

# **A Framework for Identifying Accounting Characteristics for Asset Pricing Models, with an Evaluation of Book-to-Price**

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# **A Framework for Identifying Accounting Characteristics for Asset Pricing Models, with an Evaluation of Book-to-Price**

## **Abstract**

We provide a framework for identifying accounting numbers that indicate risk and expected return. Under specified accounting conditions for measuring earnings and book value, book-to-price (B/P) indicates expected returns, providing justification for B/P in asset pricing models. However, the framework also points to earnings-to-price (E/P) as a risk characteristic. Indeed, E/P, rather than B/P, is the relevant characteristic when there is no expected earnings growth, but the weight shifts to B/P with growth. Using this framework we resolve a puzzle: in contrast to previous empirical research, we find that leverage is positively associated with future returns, as predicted by theory.

**Keywords:** Book-to-price; earnings-to-price; growth and risk; accounting principles

**JEL Classifications:** G11 G12 M41

# **A Framework for Identifying Accounting Characteristics for Asset Pricing Models, with an Evaluation of Book-to-Price**

## **1. Introduction**

A long stream of papers documents correlations between firm characteristics and future stock returns. Empirical asset pricing research interprets some of these observed “characteristic” correlations as evidence of a risk-return relationship and then proceeds to construct asset pricing models with common risk factors based on the characteristics, as in Fama and French (1993). Many of the characteristics involve accounting numbers, such as book-to-price, book rate-of-return, and investment. However, these characteristics have largely been identified simply by observing what predicts returns in the data, a data mining exercise that has resulted in a proliferation of characteristics.<sup>1</sup> A number of explanations for the phenomena have been offered, although many of these are just conjectures. Presumably to emphasize the severity of the problem, Novy-Marx (2014) finds that returns predicted by many of the observed characteristics can be explained by sunspots, the conjunction of the planets, the temperature recorded at Central Park Weather Station in Manhattan, and other seeming absurdities.

This paper presents a framework for identifying valid accounting characteristics for asset pricing, yielding additional conditions for the identification beyond simply predicting returns in the data. The framework develops from an expression that connects expected returns to expectations of earnings and earnings growth, with the connection to risk determined by accounting conditions. An identified characteristic is one that satisfies those conditions. The ability to predict returns empirically then serves as validation.

We apply the framework to investigate book-to-price (B/P), identified in a “characteristic regression model,” by Fama and French (1992) (FF) who then proceeded to construct an asset pricing model in Fama and French (1993) that includes a book-to-price factor. That model stands as perhaps the premier empirical asset pricing model, though subsequent research has expanded

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<sup>1</sup> In a survey of published papers and working papers, Harvey, Liu, and Zhu (2016) find 316 predictors, a number they say likely under-represents the total. Green, Hand, and Zhang (2013 and 2014) find that, of 333 characteristics that have been reported as predictors of stock returns, many predict returns incrementally to each other.

the set of characteristics to promote additional common factors, resulting in a proliferation of factors (as well as characteristics).<sup>2</sup> There is little theory for why B/P might indicate risk, though conjectures abound.<sup>3</sup> Our framework provides an explanation: under a specified accounting that bears resemblance to GAAP, B/P forecasts expected earnings growth that the market deems to be at risk. Our empirical analysis supports the predictions from our framework.

However, while the framework validates B/P in the FF model, it also points to earnings-to-price (E/P) as a valid characteristic. Indeed, with no expected earnings growth, E/P alone predicts the expected return and B/P is irrelevant. With growth, the weight shifts to B/P. The paper also shows that the relative weights are related to firm size, another FF factor: for smaller firms that typically have higher growth expectations, B/P is important for forecasting returns but, for large firms with lower growth expectations, B/P is not important while E/P takes primacy. Further, the paper shows how the relative weights on E/P and B/P depend on the accounting, with the expected return under fair value accounting (where B/P = 1) given by E/P, but with the weight shifting to B/P under historical cost accounting (where B/P is typically different from 1).

The paper also applies the framework to investigate the pricing of financing leverage risk in the FF model. FF factors are said to incorporate financing risk, but there is no formal analysis as to why. Indeed, Penman, Richardson, and Tuna (2007) show that the FF model does not price financing leverage appropriately. Our framework separates the components of E/P and B/P that pertain to operating risk from those that pertain to financing risk, with the expected returns associated with each identified and reconciled to the expected equity return in accordance with the Modigliani and Miller (1958) leveraging equation.

This separation enables us to revisit an issue long outstanding in empirical asset pricing: While a basic tenet of modern finance, formalized in Modigliani and Miller (1958), states that, for a given level of operating risk, expected equity returns are increasing in financial leverage,

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<sup>2</sup> Additional factors include momentum (Jegadeesh and Titman, 1993), investment (Liu, Whited, and Zhang, 2009 and Hou, Xue, and Zhang, 2015), profitability (Novy-Marx, 2012 and Fama and French, 2015), accruals quality (Francis, LeFond, Olsson, and Schipper, 2005), among others.

<sup>3</sup> Explanations for book-to-price include: (i) distress risk (Fama and French, 1992), (ii) the risk of “assets in place” vs. “risk of growth options” (Berk, Green, and Naik, 1999; Zhang, 2005), (iii) low profitability (Fama and French, 1993), (iv) high profitability (Novy-Marx, 2012), (v) investment (Hou, Xue, and Zhang, 2015; Gomes, Kogan, and Zhang, 2003; and Cooper, Gulen, and Schill, 2008) (vi) operating leverage (Carlson, Fisher, and Giammarino, 2004), and (vii) *q*-theory (Cochrane, 1991 and 1996 and Lin and Zhang, 2013).

research has had difficulty in documenting the positive relation. Indeed, papers largely report negative returns to leverage.<sup>4</sup> This is puzzling given how fundamental is the idea that leverage requires a return premium. The failure to validate such a fundamental tenant of modern finance is presumably due to a failure to identify and control for operating risk. By unlevering E/P and B/P to capture operating risk, we are able to show that equity returns are increasing in leverage. This not only yields an empirical documentation of the leverage effect that has escaped earlier research, but also validates our framework: it identifies operating risk such that one observes that leverage is appropriately priced. And it points to a deficiency in the FF model: both E/P and B/P are relevant and, once that is recognized, leverage prices according to theory.

Our analysis maintains the standard assumption in asset pricing research that the market prices risk efficiently. There is no imperative, of course, but we wish to address the research on its own grounds.

## **2. The Framework: Connecting E/P and B/P to Expected Returns**

The framework involves two key ideas. First, expected returns can be expressed in terms of expected earnings and subsequent earnings growth, with that expected return determined by the risk that these expected outcomes will not be realized. Second, given price, B/P and E/P are accounting phenomena, so how they connect to risk and return depends on the accounting. With the focus on B/P, the framework establishes conditions for the accounting for book value under which B/P can (or cannot) indicate the risk of expected earnings and earnings growth not being realized. Further, as book value and earnings articulate under accounting principles, the accounting for book value also determines earnings, and thus E/P is also identified as a potential risk characteristic.

We stress that the framework is not a formal model that connects accounting characteristics to priced risk. That would require a generally accepted asset pricing model (that identifies priced risk), and that we (collectively) do not have. While the general form is laid out in no-arbitrage asset pricing theory in terms of common risk factors and sensitivities to those factors, it is the identification of factors that has proved difficult. That, of course, is what the ad

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<sup>4</sup> See Bhandari (1988), Johnson (2004), Nielson (2006), George and Hwang (2010), Ippolito, Steri and Tebaldi (2011), and Caskey, Hughes and Liu (2012), for example. Penman, Richardson, and Tuna (2007) report the negative relation with the FF model.

hoc empirical approach is trying to do—identifying characteristics from correlations with returns in the data—and it is at this level that this paper operates. However, rather than identifying characteristics simply by observed correlations with returns, the framework sets up additional conditions to be satisfied. The empirical analysis then tests whether these conditions are indeed satisfied.

We establish conditions under which (levered) E/P and B/P convey information about expected levered returns and unlevered E/P and B/P convey information about expected unlevered returns. Leverage then explains the difference between levered and unlevered expected returns implied by these multiples consistent with no-arbitrage asset pricing theory. That sets up our tests of whether leverage is priced empirically according to theory.

## ***2.1 Expected Levered Returns***

The data dredging approach to identification of characteristics targets forward stock returns. We start by expressing these returns in terms of forecasted accounting outcomes via the clean surplus accounting relation governing financial statements.<sup>5</sup> This relation states that the book value of common equity,  $B$ , increases with comprehensive income,  $Earnings$ , and decreases with the distribution of net dividends to equity holders,  $d$ :  $B_{t+1} = B_t + Earnings_{t+1} - d_{t+1}$ . The equation is typically applied to substitute earnings and book values for dividends in the numerator of the so-called residual income model (see Ohlson 1995, for example). But that research has nothing to say about the denominator of the valuation model, the expected return at which the numerator is discounted—the issue in this paper. Re-arranging the equation,  $d_{t+1} = Earnings_{t+1} - (B_{t+1} - B_t)$  and substituting for net dividends in the stock return (with firm subscripts omitted), the expected dollar return is explained by expected forward earnings and the expected change in the premium of price over book value:

$$E(P_{t+1} + d_{t+1} - P_t) = E[Earnings_{t+1} + (P_{t+1} - B_{t+1}) - (P_t - B_t)] \quad (1)$$

(Expectations here and everywhere below are at time  $t$  when prices are formed.) Dividing through by  $P_t$  to yield the expected one-year-ahead rate-of-return,

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<sup>5</sup> The formulation requires that clean-surplus accounting must apply only in expectation. Clean-surplus accounting may be violated in accounting for earnings realizations, but expected deviations from clean-surplus must be mean zero (as with the unrealized gains and losses on marketable securities that are recorded in comprehensive income under GAAP and IFRS accounting).

$$E\left(\frac{P_{t+1} + d_{t+1} - P_t}{P_t}\right) = E(R_{t+1}) = \frac{E(Earnings_{t+1})}{P_t} + E\left(\frac{(P_{t+1} - B_{t+1}) - (P_t - B_t)}{P_t}\right) \quad (1a)$$

The identity in equation (1) has long been recognized for realized returns, for example in Easton, Harris, and Ohlson (1992). We adapt it here to apply to expected returns.<sup>6</sup>

If there is no expected change in the premium of price over book value, equation (1a) shows that the expected rate-of-return is equal to the expected (forward) earnings yield. However, given the earnings yield, a forecast of the expected return is completed with a (price-denominated) forecast of the change in premium.

That, of course, requires an explanation of what induces a change in premium. First note that payout does not affect premiums: dividends reduce book value, dollar-for-dollar, under the clean-surplus accounting operation and also reduce price dollar-for-dollar under Miller and Modigliani (1961) (M&M) conditions.<sup>7</sup> Rather, an expected change in premium is induced by expected earnings growth, as shown in Shroff (1995). If dividends do not affect the premium, the expected change in premium due to the change in book value comes from earnings, by the clean-surplus relation:  $E(P_{t+1} - B_{t+1}) - (P_t - B_t) = E[(\Delta P_{t+1} + d_{t+1} - (\Delta B_{t+1} + d_{t+1}))]$  for all  $E(d_{t+1})$  and, with  $E(\Delta P_{t+1} + d_{t+1})$  set by a no-arbitrage condition given  $P_t$ , the change in premium is determined by  $E(\Delta B_{t+1} + d_{t+1}) = E(Earnings_{t+1})$ . Thus, for a given  $P_t$ , lower expected t+1 earnings implies an increase in the premium in t+1.<sup>8</sup>

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<sup>6</sup> Our focus is on the one-year-ahead expected return, the object of most of the research that predicts returns, including our empirical work. However, at points below, the expected return is expressed as a constant over future periods for simplicity, with the understanding that multi-period expected return is not necessarily the expected return under an equilibrium asset pricing model (as often stated in interpreting bond yields). Our task is simply to identify characteristics that might direct the construction of an asset pricing model, as in Fama and French (1992).

<sup>7</sup> Dividends increase financing leverage and thus the expected return, but that is reflected in the E/P component of the expected return which is increasing in leverage (see later). Some argue that, because of tax effects, price drops by less than a dollar per dollar of dividends. Accordingly, we control for the dividend yield in the empirical analysis.

<sup>8</sup> In other words,  $P_t$  is based on expected life-long earnings at time t so that, for a given price, the lower the earnings expected for period t+1, the higher are earnings expected after t+1. That is expected earnings growth. This simply reflects the workings of accrual accounting: accrual accounting allocates earnings to periods so, for total life-long earnings expected in  $P_t$ , lower t+1 earnings means higher earnings in the future. The Internet Appendix demonstrates.

However, while equation (1a) supplies a calculation for the expected return, it holds for all accounting methods for allocating earnings to periods—even accounting that books earnings to periods randomly; equation (1) is, after all, a tautology. The clean-surplus relation is not sufficient; further specification is necessary for the accounting allocation to have implications for risk and the corresponding expected return. That accounting must convey information about risk that requires a discount to the current price,  $P_t$ , the denominator in equation (1a), to yield an expected return commensurate with the risk. That is, the discount (in price) of expected life-long earnings is conveyed by the allocation of those earnings to periods.

We consider four accounting cases. With a focus on B/P, we evaluate how B/P indicates the expected return in each case, establishing conditions under which B/P bears no relation to the expected return and conditions under which it does. The latter are the basis for our empirical tests: are the conditions satisfied in the data? The four cases are demonstrated in the Internet Appendix<sup>9</sup>. At all points, we assume that the market prices risk appropriately (market efficiency), as is standard in asset pricing research.

### 2.1.1 Accounting where B/P has no Relation to the Expected Return

*Mark-to-market accounting.* If  $E(P_{t+1} - B_{t+1}) = P_t - B_t = 0$ , the expected return equals the forward earnings yield,  $\frac{E(Earnings_{t+1})}{P_t}$ , by equation (1a). The case is illustrated with a mark-to-market bond. The expected one-period yield on a bond indicates its expected return and, under accrual accounting, the effective interest method equates the expected earnings yield to the bond yield. A bond cannot have earnings growth beyond that from a change in the effective amount borrowed, but that is determined by the coupon rate, that is, payout. Thus, there is no expected change in premium.

It follows that the FF model does not apply to mark-to-market bonds. Nor does it apply to equities under mark-to-market accounting:  $B/P = 1$  irrespective of the risk, so B/P cannot indicate the expected return. However, the expected earnings yield indicates the expected return,

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<sup>9</sup> The Internet Appendix is available at the following link:  
<https://www0.gsb.columbia.edu/mygsb/faculty/research/pubfiles/25571/Appendix%20on%20Penman%20Web%20Page.pdf>

yet the earnings yield does not appear in the FF model (while B/P inappropriately does). Case I in the Internet Appendix demonstrates.

*Permanent income accounting (no growth).* For stocks, price usually differs from book value because of historical cost accounting, so one looks to features of historical cost accounting that induce a premium and thus potentially links B/P to expected returns. A benchmark case is that of “permanent income” where earnings are recognized such that expected  $Earnings_{t+1}$  is sufficient for all future earnings: with full payout,  $E(Earnings_{s_{t+\tau}}) = E(Earnings_{s_{t+1}})$  for all  $\tau$  such that there is no expected earnings growth. Applying the clean-surplus relation with a constant expected return,  $r$ , the expected premium for all  $t + \tau$  is given by

$$E(P_{t+\tau} - B_{t+\tau}) = \sum_{s=1}^{\infty} \frac{1}{(1+r)^s} E(Earnings_{s_{t+\tau+s}} - r \cdot B_{t+\tau+s-1}) = \sum_{s=1}^{\infty} \frac{1}{(1+r)^s} E(Earnings_{s_{t+1}} - r \cdot B_t).$$

Thus expected premiums are constant. Less than full payout results in earnings growth from retention, but payout does not affect premiums. With no expected change in premium,

$$E(R_{t+1}) = \frac{E(Earnings_{t+1})}{P_t}, \text{ by equation (1a).}$$

As these conclusions hold for all  $P_t - B_t$ , it follows that B/P does not indicate the expected return in the no-growth case. Rather, the E/P ratio conveys the expected return, as in the case of mark-to-market accounting. Case II in the Internet Appendix demonstrates.

*Accounting with growth unrelated to risk and return.* In the preceding accounting cases, B/P has no relation to the expected return. It follows that B/P comes into play only with an expected change in premium (and expected growth), and that is induced by reducing  $Earnings_{t+1}$  and increasing subsequent earnings (growth), that is, by  $Earnings_{t+1}$  other than permanent earnings. However, equation (1) is a tautology, so shifting earnings recognition from  $t+1$  to the future has no necessary effect on the left-hand side: the expected return is not affected, with no effect on price, book value, or  $B_t/P_t$ . Case III in the Internet Appendix demonstrates.

### 2.1.2 Accounting where B/P indicates the Expected Return

The upshot of the accounting cases in section 2.1.1 is that B/P connects to risk only if the accounting that induces growth (and a change in premium) conveys risk such that  $P_t$  is

discounted to yield a higher expected return (with the lower price yielding a higher  $B/P_t$  that indicates that higher expected return).

To establish accounting conditions for this, we embrace the no-arbitrage Ohlson-Juettner (2005) valuation model. Assume the form of the model that distinguishes expected short-term growth from long-term growth:

$$A1. \quad \frac{P_t}{Earnings_{t+1}} = \frac{1}{r} \times \frac{g_2 - (\gamma - 1)}{r - (\gamma - 1)}$$

where  $g_2 \equiv \frac{Earnings_{t+2} + rDividends_{t+1}}{Earnings_{t+1}} - 1 > \gamma - 1$  is the growth rate in expected earnings two years ahead (with t+1 dividends reinvested) and  $\gamma$  is (one plus) the growth rate in subsequent expected abnormal earnings with the property that  $\frac{Earnings_{t+\tau+1}}{Earnings_{t+\tau}} \rightarrow \gamma$  as  $\tau \rightarrow \infty$ ; that is,  $\gamma$  is the very long-run growth rate in expected earnings. (Here a subscript greater than t indicates an expected value). Assume further a forecast of  $Earning_{t+2}$  given by

$$A2. \quad Earnings_{t+2} + rDividends_{t+1} = G.Earnings_{t+1} + \lambda B_t$$

Thus,

$$g_2 = G - 1 + \lambda \frac{B_t}{Earnings_{t+1}} \tag{1b}$$

G can be interpreted as a persistence parameter for earnings, with book value adding to the forecast through  $\lambda$ . Setting  $\gamma = 1$ ,

$$\frac{P_t}{Earnings_{t+1}} = \frac{1}{r} \times \frac{G - 1 + \lambda \frac{B_t}{Earnings_{t+1}}}{r}$$

Therefore,

$$r = \sqrt{\frac{Earnings_{t+1}}{P_t} \times \left( G - 1 + \frac{\lambda B_t}{Earnings_{t+1}} \right)}$$

$$= \sqrt{\frac{(G-1)Earnings_{t+1}}{P_t} + \frac{\lambda B_t}{P_t}} \quad (1c)$$

The modeling suits our empirical endeavor, for it distinguishes growth in the short term,  $g_2$ , (for which one can observe realizations) from long-term growth (that is elusive empirically). Further,  $\gamma$  is likely to be similar for all firms (in the long run), so  $g_2$  and  $r$  are the inputs that discriminate in the cross-section.<sup>10</sup> Equation (1c) sees  $r$  potentially related to both E/P and B/P, but our focus at this point is on B/P. Assume further:

$$A3: \lambda > 0$$

The three assumptions yield two propositions which are the subject of our empirical tests:

P1. For a given  $\frac{Earnings_{t+1}}{P_t}$ , the two-period-ahead earnings growth rate,  $g_2$  is increasing in B/P.

P2. For a given  $\frac{Earnings_{t+1}}{P_t}$ ,  $r$  is increasing in B/P.

P1 follows from assumptions A2 and A3 under which  $g_2$  is increasing in  $\frac{B_t}{Earnings_{t+1}} \equiv \frac{1}{ROE_1}$  in equation (1b) and from the relation,  $\frac{B_t}{P_t} = \frac{B_t}{Earnings_{t+1}} \times \frac{Earnings_{t+1}}{P_t}$ . P2 follows directly from equation (1c) and A3.<sup>11</sup> Case IV in the Internet Appendix demonstrates.

The analysis is somewhat sterile without an appreciation of the accounting that induces these properties and specifically  $\lambda > 0$ . Indeed, to predict a positive association between B/P and earnings growth may come as quite a surprise, for it is commonly stated (without much

<sup>10</sup> The analysis can be generalized for  $\gamma > 1$  with no effect on the directional relation between B/P and  $r$ . And it can be generalized for B/P also forecasting  $\gamma$ .

<sup>11</sup> Permanent earnings accounting is a special case. Setting  $\lambda = 0$ ,  $r = \sqrt{\frac{(G-1)Earnings_{t+1}}{P_t}}$  which is satisfied for  $G - 1 = r$  and  $\frac{Earnings_{t+1}}{P_t} = r$ , and B/P plays no role. (Earnings grow at the rate,  $r$ , because  $g_2$  refers to cum-

dividend earnings growth (with reinvested dividends); with full payout, there is no earning growth, as is section 2.1.1). As that holds for all B/P, it also covers the case of mark-to-market accounting, as in section 2.1.1.

documentation) that B/P is negatively associated with growth—a high P/B is a growth stock, not a high B/P. The crucial condition in P1 is the negative relation between  $ROE_{t+1}$  and  $g_2$  (due to assumed  $\lambda > 0$ ).

Two features of historical cost accounting under GAAP suggest that accounting induces this negative correlation, and these features connect the accounting to risk. First, the “realization principle” that governs the allocation of earnings to periods states: under uncertainty, earnings recognition is deferred to the future until the uncertainty has been resolved. Deferred earnings imply higher expected earnings growth but also lower current earnings and ROE, *ceteris paribus*, and the application of the principle under uncertainty ties the earnings deferral to risk. As an empirical matter, Penman and Reggiani (2013) show that the deferral of earnings recognition is priced in the stock market as if it indicates risk. Second, conservative accounting reduces ROE by rapid expensing of growing investment, and correspondingly induces earnings growth (Feltham and Ohlson 1995; Zhang 2000). The rapid expensing is applied when the outcome of investments (in R&D and advertising, for example) are uncertain. Conservative accounting also reduces book value, the denominator of ROE, but that serves to yield a higher ROE and lower growth expectations when growth expectations are realized and uncertainty is (successfully) resolved (and the forecast of  $g_2$  is reduced under A2). Thus, the lower B/P associated with the high ROE indicates a lower expected return, in accordance with equation (1e).<sup>12</sup>

This is only suggestive, of course, and there is no necessity that the realization principle and conservative accounting for risky investments are related to priced risk.<sup>13</sup> That is the empirical question that tests of P1 and P2 investigate.

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<sup>12</sup> While the conditions for B/P to indicate the expected return in equation (1c) are developed for a positive E/P, GAAP accounting can produce negative E/P (and negative ROE), along with risky expected earnings growth—as with negative earnings and ROE due to the expensing of R&D for a start-up firm where the gamble is on the R&D investment paying off. We note that ROE and investment enter the Investment CAPM of Hou, Chen, and Zhang (2015) and the extended Fama and French (2015) five-factor model, but with a different development from that here.

<sup>13</sup> Modeling how GAAP accounting connects to priced risk is a challenging task. Ohlson (2008) lays out a model where modified permanent income accounting produces earnings growth, with the growth rate set to equal the risk premium (and P – B is increasing in the growth rate). However, the accounting does not mirror GAAP accounting. Note that the framework here stands in contrast to a competing framework in Lyle, Callen, and Elliott (2013) and Lyle and Wang (2015), for example, where the accounting is governed by an autoregressive process that also does not represent GAAP; such a process models declining P – B (for P > B) rather than increasing P – B due to expected earnings growth.

The analysis in this section is best viewed as that for a firm with no financing leverage, for leverage changes the picture.

## 2.2 Expected Unlevered Returns

A core tenet of financial economics states that financial leverage adds to expected returns, yet empirical research has had difficulty documenting a leverage risk premium in stock returns. In this section we show that the accounting framework can be utilized to distinguish the expected return due to operating risk from that due to financing. In contrast to most asset pricing models where the leverage component is presumed to be subsumed by proposed factors (without much explanation), the contribution of leverage to the expected return is explicit. That sets up the empirical work to investigate whether leverage adds to average stock returns.

The analysis of unlevered returns recasts the balance sheet and income statement to identify their unlevered components. In the balance sheet,  $B = NOA - ND$  where  $NOA$  (net operating assets) denotes the unlevered book value (also called enterprise book value) and  $ND$  is net debt. The clean surplus relation for the enterprise explains changes in  $NOA$  rather than changes in  $B$ . The flows that explain the change are no longer *Earnings* and *Net Dividends*, but rather *Operating Income* from the enterprise,  $OI$ , and *Net Distributions* to all claimants (the sum of *Net Dividends*,  $d$ , and *Net Distributions to Debt Holders*,  $F$ ), often referred to as *Free Cash Flow*,  $FCF$ .  $NOA$  increase with operating income and decrease with net distributions to equity and net debt holders. Thus, the clean surplus relation for the enterprise states that  $d_{t+1} + F_{t+1} = FCF_{t+1} = OI_{t+1} - (NOA_{t+1} - NOA_t)$ .

Let  $P_{t+1}^{NOA}$  be the price of the firm (enterprise price) and  $P_{t+1}^{ND}$  the price of the net debt. As equity price,  $P_{t+1} = P_{t+1}^{NOA} - P_{t+1}^{ND}$ , the dollar (levered) stock return can be expressed as:

$$E(P_{t+1} + d_{t+1} - P_t) = E(P_{t+1}^{NOA} + FCF_{t+1} - P_t^{NOA}) - E(P_{t+1}^{ND} + F_{t+1} - P_t^{ND}). \quad (2)$$

That is, the (levered) equity return is the unlevered return after deducting the return to the net debt holders. The first term on the right hand side is the expected dollar (unlevered) return. Substituting the clean surplus relation for the unlevered firm and dividing through by  $P_t^{NOA}$  yields the expected unlevered (enterprise) rate of return,  $R_{t+1}^{NOA}$ :

$$E\left(\frac{P_{t+1}^{NOA} + FCF_t - P_t^{NOA}}{P_t^{NOA}}\right) = E(R_{t+1}^{NOA}) = \frac{E(OI_{t+1})}{P_t^{NOA}} + \frac{E(P_{t+1}^{NOA} - NOA_{t+1}) - (P_t^{NOA} - NOA_t)}{P_t^{NOA}} \quad (2a)$$

This is the unlevered version of equation (1a); the expected unlevered return is expressed in terms of the expected enterprise forward earnings yield,  $E\left(\frac{OI_{t+1}}{P_t^{NOA}}\right)$ , and expected enterprise earnings growth that produces an expected change in the premium of enterprise price,  $P_{t+1}^{NOA} - NOA_{t+1}$ .

It is clear that the same analysis that follows from equation (1a) to relate levered E/P and B/P to expected (levered) returns also follows from equation (2a) to connect unlevered (enterprise) E/P and B/P to unlevered returns. Indeed, the demonstrations in cases I – IV in the Internet Appendix are demonstrations of unlevered relationships when there is zero financing leverage. Note, in particular, that the conditions for B/P to indicate expected levered returns are also those for the unlevered B/P to indicate expected unlevered returns.

### ***2.3 Reconciling Levered and Unlevered Numbers and the Effects of Leverage***

In this section we show that, just as levered and unlevered returns reconcile through leverage as an implication of no-arbitrage, so do levered and unlevered E/P and B/P that potentially explain those returns. From equation (2),

$$\begin{aligned} E(R_{t+1}) &= \frac{E(P_{t+1}^{NOA} + FCF_{t+1} - P_t^{NOA})}{P_t} - \frac{E(P_{t+1}^{ND} + F_{t+1} - P_t^{ND})}{P_t} \\ &= \left[ E(R_{t+1}^{NOA}) \times \frac{P_t^{NOA}}{P_t} \right] - \left[ E(R_{t+1}^{ND}) \times \frac{P_t^{ND}}{P_t} \right] \\ &= E(R_{t+1}^{NOA}) + \frac{P_t^{ND}}{P_t} [E(R_{t+1}^{NOA}) - E(R_{t+1}^{ND})], \end{aligned} \quad (3)$$

where  $E(R_{t+1}^{NOA})$  is the expected unlevered return,  $E(R_{t+1}^{ND})$  is the expected return for net debt, and  $\frac{P_t^{ND}}{P_t}$  is the amount of leverage. This, of course, is the Modigliani and Miller (1958) leverage equation underlying the standard weighted average cost of capital calculation.

The same arithmetic reconciles the levered and unlevered earnings yields via financial leverage. Recognizing that  $Earnings_{t+1} = OI_{t+1} - Net\ Interest_{t+1}$  (both after-tax) and making the standard assumption that the book value of debt equals its market value ( $ND_t = P_t^{ND}$ ),

$$\frac{E(Earnings_{t+1})}{P_t} = \frac{E(OI_{t+1})}{P_t^{NOA}} + \frac{ND_t}{P_t} \left[ \frac{E(OI_{t+1})}{P_t^{NOA}} - \frac{E(Net\ Interest_{t+1})}{ND_t} \right] \quad (4)$$

where  $\frac{E(OI_{t+1})}{P_t^{NOA}}$  is the forward unlevered earnings yield and  $\frac{Net\ Interest_{t+1}}{ND_t}$  is the firm's borrowing rate as reported in the financial statements. This expression is the accounting analog to the M&M expected return equation (3). Financial leverage increases the levered E/P over enterprise E/P provided that the unlevered (enterprise) earnings yield is greater than the borrowing rate. Leverage is risky and adds to the expected return in equation (3), but leverage also adds to the expected enterprise earnings yield in the same way, reinforcing the point that the expected earnings yield is a basis for assessing risk and expected return. Leverage does not affect premiums:  $P_{t+1} - B_{t+1} = P_{t+1}^{NOA} - P_{t+1}^{ND} - (NOA_{t+1} - ND_{t+1}) = P_{t+1}^{NOA} - NOA_{t+1}$  if  $ND_t = P_t^{ND}$ . Thus, the effect of leverage on the expected levered return in equation (1a) is via the expected earnings yield. Accordingly, without E/P in the model, FF model relies on B/P (or firm size or beta on the market factor) to pick up leverage.

However, it is doubtful that B/P picks up leverage. Reconciling levered and unlevered B/P, Penman, Richardson, and Tuna (2007) show that, if  $ND_t = P_t^{ND}$ ,

$$\frac{B_t}{P_t} = \frac{NOA_t}{P_t^{NOA}} + \frac{ND_t}{P_t} \left[ \frac{NOA_t}{P_t^{NOA}} - 1 \right]. \quad (5)$$

Financial leverage, ND/P, increases (levered) B/P for an enterprise book-to-price greater than 1, but reduces B/P for an enterprise book-to-price less than 1. Thus, if B/P indicates risk, it is unlikely that it reflects both operating risk and leverage risk in a directionally consistent way. Penman, Richardson, and Tuna (2007) indicate that it does not: for a sample of over 120,000 US firm-years over the 1962-2001 period, that paper shows that while unlevered book-to-price is robustly positively associated with equity returns, financial leverage is robustly negatively associated with equity returns given the unlevered B/P. The results are robust to violations of the

$ND_t = P_t^{ND}$  assumption. The negative relation between leverage and returns is strongest for the group of firms where  $\frac{NOA}{P^{NOA}} < 1$ . This is about 80 percent of firms and the firms where B/P is decreasing in leverage, so the positive relation between B/P and returns in FF is not capturing financial leverage. In short, both the B/P leveraging equation (5) and related empirical findings indicate that B/P cannot handle differences in leverage risk in the cross-section.

Under Modigliani and Miller (1958) conditions, leverage does not affect price but adds to the expected return by the M&M equation (3). By the same math that derives equation (4), it is easy to show that leverage also adds to expected earnings growth:

$$g_{t+1}^{Earnings} = \frac{OI_{t+1} - Net\ Interest_{t+1}}{OI_t - Net\ Interest_t} = g_{t+1}^{OI} + \frac{Net\ Interest_t}{Earnings_t} [g_{t+1}^{OI} - g_{t+1}^{Net\ Interest}]. \quad (6)$$

Thus, the added expected return from leverage ties to higher expected earnings growth: while leverage increases expected earnings growth in equation (6), the expected return also increases in equation (3) to leave price unaffected. The connection of  $r$  to expected earnings growth (with price unaffected) resonates with the propositions in the last subsection under which B/P is related to  $r$  and  $g_2$ . However, leverage reduces B/P in equation (5), except for the case where  $\frac{NOA}{P^{NOA}} > 1$ , and  $\frac{NOA}{P^{NOA}}$  is typically less than 1. Thus, higher risk and growth associated with leverage typically yields a lower, not higher, B/P.

This seeming conflict is explained by the modeling earlier. There, proposition P1 links B/P to expected earnings growth,  $g_2$ , via a negative relationship between B/P and  $ROE_{t+1}$  (for a given E/P):  $\frac{B_t}{P_t} = \frac{1}{ROE_{t+1}} \times \frac{Earnings_{t+1}}{P_t}$ . However, with the same math that derives equation (4),

$$ROE_{t+1} = \frac{Earnings_{t+1}}{B_t} = \frac{OI_{t+1} - Net\ Interest_{t+1}}{NOA_t - ND_t} = RNOA_{t+1} + \frac{ND_t}{B_t} \left[ RNOA_{t+1} - \frac{Net\ Interest_{t+1}}{ND_t} \right] \quad (7)$$

Thus, while leverage increases  $g_2$ , it also increases  $ROE_{t+1}$ , provided the unlevered book rate of return,  $RNOA_{t+1} = \frac{OI_{t+1}}{NOA_t}$ , is greater than the net borrowing rate. Accordingly, while leverage

increases  $r$  and  $g$ , it also increases  $ROE_{t+1}$ , and an increase in  $ROE_{t+1}$  implies a lower B/P for a given E/P. The leverage effect on  $ROE_{t+1}$  implies higher  $g_2$ , thus the assumption in A2 that  $\lambda > 0$  is violated.

Accordingly, in assessing the relationship of B/P to expected return, it is important to differentiate the unlevered B/P from the leverage effect on (levered) B/P. This accords with different accounting for (unlevered) operating activities versus that for financing activities. Accounting that induces a positive relationship between B/P and  $r$  (by deferring earnings recognition under uncertainty) is applied to operating activities under GAAP. However, debt is approximately carried at market value. With approximate mark-to-market accounting, leverage has no effect on the equity premium and the effect of leverage on the expected equity return is captured by the E/P ratio. Case V in the Internet Appendix demonstrates.

#### ***2.4 Characteristic Regressions***

To identify characteristics that indicate expected returns, empirical finance runs cross-sectional “characteristic” regression models of forward stock returns on observed characteristics to discover what characteristics predict stock returns. The Fama and French (1992) regression model with beta, book-to-price, and size is an example. The preceding analysis imposes some discipline on the specification of characteristic regressions, so this section lays out cross-sectional regression models implied by that analysis.

The analysis points to E/P as well as B/P as indicators of the expected return. However, the two are relevant under different accounting conditions, with B/P given weight only in the case of expected earnings growth and where risk is related to that growth. Thus, with accounting differing in the cross-section that presumably contains some no-growth firms, estimating a cross-sectional model that applies to all firms is a doubtful exercise. However, we are interested in how a cross-sectional model like that of FF would be modified by our analysis and what a typical model would look like. Further, the earnings deferral accounting that justifies the inclusion of B/P as a characteristic is pervasive across the cross-section that adheres to GAAP. So, we first estimate a model that includes both E/P and B/P and then investigate conditions, implied by our framework, where the weight shifts from B/P to E/P.

Under our analysis, E/P is identified and B/P explains returns for a given E/P under specified conditions. Thus, our starting point is the following characteristic regression:

$$R_{t+1} = a + b_1 \frac{E(Earnings_{t+1})}{P_t} + b_2 \frac{B_t}{P_t} + \varepsilon_{t+1}. \quad (8)$$

A test for  $b_1 > 0$  is a test of the relevance of E/P. (We also include size and beta, also FF characteristics, to ensure that they do not explain the omission of E/P in the FF model). The  $b_2$  coefficient is predicted to be positive if, given E/P, B/P indicates growth that is priced as risky. With this starting point, we then investigate whether B/P is less important in explaining returns (and E/P more important) in conditions where ex ante there is presumed to be less expected earnings growth.

A characteristic unlevered return regression is similarly specified based on Equation (2a):

$$R_{t+1}^{NOA} = \alpha + \beta_1 \frac{E(OI_{t+1})}{P_t^{NOA}} + \beta_2 \frac{NOA_t}{P_t^{NOA}} + \eta_{t+1}, \quad (9)$$

This is just a substitution of unlevered variables for the corresponding levered variables in regression (8). Adding leverage to explain levered returns,

$$R_{t+1} = \alpha + \beta_1 \frac{E(OI_{t+1})}{P_t^{NOA}} + \beta_2 \frac{NOA_t}{P_t^{NOA}} + \beta_3 \frac{ND_t}{P_t} + \nu_{t+1} \quad (10)$$

Our framework predicts  $\beta_3 > 0$  if financial leverage adds to expected returns and if the included operating variables are sufficient to control for operating risk.

However, the E/P and B/P leveraging equations (4) and (5) indicate that there is a “kink” in the relation between leverage and returns for given unlevered E/P and B/P. For B/P, the kink is at  $\frac{NOA}{P^{NOA}} = 1$ . For E/P, the kink is at  $\frac{E(OI_{t+1})}{P_t^{NOA}}$  equal to the borrowing rate: when the unlevered yield is less than the borrowing rate, E/P is decreasing in leverage. The Bank of America Merrill Lynch BBB corporate bond index reports that the average effective yield for BBB rated corporate issuers over the 1996 to 2011 period is about 6.5 percent. Thus, an after-tax borrowing rate of about 4 percent (a before-tax rate of 6.5 percent with a 35 percent tax rate) implies that the kink in equation (4) is at an unlevered E/P of 4 percent (and an unlevered P/E of 25).

Accordingly, our estimation of equation (10) is carried out for subsamples around these kinks. Further, the M&M equation (3) indicates an interaction between operating risk and leverage, a point stressed in Skogsvik, Skogsvik and Thorsell (2011) who note the importance of interaction terms when assessing the relation between leverage and returns. Our empirical tests accommodate this interaction.

The test for  $\beta_3 > 0$  serves to validate our characteristic identification framework. Prior research has generally found a negative relation between leverage and equity returns, even after controlling for conjectured operating risk characteristics.<sup>14</sup> This negative relation can be explained by leverage being negatively correlated with omitted operating risk factors. This is not unreasonable if capital structure decisions are endogenous with respect to the perceived cost of default and the after-tax benefits of debt financing. Indeed, theoretical models of capital structure (Leland 1994) suggest that firms with higher levels of operating risk will endogenously choose lower levels of leverage. Our framework suggests that operating risk can be identified through the expected enterprise earnings yield and enterprise B/P. If so, we will have controlled for operating risk, but only if the identified operating variables are sufficient to identify operating risk. This qualification is important because additional omitted characteristics (with which leverage is correlated) might indicate risky operating income growth.

We benchmark our regressions against an unlevered version of the FF characteristic model:

$$R_{t+1} = \alpha + \gamma_1 \frac{NOA_t}{P_t^{NOA}} + \gamma_2 \frac{ND_t}{P_t} + \omega_{t+1} \quad (11)$$

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<sup>14</sup> Bhandari (1988) finds a positive relation between monthly returns and leverage in annual cross-sectional regressions over the years 1948-1966 but not from 1966-1979, and finds that most of the leverage effect is concentrated in Januarys in years before 1966. Johnson (2004) 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 becomes negative. George and Hwang (2010) document negative returns to leverage, which they explain with a model of market frictions related to the costs of distress. Nielsen (2006) finds negative returns to leverage after controlling for the three Fama and French factors and momentum, and attributes the negative relation to correlated operating characteristics. Other attempts to identify correlated omitted (operating) characteristics include Gomes and Schmid (2010) and Obreja (2013). Ippolito, Steri, and Tebaldi (2011) and Caskey, Hughes, and Liu (2012) attribute the negative returns to deviations from optimal capital structure.

with an accommodation for the “kink” in the B/P leveraging equation (5). This equation unlevers the B/P and adds leverage. Penman, Richardson, and Tuna (2007) report a negative coefficient on leverage from this regression (with and without beta and size, the other two FF characteristics) and thus conclude that the FF model does not price leverage appropriately. Among their conjectures is the contention that the model does not deal with operating risk appropriately (with which leverage may be negatively correlated). Our framework suggests that the earnings yield is missing. Thus regression (11) serves as a benchmark to evaluate whether the addition of the unlevered earnings yield in regression (10) turns the observed negative coefficient on leverage to positive.

### 3. Data and Summary Statistics

Our analysis covers all U.S. listed firms on Compustat during the years 1962-2013 that also have prices and monthly stock returns on CRSP. We exclude financial firms (with SIC codes 6000-6999) because the separation of operating activities and financing activities is less clear for these firms.

We require the following data items to be available for a firm-year to be included in our analysis: book value of common equity (Compustat item CEQ), common shares outstanding (CSHO), earnings before extraordinary items (IB), long-term debt (DLTT), and stock price at the end of the fiscal year (PRCC). Other variables are set equal to zero if they are missing, but our results are not particularly sensitive to this treatment. Firms with negative denominators in ratio calculations (such as  $P_7^{NOA}$ ) were deleted from the sample at any stage of the analysis that required these numbers, as were firms with per-share prices less than 20 cents. Our results are similar if we instead use a cut-off of \$1.00 per-share. A total of 170,096 firm-year observations are available for our analyses. For the regression analysis, we exclude firm-year observations where any of the accounting ratios are in the top or bottom 2 percent of the distribution for the relevant year. The number of firms available for the regression analysis each year ranges from 298 in 1962 to 5,287 in 1997, though that number varies depending on the regression specification.

Table 1 summarizes the distribution of variables involved in the analysis. We report percentiles for all of our primary variables based on the pooled set of data. Inferences are similar

when averaging percentiles from sorts each year. The notes to the table describe how each variable was calculated, but a few additional comments are warranted. The regression specifications require forecasts of forward earnings (for year  $t+1$ ). We estimate forward earnings to be the same as reported earnings for year  $t$  before extraordinary and special items. In support, the average Spearman rank correlation between realized  $Earnings_{t+1}/P_t$  and  $Earnings_t/P_t$  is 0.672. Using an estimate of forward earnings based on current (recurring) earnings not only enhances the coverage to the full range of B/P ratios and firms sizes but also avoids (i) the problems of (behavioral) biases and noise in analysts' forecasts evidenced in Bradshaw, Richardson, and Sloan (2001), Hughes, Liu, and Su (2008), and Wahlen and Wieland (2011), and (ii) the challenge of "unlevering" earnings forecasts in a consistent manner across both analysts and firms. The (market) leverage variable is calculated with the standard assumption that the market value of debt,  $P_t^{ND}$ , can be approximated by the book value of net debt,  $ND_t$ . Penman, Richardson, and Tuna (2007) find that estimates of Fama and French unlevered regressions are robust with this approximation in the cases where there have been apparent changes in credit worthiness that affect the market value.

Table 2 reports average Pearson and Spearman cross-sectional correlations between the variables in table 1, with beta and size added. In all cases, we calculate the pairwise correlation each year and report averages of correlations across years. E/P and B/P are positively correlated with both levered and unlevered equity returns for the following year, consistent with the predictions from equation (1a). E/P and B/P are also correlated with each other (Spearman correlation of 0.292). E/P and the unlevered earnings yield,  $OI/P^{NOA}$ , are highly correlated (Spearman correlation of 0.896), as are levered B/P and the unlevered B/P,  $\frac{NOA}{P^{NOA}}$ , (Spearman correlation of 0.908). Financial leverage,  $ND/P$ , has very little unconditional correlation with either levered or unlevered returns, but  $ND/P$  is positively correlated with both the levered and unlevered B/P ratios. Leverage is negatively correlated with the unlevered earnings yield. So the failure of leverage to forecast returns may be due to its correlation with the operating earnings yield, omitted in most tests in the literature, but appearing in regression equation (8).

#### 4. E/P, B/P and Subsequent Earnings Growth

We first conduct tests of P1, a condition that is necessary for B/P to indicate expected returns in our framework: for a given E/P, is B/P positively related to subsequent earnings growth?

#### 4.1 B/P and Earnings Growth

First, we report the unconditional correlation between B/P and subsequent earnings growth. Surprisingly, while it is often claimed that B/P is negatively related to growth, there is little documentation of the relation.<sup>15</sup> Panel A of table 3 reports average realized earnings growth rates two years ahead, corresponding to  $g_2$ , for ten portfolios formed from ranking firms on levered B/P each year, and Panel B reports average realized operating income growth rates for ten portfolios formed on enterprise (unlevered) book-to-price,  $\frac{NOA}{P^{NOA}}$ , each year. The averages are the mean of median growth rates for portfolios each year. These growth rates are those that an investor would have experienced by investing in the respective portfolios.<sup>16</sup> To accommodate firms with negative earnings and a small earnings base, we compute growth rates by deflating earnings changes with the absolute values of the level of earnings as described in the notes to table 3.<sup>17</sup> As growth in year t+2 is affected by investment in year t+1, both panels also report growth rates in residual earnings to control for growth from added investment. In both cases, residual earnings are calculated with a charge against beginning book value using the risk-free rate for the relevant year.

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<sup>15</sup> Chan, Karceski, and Lakonishok (2003) report a weak positive correlation between B/P and earnings growth when forming portfolios based on realized earnings growth over the next five and ten years. However, in their regression analysis, they report no evidence of a relation between B/P and future earnings growth but a strong negative association between B/P and future sales growth. Lakonishok, Shleifer, and Vishny (1994) report a positive association between B/P and future earnings growth at least when comparing differences in geometric average growth rates across the top and bottom decile of stocks formed on the basis of B/P. Finally, Chen, Petkova, and Zhang (2008) and Chen (2017) report a positive association between B/P and subsequent dividend growth. The mixed previous research on the unconditional relation between B/P and future earnings growth is not surprising as Penman (1996) demonstrates that B/P can be associated with high growth, no growth, and negative growth. Research has explored the relation between B/P and profitability (return on equity), for example in Penman (1992) and Fama and French (1995) who document a negative correlation between the two in the cross-section, but profitability is not to be confused with earnings growth.

<sup>16</sup> The growth rates are not an estimate of expected earnings growth rates because  $E\left(\frac{Earnings_{t+2}}{Earnings_{t+1}}\right) \neq \frac{E(Earnings_{t+2})}{E(Earnings_{t+1})}$ . Rather, they are the average ex post growth outcomes experienced by investors.

<sup>17</sup> The results are robust to calculations of earnings growth as total portfolio earnings in t+2 relative to that in t+1 and are similar when we require base earnings to be positive.

For both levered and unlevered B/P ratios, higher B/P is associated with higher growth. The correlation between B/P and subsequent earnings growth at the individual firm level is low: an average Spearman correlation of 0.052 and an average Pearson correlation of 0.047. (The corresponding correlations for the unlevered numbers are 0.040 and 0.039.) Table 3 shows the correlation is stronger at the portfolio level, with high B/P particularly associated with high growth. The same pattern is seen in the residual earnings growth rates. Further analysis (not reported) reveals that the positive relation between B/P and subsequent growth is primarily associated with mid-cap and small firms; for large firms (the top third by market capitalization), there is little correlation between portfolio B/P and growth. (We return to this issues in Table 6.) Of course, growth two years ahead is only one year of the subsequent earnings growth that is relevant for the determination of expected returns. However, survivorship issues overwhelm any attempt to measure realized growth other than for the short term.<sup>18</sup>

#### ***4.2 B/P and Earnings Growth, Conditional on E/P***

P1 refers to the conditional correlation of B/P with growth (that is, for a given E/P), rather than the unconditional correlation. Panel A of table 4 reports mean realized growth rates for 25 portfolios formed by ranking firms first on enterprise earnings yield,  $OI/P^{NOA}$ , and then, within each  $OI/P^{NOA}$  portfolio, on their enterprise book-to-price,  $\frac{NOA}{P^{NOA}}$ .<sup>19</sup> Figure 1 presents a graphical depiction. Panel B reports average residual enterprise earnings growth rates. These joint portfolio sorts are performed each year; the table reports mean of portfolio median growth rates across years. Enterprise earnings yield ranks growth negatively as expected; P/E ratios indicate growth. But, for a given enterprise yield, higher  $\frac{NOA}{P^{NOA}}$  is associated with higher subsequent growth on average. Conditionally, unlevered B/P is a strong indicator of subsequent enterprise earnings growth. P1 is confirmed. Further analysis (not reported) partitioned firms by market

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<sup>18</sup> For this table and that for Panel A in Table 4, we repeated the analysis for years t+3 – t+5 ahead with similar results, albeit presumably with more survivorship bias.

<sup>19</sup> Penman and Reggiani (2013) report a similar matrix of portfolios, constructed by dividing the total future levered earnings expected in price into short-term and long-term components, and show that those portfolios are actually equivalent to portfolios from a joint sort on E/P and B/P (as here). Long-term earnings relative to short-term earnings is earnings growth, so the Penman and Reggiani (2013) results underscore our framework where the expected returns are increasing in expected earnings growth if that expectation is at risk.

capitalization and found that, for large firms, portfolio  $OI/P^{NOA}$  and subsequent growth are positively related, but there is little correlation between  $\frac{NOA}{P^{NOA}}$  and growth within  $OI/P^{NOA}$  portfolios, except in the lowest E/P portfolio; the conditional correlation between  $\frac{NOA}{P^{NOA}}$  and subsequent growth is associated primarily with mid-cap and small firms. (Table 6, later, comes back to this point.)

Panels A and B show that the relationship between enterprise B/P and earnings growth is particularly strong in the lower enterprise E/P portfolios. The lowest E/P portfolios consist largely of loss firms where one might expect earnings to be particularly depressed, yielding higher growth if firms recover, as the table indicates they do, on average. Nevertheless, the differences across E/P portfolios point to a non-linearity that we accommodate in our subsequent analysis.

Panels C and D report that earnings growth forecasted by  $\frac{NOA}{P^{NOA}}$  is risky. For a given enterprise E/P, the standard deviation of realized enterprise earnings growth rates is increasing in enterprise B/P in panel C, as is the inter-decile range (the 90<sup>th</sup> percentile minus the 10<sup>th</sup> percentile of outcomes) in panel D. The inter-decile range is of particular significance because it focuses on the extreme outcomes about which investors are presumably most concerned.

Panel E reports betas (slope coefficients) from time-series regressions, for each portfolio, of two year ahead earnings growth rates on the market-wide earnings growth rate for the same year. These “earnings growth betas” are increasing in enterprise B/P for a given enterprise E/P portfolio. Not only is the earnings growth of high B/P portfolios more volatile (Panels C and D), they are also more sensitive to systematic shocks to growth. The reported earnings growth betas in panel E are based on earnings growth rates for the median firm in each cell. In unreported tests we have repeated the estimation of earnings growth betas using aggregate earnings growth across all firms in each cell. This approach will give considerably more weight to larger firms who are less subject to aggregate market shocks. As expected we see similar, albeit reduced, differences in earnings growth betas across the 25 cells using this alternative estimation approach.

Panel F reports the fraction of firms that ceased to exist in the second year ahead due to performance-related reasons, as indicated by CRSP delisting codes.<sup>20</sup> The non-survivor rates are higher for the low E/P portfolio dominated by loss firms, but are also higher for the high B/P portfolios. Across all panels in the table we see that high enterprise B/P firms are subject to more extreme earnings growth outcomes as evidenced by (i) the dispersion in portfolio level measures of earnings growth, and (ii) the sensitivity of growth to shocks to market-wide earnings growth, and (iii) the higher percentage of non-survivors due to either low payoffs attributable to firm failure and/or high payoffs due to firms being acquired by other firms.

In summary, given  $OI/P^{NOA}$ ,  $\frac{NOA}{P^{NOA}}$  indicates not only expected earnings growth (panels A and B) but also the risk surrounding the expected growth (panels C - F). Not only is P1 supported empirically, but the risk surrounding the expected growth is also related to  $\frac{NOA}{P^{NOA}}$ . The analysis is on an unlevered basis as a prelude to the analysis that adds leverage later, but results are similar with portfolios formed on levered E/P and B/P with levered earnings growth outcomes.

## 5. Estimating Characteristic Regressions

### 5.1 Regressions with Levered Explanatory Variables

The test of P1 confirms the condition in our framework for B/P to indicate expected returns. With this condition satisfied, we now proceed to P2: for a given E/P, is B/P correspondingly related to expected returns? While the variation of earnings growth rates in table 4 indicates that B/P is associated with risky growth outcomes, the risk need not be priced risk. As is standard in empirical asset pricing, we use average realized returns to infer expected returns that reflect priced risk. That is, the test of P2 is under the maintained assumption of market efficiency (as is standard). With our interest in the FF model (with levered B/P), the focus at this point is on levered E/P and B/P.

Table 5 reports results from estimating regression equations (8) and variants. Cross-sectional regressions are estimated each year, and the reported coefficients and  $R^2$  are averages

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<sup>20</sup> In unreported tests, we have also examined the fraction of firms that do not have the requisite data to compute earnings growth in the subsequent year. The pattern is very similar to that reported in panel F.

of estimates across years, with t-statistics calculated as the average coefficient estimate relative to its standard error estimated from the time-series of the coefficients. In unreported analysis we have estimated all regression specifications using monthly returns rather than annual returns, with similar results.

Regression I shows that B/P is significantly positively associated with future returns, as is well known. Regression II estimates equation (8): both E/P and B/P jointly indicate future returns, with significantly positive coefficients on both variables. The adjusted  $R^2$  is an improvement over that in Regression I with B/P alone. Regression III adds the current dividend-to-price (D/P). All else equal, dividends reduce future earnings, so the inclusion of D/P helps correct the forecast of forward earnings for the current payout. Adding D/P also controls for any tax effects of dividends on returns and the possibility that D/P itself is an indicator of expected returns via expected dividend growth. The coefficient on D/P is negative, consistent with earnings displacement, but it is not significant, taking nothing away from E/P and B/P as expected return characteristics.

Regression IV adds beta and size, the other FF characteristics, to Regression III. Size has a significant negative coefficient, with E/P and B/P retaining their significance, while beta is insignificant. Note also that our measure of forward earnings is only an estimate, so any variable that improves that estimate has a role in the regression regardless of whether it indicates subsequent earnings growth.

The results for these regressions are consistent over sub-periods—1962-1975, 1976-1985, 1986-1995, and 1996-2013—though the weight on E/P is higher in the earlier periods and the weight on B/P higher in the later periods. In summary, regression specifications I to IV support B/P as a valid characteristic, as in the FF model, but also indicates that E/P is missing from that model.

The analysis in Table 4 indicates a non-linearity across unlevered E/P portfolios in the relationship between unlevered B/P and subsequent earnings growth. To assess the robustness of the results in Table 5 to the linearity assumption underlying the regression analysis (and also to check on the influence of outliers), we also calculated mean  $t+1$  returns from investing in the portfolios in Table 4, and also for portfolios similarly constructed from a joint sort on levered

E/P and B/P rather than their levered components. We merely summarize the results here; the detail is available on request.

In both cases, average returns are increasing in the E/P ratios, with a significant difference between the high and low E/P portfolios. Further, mean returns are also increasing in B/P for each of the E/P portfolios (both for the levered and unlevered ratios), with significant differences in mean returns between high and low B/P for a given E/P. In short, the returns align with the growth rates for the portfolios in Panels A and B of Table 4 and also with the measures of the risk around the growth in Panels C - D of Table 4.

For these same portfolios, we also calculated “alphas” (estimated intercepts) from estimates of Fama and French time-series factor regressions with three factors and with four factors (including momentum). The significant intercepts observed confirm that the relation between B/P and E/P and future returns in our portfolios cannot be explained by the standard set of factors; the joint sort based on the characteristics identified by our framework exposes meaningful variation in realized returns that cannot be explained by FF factor models. Again, results are available on request.

#### *5.1.1 Relative importance of E/P and B/P in explaining expected returns*

While these regressions indicate that both E/P and B/P typically predict returns in the cross-section, our framework demonstrates that, in the case of no expected earnings growth, only E/P is relevant. B/P takes on significance only with expected earnings growth, and only when that growth is at risk of not meeting expectations. Accordingly, we now partition the cross-section into firms where a priori one expects different levels of expected earnings growth.

Our instrument for expected earnings growth is firm size. This is admittedly a crude proxy, based on the intuition that smaller firms are typically those with higher growth (and riskier) prospects while large firms are those where growth expectations have largely been achieved.<sup>21</sup> But there is another reason to partition in size: the FF model includes size as a

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<sup>21</sup> In unreported results we have used alternative, non-market based measures of firm size. Specifically, we partition firms into deciles based on book equity and book net operating assets. A challenge with using accounting based measures of size is that the very same accounting principles that give rise to risky earnings future earnings growth also affect current accounting estimates in the balance sheet. Conservative accounting creates low estimates of balance sheet values for business models with risky investment activity, thus sorting on book estimates of size can

characteristic as well as B/P (and size loads negative in Regression IV in table 5). However, rather than viewing size as another characteristic that indicates returns incrementally to B/P, we view size as a condition under which the weight on E/P in predicting returns shifts to B/P.

We estimate weights on E/P and B/P for size partitions using the Theil-Sen robust estimator advocated by Ohlson and Kim (2014). These weights are the median values of  $w_1$  and  $w_2$  from fitting  $R_{t+1} = w_1 E/P + w_2 B/P$  for all possible combinations of observations. Table 6 reports the average weights for ten portfolios formed each year from a ranking on firm size.<sup>22</sup> The weight on E/P increases with firm size, and approaches to 1.0 for the largest portfolios, the weight appropriate for no growth under our framework. Correspondingly, the weight on B/P decreases with firm size, effectively zero for the larger firms. For smaller firms (where higher growth is expected), the weight shifts from E/P to B/P, again consistent with our framework. The table also reports mean E/P and B/P for the portfolios, with E/P increasing over portfolios and B/P decreasing. The fitted returns in the table are calculated by applying the weights to E/P and B/P for the portfolio (with an intercept). These returns are decreasing in firm size, consistent with the standard observation that average returns are negatively related to size.<sup>23</sup> The last four rows of the table report the same statistics for two-year-ahead realized growth rates as in Table 4. It is clear that the weight on B/P and the associated fitted returns are increasing in the portfolio mean growth rates, their variation around the mean, and their sensitivity to market-wide shocks.

The results here are consistent with observations (in Kothari, Shanken and Sloan, 1995 and Asness, Frazzini, Israel, and Moskowitz, 2015, for example) that the B/P effect in stock returns is considerably weaker for large firms. But now a rationale is supplied, one that points to E/P for these firms rather than B/P. Andrade and Chhaochharia (2014) observe that E/P rather than B/P explains returns for large firms; again, a rationale is supplied here.

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confound the issue. That said, we see similar, albeit slightly weaker, relations using book equity and book net operating assets to partition on size.

<sup>22</sup> In a comparison with OLS coefficients, there is considerably less variation in the estimates over years, attributed to extreme values having less influence.

<sup>23</sup> These mean returns should not be interpreted as ex ante expected returns. Realized returns over this sample period (to which the weights were fitted) were those in an (on average) bull market. Indeed, the fitted returns are (on average) higher than what one typically views as a reasonable required return. This is particularly so for the small firms for, in this period, investing in risky growth paid off.

It has been observed that the FF portfolio sorts on B/P also imbed a size sort that obscures the weak B/P effect in large firms (in Lambert and Hübner, 2013 and Asness, Frazzini, Israel, and Moskowitz, 2015, for example). Consequently, there appears to be a B/P effect in large firms in FF only because the sort on B/P is actually a sort on size. The analysis here goes further, to question whether size and B/P are two separate characteristics. Size and B/P are clearly negatively correlated over portfolios in table 6, and both are associated with risky growth outcomes. Thus both may be seen as a characteristic that correlates with returns. However, our framework and table 6 promotes only B/P as a characteristic, but one that receives a higher weight with smaller firms because smaller firms have higher, riskier growth expectations.

To be sure, firm size is but one of many potential characteristics that could be used to identify firms with greater expectations of risky future earnings growth. One simple alternative is to directly measure investment activity that is immediately expensed, but which produces expected earnings growth from that investment over the initial reduced earnings. The two most common, and measurable, such investment activities are research and development (R&D) expenditures and advertising expenditures. In unreported analysis, we have repeated the analysis in table 6 but instead sort firms on the intensity of R&D and advertising expenditures. We assume a useful life of three years for R&D and one year for advertising, and deflate this simple measure of ‘intangible’ assets by either sales or net operating assets. The results are very similar to that reported in table 6: for firms with greater intangible asset intensity, B/P is more important in explaining expected returns. This is expected in our framework as the conservative nature of the accounting system defers the recognition of earnings associated with this risky investment activity. In such situations, E/P is no longer a sufficient statistic for expected returns.

Overall, the findings in table 6 confirm the insight from our identification framework that both E/P and B/P identify expected returns. There is, however, an inconsistency with the results in Fama and French (1992) who suggest that E/P is not significant in monthly cross sectional after controlling for size, beta, and B/P. Our analysis here suggests an explanation. As observed, the FF sorts confound size and B/P such that the return spread within large firms is attributed to B/P rather than size. While confirming the insignificance of B/P for large firms, table 6 also

shows that E/P and size are positively correlated over size portfolios. Thus, for large firms where E/P is particularly important, size proxies for E/P.<sup>24</sup>

## ***5.2 Regressions with Unlevered Explanatory Variables and Added Leverage***

In this section, we attempt to validate our identification approach by revisiting the puzzling negative relation between financial leverage and future equity returns observed in previous papers. The negative relation has been attributed to a failure to control for operating risk characteristics appropriately. So, we test whether a positive relation is now observed after controlling for the operating risk characteristics identified.

We start by confirming that the negative relation observed earlier holds for our sample. Regression I in table 7 reports the estimates of benchmark FF regression (11). As in Penman, Richardson, and Tuna (2007), there is a negative relation between financial leverage and future returns. In unreported analysis, we split each cross-section based on whether  $\frac{NOA}{P^{NOA}}$  is greater than or less than one, that is, around the “kink” in equation (5). As in Penman, Richardson, and Tuna (2007), the negative leverage relation is strongest for  $\frac{NOA}{P^{NOA}}$  less than one where the majority of firms lie and where leverage decreases B/P; the average coefficient on leverage (not reported in the table) is -0.030 with an associated test statistic of -3.22. Adding beta and size to the regressions does not alter the picture, and thus the conclusion remains that the FF model does not accommodate leverage risk.

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<sup>24</sup> Holding aside the modelling supporting our analysis, it is important to reconcile our empirical tests with those of Fama and French (1992). If we (i) restrict our time period to their sample period, 1963-1990, (ii) compute ‘E’ and ‘B’ consistent with Fama and French (1992), (iii) use the same lagging conventions (i.e., use financial statement data from the most recent fiscal year-end no later than December of year t when looking at returns that start in July of year t+1), (iv) include an indicator variable for negative firms and only compute E/P for firms where E > 0, and (v) use monthly return intervals as opposed to the annual return intervals, we continue to find that both B/P and E/P are associated with the cross section of future stock returns. It is only when we (i) require all components of ‘E’ and ‘B’ as measured by Fama and French (1992) to be non-missing (i.e., non-missing income statement deferred taxes, preferred dividends, and balance sheet deferred taxes), and (ii) include all firms (i.e., do not remove securities with closing share price of less than \$0.20) that we can find a sub-sample where, empirically at least, E/P is not significant in explaining future stock returns. This is not surprising as the smallest firms are those firms with the largest expectations for earnings growth, and one would expect B/P to be more important as it captures those expectations of subsequent earnings growth.

Regression II adds the enterprise (unlevered) earnings yield, the missing operating characteristic identified, to the benchmark regression, as in equation (10). The mean coefficient on leverage is now close to zero. The addition of unlevered size and beta in Regression III does not change this coefficient significantly. These findings are similar when excluding firms with operating losses and those with negative net debt (that is, cash-rich firms). They also hold for various sub-periods from 1962-2013.<sup>25</sup>

However, the analysis in section 2.3 indicates there is an interaction effect between leverage and operating risk to be accommodated. The remaining regressions in table 7 recognize these points by exploiting E/P leveraging equation (4). Regressions IV and V introduce the kink in equation (4) around the enterprise earnings yield equal to the borrowing rate with the condition for the leverage effect on the levered E/P to be favorable,  $\frac{OI}{P^{NOA}} > R_f$ . We use the 10-year U.S. Treasury rate,  $R_f$ , as the threshold borrowing rate given the scarcity of quality corporate borrowing cost data back in time. For  $\frac{OI}{P^{NOA}} > R_f$  in regression IV, the average coefficient on leverage is positive. Further, the average coefficient on the interaction variable in Regression V is reliably positive. Applying the estimated coefficients to the average values of both the leverage and the interaction variable in the cross-section, we find that the total effect of leverage is positive with an associated test statistic (not tabulated) of 2.74. Overall and in contrast to the typical finding in the literature, the analysis indicates a positive conditional relation between leverage and future equity returns.

The coefficients on the leverage variables in these regressions could be attributable to leverage being related to additional omitted aspects of operating risk. But our data suggest otherwise. First, there is a very low correlation between leverage and future unlevered returns in table 2. Second, in unreported tests we estimate regression II in table 7 using unlevered returns as the dependent variable. We find a weak negative relation (test statistic of -1.34), suggesting (weakly) that firms with higher (lower) leverage have lower (higher) operating risk. The

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<sup>25</sup> We also split on  $\frac{NOA}{P^{NOA}}$  is greater than or less than one, that is, around the “kink” in equation (5). For  $\frac{NOA}{P^{NOA}} > 1$ ,

the mean coefficient on leverage was marginally significant for the appropriate one-tail test, but not for  $\frac{NOA}{P^{NOA}} < 1$ .

weakness of the relation and its negative sign suggest that the positive conditional relation that we document between leverage and future levered returns cannot easily be explained by leverage capturing operating risk.

### 5.2.1 Leverage in Ex Post Return Regressions

The regressions in Table 7 are not very powerful for identifying differences in expected returns. Indeed, while the reported  $R^2$  are higher than typically observed for return regressions, they are still quite low. As often observed, the reason is that realized returns are a poor metric to detect small differences in expected returns because the variation in realized returns due to the unexpected return component is far greater than that of the expected return component (see e.g., Elton, 1999), and the relative contribution of leverage to the expected return is typically small.

To increase the power of the tests, we repeat the analysis, but now with a control for the contemporaneous earnings news that explains part of the unexpected component of realized returns. The analysis also permits a sharper definition of favorable and unfavorable leverage where the directional effect of leverage on returns differs. We estimate the following regression equation:

$$R_{t+1} = \alpha + \beta_1 \frac{OI_{t+1}}{P_t^{NOA}} + \beta_2 \frac{OI_t}{P_t^{NOA}} + \beta_3 \frac{NOA_t}{P_t^{NOA}} + \beta_4 \frac{ND_t}{P_t} + \nu_{t+1} \quad (12)$$

The inclusion of realized enterprise earnings,  $\frac{OI_{t+1}}{P_t^{NOA}}$ , controls for unexpected returns due to the contemporaneous realization of earnings news. We also include lagged enterprise earnings,

$\frac{OI_t}{P_t^{NOA}}$ , because extensive prior research shows that both earnings levels and changes explain realized stock returns (in Easton and Harris 1991, for example).

Table 8 reports the results. Regression I reports the results from estimating equation (12). There is a positive coefficient on the realized earnings yield and a significant increase in average  $R^2$  over the regressions reported in table 7. This reinforces the point that expected earnings are at risk so that their realizations determine realized returns. The average coefficient on lagged earnings is negative, indicating that lower prior earnings for a given earnings

realization—realized earnings growth—is associated with higher returns. This is implied by our framework where expected earnings growth is at risk, so realizations of growth move returns. After controlling for earnings realizations, there is a positive but still insignificant association between leverage and future returns.

However, the effect of leverage on returns depends on whether leverage is favorable; leverage levers up realized returns if outcomes are favorable, but reduces returns if not. So, the remaining regressions in table 8 partition on the earnings realization. Regression II excludes firms with operating losses and the remaining regressions examine cases with earnings realizations greater than and less than the borrowing rate (proxied by the 10-year Treasury rate), the inflection point for favorable and unfavorable leverage in equation (4). Regressions are run with and without leverage interaction terms. For regressions III – V that we identify with favorable leverage, the coefficient on leverage is strongly positive and the overall effect of the leverage term and the interaction term is positive. In unreported analysis, we estimate regression II excluding the main effect for leverage and find the coefficient on the interaction variable is 0.909 with a test statistic of 4.81.

Regression VI attempts to capture the case of “unfavorable” leverage. However, an interaction term cannot be calculated when operating income is negative (the most demonstrable case of an unfavorable outcome), so we include a loss dummy variable. The average coefficient on leverage is negative but not statistically different from zero. Thus we don’t observe a negative leverage effect directly. But the coefficient is considerably less than that for regression III covering favorable earnings outcomes.

In unreported analysis, we also estimated the regressions by defining favorable outcomes as  $OI_{t+1} > OI_t$  and unfavorable ones as  $OI_{t+1} < OI_t$ . For regression I for favorable news, the coefficient on leverage was 0.035 with a t-statistic of 2.72, while that for unfavorable news was -0.016 with a t-statistic of -2.14. The interaction coefficient in regression II for favorable news was 1.244 ( $t = 3.16$ ) and that for unfavorable news was -0.004 ( $t = -0.02$ ). In regression V (that excludes the leverage main effect term), the coefficient on the interaction term was 0.77 ( $t = 4.16$ ) for favorable news and -0.026 ( $t = -0.15$ ) for unfavorable news. In summary, after controlling for operating risk characteristics and the contemporaneous earnings news, we can

identify a robust positive relation between leverage and future returns, albeit asymmetric, with the relation stronger in the cases we have identified leverage as favorable.

These regressions emphasize the ex post nature of leverage. Given the negative relation between leverage and returns typically observed in prior research, the results are important. But they also shows that our framework identifies a characteristic regression model where leverage is priced positively.

## **6. Conclusion**

This paper develops a framework for identifying characteristics that indicate expected returns. Expected returns can be described in terms of expected forward earnings and subsequent earnings growth under conditions prescribed by accounting principles. Characteristics that indicate expected earnings and subsequent earnings growth that are at risk also indicate the expected return for bearing that risk, assuming the market prices risk efficiently.

The paper takes the framework to a critique of asset pricing models where book-to-price appears as a characteristic. We establish accounting conditions under which B/P indicates expected returns and those where it does not. The conditions under which B/P is a valid risk characteristic involve a particular form of accounting that resembles GAAP. We test empirically whether these conditions are satisfied. Our framework and the accompanying empirical tests show that B/P indicates expected returns because it forecasts expected earnings growth and the risk that the expectation may not be met. In one sense, the paper justifies B/P in the Fama and French asset pricing model. However, it also identifies E/P as missing from the Fama and French model. Indeed, when there is no expected earnings growth, it is E/P that indicates expected returns and B/P is irrelevant. With expected earnings growth, the weight shifts to B/P, and does progressively more so with smaller firms where growth expectations are presumably higher. While the focus is on pricing models with B/P, the framework in the paper is quite general for identifying characteristics that pertain to risk and return. For example, Penman and Zhu (2014) take the framework developed in this paper to investigate a number of “anomalies” that have appeared in empirical analysis.

The framework identifies characteristics that indicate the expected return due to operating risk versus those that indicate the financing risk premium in expected returns. The paper shows

that operating and financing risk characteristics combine to explain the (levered) equity return in the same way that unlevered stock returns and leverage combine to yield the levered equity return under Modigliani and Miller (1958). With the separation of operating and financing risk, we document a positive relation between returns and leverage. This contrasts with prior research that has consistently found a negative relation between leverage and equity returns, a finding inconsistent with basic principles of finance. We attribute the earlier negative relation as a failure to identify operating risk characteristics appropriately. Our finding of a positive relation further validates our framework.

The paper is written under the assumption that markets rationally price risk, as is standard in asset pricing in identifying characteristics that indicate risk and return; in order to address this research, we must be on the same platform. However, we indicate the expected returns for risk only under this assumption. As always in empirical asset pricing, our empirical findings (and those in asset pricing research more generally) could be attributed to inefficient pricing if the characteristics predict returns because the market fails to incorporate information about future earnings and subsequent earnings growth. Our documentation that the predicted returns are associated with fundamental (earnings) risk relieves the concern, but the paper in no way resolves the long-standing debate about market efficiency. That, of course, requires a valid factor model, but the paper holds out the prospect of developing such a model, one that comes from an accounting-based framework.

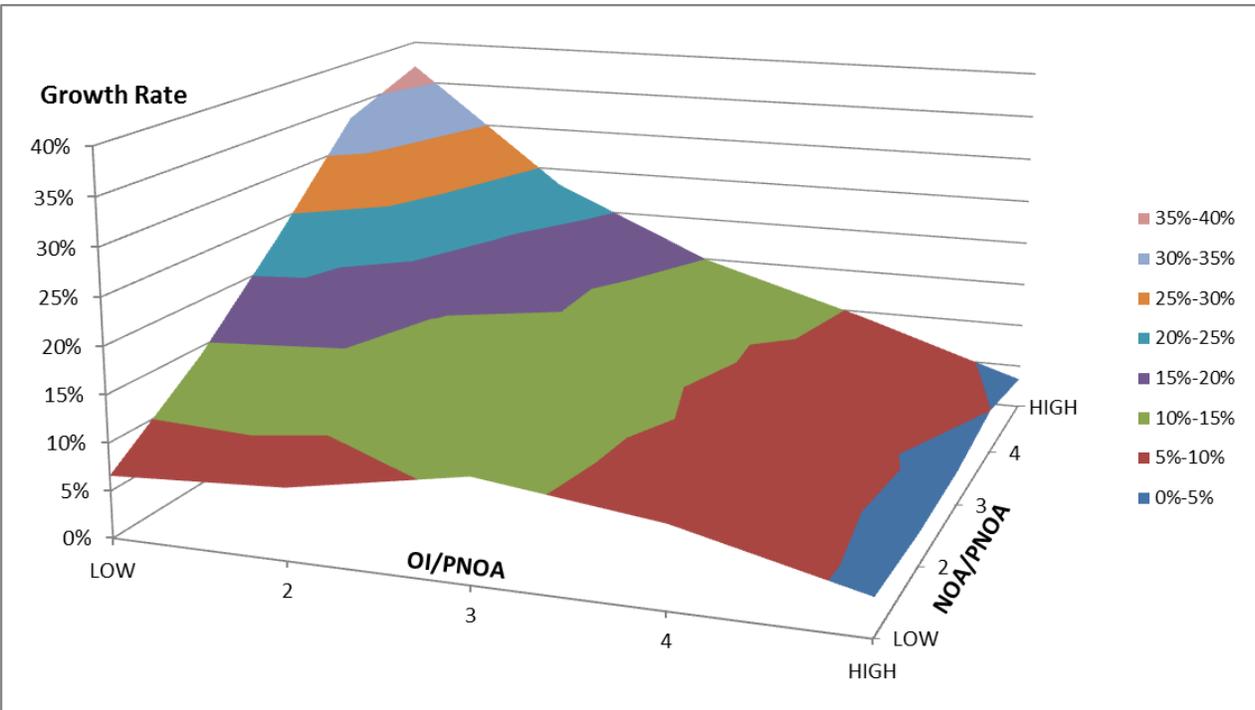
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**Figure 1. Average enterprise earnings growth rates two years ahead ( $t+2$ ) for portfolios formed from joint sorts of the enterprise earnings yield ( $OI/P^{NOA}$ ) and enterprise book-to-price ( $NOA/P^{NOA}$ ) at time  $t$ .**

See notes to Tables 1 and 4 for the calculation of variables.

**Table 1. Distribution of Variables**

This table reports selected percentiles of variables from data pooled over firms and years, 1962-2013, along with averages and standard deviations. For the calculation of averages and standard deviations, the top and bottom 2 percent of variables each year were excluded, except for returns.

Percentiles	Returns	Unlevered Returns	E/P	B/P	OI/P <sup>NOA</sup>	NOA/P <sup>NOA</sup>	ND/P
1	-0.888	-1.281	-2.103	-0.811	-1.134	-0.090	-1.074
2	-0.817	-0.968	-1.177	-0.168	-0.634	-0.013	-0.722
5	-0.679	-0.697	-0.487	0.056	-0.289	0.037	-0.409
10	-0.529	-0.480	-0.211	0.139	-0.132	0.114	-0.239
25	-0.250	-0.176	-0.015	0.304	0.003	0.332	-0.060
50	0.042	0.055	0.047	0.571	0.048	0.657	0.153
75	0.366	0.296	0.086	0.984	0.078	0.980	0.669
90	0.826	0.744	0.140	1.586	0.118	1.314	1.695
95	1.281	1.285	0.186	2.135	0.154	1.610	2.895
98	2.091	2.480	0.254	3.032	0.222	2.171	5.674
99	2.944	4.071	0.316	3.904	0.301	2.865	9.234
Average	0.156	0.111	-0.005	0.751	0.017	0.710	0.516
Std. Dev.	0.810	0.537	0.244	0.617	0.142	0.449	1.056

Accounting data are from Compustat and returns and price data are from CRSP. Financial firms are excluded. There is a maximum of 170,096 firm-years in the calculations, though less for some variables.

Returns,  $R_{t+1}$ , are buy-and-hold returns for twelve months beginning three months after the end of fiscal-year  $t$ , calculated from CRSP monthly returns. For firms that are delisted during the return period, the remaining return for the period was calculated by first applying CRSP's delisting return and then reinvesting any remaining proceeds in a size-matched portfolio (where size is measured as market capitalization at the start of the return accumulation period). This mitigates concerns about potential survivorship bias. Firms that are delisted for poor performance (CRSP delisting codes 500 and 520–584) frequently have missing delisting returns, in which case a delisting return of –100% was applied. Final accounting data for a fiscal year are presumed to have been published during the three months after fiscal-year end (and before the beginning of the return period).

Unlevered returns,  $R_{t+1}^{NOA}$ , are enterprise returns for the same annual period as the levered stock returns, calculated as  $(P_{t+1}^{NOA} + FCF_{t+1} - P_t^{NOA}) / P_t^{NOA}$ , with  $P_t^{NOA} = P_t + ND_t$  where  $ND$  is the book value of net debt as an approximation to its market value. Free cash flow,  $FCF_{t+1} = OI_{t+1} - (NOA_{t+1} - NOA_t)$ , according to the clean surplus equation for operating activities. For the calculation of operating income,  $OI$ , and net operating assets  $NOA$ , see below. Unlevered returns are calculated on a total dollar basis (rather than with per-share amounts).

E/P is an estimate of the forward earnings yield,  $E(Earnings_{t+1}) / P_t$ , with forward earnings forecast as earnings before extraordinary items (Compustat item IB) and special items (SPI) for the prior year, year  $t$ , minus preferred dividends (DVP), with a tax allocation to special items at the prevailing statutory corporate income tax rate for the

year. Earnings and prices are on a per-share basis, with prices observed three months after fiscal-year end, adjusted for stock splits and stock dividends during the three months following fiscal-year end.

B/P, the (levered) book-to-price ratio, is book value of common equity at the end of the current fiscal-year  $t$ , divided by price at  $t$ . Book value is Compustat's common equity (CEQ) plus any preferred treasury stock (TSTKP) less any preferred dividends in arrears (DVPA). Book values and prices are on a per-share basis, with prices observed three months after fiscal-year end, adjusted for stock splits and stock dividends during the three months following fiscal-year end.

$OI/P^{NOA}$  is an estimate of the forward unlevered (enterprise) earnings yield,  $E(OI_{t+1}) / P_t^{NOA}$ , with forward enterprise earnings (operating income) forecast as operating income for the prior year calculated as earnings (as above) plus net interest expense and preferred dividends with a tax allocation to net interest at the prevailing statutory tax rate for the year.

$NOA/P^{NOA}$  is unlevered (enterprise) book-to-price. Net operating assets is book value of equity plus book value of net debt. See below for the calculation of net debt.

ND/P is market leverage at the end of fiscal-year  $t$ , with the market value of debt approximated by its book value, ND. Net debt is the sum of long-term debt (Compustat item DLTT), debt in current liabilities (DLC), carrying value of preferred stock (PSTK), preferred dividends in arrears (DVPA), less preferred treasury stock (TSTKP), all reduced by financial assets ("excess cash") measured as cash and short-term investments (CHE)

**Table 2. Average Pearson and Spearman Correlations Between Variables**

This table reports average cross-sectional correlations for the period 1962-2013. Reported correlations are averages of annual correlation coefficients across the 52 years in the sample period. Pearson correlations are presented in the upper diagonal and Spearman correlations in the lower diagonal. For the Pearson correlations, the top and bottom 2 percent of observations for each variable are discarded each year with the exception of returns, beta, and size.

See notes to Table 1 for calculation of variables. Betas, estimated from a maximum of 60 monthly returns and a minimum of 24 monthly returns prior to the period beginning three months after firms' fiscal-year end, are from market model regressions using CRSP value-weighted market return inclusive of all distributions. Size is the natural log on equity market capitalization.

	Returns	Unlevered Returns	E/P	B/P	OI/P <sup>NOA</sup>	NOA/P <sup>NOA</sup>	ND/P	Beta	Size
Returns		0.568	0.058	0.080	0.076	0.072	0.009	-0.021	-0.031
Unlev Ret	0.643		0.100	0.075	0.138	0.083	-0.025	-0.014	0.028
E/P	0.176	0.182		0.082	0.784	0.112	-0.103	-0.130	0.231
B/P	0.118	0.104	0.292		0.115	0.878	0.315	-0.115	-0.291
OI/P <sup>NOA</sup>	0.173	0.211	0.896	0.234		0.147	-0.098	-0.116	0.208
NOA/P <sup>NOA</sup>	0.105	0.119	0.279	0.908	0.204		0.384	-0.152	-0.243
ND/P	0.010	0.018	0.063	0.257	-0.095	0.462		-0.073	-0.111
Beta	-0.052	-0.031	-0.174	-0.144	-0.126	-0.164	-0.109		-0.017
Size	0.055	0.070	0.196	-0.267	0.189	-0.244	-0.029	0.005	

**Table 3. Average Median Earnings Growth Rates Two Years Ahead for Portfolios Formed by Ranking Firms on Book-to-Price and Enterprise Book-to-Price**

Panel A reports means of median realized earnings growth rates and residual earnings growth rates two years ahead for ten portfolios formed each year, 1963-2013, by ranking firms on book-to-price, B/P. Panel B reports mean of median enterprise earnings growth rates and residual enterprise earnings growth rates for portfolios formed by ranking firms each year on enterprise book-to-price, NOA/P<sup>NOA</sup>.

Portfolios are formed from ranking all firm observations each calendar year, 1963-2013, on book-to-price, B/P (Panel A) and enterprise book-to-price, NOA/P<sup>NOA</sup> (Panel B). Cut-offs for the portfolios were determined from the ranking in the prior year. Variables are defined in Table 1. Firms with negative book values are excluded.

Reported growth rates are averages of median portfolio t+2 growth rates over years, 1962-2013. To accommodate negative denominators, earnings growth rates are calculated as

$\frac{\Delta Earnings_{t+2}}{(|Earnings_{t+2}| + |Earnings_{t+1}|) / 2}$ , and similarly so for operating (enterprise) income, OI. This measure

ranges between 2 and -2. Residual earnings are calculated as  $Earnings_{t+2} - (R_f \times B_{t+1})$  and residual OI is calculated as  $OI_{t+2} - (R_f \times NOA_{t+1})$ , with the growth rate over t+1 calculated in the same way as the earnings growth rate.  $R_f$  is the yield on the U.S. 10-year Treasury note for the respective year.

**Panel A: Mean of Median Earnings Growth Rates and Residual Earnings Growth Rates Two Years Ahead, in Percent**

	B/P Decile										
	LOW	2	3	4	5	6	7	8	9	HIGH	HIGH-LOW
Earnings	8.8	9.1	9.0	8.0	9.2	8.6	9.5	10.7	14.1	19.0	10.2
Residual Earnings	2.2	3.5	4.4	4.6	6.6	7.0	10.0	12.9	17.4	24.3	22.1

**Panel B: Mean of Median Enterprise Earnings (OI) Growth Rates and Residual Enterprise Earnings Growth Rates Two Years Ahead, in Percent**

	NOA/P <sup>NOA</sup> Decile										
	LOW	2	3	4	5	6	7	8	9	HIGH	HIGH-LOW
OI	6.6	10.8	9.9	9.2	9.1	9.6	9.1	10.0	12.1	15.0	8.4
Residual OI	-0.4	3.7	3.3	3.5	2.8	5.5	8.2	14.6	21.6	22.5	22.9

**Table 4. Average Median Enterprise Earnings Growth Rates Two Years Ahead and Variation in Growth Rates, for Portfolios Formed from Joint Sorts of the Enterprise Earnings Yield and Enterprise Book-to-Price**

Panel A reports the mean of median realized enterprise earnings growth rates two years ahead for portfolios formed each year, 1963-2013, on enterprise earnings yield,  $OI/P^{NOA}$  and enterprise book-to-price,  $NOA/P^{NOA}$ . Panel B reports corresponding residual earnings growth rates. Panel C reports the standard deviation of portfolio growth rates over the years, and Panel D reports the inter-decile range of growth rates. Panel E reports betas (slope coefficients) from a time-series regression of median portfolio growth rates two years ahead on the market-wide median growth rate for that year. Panel F gives non-survivor rates for the portfolios.

Portfolios are formed from ranking all firm observations each calendar year, 1963-2013, first on enterprise earnings-to-price,  $OI/P^{NOA}$ , and then, within each  $OI/P^{NOA}$  portfolio, on enterprise book-to-price,  $NOA/P^{NOA}$ . Cut-offs for the portfolios are determined from the ranking in the prior year. Variables are defined in Table 1. Firms with negative values of  $P^{NOA}$  are excluded.

Reported growth rates in Panels A and B are means of median portfolio growth rates across years. Standards deviations and inter-decile ranges in Panels C and D refer to portfolio growth rates across years. To accommodate negative denominators, growth rates are calculated as

$$\frac{\Delta OI_{t+2}}{(|OI_{t+2}| + |OI_{t+1}|) / 2}$$

where  $OI$  is operating (enterprise) income, calculated as in the notes to Table 1.

This growth rate ranges between 2 and -2. Residual enterprise earnings in Panel B is calculated as  $OI_{t+2} - (R_f \times NOA_{t+1})$ , with the growth rate over  $t+1$  calculated in the same way as the  $OI$  growth rate.  $R_f$  is the yield on the U.S. 10-year Treasury note for the year.

The betas (slope coefficients) in Panel E are from a time-series regression of portfolio growth rates two years ahead on the market-wide growth rate for that year. The market-wide growth rate is calculated using all firms in the sample for a given year. To align in calendar time, these betas were estimated using only firms with December 31 fiscal-year ends.

Non-survivors in Panel F are those with delisting codes 500, 520, 550, 551, 552, 560, 561, 570, 572, 574, 575, 580, 581, 582, 583, 584, 585, 587, 589, and 591 on CRSP.

**Panel A: Mean of Median Enterprise Earnings Growth Rates (%) Two Years Ahead**

		OI/P <sup>NOA</sup> Quintile				
		LOW	2	3	4	HIGH
NOA/P <sup>NOA</sup> Quintile	LOW	6.6	7.6	10.9	8.6	4.0
	2	14.1	12.4	11.2	8.7	3.5
	3	23.3	14.5	12.0	7.7	3.7
	4	33.4	19.3	11.7	8.6	5.0
	HIGH	37.0	23.0	14.9	9.4	3.4
HIGH-LOW		30.4	15.5	4.0	0.9	-0.6

**Panel B: Mean of Median Residual Enterprise Earnings Growth Rates (%) Two Years Ahead**

		O/P <sup>NOA</sup> Quintile				
		LOW	2	3	4	HIGH
NOA/P <sup>NOA</sup> Quintile	LOW	1.2	-0.7	4.8	4.0	-3.1
	2	9.4	0.5	3.0	4.7	-6.0
	3	19.8	5.3	4.8	2.2	-3.3
	4	35.1	18.7	11.5	9.4	0.6
	HIGH	38.2	30.7	28.9	18.0	-0.7
HIGH-LOW		36.9	31.3	24.1	14.0	2.4

**Panel C: Standard Deviation of Median Enterprise Earnings Growth Rates (%) Two Years Ahead**

		O/P <sup>NOA</sup> Quintile				
		LOW	2	3	4	HIGH
NOA/P <sup>NOA</sup> Quintile	LOW	13.2	12.1	6.2	5.9	9.9
	2	13.7	14.0	6.2	5.9	9.4
	3	20.0	19.6	7.7	7.4	9.7
	4	24.0	20.4	8.7	6.3	10.4
	HIGH	24.0	19.7	13.9	9.9	18.8
HIGH-LOW		10.8	7.6	7.7	4.0	8.9

**Panel D: Inter-decile Range of Median Enterprise Earnings Growth Rates (%) Two Years Ahead**

		O/P <sup>NOA</sup> Quintile				
		LOW	2	3	4	HIGH
NOA/P <sup>NOA</sup> Quintile	LOW	34.1	29.4	17.1	12.9	21.8
	2	37.7	30.6	15.2	14.0	22.9
	3	49.5	41.7	20.4	15.5	21.5
	4	67.6	41.5	24.0	14.6	24.1
	HIGH	64.4	42.4	33.6	29.8	41.2
HIGH-LOW		30.3	13.0	16.5	16.9	19.4

**Panel E: Enterprise Earnings Grow Betas for Earnings Growth Two Years Ahead**

		O/P <sup>NOA</sup> Quintile				
		LOW	2	3	4	HIGH
NOA/P <sup>NOA</sup> Quintile	LOW	0.71	0.94	0.73	0.81	0.94
	2	1.24	1.59	0.84	1.02	1.16
	3	1.77	1.54	0.82	0.94	1.44
	4	1.50	1.45	0.59	0.90	1.37
	HIGH	2.34	2.63	1.56	1.69	2.16
HIGH-LOW		1.63	1.69	0.83	0.88	1.21

**Panel F: Fraction (%) of Firms Delisted Between Year t+1 and t+2 for Performance Related Reasons**

		OI/P <sup>NOA</sup> Quintile				
		LOW	2	3	4	HIGH
NOA/P <sup>NOA</sup> Quintile	LOW	6.21	1.63	0.43	0.30	0.56
	2	7.20	2.07	0.39	0.31	0.63
	3	7.34	2.34	0.72	0.41	0.54
	4	8.02	3.01	0.95	0.77	1.00
	HIGH	6.29	3.47	2.17	1.39	1.51
HIGH – LOW		0.08	1.84	1.74	1.09	0.95

**Table 5. Average Coefficient Estimates and Test Statistics for Levered Characteristic Regressions**

This table reports average coefficients estimates from 52 annual cross-sectional regressions of forward stock returns (for  $t+1$ ) on time- $t$  levered characteristics, along with  $t$ -statistics and average adjusted R-square, 1962-2013.

Reported coefficients are averages from yearly cross-sectional regressions for the years, 1962-2013. The  $t$ -statistics, reported in parentheses below the average coefficient estimates, are the average coefficient divided by a standard error estimated from the time series of coefficient estimates. To minimize the influence of outliers, the top and bottom two percent of the explanatory variables were deleted each year. Variables are defined in notes to Table 1 and Table 2. The divide yield is dividends per share for year  $t$  divided by price at the end of year  $t$ ,  $dps_t/P_t$ .

	I	II	III	IV
Intercept	0.081 (2.72)	0.069 (2.26)	0.081 (2.52)	0.152 (3.70)
E/P		0.348 (2.52)	0.478 (2.75)	0.401 (2.68)
B/P	0.103 (5.97)	0.092 (5.51)	0.096 (5.29)	0.069 (4.58)
Size				-0.013 (-2.72)
Beta				0.009 (0.68)
Div. Yield			-0.866 (-1.48)	-0.536 (-1.44)
Adj-R <sup>2</sup>	0.015	0.026	0.039	0.055
# Firm-Years	170,096	166,022	164,381	140,838

**Table 6. Average Weights on E/P and B/P for Projecting Forward Stock Returns, for Ten Size Portfolios, along with Other Portfolio Characteristics**

This table reports average Theil-Sen estimates of weights on E/P and B/P for forecasting forward levered stock returns for t+1, for ten portfolios formed from ranking firms on size (market capitalization). The weights are estimated each year, 1963-2013, with means and t-statistics calculated from 51 annual estimates. The table also reports mean E/P and mean B/P for the portfolios, fitted mean returns from fitting the weights to E/P and B/P, and summary statistics of the distribution on portfolio median two-year-ahead growth rates over years.

	Size Portfolio									
	Small	2	3	4	5	6	7	8	9	Large
Weight on E/P	0.110	0.348	0.481	0.690	0.589	0.770	1.083	0.919	0.881	0.845
<i>t stat</i>	0.99	3.65	3.88	4.47	3.82	3.01	3.37	4.81	4.50	3.49
Weight on B/P	0.101	0.118	0.124	0.107	0.103	0.061	0.066	0.052	0.023	-0.004
<i>t stat</i>	7.54	6.51	7.65	5.45	5.79	2.18	3.16	2.38	1.02	-0.19
Mean E/P	-23.02%	-6.59%	-1.95%	0.50%	2.34%	3.76%	4.82%	5.54%	6.00%	6.81%
Mean B/P	1.354	1.028	0.924	0.831	0.761	0.723	0.660	0.618	0.582	0.545
Fitted Return	31.09%	23.26%	22.95%	18.06%	18.40%	13.00%	13.82%	13.70%	10.34%	7.89%
Mean Earnings Growth Rates, t+2	16.1%	13.9%	10.1%	10.2%	9.1%	9.2%	9.1%	9.9%	9.5%	8.5%
St. Dev. of Earnings Growth Rates	17.0%	12.7%	12.2%	10.4%	10.1%	10.1%	8.7%	7.4%	7.2%	6.9%
IDR of Earnings Growth Rates	44.4%	35.4%	32.7%	28.6%	27.1%	29.1%	25.9%	19.1%	16.6%	15.7%
Earnings Growth Betas	1.403	1.223	1.218	1.267	1.014	1.135	0.815	1.030	0.952	0.742

**Table 7. Average Coefficient Estimates and Test Statistics for Unlevered Characteristic Regressions**

This table reports average coefficients estimates from 52 annual cross-sectional regressions of forward stock returns (for t+1) on time t operating characteristics and leverage, along with t-statistics and average adjusted R-square, 1962-2013.

See notes to Table 5. Unlevered size is the natural log of enterprise market capitalization, measured as equity market capitalization plus the book value of net debt (in millions of dollars).  $R_f$  is the yield on the U.S. 10-year Treasury note for the relevant year. All other variables are defined in notes to Table 1 and Table 2. Firms with negative values of  $P^{NOA}$  are excluded.

	I	II	III	IV $OI/P^{NOA} > R_f$	V $OI/P^{NOA} > R_f$
Intercept	0.069 (2.13)	0.050 (1.55)	0.139 (3.34)	0.028 (0.83)	0.045 (1.40)
$OI/P^{NOA}$		0.655 (3.39)	0.546 (3.53)	1.364 (5.13)	1.176 (5.04)
$NOA/P^{NOA}$	0.126 (6.12)	0.093 (4.60)	0.070 (3.58)	0.029 (1.55)	0.029 (1.52)
UnLevSize			-0.015 (-2.71)		
Beta			0.011 (0.77)		
ND/P	-0.017 (-2.15)	-0.002 (-0.21)	0.000 (0.04)	0.036 (2.17)	-0.046 (-1.60)
$OI/P^{NOA} * ND/P$					1.018 (2.71)
Adj-R <sup>2</sup>	0.018	0.032	0.057	0.021	0.022
# Firm-Years	164,657	160,929	138,147	56,808	56,808

**Table 8. Average Coefficient Estimates and Test Statistics for Characteristic Regressions with Realized Returns and Realized Earnings**

This table reports average coefficients estimates from 51 annual cross-sectional regressions of stock returns for year t+1 on the contemporaneous realized enterprise earnings yield for the same year, leverage and other characteristics, along with t-statistics and average adjusted R-square, 1962-2012.

Reported coefficients are averages from yearly cross-sectional regressions for the years, 1962-2012. The t-statistics, reported in parentheses below the average coefficient estimates, are the average coefficient divided by a standard error estimated from the time series of coefficient estimates. To minimize the influence of outliers, the top and bottom two percent of the explanatory variables were deleted each year. Variables are defined in notes to Table 1 and Table 2. Firms with negative values of  $P^{NOA}$  are excluded.  $I_{Loss}$  is an indicator variable equal to one when  $OI_{t+1} < 0$ , and zero otherwise.  $OI_{t+1}/P_t^{NOA}$  is the realized operating income in year t+1 relative enterprise price at t and  $R_t$  is the yield on the U.S. 10-year Treasury note for the relevant year.

	I	II $OI_{t+1}/P_t^{NOA} > 0$	III $OI_{t+1}/P_t^{NOA} > R_t$	IV $OI_{t+1}/P_t^{NOA} > R_t$	V $OI_{t+1}/P_t^{NOA} > R_t$	VI $OI_{t+1}/P_t^{NOA} < R_t$
Intercept	0.028 (0.86)	-0.009 (-0.33)	0.034 (0.91)	0.064 (1.83)	0.047 (1.31)	0.016 (0.46)
$OI_{t+1}/P_t^{NOA}$	2.652 (8.26)	4.461 (15.28)	4.596 (11.10)	4.252 (12.47)	4.407 (11.90)	2.147 (2.97)
$OI_t/P_t^{NOA}$	-1.747 (-6.73)	-2.361 (-8.98)	-2.535 (-8.66)	-2.468 (-9.05)	-2.428 (-9.29)	-1.353 (-4.71)
$NOA_t/P_t^{NOA}$	0.085 (4.23)	-0.008 (-0.41)	-0.044 (-2.06)	-0.043 (-1.97)	-0.052 (-2.14)	0.039 (1.33)
$ND_t/P_t$	0.007 (0.70)	-0.052 (-2.78)	0.084 (5.68)	-0.072 (-2.32)		-0.010 (-0.68)
$OI_{t+1}/P_t^{NOA} * ND/P$		1.468 (4.22)		1.616 (3.39)	1.009 (4.83)	
$I_{Loss}$						-0.068 (-1.46)
Adj-R <sup>2</sup>	0.134	0.183	0.153	0.167	0.161	0.099
No. of Firm-Years	149,972	115,852	61,311	61,311	61,311	88,661