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Returns to buying earnings and book value: accounting for growth and risk

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Abstract Historical cost accounting deals with uncertainty by deferring the recognition of earnings until the uncertainty has largely been resolved. Such accounting affects both earnings and book value and produces expected earnings growth deemed to be at risk. This paper shows that the earnings-to-price and book-to-price ratios that are the product of this accounting forecast both earnings growth and the risk to that growth. The paper also shows that the market pricing of earnings and book values in these ratios aligns with the risk imbedded in the accounting: the returns to buying stocks on the basis of their earnings yield and book-to-price are explained as a rational pricing of the risk of expected earnings growth not being realized. Accordingly, the paper provides a rationalization of the well-documented book-to-price effect in stock returns: book-to-price indicates the risk in buying earnings growth. However, growth identified by a high book-to-price as yielding a higher return in this paper is quite different from "growth" typically attributed to a low book-to-price as yielding a lower return. Accordingly, the notion of "growth" versus "value" requires modification.

Keywords Risk · Stock returns · Growth · Earnings-to-price · Book-to-price

JEL Classification G12 · M41

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Historical cost accounting imbeds a principle for handling uncertainty: defer the recognition of earnings until the uncertainty has largely been resolved. In terms used in asset pricing, earnings is not recognized until the firm has a low beta asset, typically cash or a near-cash receivable that are booked upon "realization" of outcomes, usually with a sale. Could it be that such accounting aligns with the way that risk is priced in the market? The deferral of earnings to the future means future earnings growth. So, to restate the question, could it be that firms with more expected earnings growth are priced as being riskier? There is no necessity that accounting principles for handling uncertainty coincide with priced risk of course, but this paper suggests so: firms with higher expected earnings growth due to earnings deferral are priced to yield higher stock returns, on average.

Earnings deferral reduces short-term earnings and reduces earnings relative to book value, so, if deferral is associated with risk, a higher book-to-price for a given earnings-to-price indicates risky growth. Accordingly, the paper also shows that a joint sort on earnings-to-price and book-to-price identifies growth that is priced as risky. The sort is not only associated with stock returns but also earnings growth rates, with higher growth subject to larger shocks. The paper thus provides an explanation of returns to earnings-to-price and book-to-price that have consistently been documented in the data and trolled many times by value versus growth investors. Such a trading strategy identifies differential returns, but an understanding of how accounting works suggests that those returns may be associated with risk.

The analysis provides an accounting rationale for the well-documented book-to-price effect returns: for a given earnings-to-price (E/P), a higher book-to-price (B/P) indicates higher expected growth that is priced as risky. This suggests a revision of the notion of "value" versus "growth" investing. In that dichotomy, "growth" (associated with a low book-to-price) is deemed to be low risk, yielding lower average returns. The paper shows that it is a high B/P rather than a low B/P that indicates the risky growth.

The paper begins, in Sect. 1, with a review of how earnings-to-price and book-to-price relate to expected returns in the literature. Then, in Sect. 2, accounting principles are introduced in the context of a model that relates earnings and book value to price. This sets up the empirical analysis which follows in Sects. 3, 4, and 5.

1 Background: earnings-to-price, book-to-price, and expected returns

Considerable research shows that earnings-to-price (the earnings yield) predicts stock returns (in Basu 1977, 1983; Jaffe et al. 1989, for example). Whether those returns are reward for risk or the result of mispricing is the subject of perennial discussion, but the idea that expected earnings yields indicate the required return for risk, posited in Ball (1978), has some foundation. First, standard formulas show that the earnings yield equals the required return if there is no expected earnings growth beyond that from retention. Second, beginning with Ball and Brown (1968) and Beaver (1968), a stream of papers documents that realized stock returns are related to realized earnings, consistent with casual observation that stock prices move when earnings differ from expectation. More recently, Dubinsky and Johannes (2006)

estimate that a disproportionate portion of anticipated stock price volatility (in option prices) is associated with uncertainty resolution around earnings announcements. It appears that expected earnings are at risk; investors "buy earnings," and the E/P ratio prices the risk in expected earnings.[1]

Earnings yields used to predict stock returns are typically short-term (usually annual) yields. However, expected short-term earnings yields are not likely to be a sufficient indictor of risk and return. Investors buy not only short-term earnings but also subsequent long-term earnings, and both are presumably at risk; investors are subject to the risk that short-term earnings realizations may be different from expected but also to the risk that long-term growth expectations may not be realized.[2] If so, how do the short-term earnings yield and expected earnings growth combine to indicate the required return for the risk? The issue is subtle. Under standard formulas, E/P is increasing in the required return but decreasing in expected earnings growth, and empirical research has robustly demonstrated that P/E predicts earnings growth (as well as returns), in Beaver and Morse (1978), Fuller et al. (1992), Fairfield (1994), and Penman (1996), for example.[3] If growth is risky and requires a higher return, then growth has both an increasing and decreasing effect on E/P, so teasing out the required return from a given earnings yield and the expected growth it implies is problematical. Has book-to-price a role to play?

Research (in Fama and French 1992, for example) shows that book-to-price (B/P) also predicts stock returns, so consistently so that Fama and French (1993, 1996) have built an asset pricing model based on the observation. The same discussion of rational pricing versus market inefficiency ensues but, despite extensive modeling (and numerous conjectures), the phenomenon remains a mystery. The mystery deepens when it is said that B/P is inversely related to earnings growth while positively related to returns; low B/P stocks (referred to as "growth" stocks) yield lower returns than high B/P stocks ("value" stocks). Yet investment professionals typically think of growth as risky, requiring higher returns, consistent with the risk-return notion that one cannot buy more earnings (growth) without additional risk. The predictable returns to book-to-price have not been reconciled with those associated with earnings yields, even though earnings and book value articulate as a matter of accounting. An exception is Fama and French (1992), who claim that book-to-price "subsumes" earnings-to-price as an indicator of returns, but one typically thinks of earnings (payoffs) as being at risk rather the book values (net assets) from which earnings flow.

[1] Aggregate earnings yields have been used widely as predictors of market-wide equity risk premiums, in Fama and French (1988), Campbell and Shiller (1988, 1998), and Campbell and Thomson (2008), for example.

[2] Relative to R-squares observed in regressions of realized annual returns on realized annual earnings, R-squares increase significantly when earnings and returns are observed over longer periods (in Easton et al. 1992; Ohlson and Penman 1992, for example): long-horizon returns are strongly correlated with long-run earnings outcomes.

[3] The common Gordon formula, forward $P/E = 1/(r - g)$, where r is the required return and g is the earnings growth rate, exhibits the property, although this formula holds only for full payout. The formula also shows that, in the case of no growth, $E/P = r$. Ohlson and Juettner-Nauroth (2005) provide a formula for P/E with the same properties but payout insensitive.

This paper confirms that earnings yields predict returns. However, it also shows that, given E/P, B/P forecasts both expected earnings growth and returns that add to those indicated by E/P. The identification of growth by B/P follows as a matter of accounting: for a given short-term earnings yield, a higher book-to-price implies higher long-term earnings over those in the short-term, that is, higher long-term earnings growth. If expected earnings growth is at risk—as accounting principles that defer earnings under uncertainty would suggest—book-to-price adds to expected returns, as the empirical results confirm. Earnings and book value, the bottom-line numbers of the income statement and balance sheet, articulate in an accounting sense, but they also articulate to indicate growth, risk, and the required return.

Accordingly, the paper explains the B/P premium in stock returns as reward to the risk of buying earnings and earnings growth. B/P is positively correlated with E/P in the cross-section so, as the earnings yield is positively related to subsequent returns, so is B/P. However, for a given earnings yield, B/P further identifies growth that the market prices to yield higher returns. In the context of value versus growth investing, "growth" is redefined, with growth indicated by a higher B/P (rather than a lower B/P) associated with higher returns.

Our paper is in the vein of research (in Lettau and Ludvigson 2005; Menzly et al. 2004, for example) that sees risk associated with growth, though the growth referred to there is dividend growth rather than earnings growth. These papers see the dividend yield as increasing in risk and decreasing in dividend growth, and we see the earnings yield in the same way (if for different reasons). But when earnings are involved, so are book values, so we also bring light to the B/P effect in stock returns. Other papers associate risk with "duration" and long-term outcomes (see Bansal and Yaron 2004; Dechow et al. 2004; Bansal et al. 2005; Croce et al. 2010; and Malloy et al. 2009). Our paper stands in contrast to papers (such as Cochrane 1996; Berk et al. 1999; Gomes et al. 2003; Anderson and Garcia-Feijóo 2006; Xing 2008; Zhang and Chen 2008; and Lettau and Wachter 2007) that supply other rationalizations for the B/P effect. Some of these papers associate B/P with "growth" or "growth options" but with growth requiring lower returns.

2 Relating earnings-to-price and book-to-price to the required return

The paper is founded on two ideas. First, for a given price, both E/P and B/P are accounting phenomena—they are determined by accounting principles for reporting earnings and book value—so if these ratios are to indicate risk and return, it may have something to do with the accounting. To demonstrate, consider the case where B/P = 1. Here B/P cannot indicate risk; both a money market fund and an equity hedge fund have B/P = 1 but different risk. For these funds, B/P = 1 is a property of mark-to-market or "fair value" accounting, and that accounting removes any role for B/P to indicate risk. So, if B/P is to indicate risk, it must be that accounting principles depart from mark-to-market accounting in recognition of (or in manner that is correlated with) risk.

The second point connects accounting to risk by acknowledging the accounting principle that defers earnings under uncertainty, producing earnings growth. Deferral means lower book value (relative to mark-to-market accounting) but also lower earnings in the short term. Earnings recognition is a matter of allocation to periods; total life-long earnings is not affected by accrual accounting, so that deferral must mean lower earnings in the short-term and, for a given price, a lower short-term E/P ratio. This deferral accounting is sometimes referred to as "conservative accounting," suggestive of an accommodation of uncertainty. Examples include delaying revenue recognition until "the receipt of cash is reasonably certain," deferral of "unearned" revenues (for which cash has been received) because of remaining uncertainties, accelerated expense recognition, the accounting for "risky" R&D activities (that expenses immediately), write-downs (that effectively shift income to the future), booking liabilities but not intangible assets, and recognizing losses early but deferring the recognition of gains.

We develop these ideas more formally by connecting earnings and book value to price and then E/P and B/P to the required return, with the purpose of setting up the empirical tests.

The well-known residual earnings model connects earnings and book value to price, P_t. Given the noncontroversial dividend discount model and a clean-surplus accounting operation that connects dividends to earnings and book values (B_t),

$$P_t = B_t + \sum_{\tau=1}^{\infty} \frac{Earnings_{t+\tau} - rB_{t+\tau-1}}{(1+r)^{\tau}}. \tag{1}$$

$Earnings_{t+\tau} - rB_{t+\tau-1}$ is expected residual earnings for year $t + \tau$, where r indicates the required return.[4] (Variables subscripted with t > 1 are expected values.) Summarizing expected residual earnings for years after t + 1 with a growth rate, g, applied to expected t + 1 residual earnings presents the model in a form that distinguishes earnings expected in the short-term (t + 1) from earnings expected from subsequent growth:

$$P_t = B_t + \frac{Earnings_{t+1} - rB_t}{r - g} \tag{1a}$$

$$= B_t + \frac{(ROCE_{t+1} - r)B_t}{r - g}, \tag{1b}$$

where $ROCE_{t+1} = Earnings_{t+1}/B_t$ is the 1-year-ahead return on common equity.

The model states that the difference between price and book value is due to expected earnings implicit in price that have not yet been booked to book value.

[4] A constant discount rate is, of course, not entirely palatable. The formulation here suffices to introduce the empirical analysis, which is concerned with documenting the yield (in returns) to buying stocks in the cross-section (at a point in time) based on accounting characteristics. However, the attribution of observed yields to reward for risk is made with some hesitancy; market efficiency issues aside, a constant discount rate is inconsistent with no-arbitrage if discount rates are stochastic, and observed returns include the effect of changes in discount rates with which accounting characteristics could be correlated. See Hughes et al. (2009). Rubinstein (1976) and Breeden and Litzenberger (1978) provide dividend discount models with varying discount rates and Feltham and Ohlson (1999), Ang and Liu (2001), and Christensen and Feltham (2009) lay out residual earnings valuation models with stochastic discount rates.

With mark-to-market accounting, $P_t = B_t$. With price preserved, but $P_t > B_t$, the lower book value means earnings deferred to the future, but those earnings can be recognized in the short-term (in t + 1) or in the long-term (as growth). Thus, for a given price, a lower B/P means more earnings deferred to the future, but for a given B/P, earnings deferred from the short-term to the long-term means a lower forward E/P ($Earnings_{t+1}/P_t$).[5]

Our inquiry deals with how book-to-price (B/P), earnings-to-price (E/P), and growth connect to risk and the required return, r. From Eqs. (1a) and (1b),

$$r = \frac{Earnings_{t+1}}{P_t} + \left(1 - \frac{B_t}{P_t}\right) g \tag{2a}$$

$$= \frac{B_t}{P_t} ROCE_{t+1} + \left(1 - \frac{B_t}{P_t}\right) g. \tag{2b}$$

Variants of Eq. (2a) appear in Brief and Lawson (1992), Danielson and Press (2003), and Rajan et al. (2007), among others.[6]

Equation (2b) describes r as a weighted average of $ROCE_{t+1}$ and g with weights that sum to unity supplied by B/P. It thus emphasizes that B/P is, in the first instance, an attribute (observed in the present) that combines expected short-term earnings and growth—the future payoffs that are at risk—rather than a risk attribute itself. The B/P weighting involves price and so incorporates a discount for the risk in expected short-term earnings and growth. How then might B/P indicate risk in buying short-term earnings and growth? We consider three cases.

Case 1: $P_t = B_t$ In this case, B/P cannot indicate the required return, as illustrated with the money market fund and the risky hedge fund example earlier. The property is by application of a particular accounting, mark-to-market accounting. From (2a) and (2b) with B/P = 1, $r = \frac{Earnings_{t+1}}{P_t} = ROCE_{t+1}$. Thus, while B/P does not indicate the required return, the forward E/P and $ROCE_{t+1}$ are sufficient.

Case 2: No growth Setting $g = 0$ in Eqs. (2a) and (2b), $r = \frac{Earnings_{t+1}}{P_t} = ROCE_{t+1}$. As in the case of B/P = 1, the required return is indicated by the forward E/P, and, given E/P, B/P adds nothing to explain returns. Indeed, for a given E/P = r, B/P can take on any value but cannot indicate the required return.

Furthermore, this no-growth case challenges the standard attribution (in "value" versus "growth" investing, for example) that B/P unconditionally indicates growth. From Eq. (2b) with $g = 0$, a low B/P ("growth" in the language of growth versus value) can be due to high short-term earnings relative to book value but with no

[5] This residual earnings growth rate is the earnings growth rate, adjusted for retention and capital contributions. One infers earnings growth from residual earnings growth by reverse engineering residual earnings to infer earnings. The assumption of a constant growth rate is not necessary for our purposes: let g represent additional long-term earnings (after the forward year).

[6] The expressions require $ROCE_{t+1} > g$, a restriction that will be addressed in the empirical work. Rather than starting from the residual earnings valuation, one could start from an abnormal earnings growth valuation (in Ohlson and Juettner-Nauroth 2005) where price is based on expected forward earnings capitalized at the required return plus value from abnormal earnings growth. This model is more general (and removes the restriction) but does not involve book value. See Ohlson and Gao (2006).

subsequent growth (Penman 1996 elaborates).[7] This case also emphasizes that, while $P_t - B_t$ represents expected earnings not yet recognized in book value (and thus earnings deferred relative to mark-to-mark accounting), deferral in itself does not necessarily produce growth. For that, we turn to case 3.

Case 3: Growth Cases 1 and 2, where E/P = r and B/P has no incremental role, suggest that E/P is the starting point for forecasting expected returns. Accordingly, our empirical tests ask whether E/P forecasts returns and then, conditional on E/P, whether B/P adds to the explanation of returns. The discussion of the no-growth case implies that, if B/P adds to the required return over the earnings yield, it must have to do with growth.

Equation (2a) shows that the difference between r and the earnings yield is explained by an interaction of B/P and growth. Comparative statics that might explain r in terms of B/P and growth (for a given E/P) are not straightforward, however, for growth can affect both B/P and E/P. The three pricing scenarios below distinguish the case where growth (after t + 1) affects B/P from those where it does not. These three scenarios are the subject of our empirical tests.

Scenario 1: Growth adds to price but not to risk In this scenario, growth after t + 1 represents additional earnings that are valued in price but do not add risk; in Eq. (1a), with r unaffected, g increases price. In familiar terms, growth is added earnings from positive net-present-value investing and so adds to price. The higher price has the effect of decreasing the forward earnings yield over that for the no-growth case (a denominator effect), such that E/P < r. And, for a given book value, the added price also reduces B/P.

Under this scenario, the increasing price means that B/P is decreasing in growth, consistent with "growth" versus "value" attributions. As growth also depresses E/P, B/P in Eq. (2a) serves to adjust E/P for growth to recover the r that would be indicated by E/P (alone) in the no-growth case. B/P cancels growth, and the higher the growth (and the lower the B/P that prices growth), the higher is the weight applied to g. But r is preserved, unaffected by growth expectations.

Scenario 2: Growth adds to risk but not to price In this scenario, growth adds risk but does not add to price because price discounts for the risk in the growth; risk and growth cancel in the price. With price and book value preserved, growth can only be added by deferring earnings from the short-term to the long-term, as with accounting that defers earnings under uncertainty.[8] Forward earnings and E/P are

[7] For example, an R&D firm (a pharmaceutical company) can have a low B/P (because the R&D asset is missing from the balance sheet) and a high $ROCE_{t+1}$ (because of the missing book value) but no growth. Stated differently, a firm can be priced with a low B/P but a normal P/E = $1/r$.

[8] The practice of expensing R&D expenditures, considered to have risky payoffs, is an example. The practice reduces book value, deferring earnings to the future. But repeated expensing with growth in R&D expenditures reduces forward earnings (for a given price and book value), deferring earnings from t + 1 to the long term. And so with LIFO accounting, brand-building expenditures, conservative revenue recognition, and accelerated depreciation policies (to mention a few).

thus reduced, as in scenario 1, but (with price unchanged) the reduced E/P is due to a numerator effect. Unlike scenario 1, B/P is unaffected. Rather than B/P incorporating the pricing of growth with an increase in the denominator, growth and risk offset in price to leave B/P unchanged.[9]

The case of added leverage provides an illustration of the effect of growth and risk on price. Penman (2013, Chap. 14) shows that added leverage adds expected earnings growth.[10] However, if borrowing is a zero-NPV activity (as under standard Modigliani and Miller conditions), the added leverage does not add to price, despite the higher growth. The reason is that leverage also adds to risk and the required equity return (under the standard weighted-average cost-of-capital formula) so that growth that would otherwise add to price also reduces price for added risk; growth and risk cancel to leave price unchanged. Furthermore, for a given book value (of equity), added leverage does not change book-to-price.[11]

The same risk-return tradeoff might also apply to the operating part of a business: one cannot buy more growth without taking on more risk. However, it is a question of how the accounting is done, and principles that defer earnings under uncertainty suggest that GAAP accounting produces expected growth in response to risk. Ohlson (2008) models a particular form of accounting—permanent earnings accounting—where growth equals the risk premium so growth offsets risk, one-for-one, in price.

Scenario 3: Growth adds neither to price nor to risk Growth in scenario 2 is by construction of the accounting: conservative accounting defers earnings recognition from t + 1 to the future, and the scenario depicts the deferral as aligning the accounting with risk and the required return. But there is no necessity that the accounting be so aligned with pricing. Conservative accounting may be practiced for other reasons, or just a peculiarity; indeed, there are claims that accounting is too conservative.[12] If so, growth so induced does not affect B/P but still reduces E/P,

[9] Equations (2a) and (2b) cannot strictly be applied in the scenario where growth informs about r, for g is the residual earnings growth rate rather than the earnings growth rate, and the residual earnings growth rate is a function of r as well as growth in earnings. However, one can show via examples that, for B/P < 1, reducing forward earnings with price held constant, g increases with increases in r. From model (1a),

$$g = r - \frac{Earnings_{t+1} - rB_t}{P_t - B_t}.$$

With P_t and B_t held constant, a decrease in $Earnings_{t+1}$ and an increase in r implies an increase in g. The empirical construction in the paper finesses the issue.

[10] As $Earnings_{t+1} = OI_{t+1} - Net\ Interest_{t+1}$, where OI_{t+1} is operating income (earnings before net interest), it is easily shown that

$$g^E_{t+1} = g^{OI}_{t+1} + ELEV_t\left[g^{OI}_{t+1} - g^{Int}_{t+1}\right],$$

where g^E, g^{OI}, and g^{Int} are expected growth rates in earnings, operating income, and net interest expense, respectively, and $ELEV_t = Net\ Interest_t / Earnings_t$ measures leverage in the income statement. So provided leverage is favorable such that $\left[g^{OI}_{t+1} - g^{Int}_{t+1}\right] > 0$, leverage levers up the expected earnings growth.

[11] See Penman et al. (2007) for an examination of the relationship between book-to-price, leverage, and return.

[12] It is said that accountants practice conservatism as a defense against lawsuits, and the political process under which accounting standard setting operates forces too-conservative accounting. LIFO accounting for inventories depresses earnings and produces earnings growth (with growing inventories) but is presumably related to tax issues rather than risk.

just an in scenario 2, but both price and r are unaffected; it's just accounting![13] Accordingly, this pure accounting treatment (unrelated to real activity) does not indicate expected returns.

These three scenarios frame the questions for the empirical tests. In business operations, growth might add risk (scenario 2) but presumably also can involve positive-NPV activity that adds to price (scenario 1), so both scenarios are likely to be in play in the cross section. An observable feature differentiates the two. First, while both scenarios result in lower E/P, B/P is higher under the second scenario than in the first. This discriminating feature is the focus of our tests: for a given E/P (that may be due to either scenario 1 or scenario 2), does a higher B/P indicate higher expected growth and corresponding higher expected returns? As the lower E/P in scenario 1 comes through the denominator (higher price), but though the numerator (lower forward earnings) in scenario 2, the question is equivalent to asking whether, for a given E/P, a lower earnings-to-book ($ROCE_{t+1}$) is associated with higher expected growth and expected returns.[14] Scenario 3 serves as the null hypothesis: the division between forward and subsequent earnings is simply an accounting artifact (with no pricing implications) such that E/P and B/P have no relation to expected returns.[15]

3 The empirical construction

The empirical tests document returns for portfolios formed from a joint sort on earnings-to-price and book-to-price. The first sort is on E/P, for under case 1 and case 2, E/P is sufficient to indicate the expected return and B/P is irrelevant (given E/P). Then, to differentiate the three scenarios under case 3, firms are ranked on B/P within a given E/P portfolio to assess whether, for a given E/P, B/P adds to average returns. However, we do not wish merely to document that E/P and B/P sort returns—this is a well-known screen in value versus growth investing—but to show that those returns are associated with buying short-term earnings and subsequent earnings growth that is priced as risky. So tests are designed to highlight this feature, with a demonstration that the construction is equivalent to a sort on E/P and B/P.

The following constructs the variables corresponding to short-term and long-term earnings with which portfolios are formed. Price relative to book value, $P_t - B_t$,

[13] Feltham and Ohlson (1995) and Zhang (2000) model conservative accounting that induces growth but with a fixed price and a fixed discount rate.

[14] Simply, E/P = E/B × B/P.

[15] Fama and French (2006) have the flavor of what's going on here, but their setup is quite different. In a model that involves clean surplus accounting, as in Eq. (1b), they express the expected return in terms of B/P, profitability (earnings relative to book value, *ROCE*), and growth in book value (which they call "investment"). They investigate the relationship between returns and each one of these, holding the other two constant. But their comparative statics do not accord with the way that accounting works: one cannot vary an accounting component of Eq. (2b) while holding the other components constant. To produce more growth (for a given r and price), for example, the accountant has to change either book value or short-term earnings or both. In contrast to our results, growth (as they define it) is negatively related to expected returns in the cross section (holding their other accounting attributes constant). These points aside, the results of our paper indicate the rational pricing of risk that the stream of Fama and French papers emphasize.

represents expected future earnings not yet booked to book value. Those earnings might be realized in the short-term or the long-term. The residual earnings valuation (1a) can be restated to divide price into three components:

$$P_t = B_t + \frac{RE_{t+1}}{r} + RE_{t+1}\left[\frac{1}{r-g} - \frac{1}{r}\right], \tag{3}$$

(1) (2) (3)

where (to be reminded), $RE_{t+1} = Earnings_{t+1} - rB_t$, that is, the amount of earnings expected to be added to book value in the short term, relative to that book value. The investor buys three components: (1) book value, (2) value from earnings expected to be added to book value in the short term, without growth, and (3) value from long-term growth. Setting $g = 0$,

$$\begin{aligned} P_t &= B_t + \frac{Earnings_{t+1} - rB_t}{r} \\ &= \frac{Earnings_{t+1}}{r}, \end{aligned} \tag{4}$$

and $Earnings_{t+1}/P_t = r$, as in case 2. So Components (1) and (2) identify the expected return if there is no expected growth. Component (3) amounts to a price multiplier over the no-growth case, but, to the extent that higher growth involves higher risk, such that r increases with higher growth, the multiplier does not increase (and B/P is higher than otherwise).

This formulation involves the required return, r, but r is not known—indeed it is the object of the endeavor—and may be related to growth in the third component. The required return is that in excess of the risk-free rate, and the risk-free rate is known, so the endeavor amounts to evaluating the return premium over the risk-free rate. Thus we measure the first two components in Eq. (3) as

$$P_t = B_0 + \frac{RE_{t+1}}{r_f}, \tag{5}$$

(1) (2)

where r_f in the risk-free rate, given by the 10-year Treasury yield for the relevant year, and residual earnings is earnings in excess of r_f applied to book value. Dividing Eq. (3) by price (after substituting r_f for r),

$$\frac{B_t}{P_t} + \frac{STE}{P_t} + \frac{LTE}{P_t} = 1, \tag{6}$$

where $\frac{STE}{P_t} = \frac{Earnings_{t+1} - r_f B_t}{r_f P_t}$ is the short-term component (2) relative to price and $\frac{LTE}{P_t}$, the portion of price associated with long-term earnings expectations, is the

remainder. So a $1 of investment is seen as buying book value, earnings expected to be added to book value in the short-term, and further earnings to be added in the long-term, with the components expressed in the form of yields to that dollar. We will refer to short-term earnings and long-term earnings components as *STE* and *LTE*, with the reminder that they are price denominated.

Applying the algebra that equates the first two components of Eq. (3) with Eq. (4),

$$\mathrm{B/P} + STE = \frac{Earnings_{t+1}}{r_f P_t}, \tag{7}$$

that is, the first two components in Eq. (6) equal the forward earnings yield relative to the risk free rate, effectively the earnings yield spread.[16] From Eqs. (6) and (7), the long-term component is

$$LTE = 1 - \frac{Earnings_{t+1}}{r_f P_t}. \tag{8}$$

Thus *LTE* is the complement of the earnings yield, the residual in price after that explained by the earnings yield. It expresses the notion that higher long-term earnings expectations are associated with a lower earnings yield (a higher P/E ratio). From Eq. (7),

$$\mathrm{B/P} = \frac{Earnings_{t+1}}{r_f P_t} - STE. \tag{9}$$

This equation shows why B/P might indicate additional required return for a given earnings yield: B/P is the earnings yield adjusted for the amount of earnings added to book value in the short term (relative to book value). Thus, if B/P is to indicate risk and return over the earnings yield, it must have to do with the earnings yield relative to the amount of earnings expected to be added to book value in the short term, *STE*. But the earnings yield mirrors *LTE*, by Eq. (8) so, for a given E/P (and, correspondingly, a given *LTE*), a higher B/P implies lower *STE* relative to LTE [as in Eq. (6)]. That, of course, is growth from deferring earnings from the short-term to the long-term. The accounting principle that defers earnings to the long term when outcomes are risky suggests the growth so created may be related to the required return, as in scenario 2. Whether growth is so priced is an empirical matter, however.

4 Data description

The analysis covers U.S. listed firms over the period 1963–2006 whose book value of common equity and earnings before extraordinary items are available on Compustat for any fiscal year within the period and whose stock prices and returns are on CRSP. Price per share is observed 3 months after fiscal year-end at which time financial statement data for the fiscal year are assumed to have been reported. Monthly returns are observed for the 12 months following this point. The book-to-price

[16] The risk free rate, a constant in the cross section, merely scales E/P and book value in the calculation of *STE* and so is not particularly important.

ratio and earnings yield are at this same point, with book value per share and earnings per share at fiscal year-end adjusted for stock splits and stock dividends over the 3 months after fiscal year-end. To ensure that book value refers to the common shares, book value is Compustat's common equity plus any preferred treasury stock, less any preferred dividends in arrears.

In addition to firms with missing book value of common equity (data item 60) and earnings before extraordinary items (item 18) on Compustat, firms with negative book value or price less than 20 cents are excluded from the analysis. (We repeat the analysis with exclusion at higher prices.) Firms are also excluded if shares outstanding (item 25) is missing. Other missing Compustat data items are set equal to zero.

In order to carry out the investigation over an extended period and to incorporate the full range of B/P ratios, forward earnings (for year $t + 1$) is initially estimated as reported earnings for year t before extraordinary and special items, with a tax adjustment to special items at prevailing statutory tax rates for the year. Other forecasts based on trailing earnings are also applied. However, we also run the analysis with analysts' consensus forecasts of forward earnings from IBES files for the period, 1977–2006. Using an estimate of forward earnings based on current (recurring) earnings not only enhances the coverage but also avoids the problems of (behavioral) biases and noise in analysts' forecasts evidenced in Hughes et al. (2008), Gode and Mohanram (2013), and Wahlen and Wieland (2011), to mention just a few papers. However, analysts' forecasts presumably incorporate other information. Using current earnings for the yield effectively expresses growth against a base of earnings currently reported by the accounting.

There are 153,858 firm-years over the 44 years in the investigation, with an average of 3,497 firms per year and a range of 375 in 1963 to 6,025 in 1996. Table 1 gives the distribution of monthly returns from the 12 months over which they are observed and also distributions of the estimated forward earnings yield (E/P), return on common equity ($ROCE_{t+1}$), and *STE* and *LTE*. The table reports that the distributions of returns, B/P, and E/P in the sample are quite similar to those for all firms on CRSP and Compustat.

The median B/P for the sample in Table 1 is 0.606 (with a mean of 0.744), indicating that less than half of the value in price is represented by (discounted) expected future earnings. The observation accords with the notion that accounting, on average, defers earnings relative to a mark-to-market accounting. The distributions of *STE* and *LTE* (deflated by price) indicate how total expected residual earnings implicit in the price are typically broken down into earnings in the short term versus the long term. From the distribution of *STE*, one infers that, at the median, 21.9 % of price is accounted for by forward residual earnings if those residual earnings are assessed relative the risk-free rate and were to continue as a perpetuity (without growth). However, there is considerable variation around this median. Mean and median *LTE* are positive, indicating additional earnings are expected in the long term, on average. Again, there is considerable variation around the median.[17]

[17] As *LTE* is the complement of the earnings yield relative to the risk-free rate (Eq. 8), it is also scaled by the risk-free rate. The scaling leads to higher *LTE* for firms with low E/P and lower *LTE* for firms with high E/P. As the risk-free rate is a constant in the cross section at a point in time, the relative ranking of *LTE* across firms at a point in time is preserved however.

Table 1 Cross-sectional distribution of variables in the analysis

	All CRSP stocks	All Compustat stocks		Stocks in the sample					
	Monthly return (%)	B/P	E/P	Monthly return (%)	B/P	E/P	ROCE	STE	LTE
Mean	1.18	0.759	0.020	1.29	0.744	0.028	0.030	−0.422	0.678
SD	18.26	0.594	0.188	17.06	0.555	0.155	0.295	2.788	2.710
Percentiles									
5	−22.22	0.113	−0.327	−21.28	0.123	−0.276	−0.606	−5.318	−1.391
10	−15.42	0.180	−0.133	−14.79	0.187	−0.115	−0.240	−2.593	−0.935
20	−8.85	0.291	−0.015	−8.49	0.295	−0.009	−0.017	−0.919	−0.496
30	−5.00	0.392	0.022	−4.76	0.395	0.024	0.043	−0.296	−0.222
40	−2.10	0.497	0.04	−1.99	0.497	0.041	0.076	0.020	−0.007
50	0.00	0.609	0.053	0.00	0.606	0.055	0.101	0.219	0.190
60	2.28	0.737	0.066	2.51	0.731	0.067	0.121	0.381	0.395
70	5.29	0.901	0.082	5.47	0.890	0.082	0.142	0.544	0.646
80	9.59	1.139	0.104	9.63	1.118	0.104	0.166	0.739	1.136
90	17.61	1.573	0.146	17.31	1.518	0.143	0.211	1.058	2.738
95	27.15	2.057	0.187	26.32	1.948	0.181	0.262	1.390	5.270
No. of firm/years	216,121	166,416	162,131	153,858					

This table reports descriptive statistics from the period 1963–2006 for variables used in the empirical analysis, along with comparative statistics for selected variables for all stocks on the CRSP and Compustat databases. Returns are average monthly returns over the 12 months beginning 3 months after firms' fiscal year-end. B/P is calculated as the ratio of the per-share book value of common equity (B) to the per-share price of common equity. B is common equity (Compustat data item 60) plus any preferred treasury stock (item 227) less any preferred dividends in arrears (item 242) and is measured on a per-share basis at the end of each fiscal year, adjusted for stock splits and stock dividends over the 3 months following fiscal year-end. Price per share is the CRSP price at 3 months after fiscal year-end at which point book value and earnings for that year are presumed to have been reported. Short-term (forward) earnings expectations are estimated by earnings before extraordinary items (Compustat item 18) in the prior year less special items (Compustat item 17) adjusted for taxes, and the earnings yield (E/P) and the forward return on common equity (ROCE) are based on this estimate. The earnings yield is the earnings on a per-share basis, adjusted for stock splits and stock dividends over the 3 months following fiscal year-end, divided by price per share 3 months after fiscal year-end. STE is short-term residual earnings, with the required return set equal to the risk-free rate and that forward residual earnings then converted to a no-growth residual earnings forecast by capitalizing 1-year-ahead residual earnings at the risk-free rate, as in component 2 of Eq. (5) in the text. It is then divided by price. The risk-free rate is the 10-year Treasury yield at 3 months after fiscal year-end, obtained from the Federal Reserve website. Long-term earnings (relative to price), LTE = 1 − (B/P + STE), with the understanding that both STE and LTE are price-denominated. The distributions are from data pooled over firms and years. For the calculation of means and standard deviations (but not the percentiles), the top and bottom percentiles of observations of the accounting variables each year are eliminated (but not for the stock returns). There are 145,218 firms-years after this trimming

Table 2 Mean cross-sectional correlations between variables in the analysis, with Pearson correlations on the upper diagonal and spearman correlations on the lower diagonal

	Return	Beta	B/P	STE	LTE	E/P	ROCE	Size
Return		−0.029	0.083	0.021	−0.057	0.061	0.046	−0.040
Beta	−0.064		−0.130	−0.100	0.151	−0.152	−0.101	−0.015
B/P	0.120	−0.156		−0.311	−0.072	0.075	−0.183	−0.315
STE	0.107	−0.120	−0.155		−0.900	0.896	0.717	0.311
LTE	−0.163	0.197	−0.309	−0.815		−0.997	−0.620	−0.204
E/P	0.168	−0.197	0.312	0.808	−0.996		0.620	0.205
ROCE	0.094	−0.076	−0.377	0.852	−0.566	0.566		0.317
Size	0.030	0.013	−0.297	0.307	−0.161	0.162	0.402	

This table reports mean cross-sectional correlations over the period 1963–2006. Reported correlations are the average correlation of coefficients calculated each year

Returns are mean monthly returns over the 12 months beginning 3 months after firms' fiscal year-end. Betas, estimated from a maximum of 60 months and a minimum of 24 months prior to this date, are from market model regressions using CRSP value-weighted market return inclusive of all distributions. Size is the natural log of the market capitalization of equity (in millions of dollars). All other variables are defined in the notes to Table 1. Spearman correlation coefficients, estimated each year, utilize a total of 153,858 firm-year observations and Pearson correlation coefficients are estimated from the truncated sample of 145,218 firm-year observations, after deleting the extreme percentiles for variables other than returns, beta, and size

4.1 Basic correlations

Table 2 reports mean Pearson and Spearman correlations coefficients between variables, with the means calculated as the average of coefficients for each year. For the Pearson correlations, the top and bottom percentiles of variables (other than stock returns, betas and size) were rejected each year. However, Table 1 indicates that *STE* and *LTE* involve some extreme numbers even after this treatment, so the product-moment Pearson correlations involving these two variables should be scrutinized against the Spearman (rank) correlations. (Our tests are based on ranks.)

While B/P is perfectly negatively correlated with total earnings deferred to the future (per dollar of price), by construction of the accounting, Table 2 indicates that B/P is also negatively correlated with both *STE* and *LTE*: lower B/P means higher short-term earnings relative to book value but lower B/P also means higher subsequent earnings. But the correlations are not high, indicating that there is considerable variation in the mix of *STE* and *LTE* for a given B/P in the cross section. The mean Spearman correlation between B/P and *LTE* minus *STE* (not reported in the table) is only -0.093. This indicates that, while B/P is often identified as having a negative relationship with "growth," it actually has low correlation with long-term earnings relative to earnings in the short term, pertinent to the discussion of B/P and growth around the no-growth case for Eq. (2a) earlier. The well-known positive correlation between B/P and subsequent returns is evident in the table but note that the average rank correlation between B/P and E/P is 0.312 and E/P is positively associated with returns.

Table 3 Characteristics of earnings yield portfolios

E/P portfolio	E/P (%)	B/P	STE	LTE	Beta	Size	Annual returns (%)
1 (low)	−32.5	0.98	−6.15	6.16	1.38	2.87	16.0
2	−3.3	0.61	−1.21	1.60	1.32	4.03	10.3
3	2.0	0.59	−0.35	0.75	1.28	4.43	11.4
4	4.5	0.61	0.02	0.37	1.22	4.70	12.8
5	6.1	0.64	0.22	0.14	1.14	4.93	14.8
6	7.4	0.70	0.35	−0.05	1.06	4.92	15.2
7	8.6	0.77	0.46	−0.23	1.01	4.82	17.9
8	10.0	0.84	0.58	−0.42	0.97	4.69	18.1
9	11.8	0.93	0.75	−0.68	0.96	4.49	20.8
10 (high)	16.3	1.16	1.19	−1.35	0.99	4.11	25.3

Ten portfolios are formed each year in the period, 1963–2006, by ranking firms 3 months after fiscal year end on their annual earnings yield (E/P). Cut-off points for the allocation of stocks to the portfolios are those for the prior year data, to avoid look-ahead bias. Numbers reported are means over years of portfolio means for each year. Variables on column headings, except returns, are defined in the notes to Tables 1 and 2. Annual returns are buy-and-hold returns observed over the 12 months following the portfolio formation date

The portfolio sorts that follow start with E/P, so Table 3 documents the characteristics of 10 portfolios formed from ranking firms on E/P. As in Basu (1977, 1983), among others, E/P is positively correlated with returns over the subsequent 12 months, suggesting a relationship with risk and the required return (which one would expect if case 1 or case 2 applied in the cross-section). The return relationship is not quite monotonic, with the lowest E/P portfolio, comprised of firms with particularly high negative earnings, earning particularly high returns. B/P is positively correlated with E/P (here and in Table 2), indicating that the positive correlation between B/P and returns is in part attributable to B/P identifying short-term earnings at risk. But again, the relationship is not monotonic, with high B/P associated with both high E/P and low E/P. The higher returns associated with high B/P in portfolio 10 are associated with a correspondingly high E/P. The returns associated with relative low E/P but high B/P in portfolio 1 bear on what is to come: these firms have particularly high *LTE* relative to *STE*, that is, earnings expected in the long-term relative to those expected to be added to book value in the short term.

While E/P is positively related to returns in Table 3, it is negatively correlated with historical beta.[18] *LTE* is positively correlated with beta [and negatively related to returns, as it must be by the constructed negative correlation between E/P and *LTE* in Eq. (8)]. If long-term earnings are risky, with higher beta, they should yield higher returns, but this higher risk should also be reflected in the earnings yield (which incorporates both risk and growth) such that E/P yields higher returns for the beta associated with growth. This is not the case, unconditionally, and this tension cues our tests. Note, in addition, that *LTE* is negatively correlated with size in

[18] Portfolio betas do not average to 1.0 here and in later tables because they are arithmetic means of security betas in each portfolio, with the security betas estimated using a value-weighted market index.

Table 3—small firms have more expected long-term earnings—and small firms are identified with higher risk in the asset pricing models.

5 Empirical tests

The tests serve to discriminate between the three scenarios in Sect. 3. Investors are viewed as buying the three components in Eq. (6) corresponding to book value, the short-term, and the long-term, and the tests compare average returns to portfolios formed with varying amounts of these components. We maintain the assumption that average ex post returns identify expected returns for risk borne. Each component is price-denominated, so differential risk, if any, is presumed to be incorporated in the price discount (like a bond yield). There is no necessity that pricing be rational, of course, so the alternative market inefficiency interpretation is also on the table (and we in no way sort out this issue).

5.1 Returns to a joint sort on E/P and B/P

Our core result is in Panel A of Table 4. Each year from 1963 to 2006, at 3 months after prior fiscal year-end, firms are ranked on *LTE* and assigned to 5 portfolios, low to high.

Then, within each *LTE* portfolio, firms are ranked on B/P to form a total of 25 portfolios. Cut-off points for the portfolio allocations are determined from the ranking for the prior year to avoid look-ahead bias. Panel A reports mean buy-and-hold annual returns over the ensuing 12 months for each portfolio from the full set of replications every year (with *LTE* returns along rows and B/P returns down columns).[19] There is an average of 139.9 stocks per portfolio per year, though a smaller number in earlier years.

The remaining panels in Table 4 report various characteristics of the portfolios in Panel A that aid in the interpretation of the return results. Panel B gives the average B/P for each portfolio and Panels C and D the average *STE* and *LTE*. As $\text{B/P} + STE + LTE = 1$ (Eq. 6), the amounts in Panels B, C, and D for a given portfolio sum to 1.0, and the issue is how the weighting of the components within a portfolio is related to portfolio returns. As *LTE* mirrors E/P, by Eq. (8), the ranking on *LTE* is a reverse ranking on E/P (as Panel E demonstrates), so one can view the *LTE* portfolios as E/P portfolios. Accordingly, the two-way sort in Panel A is a sort on E/P and B/P but with the identification of the accounting components in Eq. (6) that such an investment strategy captures.

[19] Buy-and-hold returns are calculated from CRSP monthly returns. For firms that are delisted during the 12 months, we calculate the return for the remaining months by first applying the CRSP delisting return and then reinvesting any remaining proceeds at the risk-free rate. This mitigates concerns with potential survivorship biases. Firms that are delisted for poor performance (delisting codes 500 and 520–584) frequently have missing delisting returns (see Shumway 1997). We control for this potential bias by applying delisting returns of −100 % in such cases. Our results are qualitatively similar if we make no such adjustment.

Table 4 Mean annual returns and other characteristics for portfolios formed from long-term earnings expectations (*LTE*) and book-to-price

		Low	2	3	4	High	H–L	*t* stat	Low	2	3	4	High	H–L
Panel A: Mean annual returns (%) Ranking on LTE alone (a reverse ranking on E/P)									*Panel B: Average B/P* Ranking on LTE alone					
		23.2	18.1	14.9	12.1	13.5	−9.7	−2.47	1.05	0.80	0.67	0.60	0.80	−0.25
	LTE													
B/P	Low	19.7	17.1	14.2	10.9	4.3			0.55	0.40	0.28	0.17	0.14	
	2	22.1	16.0	13.0	9.1	8.8			0.79	0.59	0.42	0.30	0.32	
	3	21.6	17.0	12.1	8.5	14.4			0.96	0.73	0.55	0.45	0.60	
	4	24.3	18.0	14.7	13.4	15.5			1.18	0.90	0.74	0.68	1.04	
	High	30.0	22.6	20.2	20.1	26.4			1.77	1.39	1.29	1.33	1.99	
	H–L	10.3	5.5	6.1	9.2	22.2			1.23	0.99	1.01	1.16	1.85	
	t stat	3.92	2.92	2.78	2.62	5.67								
		Low	2	3	4	High	H–L		Low	2	3	4	High	H–L
Panel C: Average STE Ranking on LTE alone									*Panel D: Average LTE* Ranking on LTE alone					
		0.99	0.52	0.28	−0.17	−3.75	−4.73		−1.04	−0.32	0.05	0.57	3.94	4.98
	LTE													
B/P	Low	1.33	0.89	0.64	0.22	−2.00			−0.88	−0.29	0.08	0.61	2.86	
	2	1.13	0.72	0.53	0.14	−2.48			−0.92	−0.31	0.05	0.56	3.16	
	3	1.01	0.60	0.42	0.01	−3.19			−0.97	−0.33	0.03	0.55	3.60	
	4	0.90	0.44	0.23	−0.23	−4.30			−1.08	−0.34	0.03	0.55	4.27	
	High	0.56	−0.05	−0.33	−0.92	−6.84			−1.33	−0.34	0.04	0.58	5.85	
	H–L	−0.77	−0.94	−0.97	−1.13	−4.84			−0.45	−0.04	−0.04	−0.03	2.99	

Table 4 continued

		Low	2	3	4	High	H–L	Low	2	3	4	High	H–L
Panel E: Average E/P (%) Ranking on LTE alone		14.1	9.3	6.7	3.2	−18.4	−32.5	*Panel F: Average beta* Ranking on LTE alone 0.98	0.99	1.10	1.25	1.35	0.38
	LTE												
B/P	Low	12.9	9.0	6.4	2.8	−11.4		1.10	1.13	1.20	1.39	1.44	
	2	13.2	9.1	6.7	3.2	−13.3		1.00	1.03	1.17	1.35	1.42	
	3	13.7	9.3	6.8	3.4	−16.1		0.93	0.96	1.11	1.27	1.40	
	4	14.4	9.5	6.9	3.4	−20.6		0.94	0.92	1.06	1.21	1.31	
	High	16.2	9.5	6.8	3.1	−30.7		0.94	0.94	1.01	1.09	1.17	
	H–L	3.4	0.5	0.5	0.3	−19.3		−0.15	−0.19	−0.19	−0.30	−0.27	
		Low	2	3	4	High	H–L	Low	2	3	4	High	H–L
Panel G: Average size Ranking on LTE alone		4.28	4.76	4.93	4.56	3.44	−0.84	*Panel H: Intercepts (% returns) and t statistics (in italics) from four-factor model time-series regressions*					
	LTE												
B/P	Low	4.56	5.15	5.47	5.13	4.17		0.26	0.23	0.28	0.08	−0.42	−0.68
								2.48	*2.21*	*2.85*	*0.64*	*−2.06*	
	2	4.65	5.12	5.44	5.05	3.88		0.42	0.11	0.16	0.00	−0.02	−0.43
								4.06	*1.21*	*1.67*	*0.00*	*−0.07*	
	3	4.46	4.97	5.16	4.80	3.50		0.40	0.24	0.07	0.01	0.41	0.01
								3.87	*3.27*	*0.91*	*0.08*	*2.02*	
	4	4.10	4.64	4.74	4.38	3.08		0.52	0.25	0.15	0.17	0.30	−0.21
								3.68	*3.23*	*1.93*	*1.75*	*1.59*	
	High	3.43	3.77	3.75	3.46	2.45		0.73	0.52	0.42	0.40	0.98	0.24
								7.14	*5.08*	*4.12*	*3.50*	*4.74*	
	H–L	−1.13	−1.38	−1.72	−1.67	−1.72		0.48	0.29	0.13	0.31	1.40	

Table 4 continued

Five portfolios are formed each year in the period, 1963–2006, by ranking observations 3 months after fiscal year-end on the long-term earnings component of price, *LTE* (that is price-deflated). $LTE = 1 - E/P \cdot r_f$, so *LTE* is also a negative ranking in E/P. Then, within each *LTE* portfolio, five portfolios are formed by ranking on book-to-price (B/P). Cut-off points for the allocation of stocks to the portfolios are those for the prior year data, to avoid look-ahead bias. Buy-and-hold returns are then observed over the 12 months following the portfolio formation date. Portfolio returns reported in Panel A are mean returns from forming portfolios each year. The reported *t* statistics are the mean return differences between returns for the high and low portfolios indicated relative to the standard error of that mean estimated from the time series of return differences

Panels B–G report means of portfolio characteristics. Most characteristics are defined in the notes to Table 1. Betas, estimated from a maximum of 60 months and a minimum of 24 months prior to this date, are from market model regressions using CRSP value-weighted market return inclusive of all distributions. Size is the natural log of the market capitalization of equity (in millions of dollars)

Panel H reports intercepts (with *t* statistics in parenthesis) from regressing portfolio monthly excess returns (over the return on the U.S. 1-month Treasury bill) in the time-series regressions on excess returns associated with market (MKT), size (SMB), book-to-price (HML), and momentum (UMD) factors. The factor returns for MKT, SMB, HML and UMD factors and the 1-month Treasury return were obtained from Kenneth French's website at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/f-f_factors.html

The portfolio returns from ranking on *LTE* in Panel A (across the top of the panel) are negatively related to the amount of *LTE* in the portfolio. The *t* statistic of −2.47 on the mean difference in return, −9.7 %, between the highest and lowest *LTE* portfolio is calculated as the mean of return differences over years relative to the standard error of the mean calculated from the time series of return differences (as are other *t* statistics in this and later tables). As the *LTE* ranking is an inverse ranking on the earnings yield, the result also informs that returns are positively correlated with E/P ratios (relative to the risk-free rate). Indeed, the portfolios here are just the 10 E/P portfolios in Table 3 reduced to five. As in Table 3, estimated portfolio (historical) betas in Panel F are positively related to *LTE*, indicating that long-term earnings are associated with higher systematic risk, yet are negatively associated with E/P that yields higher returns.

The second ranking in Table 4, on B/P, provides insights into resolving this tension. In Panel A, B/P ranks returns for a given *LTE*, and Panel E of the table indicates that this is not just a further ranking on the yield: the earnings yield is held constant over the B/P portfolios, except in the highest *LTE* (lowest earnings yield) portfolio where the yield is actually decreasing in B/P. A ranking on B/P for a given *LTE* is an inverse ranking on *STE*, by Eq. (6), as the relative values of *STE* and *LTE* over portfolios in Panels C and D attest. Thus B/P ranks *LTE* relative to *STE*, that is, earnings expected to be added to book value in the long term relative to earnings added to book value in the short-term. That growth yields higher returns.

The result in Panel A—for a given E/P, average returns increase in B/P—support the hypothesis that B/P distinguishes scenario 2 from scenario 1: for a given E/P, growth that is priced as risky is associated with a higher B/P than growth that adds to price. As both scenarios reduce E/P, a given E/P can be due to scenario 1 or 2, depending on whether the E/P is the result of a denominator affect (on price) or a numerator effect due to the deferral of earnings. B/P distinguishes the two, because in scenario 1 growth adds to price, yielding a lower B/P; in the scenario 2, price is discounted for the risk in added growth leaving price unchanged, thus yielding a high B/P.[20]

Panel G indicates that the portfolio returns in Panel A are associated with firm size that is known to predict returns, so it could be that the sorting here is capturing this "size effect." But the size effect in stock returns is largely unexplained; the sorts here suggest that size is related to risky growth and one expects that small firms would be those with more long-run earnings prospects relative to large, mature firms where earnings potential has been realized.

In any case, Panel H reports intercepts ("alpha" excess returns) from time-series regressions over the sample period of monthly portfolio returns (in excess of the 1-month risk-free return) on excess returns for portfolios mimicking the market,

[20] One cannot rule out other explanations, of course. The highest *LTE* portfolio in Table 4 is also the lowest earnings yield portfolio, and Panel E indicates that these are loss firms, on average. High B/P for these firms might indicate distress, higher transactions costs, or lower liquidity that warrants higher returns. However, many loss firms have high long-term growth prospects (a technology firm expensing R&D in excess of short-term revenues being an example), and these growth prospects are often viewed as risky (as are payoffs to R&D). And the B/P effect in returns is evident in Table 4 across the whole range of earnings yields.

size, B/P and momentum factors. (Results from a three-factor Fama and French model excluding momentum are similar.) For this analysis, returns for firms in a particular portfolio are aligned in calendar time with the month for which factor returns and the risk-free return are observed. The *t* statistics on the estimated intercepts indicate that the excess returns associated with joint values of the earnings yield and B/P cannot be explained by sensitivity to factors returns in these models (which include a B/P factor but not an E/P factor). Nor can they be explained by correlations with size that are evident in Panel G, for the factor model also includes a size factor. To qualify, the reported alphas are unconditional alphas that assume that portfolio sensitivities to the common factors are constant through time.

Two features in Table 4 do give pause.

First, while B/P ranks growth and returns for a given earnings yield, estimated historical betas (in Panel F) are negatively associated with B/P. The negative correlation between B/P and beta is well known. The results might just speak to the inadequacy of the unconditional CAPM; changes in economic conditions affect earnings and book values but may not be reflected in the historical betas estimated over the prior 60 months here.[21] Cohen et al. (2009) indicate that both "cash flow betas" (estimated with accounting variables, indeed earnings and book values) and CAPM betas estimated subsequent to the formation of book-to-price portfolios are more in line with the returns on those portfolios. Indeed those betas are increasing in the time from portfolio formation, the time over which one would expect long-term growth expectations to be resolved.[22]

Second, the difference between the average returns of 4.3 % for the low E/P, low B/P portfolio and the 30.0 % for the high E/P, high B/P portfolio is large for an expected return spread, suggesting market inefficiency rather than reward for risk. On the other hand, the sample period is one where growth risk probably paid off handsomely.

Table 5 confirms that the sorts in Table 4 do indeed sort expected growth rates. Panel A reports mean realized 2-year-ahead earnings per share growth rates for each portfolio (growth after the forward year), and Panel D reports mean 2-year-ahead growth rates for residual earnings (with the risk-free rate as the required return). Like the mean returns in Table 4, the numbers are means of growth rates for each year in the sample. The growth rates are increasing in *LTE* (and thus decreasing in E/P), as one would expect. But they are also increasing in B/P for a given *LTE*: the combination of E/P and B/P forecasts ex post growth. Further, Panels B and C report that the standard deviation and interdecile range of earnings growth rates over years is also related to the sorts: not only does E/P and B/P indicate different growth rates but also the differential risk (by these measures) that expectations may not be

[21] Several papers posit that time-varying betas help explain B/P effects in stock returns. See Lettau and Ludvigson (2001), and Petkova and Zhang (2005), for example. Lewellen and Nagel (2006) find that a conditional CAPM cannot explain the B/P effect fully.

[22] The finding corresponds to the observation that earnings realizations explain much of long-run returns. See footnote 2.

Table 5 Annual earnings growth rates 2 years ahead of portfolio formation, for portfolios formed from long-term earnings expectations (*LTE*) and book-to-price

		Low	2	3	4	High	H–L	Low	2	3	4	High	H–L
Panel A: Mean EPS growth rates 2 years ahead (%)								*Panel B: SD of EPS growth rates (%)*					
Ranking on LTE								Ranking on LTE					
		−5.5	−0.4	0.0	4.2	26.1	31.6	12.0	9.5	10.7	17.3	19.7	7.7
	LTE												
B/P	Low	−11.5	−5.9	−4.6	−4.8	15.2		15.2	13.2	10.4	16.1	18.9	
	2	−5.6	−1.6	−3.2	−1.6	19.6		13.3	11.3	11.3	18.5	19.7	
	3	−5.9	−0.1	−3.6	3.3	25.8		14.7	11.4	12.0	19.4	21.0	
	4	−3.1	0.6	0.6	5.8	30.1		14.3	10.2	13.3	21.7	26.2	
	High	−2.0	3.6	10.7	18.7	38.0		19.3	17.5	19.8	25.7	28.1	
	H–L	9.5	9.5	15.3	23.5	22.8		4.1	4.3	9.3	9.5	9.2	
		Low	2	3	4	High	H–L	Low	2	3	4	High	H–L
Panel C: Interdecile range of EPS growth rates (%)								*Panel D: Mean residual earnings growth rates (%)*					
Ranking on LTE								Ranking on LTE					
		30.9	25.7	29.2	37.8	44.9	14.0	−9.5	−2.8	−2.5	4.2	26.9	36.4
	LTE												
B/P	Low	37.8	27.6	29.1	36.6	41.9		−22.1	−15.0	−14.6	−15.2	8.6	
	2	29.2	27.6	27.1	40.3	40.7		10.9	−8.7	−11.0	−7.9	17.9	
	3	28.7	28.0	30.2	43.1	51.7		11.5	−3.8	−9.5	2.1	26.4	
	4	37.2	27.0	37.0	49.3	65.2		−5.3	1.8	2.5	11.4	34.9	
	High	50.3	39.0	46.0	60.0	69.8		4.9	12.0	23.8	30.8	44.1	
	H–L	12.5	11.5	16.8	23.3	27.9		27.0	26.9	38.4	46.0	35.5	

Portfolios are the same as those in Table 4. To accommodate negative denominators, growth rates are calculated as $\frac{\Delta X_{t+2}}{(|X_{t+2}|+|X_{t+1}|)/2}$, where X is earnings per share (in Panel A) or residual earnings (in Panel D). Residual earnings are calculated with the required return set to the risk-free rate. SD is standard deviation

Table 6 Mean annual returns for portfolios formed from expected short-term earnings added to book value (*STE*) and long-term earnings expectations (*LTE*)

		Low	2	3	4	High	H–L	*t* stat
Ranking on STE alone		17.0	13.0	14.3	16.1	20.5	3.5	1.00
	STE							
LTE	Low	22.5	24.0	23.9	20.5	26.5		
	2	15.8	17.4	14.7	17.4	22.7		
	3	12.8	11.4	12.8	15.4	20.0		
	4	15.3	9.7	12.2	13.1	16.9		
	High	19.0	5.7	9.7	13.6	16.3		
	H–L	−3.5	−18.2	−14.1	−6.9	−10.2		
	t stat	−0.89	−5.31	−3.80	−2.92	−3.32		

Portfolios are formed as in Table 4 except firms are first ranked on expected short-term earnings relative to book value (*STE*) and then, within *STE* portfolios, on long-term earnings expectations (*LTE*)

realized. Thus the returns in Table 4 not only align with earnings growth but also the risk in growth.[23]

5.2 Returns to a joint sort on STE and LTE

If *LTE* relative to *STE* predicts returns for a given earnings yield, the question arises as to whether *LTE* relative to *STE* does so unconditionally. One expects that some (or even most) of *LTE* represents growth that adds to price under scenario 1 or pure accounting growth under scenario 3 rather than growth that reflects risk under scenario 2. If so, *LTE* added to *STE* might not add significantly to returns.

Table 6 investigates. Firms are formed into five portfolios from a ranking on *STE* (across rows) and then, within each *STE* portfolio, into a further five portfolios from a ranking on *LTE* (down columns). So portfolios vary on *LTE* relative to *STE*. The portfolio returns from ranking on *STE* alone, across the top of Table 6, differ little. On the second ranking on *LTE*, down columns, *LTE* predicts returns for a given *STE* but in a direction different from what one expects if higher *LTE* relative to *STE* were to indicate risk and return. As $STE = 1 - (B/P + LTE)$ by Eq. (6), a ranking on *LTE* (down columns) for a given *STE* examines whether higher returns are associated with the division between B/P and *LTE*. The ranking thus examines returns under scenario 1 where B/P cancels growth that depresses E/P but it not related to risk or return. The results indicate that the canceling is operative, but more so: for a given *STE*, the ranking on *LTE* (and the negative ranking on B/P) actually ranks returns negatively.

These negative returns to *LTE* (for a given *STE*) could be due to too much earnings deferred to the long term when firms are less risky; accounting is too

[23] The ex post growth rates are calculated only for firms that survived 2 years ahead. While survivorship rates differ somewhat over *LTE* portfolios (83.8 % for the low *LTE* portfolios versus 71.7 % for the high *LTE* portfolios), the rate varied little over B/P portfolios, except for the high *LTE* portfolio where the survivorship rate for the low B/P group was 75.7 versus 70.4 % for the high B/P group.

Table 7 Mean annual returns and for portfolios formed from book-to-price and long-term earnings expectations (*LTE*)

		Low	2	3	4	High	H–L	*t* stat
Mean annual returns (%)								
Ranking on B/P alone								
		9.3	12.6	15.4	18.4	24.3	15.0	5.57
	B/P							
LTE	Low	17.0	17.6	20.8	22.4	29.6		
	2	11.6	14.2	16.7	18.9	25.2		
	3	9.5	12.5	14.2	19.4	23.4		
	4	4.6	10.7	13.5	18.3	22.8		
	High	5.6	9.6	13.7	16.9	24.2		
	H–L	−11.3	−7.9	−7.1	−5.5	−5.4		
	t stat	−2.74	−2.22	−1.82	−1.43	−1.26		

Portfolios are formed as in Table 4 except firms are first ranked on book-to-price (B/P) and then, within B/P portfolios, on long-term earnings expectations (*LTE*)

conservative: the results are explained by scenario 3. A second explanation recognizes the earnings yield as the anchor for the required return, as in Eq. (2a), for it indicates the required return in case 1 and case 2 (with no growth). As the ranking on *LTE* is an inverse ranking on E/P, the second sort recovers the earnings yield that indicates return. A third explanation, of course, sees B/P identified with risk exposures other than those to do with the accounting.

5.3 Returns to a joint sort on B/P and E/P

Table 7 reports a final set of portfolio returns. Firms are ranked first on B/P (across rows) then, within each B/P portfolio, on *LTE*, reversing the order of the rankings in Table 4. The "B/P effect in stock returns" is clearly evident from the first ranking, with a *t* statistic of 5.57 on the mean difference of 15.0 % between high and low B/P portfolios. The differences in returns across B/P portfolios can be partly attributed to B/P being positively correlated with earnings yields (that predict returns).[24] However, the return spread is considerably higher than that for earnings yields in Table 4. Equation (9) suggests a reason: B/P picks up two sources of risk. B/P is the earnings yield (with the risk and return implied), adjusted for earnings expected to be added to book value in the short term relative to the long-term (with additional risk and return implied).

Is it thus the case that B/P "subsumes" returns to E/P as Fama and French (1992) maintain? The second sort in Table 7 addresses the question. As the ranking on *LTE*

[24] The mean rank correlation between B/P and E/P in Table 2 is 0.312 and is 0.477 for firms with positive E/P.

is an inverse ranking on the earnings yield, the investigation tests whether E/P adds to returns for a given B/P. The evidence in the table is mixed. The reported t statistics indicate significant return differences across earnings yield (*LTE*) portfolios in the lower B/P portfolios but not the higher B/P portfolios, and in Table 4 it is the higher B/P ratios that add to returns for a given E/P. For positive earnings yields—where B/P and E/P are more strongly correlated—E/P adds to return for all levels of B/P (not tabulated).

The combination of the findings here and in Table 4 prompt an interpretation for the B/P effect in stock returns: B/P indicates risk in earnings and earnings growth. B/P is positively correlated with short-term earnings yields and thus indicates the risk and return associated with earnings yields. But, in addition, B/P indicates growth over the short term that also is at risk and requires additional return. The additional return to B/P is most striking in the low E/P portfolios where a good deal of risk is attributable to growth. However, it is evident across the whole range of E/P where higher B/P ratios indicate considerable long-term earnings expected over the short term. Overall, the results endorse the notion that it is earnings and earnings growth that are at risk and B/P aids in the identification of that risk. The interpretation accords with the insights from Eq. (2a): in the no-growth case, B/P can vary widely but have no relation to growth and add nothing to the earnings yield in indicating the required return. Only when B/P indicates growth over the short term can B/P indicate risk and return and then only if the growth indicated is growth that requires a higher return.

5.4 Results for subsamples

To discover how pervasive these findings are, we repeated the tests for varying conditions within the sample. Full details of this additional analysis are available on request.

The results in Table 4 hold for firms with positive earnings yields, and B/P ranks returns for a portfolio consisting only of loss firms. Results are also similar for firms with $STE < 0$, that is, $ROCE_{t+1} < r_f$. The analysis above excludes firms with per-share prices less than 20 cents that may be infrequently traded. Results were similar when the cut-off was changed to \$1, \$2, and \$5. Observing returns beginning 4 months after fiscal year-end (rather than 3 months) exhibited no difference, and results were similar for December 31 fiscal-year-end firms where cutoffs for portfolios can be determined from the ranking for the current year (rather than the prior year). We carried out the analysis excluding firms in the financial services industries (SIC codes 6000–6999). We also validated the robustness of the findings over time by looking at years 1963–1984 and 1985–2006 separately. Results were somewhat stronger in the earlier period. Results were also similar working with 8×8 portfolio sorts (with fewer firms in portfolios) and with independent two-way sorts rather than nested sorts, providing a wider range in the second sort.

We applied an alternative forecast for forward earnings, $Earnings_{t+1} = ROCE_t \times B_t$, that accommodates expected earnings increases due to growth in book value in the prior year. Results are similar. Though many papers are skeptical (as referenced earlier), analysts' forecasts presumably contain further information

about forward earnings that is incorporated in the price in the B/P ratio. We repeated the analysis for the period 1977–2006 for which the forecasts are available on IBES files. The sample covers fewer years, but is also limited to firms which analysts and IBES cover. (There are fewer small firms.) Results with analysts' forecasts are similar, though not as strong as those in Table 4. Earnings yields still rank returns, though the return spread is not as wide as that in Table 4. For a given earnings yield (and *LTE*), B/P does rank returns, but the differences are not as large, significant in three of the five portfolios. Curiously, we also found that the spread of returns when ranking unconditionally on B/P was considerable less than that in Table 7 for the larger set of firms.

The full analysis was repeated for small (bottom third), medium (middle third), and large (top third) firms by market capitalization of their equity. Cut-offs were determined from the ranking for the previous year. In the joint *LTE*, B/P ranking (as in Table 4) for large firms, *LTE* (and thus E/P) ranked returns significantly, but not B/P on the second ranking. Correspondingly, results were stronger for the second ranking in Table 4 in small and mid-cap firms. These firms are more likely to have growth at risk that differentiates them from the risk in the market as a whole. For the tests in Table 7, the results from ranking first on B/P were stronger for small-cap and mid-cap, but those on the second ranking (effectively a ranking on E/P) were stronger for large-cap.

6 Conclusion

The paper confirms results in earlier studies that earnings yields (earnings-to-price) predict stock returns. The result is consistent with the notion that expected earnings are at risk and price discounts for that risk. However, investors not only buy short-term earnings but also subsequent earnings (growth), and both are presumably at risk. The paper shows that book-to-price indicates expected returns associated with expected earnings growth: for a given earnings yield, book-to-price yields additional expected returns in the data, and those additional returns can be explained by book-to-price indicating risky growth. Accordingly, the so-called book-to-price effect in stock returns can be explained as rational pricing but in a way that differs from the typical characterization in "value" versus "growth" investing, where low book-to-price indicates "growth" and that growth is associated with lower returns. Rather, high book-to-price indicates growth and yields higher returns (for a given earnings yield), consistent with the notion that growth is risky and is priced as such.

Thus, while research has shown that both book-to-price and earnings-to-price predict stock returns, the results here suggest that expected returns are best explained by book-to-price and earnings-to-price jointly, for then the expected returns associated with risky growth are identified. Book-to-price predicts returns unconditionally, but this is explained by the positive correlation between book-to-price and earnings-to-price in the cross section plus book-to-price identifying risky growth for a given earnings-to-price.

The documented returns could, of course, represent (abnormal) returns to the market's inefficient pricing of earnings and book values, and the paper in no way

resolves this issue. However, the attribution of the documented average returns to the rational pricing of risk gains currency from a consideration of the accounting principles that determine earnings and book values. Accounting defers earnings recognition to the future under uncertainty and defers relatively more earnings to the long-term future when outcomes are particularly risky. So earnings deferred to the long run, relative to earnings in the short run, indicates the risk a firm faces. For a given earnings yield, book-to-price captures this feature, simply by the way that earnings-to-price and book-to-price articulate. There is no imperative that accounting reflects priced risk, but our results suggest so.

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