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

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Abstract: This paper lays out a decomposition of book-to-price (B/P) that derives from the accounting for book value and which articulates precisely how B/P "absorbs" leverage. The B/P ratio can be decomposed into an enterprise book-to-price (that pertains to operations and potentially reflects operating risk) and a leverage component (that reflects financing risk). The empirical analysis shows that the enterprise book-to-price ratio is positively related to subsequent stock returns but, conditional upon the enterprise book-to-price, the leverage component of B/P is *negatively* associated with future stock returns. Further, both enterprise book-to-price and leverage explain returns over those associated with Fama and French nominated factors – including the book-to-price factor – albeit negatively so for leverage. The seemingly perverse finding with respect to the leverage component of B/P survives under controls for size, estimated beta, return volatility, momentum, and default risk.

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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 (or book-to-market or HML) 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 feature that loads 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 rational asset pricing is agreed upon. An elementary notion in corporate 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, founded on no-arbitrage assumptions, is formalized in

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

Modigliani and Miller (1958), and the notion that borrowing adds risk and expected return has become widely accepted such that, any observation to the contrary would be deemed to be anomalous. In this paper, we separate the leverage component of the B/P ratio pertaining to financing risk from the component that pertains to operations – and potentially to operating risk – and indeed observe an anomalous finding with respect to the leverage component.

For a given price, the B/P ratio depends on how book values are accounted for. If net debt is carried on the balance sheet at market value, the difference between the price and book value of equity is due solely to the accounting for net assets involved in business operations rather than leverage. Yet, we show, the B/P ratio is affected by leverage, and the paper presents an expression that decomposes the B/P ratio into operating and leverage components. The first component – the book value of net operating assets divided by their market value – pertains to business operations and involves that part of the balance sheet where accounting measurement induces a difference between price and book value. This "enterprise book-to-price" serves as a proxy for operating risk under the risk explanation of the B/P effect. The second component – net debt divided by the market value of equity – is the generally accepted measure of leverage that captures financing risk if debt on the balance sheet is measured at market value and market prices are efficient.

We find that the operating component of the B/P ratio 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 firms with both high and low B/P ratios. The negative correlation survives with controls for conjectured operating risk proxies with which leverage may be negatively correlated. The finding violates a basic understanding of how leverage should be priced and points either to an incomplete representation in common asset pricing models or to a mispricing of leverage (and, by implication, a mispricing of firms' operations). The negative correlation between leverage and returns survives with controls for factor returns in popular pricing models, including those for the book-to-price factor which Fama and French maintain "absorbs" leverage. Indeed, the enterprise book-to-price component of B/P, as well as the leverage component, also explains returns incremental to B/P factor returns. The results thus indicate that the book-to-price pricing models obscure a more complicated relationship between returns and the components of B/P.

Surprisingly, given its centrality as a principle in finance, there has been little prior research examining the (conditional) relation between leverage and returns. Bhandari (1988) reports a positive relation between monthly returns and leverage in annual cross-sectional regressions over the years, 1948-1979, and documents that this result is concentrated in January. However, this positive relation is also concentrated in years prior to 1966. This raises the question of whether his result (and, indeed, ours) is sample specific. Johnson (2004) develops an option based value of the firm in the presence of information risk (measured by analyst forecast dispersion). He finds a weak unconditional positive relation between leverage and future returns, but after controlling for underlying firm characteristics (for example, volatility) the relation between leverage and future returns switches to negative, consistent with our result.

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 good example is a pure investment fund where "net asset value" typically equals market value, since 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] However, for B/P to capture cross-sectional variation in risk characteristics, that risk must be captured by the application of accrual accounting. Accordingly, accounting explanations must be brought to the examination of the B/P effect. 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 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**

[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.

The book value of operations is net operating assets (NOA), the difference between assets involved in operations (OA) and liabilities involved in operations (OL). Operating liabilities (such as accounts payable, deferred revenues, pension liabilities, and accrued expense liabilities) arise from trading with customers and suppliers in the course of operations rather than borrowing in the capital market to raise cash for operations. NOA 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 the firm is a net creditor rather than a net debtor. Further, net operating assets can be negative (though rarely) if operating liabilities are in excess of operating assets.

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:

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

If net debt is carried on the balance sheet at market value, (i.e, $P^{ND} = ND$), 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 which accountants typically measured 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; 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 ($P^{ND} = ND$) is assumed in the application of discounted cash flow methods of valuation, where it is conventional 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. This may affect our empirical analysis and we address this in section 4.[3]

While the difference between price and book value may not be affected by leverage, the ratio of book value to price, B/P is. As $B = NOA - ND$, then

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

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

If ND is measured at market value (i.e., $P^{ND} = ND$) then $P = P^{NOA} - ND$ and $\frac{P^{NOA}}{P} - \frac{ND}{P} = 1$, or alternatively, $\frac{P^{NOA}}{P} = 1 + \frac{ND}{P}$ and

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

[3] 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.

Rearranging,

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

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). This weighted average can be expressed in the form of a leveraging equation (1). 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) shows 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 positive leverage, or one with a relative low enterprise book-to-price and negative leverage. Correspondingly, 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 negative leverage or a relatively low enterprise book-to-price with positive 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 idea in Fama and French (1992) that B/P absorbs leverage. In a sense, this is so, but we clarify the subtleties of the relationship between B/P and leverage. Most importantly, the analysis stresses that differences between price and book value do not arise from leverage, and in attributing expected stock returns to book-to-price, one must distinguish the leverage effect in the B/P ratio from that attributable to the measurement of net assets used in operations.

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 (as the leverage component 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 obtain our data from two sources. Financial statement data is from COMPUSTAT and stock returns are from CRSP. The sample includes all firm-year observations, excluding the financial services industry (in SIC codes 6000-6999), with available data from 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 extraordinary items (Compustat item #18), common shares outstanding (Compustat item #25), book value of common equity (Compustat item #60), and stock price at the end of the fiscal year (Compustat item #199). Other variables are set equal to zero if they are missing, but our results are not sensitive to this treatment.[4]

Our variable calculations follow Nissim and Penman (2001). B/P is 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 item #60) plus any preferred treasury stock (Compustat item #227) less any preferred dividends in arrears (Compustat item #242,), and is measured at the end of the fiscal year. P is the number of common shares outstanding (Compustat item #25) multiplied by the stock price at the end of the fiscal period (Compustat 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.

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

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 item #9), debt in current liabilities (Compustat item #34), carrying value of preferred stock (Compustat item #130), preferred dividends in arrears (Compustat item #242), less preferred treasury stock (Compustat item #227). FA is cash and short-term investments (Compustat item #1).[5]

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 (B) and net debt (ND), both 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.[6]

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}, and B/P - NOA/P^{NOA}. This yields 132,678 firm-year observations for the portfolio analysis and 120,753 firm-year observations for the regression analysis.

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[5] Even though some interest-bearing securities (that might be considered as "excess cash") are included in Compustat Item #32, Investment and Advances-Other, we do not include these in FA due to data limitations. This COMPUSTAT data item 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. Some part of cash should be identified as operating cash, but the allocation to operating cash is problematic, varies over industries (and is presumably quite small). In any event, excluding cash from our measure of market leverage does not affect our conclusion that there is a negative relation between leverage and future returns after conditioning on various measures of operating risk.

[6] 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 want ND to contain items whose book values are at market value.

2.2 Basic Correlations

Panel A of Table 1 reports buy-and-hold returns for 13 portfolios formed by ranking firms each year by their (levered) B/P ratios.[7] Returns are size-adjusted to abstract from the so-called "size effect," and include delisting returns (results are similar using raw returns, and are available on request). Specifically, we assign every firm-year observation into ten portfolios based on the market capitalization at the start of the return accumulation period. We subtract the equal weighted return for the respective size portfolio from the raw return to compute the size-adjusted return (results are similar using market-adjusted returns). 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 been published.[8] The returns in the table are means 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

[7] The cut-offs for determining portfolios were the deciles from the ranking in the previous year (to avoid any look-ahead bias). As no firms were rejected for Table 1, the means in extreme portfolios are particularly sensitive to outliers. Medians in extreme portfolios are considerably less extreme than the means.

[8] 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 were not published within four months. Our results are virtually identical with this more conservative return window.

that pertains to the operating activities. The spread on the enterprise book-to-price is however, smaller than that for B/P; for all portfolios except 10a, 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 high B/P firms 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 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, $\frac{NOA}{P^{NOA}}$ 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, inconsistent with 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 (4 - 6), although the differences are not striking, but firms with negative leverage in portfolios 1 and 2 (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 leverage component of B/P 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 differences in portfolio returns 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).[9] 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 deleting outliers (as described in section 2.1). The reported correlations are means of annual correlation coefficients.

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 is positive (0.263 Spearman and 0.315 Pearson) as equation (1) suggests, but the negative correlation between $\frac{NOA}{P^{NOA}}$ and leverage means that the 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 strong positive correlation between $\frac{NOA}{P^{NOA}}$ and leverage.

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[9] There is temporal variation in the relative assignment of firms into the two groups (i.e., $\frac{NOA}{P^{NOA}} > 1$ and $\frac{NOA}{P^{NOA}} < 1$). For example, for the period 1973-1978 there is a greater fraction of firms in the former category, whereas from 1993 to 1998 there is a greater fraction of firms in the latter category. This temporal variation is not surprising as it follows market wide variation in firm values. However, for our purposes an absolute (not a relative) cut-off is required given the leveraging equation (1).

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

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 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

[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.

[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. Accounting maintains this condition with the "effective interest method."

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 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).

Pairing the equity return in 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 includes operating risk, indicated by $\frac{NOA_t}{P_t^{NOA}}$, 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 book values, decomposed into operating and financing components (and denominated in the same price), explain future stock returns (denominated in the same price). Not only does equation (2) say that leverage adds to expected returns but also, for a given leverage, the financing return premium is increasing in expected returns from operations (provided these are greater than the expected return to debt). Accordingly, the interaction between $\frac{NOA_t}{P_t^{NOA}}$ and $\frac{ND}{P}$ (that levers both the B/P ratio and returns) is of interest.

We first examine how the operating and financing components of B/P explain differences in returns by regressing future returns on the components in cross-section. We then report the results of factor regressions where portfolio returns representing payoffs to the B/P components are adjusted for their sensitivity to returns associated with factors nominated in extant asset pricing models as rewarding (operating and financing) risk to investing in equities.

3.1 Characteristic Regressions

Assuming that enterprise book-to-price is a risk characteristic, 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 indicates omitted, unidentified firm characteristics other than $\frac{NOA}{P^{NOA}}$ that pertain to operating risk. 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 $\frac{NOA}{P^{NOA}}$, $\frac{ND}{P}$, and the difference between B/P and NOA/P^{NOA}, along with other measures that appear in popular empirical asset 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 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 (as in Fama and Macbeth 1973). Results are reported for the full

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

sample in Panel A and for $\frac{NOA}{P^{NOA}}$ greater than or equal to one 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 estimated 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 returns, 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 Panel A and also in Panel C covering the 74.4% of observations in the sample that have $\frac{NOA}{P^{NOA}}$ 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 assets is positive (in all three panels); $\frac{FA}{P}$, rather than $\frac{FL}{P}$, is rewarded with a return premium.[14]

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

[14] The separation of financial assets from financial liabilities deals with the objection that financial assets ("cash") are not negative debt, but rather instruments for hedging cash flows from operations. See Acharya, Almeida and Campello (2004).

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, both before and after controlling for $\frac{NOA}{P^{NOA}}$ in regressions IV and VI. 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 the interaction between $\frac{NOA}{P^{NOA}}$ and $\frac{ND}{P}$, one would expect a positive return association if this interaction were between operating and financing risk factors, as leveraging equation (2) suggests. For $\frac{NOA}{P^{NOA}} < 1$, the difference is decreasing in leverage but the coefficient is positive.

These results indicate that the leverage portion of the B/P ratio is not priced according to standard precepts, contradicting a basic tenet in finance, expressed in leveraging equation (2): given operating risk, leverage adds to expected returns.

The results could be due to leverage being negatively correlated with unidentified characteristics that load on (unidentified) risk factors. Indeed, leverage may be endogenous, with firms choosing lower financial leverage when their operating risk is higher. The results for regression VIII in Table 3, with the standard risk characteristics, beta and ln(Size), in the regression, do not support this: The coefficient on leverage is still negative.[15] Return volatility

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[15] 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. Our result is inconsistent with the observations is Ferguson and Shockley (2003) that beta, measured

may indicate higher risk and hence a choice by the firm to carry lower leverage. In further analysis (unreported) we included the standard deviation of the (unlevered) enterprise rate of return, estimated over the 252 trading days prior to the return period, to regression VIII. As in Ang, Hodrick, Xing, and Zhang (2004), the estimated coefficient on the volatility measure was negative (though not significant); the coefficient on leverage remained negative (and significant). Our analysis has split liabilities into operating (OL) and financing (FL) and it could be that firms substitute operating liabilities for financing liabilities such that low financing leverage is associated with high operating liabilities (and thus higher operating risk). The spearman correlation between $\frac{ND}{P}$ and a measure of that risk, $\frac{OL}{P^{NOA}}$ is 0.247, indicating that this is not an issue, and adding $\frac{OL}{P^{NOA}}$ to regression in Table 3 had little effect on the results. Of course, we may not have identified all operating risk factors.[16] However, we repeated the regression analysis in Table 3 within industries, using the Fama and French (1997) industry classification scheme. Averaging coefficients across the 1,068 industry-year groupings, we found very similar results. To the extent that operating risk is the same within industries, these results cannot be attributed to leverage indicating differences in operating risk.

3.2 Double Sorts and Factor Regressions

To identify any nonlinearities and interaction effects, Panel A of Table 4 reports mean returns for portfolios formed on joint realizations of $\frac{NOA}{P^{NOA}}$ and $\frac{ND}{P}$. In this analysis we use size-adjusted

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here with respect to an equity market portfolio, omits covariance with debt assets. They show that market leverage corrects for the mismeasurement of beta, but in a direction opposite to that documented here.

[16] The result could also be due to a long run of negative outcomes for highly levered firms during the sample period, such as lower inflation than anticipated (that results in unanticipated losses for net debtors). But see Section 3.4. And the sample period is one of ex post favorable outcomes for business investing, on average, which should be associated with favorable payoffs to leverage.

returns. 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 enterprise book-to-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 monotonically. 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.

Leveraging equation (2) states that expected returns are not only increasing in leverage but, for a given leverage, in expected returns to operations. Thus, if enterprise book-to-price is a measure of operating risk, one would expect particularly high returns to be associated with high $\frac{NOA}{P^{NOA}}$ and high $\frac{ND}{P}$. This is not the case in panel A of Table 4. The mean difference between the return for the highest $\frac{ND}{P}$ quintile portfolio within the highest $\frac{NOA}{P^{NOA}}$ portfolio (4.0%) and that for the lowest $\frac{ND}{P}$ quintile portfolio (1.7%) within the lowest $\frac{NOA}{P^{NOA}}$ portfolio is only 2.3%, with a t-statistic of 0.45 (untabulated). This contrasts with the mean return of 23.2% from investing long in the lowest leverage quintile within the highest $\frac{NOA}{P^{NOA}}$ portfolio and shorting the highest leverage quintile within the lowest $\frac{NOA}{P^{NOA}}$ portfolio. This 23.3% is also 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 (untabulated) 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 based 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 9 – 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 lower return, the higher 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 9 – 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. These 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.

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.[17]

Panel D of Table 4 investigates whether these differences in portfolio returns are explained by factor returns nominated in previous research to reward risk. Monthly excess returns (over the risk-free rate) for each of the 50 portfolios in Panel A of Table 4 were regressed, over the 480 months in the sample period, on mimicking returns for the three Fama and French (1993) factors – the market factor (MKT), size (SMB) and book-to-market (HML) – plus the return to the momentum factor (UMD) attributed to Jegadeesh and Titman (1993). The "alpha" intercepts from these regressions are given in Panel D, along with differences between the alpha returns for the extreme portfolios in each column and row and t-statistics on those differences.

[17] 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. For $\frac{NOA}{P^{NOA}} < 1$ (portfolios 1 - 7), this is not an issue for the inferences from Panel A because the rank correlation between $\frac{NOA}{P^{NOA}}$ and $\frac{ND}{P}$ (in Table 2) is positive. The Table 3 results also 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.

It is clear that differences in returns for leverage portfolios within each $\frac{NOA}{P^{NOA}}$ portfolio are not explained entirely by their sensitivity to factor returns, and the alpha returns are negatively related to the level of leverage. In essence, we have identified an additional factor associated with leverage but one on which leverage loads in an unexpected way. As the book-to-price factor is included in these regressions, the results also show that book-to-price factor returns do not "absorb" leverage effects. Further, the returns on $\frac{NOA}{P^{NOA}}$ portfolios in the columns, and the associated t-statistics, indicate that the book-to-price factor does not absorb the return to enterprise book-to-price -- which is the metric identified with the difference between price and book value -- though the return differences (hedge return, HIGH-LOW)) are driven primarily by the highest $\frac{NOA}{P^{NOA}}$ portfolio. The decomposition of the B/P ratio into operating and financing components has provided an explanation of returns that the aggregate book-to-price obscures.[18]

In sum (to this point), while Panel C of Table 1 indicates that market leverage has 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. Further, the returns to leverage are in excess of those associated with market, size, book-to-market and momentum factors on which leverage could load. However, the conditional correlation is negative and the magnitude of the excess returns is negatively related to leverage. The explanation that the leverage loads on an additional, unidentified operating risk factor must be entertained, as must the conjecture that leverage corrects for measurement error in the enterprise

[18] Factor regressions including only the market factor produced similar results, as did regressions including the market factor, size and momentum (but excluding book-to-price) and regressions with the market factor, size and book-to-price. One additional risk factor that could be related to leverage is liquidity. We performed additional analyses with a five factor model that includes the liquidity mimicking portfolio described by Pastor and Stambaugh (2003). We continue to find systematic patterns in alpha from this expanded model. Specifically, we continue to find a monotonic negative relation between leverage and alpha within each NOA/P^{NOA} portfolio.

book-to-price as a proxy for firm's exposure to common returns. Our exploration of possible operational explanations in Table 3 was unsuccessful in identifying an omitted variable. Such an explanation requires leverage to load inversely on an unidentified factor, orthogonal to $\frac{NOA}{P^{NOA}}$, the market return, size and momentum, such that, when the factor loading is low, leverage is high and vice versa. Following Merton (1973), if that factor is related to future investment opportunities, it would have to be that high leverage firms can exploit those opportunities when they arise.

The alternative explanation is market inefficiency. Indeed, if one views the four-factor model employed in Panel D of Table 4 as a satisfactory asset pricing model, the alphas reported there are abnormal returns. Market price, in the denominator of $\frac{NOA}{P^{NOA}}$ also denominates the "market" leverage measure, $\frac{ND}{P}$. If the 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) market leverage to be associated with lower (higher) stock returns than one would expect given intrinsic financing risk.[19] Of course, if size, book-to-price, or momentum effects are abnormal returns rather than returns to risk bearing, the returns to enterprise book-to-price and leverage are incremental to these effects. In particular, low market leverage due to a high price in the denominator cannot be attributed to momentum overpricing. Broadly, the results are 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.

[19] In an investigation of returns around changes in leverage that result 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.

3.3 A Parallel Investigation Separating Net Debt from Price

In response to the conjecture that the leverage result may be due to the denomination in inefficient prices, Table 5 investigates net debt with a control for price. To do this, the table decomposes size into an enterprise price component and a net debt component.

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 shows that the size effect is (weakly) supported in our data. Like B/P, size 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 price, $\ln(P^{NOA})$ 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 business enterprise and netting in debt that (in theory) is associated with higher expected returns confounds the size effect (that bears 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. 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 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 could be a reward to risk but could also be due to inefficient prices. Notwithstanding, delinking net debt from (possibly inefficient) prices yields a result consistent with theory.

However, introducing ln(NOA) and $\frac{NOA}{P^{NOA}}$ in regressions III and IV in Table 5 flips the sign of the net debt coefficient: 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.[20]

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 return is 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 (to common) relative to the book value of common equity. Earnings is income from operations (enterprise income, *OI*) less net interest

[20] As an alternative approach to address the issue of inefficient prices, we have also performed all of the regression analyses in Table 3 using a measure of book leverage (i.e., ND/B) rather than market leverage. Across the specifications where ND/P was statistically negatively associated with future returns we find the same result using ND/B instead. For example, regression model VIII in table 3 panel A estimated with ND/B instead of ND/P, generates a coefficient estimate of -0.019 on the leverage variable, with a t-statistic of -4.64.

(interest expense minus interest income, i) on 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 equations (2) and (1).[21] 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, $NBC_{t+1} = i_{t+1}/ND_t$.

Past book rates of return strongly 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 $RNOA_t < NBC_t$.[22]

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

[21] The equation requires a slight modification where there is a minority interest, but the adjustment is typically small. See Penman (2007, p. 380).

[22] ROCE is before extraordinary and special items, net of preferred dividends. 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 (-0.027 with a t-statistic of -4.64)[23]. 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 8.64), 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 (-0.049 with a t-statistic of -3.10) for firms where $RNOA_t < NBC_t$, appropriate for the case of unfavorable leverage.[24]

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 were a risk attribute): after controlling for a risk from operations, leverage reduces expected stock returns. As the sample period has been one

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[23] t-statistics in this section are calculated as the mean of the estimated coefficients relative to their estimated standard errors. To adjust for autocorrelation in the regression coefficients (which is likely with accounting measures), estimated standard errors are multiplied by $k = \sqrt{\frac{1+\phi}{1-\phi} - \frac{2\phi(1-\phi^n)}{n(1-\phi)^2}}$ where φ is the estimated first order autocorrelation coefficient and n equals the number of annual regressions (see Abarbanell and Bernard 2000).

[24] The coefficients on RNOA are positive, with t-statistics of 10.30 for the $RNOA_t \geq NBC_t$ group and 3.80 for the $RNOA_t < NBC_t$ group.

where leverage paid off (favorably) in earnings, it is less likely that the return results are due to a series of negative realizations for highly levered firms.

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 market value and, of course, that market prices are efficient estimates of the value of equity. Our attribution of the difference between price and book value to operating rather than financing aspects of the balance sheet, and the derivations of leveraging equations (1) and (2), follow from these maintained these assumptions. 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.[25]

At issue is an explanation for why leverage, as measured by $\frac{ND}{P}$, is negatively correlated with returns. Our results are inconsistent with rational theories of the pricing of leverage if ND appropriately measures the value of debt and prices are efficient. The 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, $\frac{NOA}{P^{NOA}}$,

[25] Net debt includes preferred stock and convertible debt and preferred stock whose carrying value may not be their market value. However, the results in Table 3 are robust to excluding these obligations from the calculation of net debt. One could argue that the book value of the debt does not equal its value, net of the value of the tax shield that debt provides. We do not make the implied adjustment. Effectively, we see the value of the debt tax shield (if any) as another asset missing from the books – accruing to the levered firm rather than the debt -- so widening the difference between the price and book value of the enterprise.

calculated as $\frac{NOA}{P+ND}$. If, for a given level of calculated $\frac{NOA}{P^{NOA}}$, 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 of operating risk 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. Instead, our results point to a market inefficiency explanation for the negative relation. At the end of this section, we come back to the mismeasurement of ND to identify situations where ND is not likely to be measured at market value (i.e., firms who have experienced significant deteriorations in credit quality) and document our results are robust to excluding such firms.

However, we cannot 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.

4.1 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 (in equities) 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 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.[26] 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 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 and high $\frac{ND}{P}$).

To address these issues, we incorporate measures of distress risk into our analysis. 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

[26] 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.

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).[27] 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. 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.[28] 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 survive with variables from Table 5

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[27] 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.

[28] 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.

included. It is clear from the regression II result in Table 7 that the default score captures 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 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 from zero 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 (i.e., in the low default probability quintiles).

The above analysis is not entirely satisfactory. Differences between the book value and market value of debt are induced by *changes* in default probability after the date that debt is booked, rather than the level of default probability. To better identify firms where mismeasurement of ND is likely to be an issue, we measure default risk changes after the origination of the debt. Panel D of Table 8 repeats the regression analysis in Panel C, but with quintiles formed from ranking firms on changes in default probability. 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 (3) is somewhat higher (less negative), they are negative in both extremes even though one (HIGH) indicates deteriorating credit quality and the other (LOW) improving credit quality. Accordingly, possible mismeasurement of the value of debt and financial leverage does not 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.

An alternate approach to examining the impact of credit risk is via credit ratings. Unfortunately, we are able to obtain the senior credit rating for only a subset of our firms (S&P only rates a subset of all SEC registrants and this coverage has increased through time). Nonetheless, we extract the senior credit rating from Compustat (item #280) and restrict our analysis to firms with investment grade debt only (i.e., "BBB" and above ratings). For this sample we have 7,475 firm-year observations and continue to find a negative relation between leverage and future excess stock returns. For example, the coefficient on ND/P in model VIII of table 3 panel A for this sub-sample is -0.027 with a t-statistic of -1.87.

Our analysis of changing credit quality is only a partial solution to the problem of measurement error in market leverage. Investors in long term zero coupon bearing bonds are exposed not only to credit risk but (perhaps more importantly) shocks to the term structure of interest rates. While the majority of debt (over two-thirds of all issues covered on the Fixed Income Securities Database as reported by Billet, King and Mauer, 2006) has a maturity less than ten years, the remaining debt issues have significant exposure to interest rate risk. And this risk can cause significant deviations between the book and market value of the fixed income instrument. To address this issue, we measured the fraction of total outstanding debt that is expected to mature in the next five years (Compustat records the expected debt maturities over the next five years) and repeat our analyses for the sub-sample of firms that have more than half of outstanding debt falling due in the next five years. For this group of firms (slightly less than half of the full sample) market leverage is better measured. For this sample we continue to find a negative relation between market leverage and future excess stock returns.[29]

4.2 Some Robustness Checks

It is possible that the negative relation between leverage and future returns may be attributable to a correlation between our leverage measure and external financing activity. Prior research has shown a strong negative relation between external financing activity and future stock returns (e.g., Ritter, 2003 and Bradshaw, Richardson and Sloan 2005). To address the possibility, we excluded firm-year observations where the absolute value of the change in ND is greater than

[29] For example, the monthly return spreads sorting on ND/P within NOA/P^{NOA} deciles as reported in panel D of table 4 continue to be significantly negative, ranging from -1.33 percentage points per month for the lowest NOA/P^{NOA} decile to -0.46 percentage points per month for the highest NOA/P^{NOA} decile.

five percent of the absolute value of its starting value (i.e., delete firm-years where $|ND_t-ND_{t-1}|/|ND_{t-1}| > 5\%$). This reduces our sample to 73,086 firm-year observations which have *not* experienced a significant increase or decrease in debt in a given fiscal year. The inferences from our empirical analysis are virtually the same with this reduced sample (i.e., there is still a negative relation between leverage and future returns after conditioning on standard measures of operating risk).

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 (as in Bhandari, 1988, for example) and found our results are robust to excluding these returns. Finally, results are robust to using two-year-ahead returns.

5. Conclusion

We decompose 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 financing activities. While net financing debt on the balance sheet typically approximates its market value, and so does not contribute to the difference between the price and the book value of equity, the B/P ratio is determined by both the enterprise book-to-price ratio and financing leverage, by construction.

With this insight, the paper has explored how the operating and financing 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 solely leverage, which 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, rational models of capital structure are quite clear 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 (levered) B/P should yield additional return (as a reward for the leverage risk) over that indicated by the difference between price and book value, the return is in fact less.

Further investigation shows that the leverage result is not explained by returns on four factors –market, size, book-to-market, and momentum – that have been nominated in previous research to be rewards for risk bearing. In particular, the book-to-price effect does not absorb the payoff to leverage (as is commonly stated). Rather leverage explains differences in returns not captured by book-to-price, albeit inversely: Adding leverage to the enterprise book-to-price (which the levered B/P ratio does, by construction), results in lower returns.

The seemingly perverse result with respect to leverage persists with controls for size, estimated beta, industry identification, the volatility of stock returns, and the risk in operating liabilities. Further, the result survives an investigation into whether net debt is appropriately measured on the balance sheet (and thus whether market leverage is 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.

The failure to find such a relation could be due to the following non-mutually exclusive possibilities: (i) measurement error in leverage, (ii) omitted operating risk factors that are negatively correlated with leverage, or (iii) mispricing of leverage by the market. Disentangling these explanations is difficult (and in the absence of an agreed upon model for expected returns impossible). However, after an extensive analysis to mitigate the possibility of the first two explanations, we are left with a puzzling result that leverage is negatively related to future returns. While we cannot rule out that market leverage may load on some unrecognized operating risk factor – in a strange way – or that the results may just be due to sample-specific realizations (in the last half of the twentieth century), mispricing must be entertained as an explanation. At a minimum, future research needs to be careful when utilizing parsimonious asset pricing models (e.g., Fama-French 3- or 4-factor models) to capture risk. If these asset pricing models do not reflect a premium for leverage it is not clear to what extent the cross-sectional variation in returns that is explained by these models is a reward for risk or mispricing. We have uncovered a puzzling result that is difficult to explain with extant asset pricing models.

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Table 1

Mean Annual Size-Adjusted Returns for Portfolios Formed on Book-to-Price (B/P) and B/P Components

This table reports mean size-adjusted returns over the subsequent twelve months for portfolios formed on B/P, enterprise book-to-price, market leverage, and the difference between B/P and enterprise book-to-price; 1962-2001.

Panel A: Future Returns for B/P Portfolios

Portfolio	N	Mean B/P	Mean Values for each Portfolio			
			Future Returns	NOA/P^{NOA}	ND/P	B/P - NOA/P^{NOA}
Negative	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: Future Returns for Enterprise Book-to-Price (NOA/P^{NOA}) Portfolios

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	-0.767	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: Future Returns for Market Leverage (ND/P) Portfolios

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: Future Returns for Portfolios Formed on B/P - NOA/P^{NOA}

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

Portfolios are formed by ranking all firm observations each calendar year on the measures at the head of each panel. In Panels A and B, firms with negative values for B/P and NOA/P^{NOA} are placed into a separate "negative" portfolio, and in Panel B cases of negative P^{NOA} are further identified. Firms with positive market values (and all observations in Panels C and D) are placed into ten portfolios every year using percentile cut-offs. Extreme deciles are divided into two sub-portfolios at the 5 and 95 percentiles. Percentile cut-off points are those for the prior year data, to avoid look-ahead bias in the portfolio formation. In total, 132,678 firm-years are used in the analysis, covering all firms with available data on the Compustat and CRSP data files.

B/P is the book value of equity (B) relative to the market value of equity (P), calculated at fiscal year end. NOA/P^{NOA} is the enterprise book-to-price ratio, measured as the book value of net operating assets (NOA) relative to the market value of net operating assets (P^{NOA}), where P^{NOA} = P + ND. ND is the book value of net debt (financial liabilities minus financial assets) and ND/P is market leverage.

The twelve-month return period for each firm begins four months after fiscal year end. Returns are buy-and-hold returns. Size-adjusted returns are calculated by deducting the value-weighted average return for all firms in the same size-matched decile, where size is measured as market capitalization of the equity at the beginning of the return accumulation period. Returns reported in the table are means of returns for each year, 1962-2001, as are means of other variables in the table. Value and equal weighted market-adjusted returns calculations yield qualitatively similar results.

Table 2

Correlations Between B/P, its Components, Size, Beta and Returns

This table reports mean cross-sectional correlations for the period 1962-2001. Reported correlations are average correlation coefficients across the 40 years in the sample, with weights based on the square root of the number of observations each year. Spearman correlations are presented in the upper diagonal, and Pearson correlations in the lower diagonal.

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	0.263	0.621	-0.361	-0.062	-0.026	0.016
NOA/P^{NOA}	0.651	--	-0.290	0.145	-0.330	-0.074	0.011	0.046
ND/P	0.315	-0.271	--	0.811	-0.007	0.018	-0.056	-0.049
B/P - NOA/P^{NOA}	0.752	0.004	0.652	--	-0.138	0.008	-0.041	-0.017
Size	-0.304	-0.281	-0.037	-0.157	--	0.212	0.099	0.018
Beta	-0.049	-0.075	-0.002	0.001	0.173	--	-0.015	-0.031
Size-adj returns	0.009	0.026	-0.033	-0.010	0.010	-0.005	--	0.905
Raw Returns	0.037	0.047	-0.021	0.010	-0.053	-0.012	0.950	--

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	0.127	0.075	-0.065	-0.161	0.120	0.132
NOA/P^{NOA}	0.827	--	0.598	-0.416	-0.067	-0.195	0.099	0.112
ND/P	0.108	0.508	--	-0.905	0.042	-0.124	0.007	0.012
B/P - NOA/P^{NOA}	0.219	-0.347	-0.680	--	-0.040	0.092	0.013	0.009
Size	-0.074	-0.071	-0.034	-0.028	--	0.173	0.108	0.102
Beta	-0.143	-0.193	-0.115	0.075	0.154	--	-0.050	-0.050
Size-adj Returns	0.067	0.056	-0.006	0.032	0.006	-0.028	--	0.935
Raw Returns	0.074	0.064	-0.002	0.031	0.004	-0.025	0.968	--

Spearman correlation coefficients, estimated each year, utilize a total of 35,345 firm-year observations in Panel A and 97,333 firm-year observations in Panel B. Pearson correlation coefficients are estimated from the truncated sample of 30,958 firm-year observations in Panel A and 91,413 firm-year observations in Panel B, 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 defined in the notes to Table 1. Size is the log of market value of equity, ln (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. The market return used in the beta calculation is the CRSP value-weighted market return inclusive of all distributions. Size-adjusted returns are calculated as indicated in the notes to Table 1.

Table 3

Regression Analysis for B/P Decomposition

This table reports time-series means and t-statistics for coefficients estimated from annual cross-sectional regressions of raw stock returns on B/P, B/P components, and other characteristics, for the period 1962-2001.

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 *(1.02)*	0.057 *(1.39)*	0.116 *(3.76)*	0.121 *(3.96)*	0.044 *(1.07)*	0.047 *(1.17)*	0.022 *(0.59)*	0.107 *(1.81)*
B/P	0.163 *(5.48)*							
NOA/P^{NOA}		0.109 *(2.78)*			0.159 *(4.27)*	0.154 *(4.36)*	0.138 *(3.60)*	0.129 *(3.83)*
ND/P			-0.009 *(-0.77)*		-0.045 *(-4.99)*			-0.036 *(-4.81)*
B/P - NOA/P^{NOA}				0.143 *(2.48)*		0.252 *(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

Reported coefficients are means from yearly cross-sectional regressions for the years, 1962-2001. The t-statistics, reported in parentheses below the mean coefficient estimates, are the mean coefficient divided by a standard error estimated from the time series of coefficient estimates. Returns are buy-and-hold returns for the twelve-month period beginning four months after fiscal year end. FL is financial liabilities and FA in financial assets. Other variables are defined in notes to Table 1 and Table 2. To minimize the influence of outliers, extreme percentiles of the following variables were deleted: B/P, ND/P, NOA/P^{NOA}, and B/P - NOA/P^{NOA}. Firm-years with negative values for NOA or P^{NOA} are excluded from the regression analysis.

Table 4

Mean Size-Adjusted Returns and Alpha Returns from a Four-Factor Model for Portfolios Formed on Joint Sorts of Enterprise Book-to-Price, Market Leverage and B/P

Panels A - C report mean size-adjusted returns over the subsequent twelve months for portfolios formed by sorting firms into ten portfolios from a ranking on the first variable indicated in the three panels then, within each of those portfolios, five portfolios from ranking on the second variable; 1962-2001

Panel D reports alpha (intercept) returns from time-series regressions of monthly excess returns (over the risk-free rate) for each portfolio in Panel A on market, size, book-to-price, and momentum mimicking factor returns over the period 1962-2001.

Panel A: Size-adjusted returns over 12 months for portfolios sorted first on NOA/P^{NOA} then on ND/P

		ND/P Quintile					(HIGH-LOW)
		LOW	2	3	4	HIGH	
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: Size-adjusted returns over 12 months for portfolios sorted first 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: Size-adjusted returns over 12 months for portfolios sorted first 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)*	

Panel D: Monthly alpha excess returns (intercepts) from four-factor model time-series regressions for portfolios sorted first on NOA/P^{NOA} then on ND/P

		ND/P Quintile					(HIGH-LOW)
		LOW	2	3	4	HIGH	
NOA/P^{NOA} Decile	LOW	0.0067	0.0016	0.0018	-0.0025	-0.0069	-0.0136 *(-6.10)*
	2	0.0076	0.0044	0.0022	-0.0013	-0.0008	-0.0083 *(-3.74)*
	3	0.0068	0.0039	0.0011	-0.0030	-0.0028	-0.0095 *(-4.67)*
	4	0.0059	0.0024	0.0000	-0.0011	-0.0020	-0.0079 *(-4.12)*
	5	0.0064	0.0041	0.0004	-0.0010	-0.0006	-0.0070 *(-4.23)*
	6	0.0070	0.0018	0.0006	-0.0002	-0.0013	-0.0083 *(-4.72)*
	7	0.0052	0.0025	0.0009	-0.0012	-0.0003	-0.0055 *(-3.16)*
	8	0.0061	0.0046	0.0027	0.0015	0.0032	-0.0030 *(-1.80)*
	9	0.0082	0.0049	0.0037	0.0018	0.0013	-0.0069 *(-3.51)*
	HIGH	0.0125	0.0100	0.0098	0.0072	0.0091	-0.0034 *(-1.62)*
(HIGH-LOW)		0.0058 *(3.18)*	0.0084 *(4.53)*	0.0080 *(4.28)*	0.0097 *(4.53)*	0.0160 *(6.52)*	

Portfolios are formed from ranking all firm observations each calendar year, 1962-2001. Ranking variables are defined in Table 1. Firm-years with negative values for NOA or P^{NOA} are excluded from the analysis, leaving a sample of 129,851 firm-years.

In Panels, A – C, size-adjusted returns are calculated as in Table 1. Reported returns are means over yearly returns for 1962-2001. The t-statistics that test the mean difference between returns in extreme cells in each row and column are presented in parentheses beneath the mean return difference between those extreme cells. These t-statistics are based on the 40 annual returns for each cell, with standard errors estimated from the time series of return differences.

Panel D involves 480 months of excess returns (over the ten-year risk-free rate) in the time-series regressions. The factor returns for MKT, SMB, HML and UMD factors were obtained from Kenneth French's website at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/f-f_factors.html. The t-statistics on the HIGH-LOW return comparisons are those on the intercept from regressing HIGH-LOW portfolio returns on the mimicking factors over the 480 months, where the HIGH-LOW return is a zero-net-investment return from a long position in the HIGH portfolio and a canceling short position in the corresponding LOW portfolio.

Table 5

Regression Analysis with a Decomposition of Size

This table reports time-series means and t-statistics for coefficients estimated from annual cross-sectional regressions of raw stock returns on size, decomposed into enterprise size and net debt, for the period 1962-2001.

	I	II	III	IV
Intercept	0.197 *(4.03)*	0.212 *(4.04)*	0.186 *(3.52)*	0.048 *(0.74)*
Size (ln(P))	-0.013 *(-2.16)*			
$\ln(P^{NOA})$		-0.027 *(-3.05)*	-0.091 *(-5.76)*	-0.001 *(-0.03)*
ln(ND)		0.015 *(2.95)*	-0.014 *(-3.52)*	-0.006 *(-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

Returns are calculated as in the Table 3 regression analysis, as are mean coefficients and associated t-statistics. $\ln(P^{NOA})$ is the natural logarithm of enterprise market value. ln(ND) is the natural logarithm of net debt. All other variables are defined in notes to Tables 1 and 2. Firm-years with negative values for NOA or P^{NOA} are excluded from the analysis. The sample consists of 120,753 firm-year observations from 1962-2001.

Table 6

Regression Analysis for B/P Decomposition with Controls for Default Risk

This table reports time-series means and t-statistics for coefficients estimated from annual cross-sectional regressions of raw stock returns on B/P, B/P components, and a measure of default probability, Pr(Z), for the period 1962-2001.

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

	0	I	II	III	IV	V	VI	VII	VIII
Intercept	0.082	0.058	0.059	0.071	0.075	0.047	0.057	0.031	0.120
	(1.98)	*(1.39)*	*(1.39)*	*(1.71)*	*(1.82)*	*(1.11)*	*(1.37)*	*(0.80)*	*(2.07)*
B/P		0.079							
		(6.52)							
NOA/P^{NOA}			0.087			0.091	0.067	0.060	0.067
			(5.37)			*(5.83)*	*(4.13)*	*(3.53)*	*(3.93)*
ND/P				-0.012		-0.020			-0.027
				(-8.41)		*(-1.58)*			*(-4.18)*
B/P - NOA/P^{NOA}					0.164		0.130		
					(5.64)		*(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	0.045	0.018	0.156	0.214	0.050	0.097	0.088	0.131
	(2.13)	*(0.66)*	*(0.27)*	*(1.51)*	*(3.04)*	*(0.55)*	*(1.55)*	*(1.06)*	*(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

The Z-score is 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 from fiscal-year-end data 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 variables used in the Z-score model are winsorized at the 1st and 99th respectively. The Z-score transforms to a probability as follows: Pr(Z) = $e^Z/(1+e^Z)$. These calculations are described in detail in Hillegeist et al (2004). The sample consists of 120,753 firm-year observations from 1962-2001 with available data to compute the Z score. Firm-years with negative values for NOA or P^{NOA} are excluded from the regression analysis. Other variables are as defined in earlier tables.

Table 7

Regression Analysis for Size Decomposition with Controls for Default Risk

This table reports time-series means and t-statistics for coefficients estimated from annual cross-sectional regressions of raw stock returns on size, decomposed into enterprise size and net debt, and a measure of default risk, Pr(Z), for the period 1962-2001.

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

See notes to Tables 5 and 6.

Table 8

Regression Analysis for B/P Decomposition for Varying Amounts of Default Risk and Changes in Default Risk

This table reports time-series means and t-statistics for coefficients estimated from annual cross-sectional regressions of raw stock returns on B/P and B/P components, for quintile groups formed from a ranking on estimated default probability, Pr(Z), and changes in default probability, for the period 1962-2001.

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

See notes to Tables 3 and 6. The change in Pr(Z) is computed as $Pr(Z)_t - Pr(Z)_{t-3}$. With a requirement of three years of prior data, the sample in Panel D reduces to 75,577 firm-year observations.