Paths to Valuation, Asset Pricing, and Practical Investing: Can Accounting and Finance Approaches be Reconciled?

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Abstract. This paper compares accounting and finance approaches to equity valuation, with a focus on practical investing. It shows how the two endeavors tie to the same theoretical foundation so they have the potential of being unified. Finance has largely focused on the "denominator" aspect of valuation—the discount rate— under the mantra of "asset pricing" while accounting has largely focused on the numerator—specifying the expected accounting outcomes to be discounted. The paper shows how both accounting and finance can be unified to resolve both the numerator and denominator issue in valuation. Important to this is an understanding of book-to-price which finance sees as a denominator attribute indicating risk and expected return, while accounts see it as a numerator attribute. The paper shows how book-to-price features in both, in particular how an appreciation of the accounting for book value provides an understanding of why book-to-price is related to risk and return

This paper takes steps towards reconciling asset pricing in finance and valuation research in accounting and to place them on a common platform. Both disciplines presumably aim to enhance investing practice, so the focus is on synthesizing the two areas to develop tools for application by investors.

Asset pricing is largely a study of relative pricing based on no-arbitrage: Given expected payoffs, asset prices are set in relation to each other such that differences in prices are determined only by the risk in those payoffs. Thus most of asset pricing deals with the determination of risk and its pricing, that is, with the discount applied to expected payoffs (the so-called required return or the cost-of-capital). In contrast, accounting-based valuation research and the related endeavor in financial statement analysis deal with the issue of how one pulls information together to determine the expected payoffs to be discounted, but has little to say about the discount rate. Both endeavors have much to learn from each other; indeed it is the contention here that a synthesis will lead to richer asset pricing and valuation.

The two endeavors often lead to conflicting recommendations, frustrating the student and practitioner. Finance proposes discounted cash flow models for valuation, accounting focuses on expected earnings. Students in a security analysis or corporate finance course are told to adopt a no-arbitrage (efficient market) view and focus on the analysis of risk and asset allocation. Those same students going into a financial statement analysis and valuation class are told that accounting analysis identifies "anomalies" that calls the efficient market hypothesis into question, but see little attempt to evaluate risk and establish a required return against which the so-called anomalies can be evaluated. The accounting professor refers them to asset pricing in finance but there he finds that we have not actually worked out what the required return is as a practical matter. The student is particularly agitated when prominent asset pricing models that

purport to deliver the required return contain book-to-price which in accounting-based valuation bears on the expected payoffs, not the discount rate. Can these conflicts be reconciled?

What is Agreed Upon

Modern finance has supplied the theoretical foundation for asset pricing, valuation and investing. The core idea of no-arbitrage is accepted by both endeavors, though accounting research is not as quick to accept actual asset prices as the "efficient" manifestation of the idea.[1] The idea that "intrinsic" values bear a no-arbitrage relation to available information is held by all, even if actual prices do not. Further, the Modigliani and Miller (1961) (M&M) propositions on dividend irrelevance and financing irrelevance are foundational both to asset pricing and accounting-based valuation, at least as a benchmark for investigating exceptions. Indeed the foundational papers of modern accounting-based valuation, Ohlson (1995) and Feltham and Ohlson (1995), show that the M&M dividend irrelevance notion in embedded in traditional accounting principles, and Penman and Sougiannis (1997) shows that U.S GAAP accounting works to honor the M&M principle.

Of most importance to valuation, the theoretical valuation model is agreed upon: Value (and efficient price) is based on expected cash flows, discounted for risk, for cash buys consumption and it is future consumption (and the risk to that consumption) that the investor is concerned about. Formally, given no-arbitrage, the current price,

$$P_t = \sum_{\tau=1}^{\infty} \frac{d_{t+\tau} - Cov(d_{t+\tau}, Y_{t+\tau})}{(1+r_{Ft})^\tau} \tag{1}$$

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[1] Behavioral finance has lately grappled with the issue of why market prices might not be "rational," and some of that work turns on the issue of investors' ability to process information.

where $d_{t+\tau}$ is cash dividends in year t + τ and $Y_{t+\tau}$ is an (unspecified) random variable common to all assets; see Rubinstein (1976). (Subscripts with τ > 0 indicate expected values.) Thus a no-arbitrage price is equal to the sum of discounted certainty-equivalent payoffs, with the risk adjustment in the numerator in the covariance term, with the numerator then discounted by the term structure of riskless interest rates, r_{Ft}. The model applies to all assets, but we will concern ourselves with the value of equities and the firm behind the equity claim.

With the $Y_{t+\tau}$ variable unidentified, the model has little empirical content, so the class-room version (used in practice) takes the discount for risk to the denominator with a discount rate, r, that adds a risk premium to the risk-free rate:

$$P_t = \sum_{\tau=1}^{\infty} \frac{d_{t+\tau}}{(1+r)^\tau}.$$

(2)

This valuation is consistent with no-arbitrage only for a constant discount rate, but we will work with this popular version for simplicity and familiarity (with no loss of insight). The model is often referred to as the discounted dividend (DDM) model.

This model in noncontroversial, but issues arises about how to apply the model in practice. There is both a numerator and denominator issue: How do I develop expectations of dividend payoffs and how do I determine the discount rate for the denominator?

The Numerator Issue

Both finance and accounting recognize that the dividend discount model is impractical. First, forecasting "to infinity" as dictated by model (2) is clearly not practical: Forecasting the dividend in year 2050 and onwards for a Microsoft or a Cisco System is difficult indeed, more so for a firm that pays no dividends at present. (In the long run we are all dead.) Practical valuation thus

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deals with finite-horizon forecasting with an added "continuing value" or "terminal value." Restating the DDM for a finite-horizon forecast to year T,

$$P_t = \sum_{\tau=1}^{T} \frac{d_{t+\tau}}{(1+r)^{\tau}} + \frac{P_T}{(1+r)^{T}}$$ (2a)

This valuation is, of course, circular for we must forecast the terminal price, P_T, to establish current price, P_t. But there is a second objection, raised by the Miller and Modigliani dividend irrelevance proposition: All dividends up to the liquidating dividend are a matter of dividend policy which is irrelevant to current value. Dividend payout is a zero-net-present-value activity (at least where there are no frictions like taxes): In model (2a), higher expected dividends up to year, T, reduce P_T to leave P_t unchanged. As firms are considered to be going concerns (without liquidation), expected dividends are not the appropriate target for valuation. A conundrum has to be resolved: Value is based on expected dividends, but forecasting dividends is irrelevant to valuation. The resolution of the conundrum amounts to identifying a practical approach to valuation.

Finance typically finesses the dividend conundrum by recognizing the cash conservation equation (otherwise referred to as the sources-and-uses-of-funds equation):

$$FCF_{t+\tau} = d_{t+\tau} + F_{t+\tau}.$$ (3)

That is, the net cash from the firm, free cash flow (FCF_t), is applied as cash payout to shareholders or to net debt holders, F_t. Thus, substituting for $d_{t+\tau} = FCF_{t+\tau} - F_{t+\tau}$ in eq. (2a) for all t + τ, the finite-horizon dividend discount model is restated as

$$P_t = \sum_{\tau=1}^{T-1} \frac{FCF_{t+\tau}}{(1+r)^{\tau}} + \frac{FCF_T}{(1+r)^T (r-g)} - P_t^{ND} \tag{4}$$

where P_t^{ND}, the value of the net debt, is the present value of expected cash flows to debt, $F_{t+\tau}$

(and the required return now pertains to "the firm" rather than the equity). This is often referred

to as the discounted cash flow (DCF) model. But note that the finite-horizon forecasting leaves

the practitioner with the issue of specifying an expected growth rate, g, for the continuing value.

As this growth rate summarizes the expected free cash flow after the horizon year (to infinity),

there is no practical improvement over an infinite-horizon forecast unless one has a handle on

this growth rate. And, as every MBA student appreciates, the growth rate for the continuing

value if highly speculative.

It is questionable whether anything is being put on the table with the substitution that

takes us from the DDM to the DCF model. After all, it is mere algebra based on the identity (3).

Indeed, if there is no net debt, $FCF_{t+\tau} = d_{t+\tau}$, that is, free cash flows are the same as value-

irrelevant dividends, and adding debt flows adds a cash flow that, under the Modigliani and

Miller (1958) financing irrelevance proposition is also irrelevant to value.[2] Accounting has a

further point to make: Free cash flow is cash accounting and cash accounting is not appropriate

accounting for value. The point is appreciated by considering the cash flows for Wal-Mart

Stores, Inc. below:

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[2] Entertaining exceptions to the M&M propositions can be fruitful, but a core valuation model cannot be built from the consideration of the frictions that provide those exceptions.

Wal-Mart Stores Inc. (in millions of dollars)

	1992	1993	1994	1995	1996
Cash from operations	1,553	1,540	2,573	3,410	2,993
Cash investments	2,150	3,506	4,486	3,792	3,332
Free cash flow	(597)	(1,966)	(1,913)	(382)	(339)
Earnings	1,608	1,995	2,333	2,681	2,740

Free cash flow is cash flow from operations minus cash investment back into the operations. For these years (and most of Wal-Mart's existence), free cash flows are negative. The reason is that this growing firm invests more cash than it generates from operations. A student attempting to apply a DCF model at on the basis of cash flows like these would be perplexed: Negative cash flow imply a negative value. The problem would be resolved by estimating a "continuing value," as in model (4), but that continuing value (always a doubtful number) would be more than 100 percent of the value, and one has no basis for calculating it with negative numbers. But the problem is more a conceptual problem: The free cash flow measure treats investment as a negative and a thus reduction to present value in model (4) whereas firms typically invest to add value. Free cash flow is in part a liquidation concept: Firms increase free cash flow by liquidating investments and reduce it by investing in the business. Of course, if one forecasts the very long run—strictly to infinity—one will forecast the cash flows that result from investment, but that is not practical. Indeed, if forecasting the long run is necessary, the dividend discount model works in the long run. But in the long run we are all dead.

The accountant sees DCF valuation as cash accounting: One forecasts the cash flows that are expected to come through the cash flow statement. The accountant recognizes cash accounting as deficient but has an alternative: accrual accounting. Under accrual accounting, investment is typically not "expensed immediately" but rather added to the balance sheet, to be expensed later as its value expires. As assets, they are seen as something that produces value in the future rather than as a detriment to value. In addition, cash flows from operations are modified by additional accruals that are also added to the balance sheet as assets and liabilities. Revenue is booked to the income statement when the firm has a claim on a customer (and a receivable is booked to the balance sheet), not when cash is received, and expenses are booked when a liability is incurred to suppliers, not when cash is paid. Both bring the future forward in time. So, for example, if a firm remunerates employees with pension benefits to be paid 30 years in the future, a DCF valuation will have to forecast cash flows 30 years hence, in the long run. But accrual accounting includes the value affect as an expense in earnings immediately (and books a corresponding pension liability to the balance sheet). Formally,

Earnings from the business = Free cash flow + Cash investment + Additional Accruals,

with the cash investment and additional accruals added to book value in the balance sheet. Rather than just a cash flow statement, the accounts now report an income statement and balance sheet. Note that Wal-Mart's earnings are positive (and indeed growing as a regular rate) as a result of this accrual accounting.[3] To advise a student to forecast earning and then back out the accruals

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[3] These ideas are elaborated upon in Penman (1997), Penman (2010), Chapter 4 and Penman (2011), Chapter 2.

"to get to the cash flows" (as is done to apply DCF analysis) seems counter-productive if one ends up with the problem of valuing the negative cash flows of Wal-Mart.[4]

The income statement and balance sheet under accrual accounting tie together according to a "clean surplus" relation if successive book values numbers for equity, B, are accounted for as follows:[5]

$$B_{t+\tau} = B_{t+\tau-1} + Earnings_{t+\tau} - d_{t+\tau}. \tag{5}$$

Substituting for dividends in this equation into the DDM,

$$P_t = B_t + \sum_{\tau=1}^{\infty} \frac{Earnings_{t+\tau} - r.B_{t+\tau-1}}{(1+r)^\tau} \tag{6}$$

The numerator is referred to as residual earnings and the model as the residual earnings model. The balance sheet shows up in the valuation, and value is added to the balance sheet if expected earnings are in excess of those from book value earning at the required return (that is, residual earnings are positive).[6] With investment now on the balance sheet, the forecasting target, residual earnings, is not affected by investment. Further, investment that earns only at the required return (zero-NPV investment) does not add to the valuation. In short, the accounting, and the valuation that follows from it, aligns with the value creation.

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[4] Schemes to differentiate "maintenance capital expenditures" components of free cash flow are essentially accrual accounting applications, but ones that do not keep track of the implied balance sheet (containing non maintenance capital expenditures).

[5] Strictly, the earnings must be "comprehensive" earnings such that all earnings must be reported in the income statement and not as "dirty-surplus" earnings reported directly to the balance sheet.

[6] Feltham and Ohlson (1999) state the model in the form of model (1), that is, with the discount for risk in the numerator and thus with a generalization for stochastic discount rates. See Ang and Liu (2001) and Christensen and Feltham (2009) for further development. Ohlson and Juettner-Nauroth (2005) present an equivalent valuation to model (6), based on forecasted changes in residual earnings, with a generalization to accounting that does not require the clean-surplus operation.

Empirical work in Penman and Sougiannis (1998), Francis, Olsson, and Oswald (2000), and Courteau, Kao, and Richardson (2001) shows that applying GAAP accounting with this model yields valuations that explain prices considerably better that DCF valuations when one forecasts over (practical) finite horizons. But note that the only accounting in the model, as stated, is the clean-surplus relation. The numbers for earnings and book value that go into a model depend on the type of accrual accounting employed, and so does the efficacy of the model for practical valuation (for less than infinite forecasting horizons). While the model has been expensively applied using U.S. GAAP and international (IFRS) accounting, there has been little research into what the appropriate accounting for equity valuation should be, so there is an extensive agenda facing academic accountants. The key question is: What is the appropriate accrual accounting for value? Is it historical cost accounting? Fair value accounting? Penman (2011) explores. But, in the minds of accounting researchers, one issue has been settled: In principle, accrual accounting rather than cash accounting is desirable for valuation. With infinite forecasting horizons, the DDM, DCF model, and the residual earnings model yield equivalent valuations, but with limited horizon forecasting, accrual accounting dominates, and valuation as a practical matter, is a matter of forecasting with finite horizons. That is a different view from mainstream finance.

The Denominator Issue

It is the denominator issue that has been the focus in asset pricing, delivering formal models like the capital asset pricing model (CAPM) and the Fama and French (1993) three-factor model that prescribe the required return. These models are based on the foundational principles of modern finance, particularly no-arbitrage and the implication that risk pertains to common factors that cannot be avoided with (costless) diversification. But as a practical matter, the models have been

disappointing and have not stood up to empirical testing. Indeed, it is fair to say that we don't know how to calculate the required return—it's rather a guess.[7] The problem is that most models require expectations of risk premiums on a number of common factors as well as covariances with respect to these factors. Futher, the common factors for which these risk premiums and covariances are to be identified (other than the market factor under the CAPM) are themselves unidentified. Indeed in most multi-factor models, like the Fama and French model, the factors are identified by correlations in the data—factor dredging—without analytical development, which is quite unsatisfactory. Risk premiums and covariances are ex ante notions (that are not observable) and stochastic, leaving the practitioner with a difficult problem in extrapolating from the past to the future. Conditional asset pricing model have been proposed, but identifying the conditioning state and its implication for the required expectations is elusive. It is fair to say that asset pricing, though enhancing our understanding of risk and the required return in theory (considerably), has not been a success as a practical matter.

A particular curiosity arises with respect to the Fama and French model and models that add a fourth factor to the three factors in the Fama and French model: Book-to-price (B/P) features prominently as an attribute that indicates a firm's sensitivity to a common factor. Finance is largely mystified as to why book-to-price would be a risk attribute, though conjectures abound—B/P indicates distress risk, the risk of assets in place, the risk of growth options. The

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[7] Surveys of academics, analysts, and companies put estimates of the market risk premium, an important input to CAPM calculations, in a range between 3 percent and 10 percent, although some of that is due to variation over time. See, for example a survey conducted by Pablo Fernandez of IESE Business School at http://ssrn.com/abstract=1473225 and http://ssrn.com/abstract=1609563. See also a survey by Ivo Welch of Brown University at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1084918. The uncertainty about the risk premium is also evident in the varying prescription for the number in textbooks. For a round-table discussion on the issue, see http://papers.ssrn.com/sol3/papers.cfm?abstract_id=234713. As the cost of capital is determined under the CAPM by multiplying the estimated risk premium by an estimated beta, the variation in the cost of capital is magnified by beta (and by the estimation error in beta). Multifactor models, with additional risk premiums and betas to be estimated, magnify the problem.

attribution is difficult because B/P was identified (in Fama and French 1992) merely by observed correlations between B/P and returns without supporting theory. Indeed, those correlations can be interpreted as reflecting abnormal returns due to market inefficiency rather than returns to the rational pricing of risk.

But another feature intrigues. In these asset pricing models, B/P is an input to the denominator of a valuation. Accounting based valuation, however, sees B/P as a numerator measure: Given the required return, model (6) says that price-to-book represents expected earnings to be added to book value (which are then discounted). Can the two views be reconciled? Can B/P play a role in both the numerator and the denominator? And, if so, can the mystery of B/P and returns be solved?

Restating the accounting valuation in eq. (6) with forecasts beyond the forward year represented by a constant growth rate applied to forward residual earnings,

$$P_t = B_t + \frac{Earnings_{t+1} - r.B_t}{r - g}.$$ (7)

Inverting this model to place the required return on the left-hand side,

$$r = \left[\frac{B_t}{P_t} \times ROE_{t+1} \right] + \left[(1 - \frac{B_t}{P_t}) \times g \right]$$ (8)

That is, the required return is the weighted average of the expected forward (book) return on equity, ROE_{t+1} and the expected growth rate, with the weights (that sum to 1.0) supplied by B/P.[8] In this formulation B/P is not at risk; rather forward ROE and growth are at risk and B/P weights

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[8] The step from eq. (6) to eq. (7) requires $ROE_{t+1} > g$. The formula can be adapted for finite-forecasting horizons of any length.

the two expectations (via the pricing of book value) to yield a required return that reflects the discount in price for the risk. We thus have an expression where B/P connects to the required return. As $\dfrac{B_t}{P_t} \times ROE_{t+1} = \dfrac{B_t}{P_t} \times \dfrac{Earnings_{t+1}}{B_t}$, eq. (8) can be restated as

$$r = \frac{Earnings_{t+1}}{P_t} + \left[(1 - \frac{B_t}{P_t}) \times g \right] \qquad (8a)$$

That is, the required return is supplied by the forward earnings yield, with an accommodation for growth weighted by $1 - \dfrac{B_t}{P_t}$. For B/P = 1.0, the required return is given by the forward earnings yield, which we understand is the case under mark-to-market accounting (as with a bond yield). Equities typically have B/P $\neq$ 1.0 and (unlike a bond) promise growth. Growth increases the P/E ratio (and decreases the E/P ratio) but the weighting of growth by $1 - \dfrac{B_t}{P_t}$ serves to correct the E/P to yield the required return as if there were no growth. This formulation points to the forward E/P as the starting point for evaluating the required return, with B/P added in the case of growth.

Growth is typically seen as adding to price, yielding a lower B/P (and the B/P in the formula serves to correct the lower E/P due to growth). In this case, a lower B/P (rather than a higher B/P) adds to the required return for a given E/P that is depressed by the growth. However, Penman and Reggiani (2010) recognize that growth, *g*, can also be produced by the accounting itself: Accounting that defers earnings recognition to the future produces growth. Such deferral is made under an accounting principle that responds to risk: Under uncertainty, accounting defers the recognition of earnings until uncertainty has been resolved, in effect until a low beta asset like cash or a receivable has been received. Such deferral can only be done by reducing E/P—

deferral shifts earnings from the near term to the long term to produce the growth—so E/P is again depressed. But, if the growth is priced as risky, it does not add to price, so B/P is higher than if the growth adds to price. Thus, for a given E/P, a higher B/P indicates a higher required return.

E/P and B/P are in part accounting phenomena, they depend of how one accounts for earnings and book value. Accordingly, if B/P (or E/P) are to indicate risk and the required return, it might have something to do with the how accounting handles risk.The Penman and Reggiani (2010) paper, delivered at the Jerusalem conference, points to that connection: Accounting creates earnings growth in response to risk and, if that growth is actually priced as risk in the market, a higher B/P for a given E/P will indicate that risk and the required return.

The empirical results suggest so. In the panel below, firms are ranked each year, 1963-2006, on their estimated forward P/E (the inverse of the E/P) and then, within each P/E portfolio, on their B/P. The numbers in the panel are the average earnings growth rates two years ahead, that is, the year after the forward year. Mean growth rates are positively associated with P/E, as one would expect, but for a given P/E are also positively associated with B/P. While unconditionally, P/B indicates growth, as is usually summized, so does P/E, so the correlation of P/B with growth can be attributed to the correlation of P/B with P/E. However, for a given P/E, B/P (not P/B) indicates higher average growth.

Mean Percentage Earnings Growth Rates Two Years Ahead for Portfolios
formed on P/E and B/P; 1963-2006

		Low	2	3	4	High	High-Low
Ranking on P/E		-5.5	-0.4	0.0	4.2	26.1	31.6
	Low	-11.5	-5.9	-4.6	-4.8	15.2	
Ranking on B/P	**2**	-5.6	-1.6	-3.2	-1.6	19.6	
	3	-5.9	-0.1	-3.6	3.3	25.8	
	4	-3.1	0.6	0.6	5.8	30.1	
	High	-2.0	3.6	10.7	18.7	38.0	
	High-Low	9.5	9.5	15.3	23.5	22.8	

The fact that B/P forecasts growth may have nothing to do with risk and return, but Penman and Reggiani (2010) indicate that the expected growth forecasted by B/P is indeed risky. The panel below reports the standard deviation of growth rates for each portfolio over the years. The standard deviations are clearly related to the mean growth rates above (and to B/P). A similar pattern is observed for the inter-decile range: For a given E/P, higher B/P is associated with higher growth rates, on average, but it is growth that is subject to larger shocks.

Std Dev of Percentage Earnings Growth Rates Two Year Ahead for Portfolios formed on P/E and B/P ; 1963-2006

		Low	2	3	4	High	High-Low
Ranking on P/E		12.0	9.5	10.7	17.3	19.7	7.7
	Low	15.2	13.2	10.4	16.1	18.9	
	_2_	13.3	11.3	11.3	18.5	19.7	
Ranking on B/P	_3_	14.7	11.4	12.0	19.4	21.0	
	_4_	14.3	10.2	13.3	21.7	26.2	
	High	19.3	17.5	19.8	25.7	28.1	
	High-Low	4.1	4.3	9.3	9.5	9.2	

One might ask if such variation in growth rates is priced as risky—it could be diversifiable risk—but B/P is denominated in price that discounts for priced risk. Indeed, these differential risky growth rates are associated with differential returns. The following panel reports mean year-ahead, buy-and-hold returns for the 25 portfolios:

Mean Percentage Annual Returns for Portfolios formed on P/E and B/P; 1963-2006

		Low	2	3	4	High	H-L	t-stat
Ranking on P/E		23.2	18.1	14.9	12.1	13.5	-9.7	-2.47
Ranking on B/P	*Low*	19.7	17.1	14.2	10.9	4.3		
	2	22.1	16.0	13.0	9.1	8.8		
	3	21.6	17.0	12.1	8.5	14.4		
	4	24.3	18.0	14.7	13.4	15.5		
	High	30.0	22.6	20.2	20.1	26.4		
	H-L	10.3	5.5	6.1	9.2	22.2		
	t-stat	3.92	2.92	2.78	2.62	5.67		

Clearly, average returns are related to E/P as eq. (8a) indicates but, for a given E/P, they are also associated with B/P, with a higher B/P associated with higher returns. And the reason is supplied: B/P forecasts growth that growth is priced as risky. This is not just a matter of empirical observation. Rather an accounting principle is involved: Earnings are deferred into the future under uncertainty, yielding earnings growth and the earnings and book value in E/P and B/P such that these multiples together indicate growth that is at risk. Earnings and book values articulate in accounting (under the clean surplus relation (5)), and they also articulate to indicate risk and return.

Of course, one cannot dismiss the conjecture that these return results are due to market mispricing. But, if one seeks to understand why B/P would predict returns for risk (in and efficient market), the accounting analysis supplies it. Intuitively, the idea is not hard to accept. Apart from the idea that the accounting produces growth under uncertainty, one understands that

a risk-return tradeoff means that a firm typically cannot get more earnings (growth) without more risk. Leverage adds to expected earnings growth but also adds to risk, reflecting that risk-return tradeoff, as so well might business operations. Growth gets hit in recessions and payoffs well in good times.

Characteristic Regressions and Asset Pricing

Fama and French identify B/P's role in an asset pricing model simply based on the observation that B/P is correlated with returns in the data. This purely empirical approach more generally involves estimating (what the asset pricing literature calls) characteristic regressions—cross-sectional regressions of future returns on firm characteristics. Characteristics that are found to be significant in these regressions—like beta, firm size, and B/P—become the feature for forming "factor mimicking" portfolios whose returns represent outcomes to risk that cannot be diversified away. "Factor regressions" then estimate firms' sensitivity to these common factors. The latter step is seen as validation that the observations made from characteristic regressions are indeed due to firms' sensitivity to common, non-diversifiable risk. But this, again, is a fit to data; as Daniel and Titman (1997) point out, returns can covary with common characteristics rather than a common risk factor.

The pure empirical approach to identification of an asset pricing model (without theory) is dangerous data dredging , but one might at least require these characteristic regressions to be well specified. Eq. (8) and (8a) and the panels above suggest that selecting B/P as a risk attribute without E/P is suspect and indeed the appropriate specification of characteristic regressions that includes B/P suggests so.

But we can be more formal. Substituting dividends, $d_{t+1} = Earnings_{t+1} - (B_{t+1} - B_t)$ from the clean-surplus eq. (5), into the expected stock return for period t+1,

$$\frac{E(P_{t+1} - P_t + d_t)}{P_t} = E(R_{t+1}) = \frac{E(Earnings_{t+1})}{P_t} + \frac{E(P_{t+1} - B_{t+1}) - (P_t - B_t)}{P_t} \qquad (9)$$

That is, the expected stock return is always equal to the expected earnings plus the expected

change in premium over book value (all deflated by observed P_t). The forward earnings yield

enters and this is sufficient for the prediction of the expected stock returns if there is no expected

change in premium. To complete the specification, it remains to identify the determinants of a

change in premium. The intuition is easy to grasp: If price increases more that book value, the

market is anticipating higher earnings in the future that those that update the book value

currently. That is, an increase in the premium is due to information that forecasts earnings

growth. More formally, model (6) supplies the explanation: A change in premium is just a

change in expected residual earnings. Applying the constant growth version of the residual

earnings model in model (7), for simplicity, and substituting into eq. (9),

$$\frac{E(P_{t+1} - P_t + d_t)}{P_t} = E(R_{t+1}) = \frac{E(Earnings_{t+1})}{P_t} + \frac{E(Earnings_{t+2} - rB_{t-1} - Earnings_{t+1} - rB_t)}{P_t}$$

$$= \frac{E(Earnings_{t+1})}{P_t} + \frac{gE(Earnings_{t+1} - rB_t)}{P_t} \qquad (10)$$

(The expected growth must be growth in residual earnings, for only growth in excess of the

required return adds to price.)[9]

As with eq. (8a), eq. (9) points to an omission in the Fama and French model: The

forward earnings yield is a natural starting place for the specification of a characteristic

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[9] As a change in residual earnings, $Earnings_{t+2} - rB_{t-1}$ — $(Earnings_{t+1} - rB_t) = Earnings_{t+1} + rd_t - (1+r)Earnings_t$, one can refer to the growth as expected abnormal (cum-dividend) earnings growth that explains the P/E ratio, as in Ohlson and Juettner-Nauroth (2005).

regression.[10] However, is there a role for the Fama and French B/P attribute in this framework? Well, eq. (8a) suggest so and eq. (9) informs that, given earnings-to-price, any variable that forecasts a change in premium and thus growth will explain expected stock returns if the current price, P_t (the deflator) discounts the expected growth as risky growth. Is this so for B/P. The portfolio analysis above indeed indicates so. With a characteristic regression in mind, B/P enters the regression as a matter of math, for both B_t and P_t appear in eq. (9). A regression specification follows from that equation:

$$R_{t+1} = a + b_1 \frac{E(Earnings_{t+1})}{P_t} + b_2 \frac{B_t}{P_t} + \varepsilon_t \tag{11}$$

where the intercept and coefficients are such that the disturbance is mean zero. The coefficient on B/P, b_2, takes on a value different from zero if B/P is positively correlated with growth, as it appears to be in the panels above.

We have thus identified, via an understanding of how accounting ties to stock returns, how E/P and B/P relate to those returns. In so doing, we have identified the appropriate specification for a characteristic regression that involves accounting numbers. Most importantly from as asset pricing point of view, we have identified why book-to-price might be a risk characteristic: Given earnings-to-price, book-to-price indicates risk and return if it indicates growth that is priced as risky. No longer is the attribution subject to mystery and conjecture. Book-to-price enters as a valid attribute because it is positively correlated with earnings-to-price, the determinant with no growth, but in addition because it indicates risky growth.[11]

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[10] Fama and French (1992) do claim that book-to-price "subsumes" earnings-to-price in explaining cross-sectional differences in stock returns.

[11] Other papers involve earnings and book value (or the rate-of-return, earnings divided by book value) in asset pricing models, and can be interpreted within the framework here. See, for example, Chen, Novy-Marx, and Zhang (2010).

Conclusion

Regrettably, the research endeavors in accounting and finance have too long been departmentalized, just like their institutional separation in universities. Putting them on the same platform produces considerable insights, as this paper highlights.

The foundation for both endeavors is provided by the modern theory of finance (with which accounting-based valuation is quite consistent). That theory has produced many products, particularly in the area of financial engineering with models like the Black-Scholes option pricing model and its variants. These products, based as they are on the core no-arbitrage idea of modern financial theory, have been quite successful for relative pricing. (Though denigrated in the recent financial crisis, the experience leads to improvement rather than dismissal.) But it is fair to say that finance has not had much of an impact on practical equity investing: While the Black-Scholes model yields a stock option price as a relative (no-arbitrage) price to the stock price, finance has little to contribute towards the practical pricing of the stock itself apart from the insight that the (efficient) price must bear a no-arbitrage relationship to expected future cash flows. That is not to denigrate the remarkable insights in asset pricing, but that largely deals with risk and discount rate rather than the price and, indeed, a practical measure of the discount rate has eluded us.

What is missing in finance is the analysis of how to pull the information together to establish the efficient price, even though it is recognized that an efficient price is a no-arbitrage price with respect to "available information." Accounting is a system for pulling information together in a structured way—through articulating income statements and balance sheets, tracking stocks and flows much like any engineering (or indeed economic system)—and so has something to offer. The paper has shown that one gets insights about the numerator in a

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valuation by working within an accounting structure. However, the paper has also shows that one may get insights into the denominator of a valuation, the discount rate, by also working within an accounting structure. Earnings and book values, the bottom-line numbers of the income statement and balance sheet, are involved in the numerator, but they are also involved in the denominator. That makes sense: Under accounting-based valuation, it is earnings (in the numerator) that are at risk, so risk is evaluated via the accounting for earnings, And, where earnings are involved, so are book values because income statements and balance sheets articulate.

That being said, accounting research into the denominator is rudimentary but does hold out the prospect of an accounting-based asset pricing model flowing from the characteristic regressions specified in this paper. It that were to evolve, accounting and finance would very much be on the same platform. The cohesive view would be that of an investor "buying earnings" and earnings growth rather than cash flows, with his or her understanding that risk means that actual earnings and earnings growth may differ from expectation. The perspective fits with the common view that earnings drive stock prices: Stock prices move when earnings are different from expectation.

References

Ang, A., and J. Liu. 2001. A general affine earnings valuation model. *Review of Accounting Studies* 6, 397-425.

Chen, L., R. Novy-Marx, and L. Zhang. 2010. An alternative three-factor model. Unpublished paper, Washington University in St. Louis, University of Chicago, and University of Michigan.

Christensen, P., and G. Feltham. 2009. Equity valuation. *Foundations and Trends in Accounting* 4, 1-112.

Courteau, L., J. Kao, and G. Richardson. 2001. Equity valuation employing the ideal versus ad hoc terminal value expressions. *Contemporary Accounting Research* 18, 625-661.

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

Fama, E., and K. French. 1992. The cross-section of expected stock returns. *Journal of Finance* 47 (June), 427-465.

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

Feltham, G., and J. Ohlson. 1995. Valuation and clean surplus accounting for operating and financial activities. *Contemporary Accounting Research* 12, 689-731.

Feltham, G., and J. Ohlson. 1999. Residual income valuation with risk and stochastic interest rates. *The Accounting Review* 74 (April), 165-183.

Francis, J., P. Olsson, and D. Oswald. 2000. Comparing the accuracy and explainability of dividend, free cash flow, and abnormal earnings equity valuation estimates. *Journal of Accounting Research* 38, 45-70.

Miller, M., and F. Modigilani. 1961. Dividend policy, growth and the valuation of shares. *Journal of Business* 34 (October), 411-433.

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

Ohlson, J. (1995). Earnings, book values, and dividends in equity valuation. *Contemporary Accounting Research*, 12 (Spring), 661-687.

Ohlson, J., and B. Juettner-Nauroth. 2005. Expected EPS and EPS growth as determinants of value. *Review of Accounting Studies* 10, 349-365.

Penman, S. 2010. *Financial Statement Analysis and Security Valuation*, 4th ed. New York: The McGraw-Hill Companies.

Penman, S. 2011. *Accounting for Value*. New York: Columbia University Press.

Penman, S. 1997. A synthesis of equity valuation techniques and the terminal value calculation for the dividend discount model. *Review of Accounting Studies* 2 (December), 303-23.

Penman, S., and F. Reggiani. 2010. Returns to buying earnings and book value: Accounting for growth and risk. Unpublished paper, Columbia University and Bocconi University.

Penman, S., and T. Sougiannis. 1997. The dividend displacement property and the substitution of anticipated earnings for dividends in equity valuation. *The Accounting Review* 72 (January), 1-21.

Penman, S., and T. Sougiannis. 1998. A comparison of dividend, cash flow, and earnings approaches to equity valuation. *Contemporary Accounting Research* 15 (Fall), 343-383.

Rubinstein, M. 1976. The valuation of uncertain income streams and the pricing of options. *The Bell Journal of Economics* 7 (Autumn), 407-425.