708	3.810	0.079	3.375	1.413	2.954

The table reports buy and hold 12 month returns for various portfolios. Portfolios are formed by ranking all firm-year observations each year. Firms with negative values for B/P and NOA/P^{NOA} are placed into a separate "negative" portfolio. Firms with positive values (and all ND/P observations) are placed into ten portfolios every year using percentile cut-offs. We further decompose the extreme deciles into two sub-portfolios. Rankings are based on prior year data. For example, if we are considering firm XYZ for the fiscal year ended December 31, 2000, we will use the distribution from the 1999 fiscal year (i.e., all firms with the last month of the fiscal year in 1999) to identify which decile firm XYZ belongs to for the 2000 fiscal year. The use of a prior period distribution ensures no look-ahead bias in our portfolio formation.

We use size-adjusted returns in the table. The size-adjusted return is calculated by deducting the value-weighted average return for all firms in the same size-matched decile, where size is measured as market capitalization at the beginning of the return cumulation period. The return cumulation period begins four months after the end of the fiscal year. In unreported results we also use value and equal weighted market adjusted returns with qualitatively similar results.

Our variable construction follows the approach in Nissim and Penman (2001) and is outlined below:
B/P is the book to price ratio. It is calculated as the ratio of book value of equity (B) to the market value of equity (P). B is calculated as common equity (Compustat data item #60) plus any preferred treasury stock (Compustat data item #227) less any preferred dividends in arrears (Compustat data item #242) and is measured at the end of the fiscal year. P is calculated as the number of common shares outstanding (Compustat data item #25) multiplied by the stock price at the end of the fiscal period (Compustat data item #199). Note that the adjustment for preferred treasury stock and preferred dividends in arrears are necessary to ensure correct treatment of sources of financing. In any event excluding this adjustment does not affect our analysis.

ND/P is our measure of financial leverage. It is measured as the ratio of net financial obligations or net debt (ND) to the market value of equity (P). ND is calculated as the difference between financial liabilities (FL) and financial assets (FA). FL is the sum of long term debt (Compustat data item #9), debt in current liabilities (Compustat data item #34), carrying value of preferred stock (Compustat data item #130), preferred dividends in arrears (Compustat data item #242) less preferred treasury stock (Compustat data item #227). FA is cash and short term investments (Compustat data item #1).

NOA/P^{NOA} is our measure of enterprise book-to-price. It is measured as the ratio of the book value of net operating assets (NOA) to the market value of net operating assets (P^{NOA}). NOA is the sum of common equity (Compustat data item #60), ND, and minority interest (Compustat data item #38). P^{NOA} is the market value of net operating assets. The market value of net operating assets is equal to the sum of the market value of net financial obligations and the market value of equity (from the balance sheet identity). Assuming that the book values of net financial obligations are a close approximation to their market values then P^{NOA} is simply the sum of ND and P as defined above.

We require the following data items to be available for a firm-year to be included in our analysis: total assets (Compustat data item #6), income before extra-ordinary items (Compustat data item #18), common shares outstanding (Compustat data item #25), book value of common equity (Compustat data item #60) and stock price at the end of the fiscal year (Compustat data item #199). All other variables are set equal to zero if they are missing.

Our decomposition of B/P and NOA/P^{NOA} is based on the articulation of financial statements (i.e., total assets is equal to the sum of total liabilities and equity) and our assumption that the market values of financial obligations (both financial assets and financial liabilities) are approximately equal to their carrying values. Under these conditions, the following equation holds:

$$\frac{B}{P} = \frac{NOA}{P^{NOA}} + \frac{ND}{P} \times \left(\frac{NOA}{P^{NOA}} - 1 \right) \tag{1}$$

Firms with negative values for the following variables: NOA and P^{NOA} are included in our portfolio level analyses but are excluded from our regression analyses. In our portfolio analysis we place firm-years that have negative values for NOA and P^{NOA} in a separate portfolio. For example, all firm-years with negative NOA or P^{NOA} are placed into a separate negative NOA/P^{NOA} portfolio in panel B above. In our empirical analyses we code the ratio NOA/P^{NOA} as missing values when NOA or P^{NOA} are negative. For example, firm XYZ reports NOA of -5 and has P^{NOA} of 10. The ratio NOA/P^{NOA} would be equal to -0.5. We set NOA/P^{NOA} equal to a missing value for this firm-year observation. This firm-year observation is included in our portfolio analyses, just that the NOA/P^{NOA} variable is coded as missing.

Table 2

Correlations of B/P and its components.

This table examines the correlations between B/P and B/P components for the period 1962-2001. The sample covers all firm years with available data on *Compustat* and *CRSP*. Correlation coefficients reported are the weighted average correlation coefficients across the 40 years in the sample (weights are based on the square root of the number of observations each year). Spearman (Pearson) correlations are presented in the upper (lower) diagonal. t-statistics are reported in parentheses.

Panel A: Correlations ($NOA/P^{NOA} \geq 1$)

	B/P	NOA/P^{NOA}	ND/P	B/P - NOA/P^{NOA}	Size	Beta	Size-adj Returns	Raw Returns
B/P	--	0.803 *(94.90)*	0.263 *(23.02)*	0.621 *(40.10)*	-0.361 *(-25.20)*	-0.062 *(-4.29)*	-0.026 *(-3.09)*	0.016 *(1.44)*
NOA/P^{NOA}	0.651 *(45.77)*	--	-0.290 *(-28.99)*	0.145 *(6.75)*	-0.330 *(-29.53)*	-0.074 *(-6.01)*	0.011 *(1.29)*	0.046 *(4.27)*
ND/P	0.315 *(25.74)*	-0.271 *(-44.68)*	--	0.811 *(130.94)*	-0.007 *(-0.63)*	0.018 *(1.26)*	-0.056 *(-5.38)*	-0.049 *(-4.44)*
B/P - NOA/P^{NOA}	0.752 *(60.43)*	0.004 *(0.15)*	0.652 *(113.96)*	--	-0.138 *(.9.46)*	0.008 *(0.63)*	-0.041 *(-4.07)*	-0.017 *(-1.53)*
Size	-0.304 *(-21.61)*	-0.281 *(-26.73)*	-0.037 *(-3.18)*	-0.157 *(11.94)*	--	0.212 *(8.97)*	0.099 *(8.48)*	0.018 *(1.02)*
Beta	-0.049 *(-4.07)*	-0.075 *(-6.67)*	-0.002 *(0.18)*	0.001 *(0.10)*	0.173 *(7.11)*	--	-0.015 *(-0.79)*	-0.031 *(-1.84)*
Size-adj returns	0.009 *(1.04)*	0.026 *(3.24)*	-0.033 *(-3.81)*	-0.010 *(-1.11)*	0.010 *(0.97)*	-0.005 *(-0.27)*	--	0.905 *(62.20)*
Raw Returns	0.037 *(4.07)*	0.047 *(5.82)*	-0.021 *(-2.35)*	0.010 *(1.00)*	-0.053 *(-3.31)*	-0.012 *(-0.79)*	0.950 *(112.36)*	--

Panel B: Correlations ($NOA/P^{NOA} < 1$)

	B/P	NOA/P^{NOA}	ND/P	B/P - NOA/P^{NOA}	Size	Beta	Size-adj Returns	Raw Returns
B/P	--	0.835 *(119.67)*	0.127 *(7.67)*	0.075 *(5.47)*	-0.065 *(-2.90)*	-0.161 *(-18.08)*	0.120 *(8.71)*	0.132 *(8.88)*
NOA/P^{NOA}	0.827 *(80.91)*	--	0.598 *(99.36)*	-0.416 *(-23.97)*	-0.067 *(-3.94)*	-0.195 *(-14.98)*	0.099 *(5.53)*	0.112 *(6.18)*
ND/P	0.108 *(4.87)*	0.508 *(57.28)*	--	-0.905 *(-156.34)*	0.042 *(3.73)*	-0.124 *(-7.68)*	0.007 *(0.42)*	0.012 *(0.79)*
B/P - NOA/P^{NOA}	0.219 *(9.70)*	-0.347 *(-27.89)*	-0.680 *(-59.19)*	--	-0.040 *(-3.06)*	0.092 *(4.85)*	0.013 *(0.83)*	0.009 *(0.61)*
Size	-0.074 *(-3.21)*	-0.071 *(-4.02)*	-0.034 *(-3.45)*	-0.028 *(-1.95)*	--	0.173 *(6.69)*	0.108 *(13.32)*	0.102 *(4.75)*
Beta	-0.143 *(-15.44)*	-0.193 *(-14.97)*	-0.115 *(-10.98)*	0.075 *(5.32)*	0.154 *(6.19)*	--	-0.050 *(-2.75)*	-0.050 *(-2.91)*
Size-adj Returns	0.067 *(6.25)*	0.056 *(3.94)*	-0.006 *(-0.67)*	0.032 *(3.11)*	0.006 *(0.89)*	-0.028 *(-1.86)*	--	0.935 *(99.08)*
Raw Returns	0.074 *(6.03)*	0.064 *(4.25)*	-0.002 *(-0.22)*	0.031 *(3.00)*	0.004 *(0.20)*	-0.025 *(-1.71)*	0.968 *(174.56)*	--

Spearman correlation coefficients are based on the full sample of 35,345 (97,333) firm-year observations for panel A (B). Pearson correlation coefficients are based on the truncated sample of 30,958 (91,413) firm-year observations for panel A (B). We use the truncated sample for Pearson correlation coefficients after deleting the extreme percentiles for each of the following variables: B/P, ND/P, NOA/P^{NOA} and B/P-NOA/P^{NOA}. Variables are as defined in table 1.

Size is the log of market value of equity (P).

Beta is estimated from a market model regression of firm returns on market returns using weekly return data for the fiscal year for which we measure B/P data. The market returns used in the beta calculation is the CRSP value-weighted market return inclusive of all distributions.

Table 3

Regression Analysis for B/P Decomposition. Time-Series Means and t-Statistics for Coefficients from Annual Cross-Sectional Regressions of raw returns on B/P and B/P components. The sample consists of 120,753 firm-year observations from 1962-2001. Firm-years with negative values for NOA or P^{NOA} are excluded from the regression analysis.

Panel A: Full sample (sample size is 120,753 firm-year observations)

	I	II	III	IV	V	VI	VII	VIII
Intercept	0.077	0.069	0.141	0.142	0.067	0.075	0.057	0.141
	(2.36)	*(1.93)*	*(4.67)*	*(4.89)*	*(1.87)*	*(2.10)*	*(1.69)*	*(2.52)*
B/P	0.091							
	(6.27)							
NOA/P^{NOA}		0.099			0.116	0.094	0.090	0.087
		(4.66)			*(6.04)*	*(4.56)*	*(4.05)*	*(4.20)*
ND/P			0.001		-0.022			-0.021
			(0.08)		*(-2.62)*			*(-3.12)*
B/P - NOA/P^{NOA}				0.131		0.110		
				(4.13)		*(3.75)*		
Size								-0.010
								(-1.29)
Beta								0.001
								(0.01)
FL/P							-0.013	
							(-1.88)	
FA/P							0.216	
							(3.46)	
Adj. R^2	0.014	0.015	0.003	0.004	0.016	0.017	0.020	0.037

Panel B: NOA/P^{NOA} greater than or equal to 1 (sample size is 30,958 firm-year observations)

	I	II	III	IV	V	VI	VII	VIII
Intercept	0.175	0.134	0.230	0.218	0.154	0.145	0.158	0.272
	(5.11)	*(3.36)*	*(8.34)*	*(8.03)*	*(3.94)*	*(3.45)*	*(3.99)*	*(4.69)*
B/P	0.027							
	(1.83)							
NOA/P^{NOA}		0.062			0.051	0.049	0.030	0.019
		(2.73)			*(2.33)*	*(1.91)*	*(1.26)*	*(0.85)*
ND/P			-0.007		-0.003			-0.012
			(-0.65)		*(-0.26)*			*(-1.61)*
$B/P - NOA/P^{NOA}$				0.009		0.024		
				(0.29)		*(0.69)*		
Size								-0.023
								(-2.71)
Beta								0.011
								(0.47)
FL/P							-0.001	
							(-0.08)	
FA/P							0.110	
							(2.31)	
Adj. R^2	0.003	0.003	0.003	0.002	0.005	0.005	0.008	0.026

Panel C: NOA/P^{NOA} less than 1 (sample size is 89,795 firm-year observations)

	I	II	III	IV	V	VI	VII	VIII
Intercept	0.036	0.057	0.116	0.121	0.044	0.047	0.022	0.107
	(1.02)	*(1.39)*	*(3.76)*	*(3.96)*	*(1.07)*	*(1.17)*	*(0.59)*	*(1.81)*
B/P	0.163							
	(5.48)							
NOA/P^{NOA}		0.109			0.159	0.154	0.138	0.129
		(2.78)			*(4.27)*	*(4.36)*	*(3.60)*	*(3.83)*
ND/P			-0.009		-0.045			-0.036
			(-0.77)		*(-4.99)*			*(-4.81)*
B/P - NOA/P^{NOA}				0.143		0.252		
				(2.48)		*(4.96)*		
Size								-0.008
								(-1.03)
Beta								-0.001
								(-0.06)
FL/P							-0.033	
							(-4.40)	
FA/P							0.318	
							(4.68)	
Adj. R^2	0.012	0.012	0.003	0.004	0.015	0.017	0.019	0.038

T-statistics are reported in parentheses below coefficient estimates. Variables are as defined in table 1. To minimize the influence of outliers on our analysis we delete the extreme percentiles of the following variables: B/P, ND/P, NOA/P^{NOA}, B/P - NOA/P^{NOA}.

ln(P^{NOA}) is the natural logarithm of P^{NOA}. ln(ND) is the natural logarithm of ND.

Table 4

This table examines the future size-adjusted returns for joint portfolios formed on NOA/P^{NOA} and ND/P. The sample covers 129,851 firm years with available data on *Compustat* and *CRSP*. This table reports results time series annual mean returns. Firm-years with negative values for NOA or P^{NOA} are excluded from the joint portfolio analysis.

Panel A: First sorted on NOA/P^{NOA} then on ND/P

		ND/P Quintile					(HIGH-
		LOW	2	3	4	HIGH	LOW)
NOA/P^{NOA} Decile	LOW	0.017	-0.053	-0.069	-0.099	-0.131	-0.148 *(-2.78)*
	2	0.053	-0.017	-0.049	-0.061	-0.079	-0.133 *(-2.74)*
	3	0.034	-0.006	-0.048	-0.052	-0.052	-0.086 *(-2.89)*
	4	0.032	0.017	-0.034	-0.050	-0.046	-0.077 *(-3.52)*
	5	0.055	0.030	0.000	-0.051	-0.024	-0.079 *(-2.34)*
	6	0.026	0.016	-0.015	-0.017	-0.034	-0.060 *(-3.19)*
	7	0.039	0.016	0.008	-0.007	-0.023	-0.062 *(-2.57)*
	8	0.043	0.037	0.018	-0.005	-0.013	-0.056 *(-2.05)*
	9	0.053	0.057	0.029	0.007	-0.001	-0.055 *(-2.03)*
	HIGH	0.101	0.056	0.066	0.039	0.040	-0.061 *(-1.61)*
(HIGH-LOW)		0.084 *(1.65)*	0.109 *(3.01)*	0.135 *(4.48)*	0.138 *(3.17)*	0.170 *(4.20)*	

Panel B: First sorted on NOA/P^{NOA} then on B/P

		B/P Quintile					(HIGH-LOW)
		LOW	2	3	4	HIGH	
NOA/P^{NOA} Decile	LOW	-0.153	-0.077	-0.064	-0.042	0.020	0.173 *(3.24)*
	2	-0.082	-0.045	-0.035	-0.025	0.057	0.139 *(2.98)*
	3	-0.065	-0.037	-0.036	0.023	0.039	0.105 *(3.21)*
	4	-0.051	-0.027	-0.012	0.014	0.029	0.080 *(3.43)*
	5	-0.027	-0.010	0.018	0.011	0.062	0.088 *(2.08)*
	6	-0.016	-0.026	0.014	0.006	0.010	0.026 *(1.09)*
	7	-0.005	-0.015	0.008	0.023	0.046	0.051 *(1.65)*
	8	-0.009	0.011	0.019	0.029	0.044	0.053 *(1.91)*
	9	0.005	0.017	0.081	0.004	0.028	0.023 *(0.74)*
	HIGH	0.061	0.070	0.076	0.046	0.056	-0.005 *(-0.15)*
(HIGH-LOW)		0.214 *(5.70)*	0.146 *(3.63)*	0.140 *(4.32)*	0.087 *(2.41)*	0.036 *(0.74)*	

Panel C: First sorted on B/P then on ND/P

		ND/P Quintile					(HIGH-LOW)
		LOW	2	3	4	HIGH	
B/P Decile	LOW	-0.047	-0.091	-0.109	-0.145	-0.069	-0.022 *(0.62)*
	2	-0.017	-0.031	-0.053	-0.074	-0.027	-0.011 *(0.27)*
	3	-0.003	-0.022	-0.039	-0.042	-0.049	-0.046 *(1.53)*
	4	0.033	-0.005	-0.001	-0.037	-0.028	-0.062 *(1.52)*
	5	0.069	0.021	0.016	-0.014	-0.034	-0.103 *(2.70)*
	6	0.049	0.027	0.010	-0.013	-0.026	-0.075 *(2.98)*
	7	0.071	0.031	0.027	0.005	-0.011	-0.082 *(2.48)*
	8	0.048	0.033	0.041	0.021	-0.021	-0.069 *(2.19)*
	9	0.099	0.065	0.033	0.025	-0.001	-0.100 *(3.33)*
	HIGH	0.074	0.057	0.051	0.051	0.008	-0.066 *(1.61)*
(HIGH-LOW)		0.122 *(2.89)*	0.147 *(4.00)*	0.159 *(4.52)*	0.197 *(6.14)*	0.078 *(2.27)*	

Variables are as defined in earlier tables. t-statistics testing the differences between extreme cells in each row and column are presented in parentheses beneath the difference in returns across the extreme cells. These t-statistics are based on the 40 annual returns for each cell.

Table 5

Additional Regression Analyses for B/P Decomposition. Time-Series Means and t-Statistics for Coefficients from Annual Cross-Sectional Regressions of raw returns on B/P and B/P components. The sample consists of 120,753 firm-year observations from 1962-2001. Firm-years with negative values for NOA or P^{NOA} are excluded from the regression analysis.

	I	II	III	IV
Intercept	0.197	0.212	0.186	0.048
	(4.03)	*(4.04)*	*(3.52)*	*(0.74)*
Size	-0.013			
	(-2.16)			
$\ln(P^{NOA})$		-0.027	-0.091	-0.001
		(-3.05)	*(-5.76)*	*(-0.03)*
ln(ND)		0.015	-0.014	-0.006
		(2.95)	*(-3.52)*	*(-1.49)*
ln(NOA)			0.096	
			(5.70)	
NOA/P^{NOA}				0.137
				(6.12)
Adj. R^2	0.015	0.020	0.034	0.033

Variables are as defined in earlier tables.

Table 6

Impact of Distress. Time-Series Means and t-Statistics for Coefficients from Annual Cross-Sectional Regressions of raw returns on B/P and B/P components. The sample consists of 120,753 firm-year observations from 1962-2001 with available data to compute the Z score as reported in Hillegeist et al (2004).

Panel A: Full sample (sample size is 120,753 firm-year observations)

	0	I	II	III	IV	V	VI	VII	VIII
Intercept	0.082 *(1.98)*	0.058 *(1.39)*	0.059 *(1.39)*	0.071 *(1.71)*	0.075 *(1.82)*	0.047 *(1.11)*	0.057 *(1.37)*	0.031 *(0.80)*	0.120 *(2.07)*
B/P		0.079 *(6.52)*							
NOA/P^{NOA}			0.087 *(5.37)*			0.091 *(5.83)*	0.067 *(4.13)*	0.060 *(3.53)*	0.067 *(3.93)*
ND/P				-0.012 *(-8.41)*		-0.020 *(-1.58)*			-0.027 *(-4.18)*
B/P - NOA/P^{NOA}					0.164 *(5.64)*		0.130 *(5.07)*		
Size									-0.011 *(-1.46)*
Beta									0.001 *(0.07)*
FL/P								-0.015 *(-1.21)*	
FA/P								0.224 *(4.09)*	
Pr(Z)	0.157 *(2.13)*	0.045 *(0.66)*	0.018 *(0.27)*	0.156 *(1.51)*	0.214 *(3.04)*	0.050 *(0.55)*	0.097 *(1.55)*	0.088 *(1.06)*	0.131 *(2.48)*
Adj. R^2	0.011	0.019	0.018	0.014	0.015	0.021	0.021	0.024	0.039

Panel B: NOA/P^{NOA} greater than or equal to 1 (sample size is 30,958 firm-year observations)

	0	I	II	III	IV	V	VI	VII	VIII
Intercept	0.189	0.156	0.084	0.141	0.169	0.062	0.082	0.057	0.153
	(4.63)	*(3.29)*	*(1.57)*	*(3.72)*	*(4.67)*	*(1.19)*	*(1.49)*	*(1.14)*	*(2.39)*
B/P		0.028							
		(2.02)							
NOA/P^{NOA}			0.065			0.053	0.051	0.030	0.019
			(2.94)			*(2.49)*	*(1.79)*	*(1.28)*	*(0.83)*
ND/P				-0.008		-0.005			-0.022
				(-0.59)		*(-0.34)*			*(-2.08)*
B/P - NOA/P^{NOA}					0.005		0.021		
					(0.16)		*(0.49)*		
Size									-0.024
									(-2.85)
Beta									0.014
									(0.61)
FL/P								-0.004	
								(-0.28)	
FA/P								0.121	
								(2.52)	
Pr(Z)	0.068	0.034	0.122	0.154	0.077	0.167	0.114	0.189	0.352
	(0.77)	*(0.42)*	*(1.37)*	*(1.54)*	*(1.07)*	*(1.68)*	*(1.52)*	*(1.94)*	*(3.28)*
Adj. R^2	0.002	0.004	0.005	0.006	0.003	0.009	0.007	0.011	0.030

Panel C: NOA/P^{NOA} less than 1 (sample size is 89,795 firm-year observations)

	0	I	II	III	IV	V	VI	VII	VIII
Intercept	0.072	0.032	0.054	0.059	0.038	0.036	0.023	0.012	0.099
	(1.72)	*(0.73)*	*(1.23)*	*(1.42)*	*(0.93)*	*(0.82)*	*(0.54)*	*(0.29)*	*(1.64)*
B/P		0.147							
		(5.60)							
NOA/P^{NOA}			0.097			0.123	0.079	0.096	0.105
			(3.25)			*(3.99)*	*(2.69)*	*(3.11)*	*(3.69)*
ND/P				-0.030		-0.042			-0.040
				(-2.27)		*(-3.18)*			*(-4.29)*
B/P - NOA/P^{NOA}					0.329		0.318		
					(5.69)		*(5.65)*		
Size									-0.008
									(-1.10)
Beta									-0.001
									(-0.05)
FL/P								-0.034	
								(-2.56)	
FA/P								0.320	
								(5.13)	
Pr(Z)	0.117	0.006	-0.018	0.167	0.308	0.046	0.192	0.075	0.071
	(1.53)	*(0.09)*	*(-0.27)*	*(1.65)*	*(3.55)*	*(0.50)*	*(2.54)*	*(0.88)*	*(1.17)*
Adj. R^2	0.011	0.018	0.015	0.014	0.017	0.018	0.021	0.023	0.040

Variables are as defined in earlier tables. Firm-years with negative values for NOA or P^{NOA} are excluded from the regression analysis.
The Z-score is calculated using fiscal year end data and are an assessment of the risk of bankruptcy over the twelve month period beginning four months after the end of the fiscal year. For the period 1962-1979 the Z-score is computed as -1.20*WC/TA – 1.40*RE/TA – 3.30*EBIT/TA – 0.60*V_E/TL - 0.999*S/TA. For the period 1980-2001 the Z-score is computed as -4.34 - 0.08*WC/TA + 0.04*RE/TA – 0.10*EBIT/TA – 0.22*V_E/TL + 0.06*S/TA. WC/TA is working capital (Compustat item #4 – Compustat item #5) divided by beginning of year total assets (Compustat item #6), RE/TA is retained earnings (Compustat item #36) divided by beginning of year total assets, EBIT/TA is earnings before interest and taxes (Compustat item #178) divided by beginning of year total assets, VE/TL is the market value of equity (Compustat item #25 * Compustat item #199) divided by total liabilities (Compustat item #181), S/TA is sales (Compustat item #12) divided by beginning of year total assets. All independent variables used in the Z-score model are winsorized at the 1st and 99th respectively. We convert the Z-score to a probability as follows: $e^Z/(1+e^Z)$. These calculations are described in detail in Hillegeist et al (2004).

Table 7

Additional Regression Analyses for B/P Decomposition. Time-Series Means and t-Statistics for Coefficients from Annual Cross-Sectional Regressions of raw returns on B/P and B/P components. The sample consists of 120,753 firm-year observations from 1962-2001 with available data to compute the Z score as reported in Hillegeist et al (2004). Firm-years with negative values for NOA or P^{NOA} are excluded from the regression analysis.

	I	II	III	IV
Intercept	0.136 *(2.24)*	-0.089 *(-1.22)*	0.022 *(0.35)*	-0.122 *(-1.58)*
Size	-0.013 *(-2.01)*			
$\ln(P^{NOA})$		0.010 *(1.03)*	-0.054 *(-3.54)*	0.018 *(1.81)*
ln(ND)		-0.021 *(-3.76)*	-0.027 *(-5.40)*	-0.026 *(-4.99)*
ln(NOA)			0.072 *(4.60)*	
NOA/P^{NOA}				0.097 *(4.95)*
Pr(Z)	0.149 *(2.01)*	0.568 *(5.44)*	0.312 *(4.56)*	0.402 *(5.05)*
Adj. R^2	0.026	0.029	0.037	0.037

Variables are as defined in earlier tables. Firm-years with negative values for NOA or P^{NOA} are excluded from the regression analysis.

The Z-score is calculated using fiscal year end data and are an assessment of the risk of bankruptcy over the twelve month period beginning four months after the end of the fiscal year. For the period 1962-1979 the Z-score is computed as -1.20*WC/TA – 1.40*RE/TA – 3.30*EBIT/TA – 0.60*V_E/TL - 0.999*S/TA. For the period 1980-2001 the Z-score is computed as -4.34 - 0.08*WC/TA + 0.04*RE/TA – 0.10*EBIT/TA – 0.22*V_E/TL + 0.06*S/TA. WC/TA is working capital (Compustat item #4 – Compustat item #5) divided by beginning of year total assets (Compustat item #6), RE/TA is retained earnings (Compustat item #36) divided by beginning of year total assets, EBIT/TA is earnings before interest and taxes (Compustat item #178) divided by beginning of year total assets, VE/TL is the market value of equity (Compustat item #25 * Compustat item #199) divided by total liabilities (Compustat item #181), S/TA is sales (Compustat item #12) divided by beginning of year total assets. All independent variables used in the Z-score model are winsorized at the 1^{st} and 99^{th} respectively. We convert the Z-score to a probability as follows: $e^Z/(1+e^Z)$. These calculations are described in detail in Hillegeist et al (2004).

Table 8

Selected Regression Analysis for B/P Decomposition by Pr(Z) Q
uintiles and Change in Pr(Z) Quintiles. Time-Series Means and t-Statistics for Coefficients from Annual Cross-Sectional Regressions of raw returns on B/P and B/P components. The sample consists of 120,753 (75,577) firm-year observations from 1962-2001 with available data to compute the Z score (change in Z score) as reported by Hillegeist et al (2004). Firm-years with negative values for NOA or P^{NOA} are excluded from the regression analysis.

Panel A: Regression Model I $R_{t+1} = \alpha + \lambda_1 \frac{B_t}{P_t} + \varepsilon_t$

	Pr(Z) Quintile				
	LOW	2	3	4	HIGH
Intercept	0.043	0.064	0.068	0.090	0.113
	(0.98)	*(1.87)*	*(2.12)*	*(2.82)*	*(3.63)*
B/P	0.146	0.135	0.129	0.081	0.057
	(3.66)	*(6.10)*	*(6.92)*	*(5.28)*	*(3.90)*
Adj. R^2	0.013	0.011	0.012	0.010	0.009

Panel B: Regression Model V $R_{t+1} = \alpha + \lambda_1 \frac{NOA_t}{P_t^{NOA}} + \lambda_2 \frac{ND_t}{P_t} + \varepsilon_t$

	Pr(Z) Quintile				
	LOW	2	3	4	HIGH
Intercept	0.048	0.098	0.110	0.083	0.076
	(1.17)	*(2.71)*	*(2.92)*	*(2.19)*	*(2.10)*
NOA/P^{NOA}	0.014	0.044	0.090	0.102	0.117
	(0.30)	*(2.01)*	*(4.27)*	*(4.88)*	*(4.45)*
ND/P	-0.337	-0.248	-0.154	-0.036	-0.017
	(-4.61)	*(-3.66)*	*(-3.26)*	*(-1.43)*	*(-1.79)*
Adj. R^2	0.016	0.016	0.018	0.017	0.014

Panel C: Regression Model VIII $R_{t+1} = \alpha + \lambda_1 \frac{NOA_t}{P_t^{NOA}} + \lambda_2 \frac{ND_t}{P_t} + \lambda_3 Size_t + \lambda_4 Beta_t + \varepsilon_t$

	Pr(Z) Quintile				
	LOW	2	3	4	HIGH
Intercept	0.066	0.151	0.165	0.195	0.169
	(1.08)	*(2.30)*	*(2.53)*	*(3.38)*	*(3.34)*
NOA/P^{NOA}	-0.010	0.030	0.075	0.076	0.078
	(-0.21)	*(1.19)*	*(2.84)*	*(3.63)*	*(3.87)*
ND/P	-0.335	-0.200	-0.178	-0.053	-0.020
	(-4.51)	*(-3.99)*	*(-4.39)*	*(-2.75)*	*(-2.70)*
Size	0.002	-0.006	-0.009	-0.010	-0.015
	(0.29)	*(-0.71)*	*(-1.08)*	*(-1.54)*	*(-1.89)*
Beta	0.001	-0.005	0.010	-0.029	0.018
	(0.02)	*(-0.31)*	*(0.42)*	*(-1.52)*	*(0.87)*
Adj. R^2	0.040	0.041	0.043	0.038	0.037

Panel D: Regression Model VIII

$$R_{t+1} = \alpha + \lambda_1 \frac{NOA_t}{P_t^{NOA}} + \lambda_2 \frac{ND_t}{P_t} + \lambda_3 Size + \lambda_4 Beta + \lambda_5 \Pr(Z)_t + \varepsilon_t$$

	Change in Pr(Z) Quintile				
	LOW	2	3	4	HIGH
Intercept	0.088	0.134	0.157	0.195	0.017
	(1.49)	(2.29)	(3.31)	(3.33)	(0.15)
NOA/P^{NOA}	0.065	0.057	0.052	0.037	0.095
	(2.04)	(2.65)	(2.84)	(1.67)	(3.21)
ND/P	-0.114	-0.048	-0.011	-0.030	-0.045
	(-3.39)	(-2.08)	(-0.75)	(-2.96)	(-2.52)
Size	-0.002	-0.009	-0.009	-0.015	-0.013
	(-0.25)	(-1.45)	(-1.47)	(-2.15)	(-1.60)
Beta	-0.007	-0.004	-0.012	0.006	0.027
	(-0.37)	(-0.20)	(-0.98)	(0.28)	(1.05)
Pr(Z)	0.169	0.142	0.171	0.101	0.271
	(1.51)	(1.06)	(1.38)	(0.96)	(1.20)
Adj. R^2	0.042	0.043	0.039	0.032	0.039

Variables are as defined in earlier tables. Firm-years with negative values for NOA or P^{NOA} are excluded from the regression analysis.
The Z-score is calculated using fiscal year end data and are an assessment of the risk of bankruptcy over the twelve month period beginning four months after the end of the fiscal year. For the period 1962-1979 the Z-score is computed as -1.20*WC/TA – 1.40*RE/TA – 3.30*EBIT/TA – 0.60*V_E/TL - 0.999*S/TA. For the period 1980-2001 the Z-score is computed as -4.34 - 0.08*WC/TA + 0.04*RE/TA – 0.10*EBIT/TA – 0.22*V_E/TL + 0.06*S/TA. WC/TA is working capital (Compustat item #4 – Compustat item #5) divided by beginning of year total assets (Compustat item #6), RE/TA is retained earnings (Compustat item #36) divided by beginning of year total assets, EBIT/TA is earnings before interest and taxes (Compustat item #178) divided by beginning of year total assets, VE/TL is the market value of equity (Compustat item #25 * Compustat item #199) divided by total liabilities (Compustat item #181), S/TA is sales (Compustat item #12) divided by beginning of year total assets. All independent variables used in the Z-score model are winsorized at the 1^{st} and 99^{th} respectively. We convert the Z-

score to a probability as follows: $Pr(Z) = e^Z/(1+e^Z)$. These calculations are described in detail in Hillegeist et al (2004).

The change in Pr(Z) is computed as $Pr(Z)_t – Pr(Z)_{t-3}$. We require three years of prior data, reducing the sample to 75,577 firm-year observations for the Panel D analysis.