Financial Forecasting, Risk, and Valuation: Accounting for the Future

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In the spirit of the cross-disciplinary theme of this conference, this paper attempts to synthesize financial forecasting, risk determination, and accounting in the context of asset valuation. Forecasting is often seen as the province of the econometrician. The paper makes the point that forecasting and accounting are so much linked that one can say that forecasting is really a matter of accounting for the future. Risk analysis (for valuation) has been the province of "asset pricing" in finance. The paper argues that accounting also bears on risk determination, introducing the idea that the asset pricing also involves accounting for the future. Accordingly, accounting is very much the focus in valuation. Indeed, the paper opens up the possibility that all aspects of valuation can be carried out within an accounting framework.

Forecasting and risk determination are very much at the heart of practical valuation. Asset value bears on future, uncertain payoffs, so valuation requires forecasting under uncertainty, with both the forecast and the uncertainty priced. For a one period payoff (for example), the valuation task is expressed as $V_t = E(X_{t+1})/(1+r)$ where X_{t+1} is a forecast of consumption, typically expressed as cash that can purchase consumption, and r is the discount for uncertainty (as well as a charge for the price of delayed consumption). Forecasting bears of the determination of the expected payoff, asset pricing on the determination of the discount rate. Can both be seen as a matter of accounting?

Forecasting and Accounting

The statistical approach to forecasting sees forecasted numbers as drawings from a conditional distribution, with the mean given by transitional parameters applied to current observables, and the risk (error) in the forecast given by distribution of unpredictable realizations around this mean. Observables are seen as being generated by an assumed "process" (an ARIMA process, for example). A purely statistical exercise simply estimates the parameters of the process from behavior in the data. But observables are

often generated by nature, with the process governed by laws of nature, albeit often not deterministically. So those laws are utilized in the forecasting, such that tomorrow's weather is forecasted based on the principles of meteorology, albeit with error.

Accounting is also a "process", but not one generated by nature. Rather accounting is man-made, a matter of design choice. The design consists of a number of structural relations (accounting equations) that articulate the balance sheet, income statement, and cash flow statement and a set of accounting principles – so-called recognition and measurement principles – that prescribe the numbers that go into those statements. The process has three features that link accounting to forecasting and valuation:

1. Accounting links to cash flows (and thus consumption and valuation) through the basic structural relation that ties the balance sheet and income statement to the cash flow statement:

   Cash flow from an asset = Earnings – Change in the balance sheet value of asset.

   With equity valuation in mind, this "clean-surplus equation" is most often stated for equity, but applies to any asset, including debt (for debt valuation) and the firm, debt plus equity (for enterprise valuation).

2. Accounting principles (that determine earnings and balance-sheet book values) operate to allocate earnings between periods. Periodic earnings and cash flows differ according to timing rules prescribed by the accounting, by the clean-surplus equation, but total earnings from an asset always equals total cash flows (because the change in book value is zero over the life of the asset).

3. Components of financial statements tie to earnings and book values according to fixed, structural relations.

Point 1 implies that, rather than forecasting cash flows for valuation, one can equivalently forecast earnings and book value. Forecasting can be seen as a matter of

accounting for the future. That accounting can be cash accounting (so cash flows are forecasted) or, alternatively, a specified accrual accounting (so earnings and book value are forecasted). The first order in forecasting is to specify what is to be forecasted and that specification is a matter of accounting (for the future). The implied research question, then, is what accounting best facilitates forecasting and the valuation. Cash accounting and IFRS can been compared on their utility for forecasting and valuation, and so can IFRS and U.S. GAAP accounting (for example). Accounting is a matter of design for utilitarian purposes – in this case, valuation – so the researcher (and ultimately the accounting standard setter) asks: What accounting best serves forecasting and valuation? Historical cost accounting? Fair value accounting? A new design?

Point 2 informs that the specification of accounting for the future also specifies the accounting for the present; accounting allocates to periods and, to the point, allocates between the present and the future. Accordingly, accounting principles determine the transition from the present to the future, so forecasting of future accounting numbers from current, observed numbers is also a matter of accounting. Statistical forecasting specifies that evolution with parameters from a process estimated from the data or dictated by nature. Accounting specifies the evolution from the process dictated by the accounting principles employed. Accounting is self-referential, with future numbers specified as the target for forecasting determined in part by the accounting for the current numbers. That self reference directs the forecasting.

Point 3 says that earnings and book value are constructed from other aspects of the financial statements in a deterministic way. There are two implications for forecasting. First, forecasts of earnings and book values (and thus cash flows) can be constructed from more elementary elements; the structure lays out the building blocks of a forecast. So, as a simple example, a forecast of earnings is satisfied by a forecast of revenues and expenses (and their components). Second, structural relations discipline forecasting, and the forecaster cannot wander beyond the bounds imposed by these relations. For example, a forecast of earnings is constrained by accounting relations that require that earnings must not only equal revenues minus expenses but also equal the change in book value (for a given dividend), and the change in book value must equal the change in assets

minus the change in liabilities. Forecasts outside these bounds are inadmissible (speculation).

Formalization

Accounting Feature 1. The standard derivation of the residual earnings valuation formula from the dividend discount formula formalizes Point 1. Given a constant discount rate, *r*, the value of an asset now (at time t) is

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

where $d_{t+\tau}$ is the expected dividend (cash flow) from the asset in period, $t + \tau$. (Here and throughout the paper, variables time-subscripted with $\tau > 0$ are expected values.) This model is also, of course, a statement of the no-arbitrage price if *r* is the required return for risk borne.[1] Substituting the clean-surplus relation, $d_{t+\tau} = Earnings_{t+\tau} - (B_{t+\tau} - B_{t+\tau-1})$ into equation (1) for all $\tau > 0$,

$$P_t = B_t + \sum_{\tau=1}^{\infty} \frac{Earnings_{t+\tau} - rB_{t+\tau-1}}{(1+r)^{\tau}} \tag{2}$$

$Earnings_{t+\tau}$ is earnings on the asset for period $t+\tau$ and $B_{t+\tau-1}$ is the book value of the asset on the balance sheet at the end of the prior period, both specified by a particular set of accounting principles. $Earnings_{t+\tau} - rB_{t+\tau-1}$ is referred to as residual earnings for year $t+\tau$. The model is usually applied to equities but applies to any asset (such as a bond), though for terminal assets (such as a bond) the summation runs only to maturity. [2]

With no accounting restriction other than the clean-surplus relation, the model holds for all accounting methods. Accordingly, application of the model requires further specification of the accounting, and that accounting is an open issue. For example, one might specify a ("mark-to-market") accounting whereby

$$P_t = B_t$$

[1] The model holds as a statement of no-arbitrage only with a constant discount rate. We use this "textbook version" for familiarity and simplicity. Rubinstein (1976) and Breeden and Litzenberger (1978) provide dividend discount models with varying discount rates where the discount for risk appears in the numerator which is then discounted at the risk-free rate. Feltham and Ohlson (1999) and Ang and Liu (2001) lay out residual earnings valuation models with stochastic discounts rates. The commentary here can be adapted to the more general model except that reference to risk premiums would refer to discount for (time-subscripted) covariances in the numerator rather than additions to the risk-free rate.

[2] The residual earnings model has been around a long time. See, for example, Preinreich (1938). The model has been resurrected in recent times by Peasnell (1982), Brief and Lawson (1992), and Ohlson (1995).

(as with a liquid, mark-to-market investment fund where investors trade in and out of the fund at book value, "net asset value"). This accounting forces an expectation of future residual earnings of zero, so the forecasting task is removed: Valuation is satisfied by the accounting for the present. Alternative accounting involves $P_t \neq B_t$ but, for a given P_t, means that expected residual earnings is non-zero for some $t+\tau$. One sees that the accounting determines what is to be forecasted; forecasting is a matter of accounting for the future. Cash accounting and the dividend discount model is just a special case where the balance sheet is empty, it reports no book value. Its unlevered equivalent, the discounted cash flow formula, is just the residual earnings formula stated for an accounting where earnings from operations equals free cash flow and book value equals net debt.[3]

These observations pose the research question: What is the appropriate accounting for forecasting and valuation? The issue does not arise for infinite horizon forecasting, for equation (2) is then equivalent to equation (1) for all accounting for earnings and book value; one is indifferent to the accounting. However, practical forecasting must be done over finite horizons, so the question amounts to one of relative forecasting error for a given forecasting horizon.[4] As with all forecasting, that question might be addressed in terms of assessed error distributions and the standard statistical metrics for evaluating those distributions. But now the accounting also enters in.

For a finite forecasting horizon, T, the dividend discount model (1), is stated (consistent with no-arbitrage) as

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

By substituting earnings and changes in book value for dividends, it follows that (for all accounting for earnings and book value),

[3]Lücke (1955) is the first to show this, I am told.

[4] For terminal investments, cash accounting typically suffices (as it does in bond valuation). Indeed, it is the practical problem of finite horizon forecasting for going-concern (infinite-horizon) assets that accrual accounting potentially plays a role. This point is at the crux of the discussion in Penman and Sougiannis (1998), Lundholm and O'Keefe (2001a), Penman (2001) and Lundholm and O'Keefe (2001b) on valuation errors from alternative models. See also Francis, Olsson, and Oswald (2000) and Corteau, Kao, and Richardson (2001).

$$P_t = B_t + \sum_{\tau=1}^{T} \frac{Earnings_{t+\tau} - rB_{t+\tau-1}}{(1+r)^{\tau}} + \frac{P_{t+T} - B_{t+T}}{(1+r)^{T}} \quad (2b)$$

The last term is the amount of value omitted from the balance sheet at t+T under the specified accounting; that is, $P_{t+T} - B_{t+T}$ is the error in the balance sheet in capturing value at the forecast horizon. (It is referred to as the "continuing value" in text books.) Accordingly, a given accounting can be evaluated by the amount of valuation error it produces (in expectation) in the balance sheet for a given forecast horizon. For a particular accounting where $P_t \neq B_t$ but the accounting is expected to add earnings to book value in the future such that $P_{t+T} = B_{t+T}$, the accounting yields zero error for the specified T (and correspondingly, residual earnings after T are expected to be zero). The case of $P_t = B_t$ is a special case, of course, where there is no error at T = 0.[5] The claimed dominance of accrual-accounting valuation over discounted cash flow analysis (cash accounting) for equity valuation in based on the observation that $P_{t+T} - B_{t+T}$ is typically greater under discounted cash flow analysis: Book value under discounted cash flow valuation records only net debt and, as net debt is typically positive (yielding negative book value of equity), $P_{t+T} - B_{t+T}$ is greater than P_{t+T}.

However, in evaluating ex ante error for a particular accounting specification, one must recognize that accounting reports an income statement as well as a balance sheet. Under the no-arbitrage condition, successive prices (cum-dividend) are reconciled such that

$$P_{t+T} = \frac{P_{t+T+1} + d_{t+T+1} - P_{t+T}}{r} \quad (3)$$

Substituting the accounting relation, $d_{t+T+1} = Earnings_{t+T-1} - (B_{t+T+1} - B_{t+T})$,

$$P_{t+T} = \frac{Earnings_{t+T+1} + P_{t+T+1} - B_{t+T+1} - (P_{t+T} - B_{t+T})}{r} \quad (4)$$

This substitution recognizes that the stock return in the numerator of equation (3) is always equal to earnings plus the change in the premium over book value in the balance sheet for the earnings period. If that change in premium – the error in the balance sheet – is zero, then

[5] One might also add that an accounting system dominates when $P_{t+T} = B_{t+T}$ is satisfied for a smaller T.

$$P_{t+T} = \frac{Earnings_{t+T+1}}{r}$$

Accordingly, even though accounting principles produce error in the balance sheet, that is not important if balance sheet errors cancel: P_{t+T} is recovered by capitalizing earnings, and a valuation can be implement by applying the finite-horizon dividend discount model in (1a) with P_{t+T} as a terminal value. Penman (1998) elaborates.[6]

The idea that error in the balance sheet is unimportant to earnings measurement when that error is a constant was once (in textbooks of old) called the canceling error theorem.[7] It is demonstrated in instruction to first-year accounting students: R&D expense and earnings are the same whether one capitalizes and amortizes R&D expenditures or expenses them immediately provided there is no growth that would affect book value. In a valuation context it implies that one is indifferent between two accounting systems that have very different errors in the balance sheet (R&D capitalization versus expensing, for example) if those errors cancel. Even though discounted cash flow analysis has much value missing from the balance sheet (such that typically $P_{t+T} - B_{t+T} > P_{t+T}$), it survives without error if one expects the premium of price over net debt to be constant. This point is the crux of the matter.

Empirical work in Penman and Sougiannis (1998) and Francis, Olsson, and Oswald (2000), compares valuation errors of accrual-based valuation models and cash flow models against observed prices, and broadly affirms that accrual models (based on U.S. GAAP) produce lower valuation error. Consistent with the above, they show, however, that the error with accrual accounting is higher when the premium over book value is higher and when changes (growth) in the premium are expected.

However, little accounting theory has been advanced for evaluating different accounting systems for forecasting and valuation. The field is wide open. But it is an important one. Indeed it is at the heart of accounting design and forecasting for valuation. With an eye on the error criterion, one might suggest that the best accounting would be fair value accounting that sets $P_t = B_t$: a perfect balance sheet with T = 0 that the removes

[6] Penman (1998) generalizes further with an accounting feature, g, that results in a constant error in earnings such that $P_{t+T+1} - B_{t+T+1} = g\,(P_{t+T} - B_{t+T})$. Feltham and Ohlson (1995) shows that conservative accounting induces this feature.

[7] Easton, Harris, and Ohlson (1992) first invoked the idea in a valuation setting. Ohlson (2005) elaborates.

the need for forecasting. Essentially, accountants do all the forecasting for the investor and analysts disappear. The movement amongst standard setters for fair value accounting and an asset-liability approach (rather than an income statement approach) seems to be inspired by the idea of developing a better balance sheet. So are the prescriptions of those who argue that more "intangible" assets should be recorded on the balance sheet. However, while this accounting may appear to reduce balance sheet error, the question is ultimately that of average ex post valuation error using both income statements and balance sheets. Indeed fluffy asset values from Level-3 fair value guesstimates may produce large errors in term of investment outcomes, for imprecise estimates in the balance sheet are compounded in the income statement.[8] The idea that "better" balance sheet accounting produces a better accounting for valuation is misdirected: It ignores the canceling error notion. Historical cost accounting leaves value off the balance sheet, but focuses on earnings which, we have seen, has an important role reducing the error from an accounting system.[9] So, there is no problem with omitted intangible assets, for example, if earnings from the assets are flowing through the income statement. For the case where $P_t \neq B_t$

$$P_t = \frac{Earnings_{t+1}}{r}$$

if $P_{t+1} - B_{t+1} = P_t - B_t$. The Coca-Cola Company has an important brand asset missing from the balance sheet (giving it a price-to-book ratio of about 6), but is easy to value from its earnings on that brand.[10]

These points aside, clearly much research needs to be done. The main point here is that forecasting must entertain accounting but the evaluation of appropriate accounting (for valuation) must also entertain its use in forecasting. Accordingly, accounting prescriptions might move away from pure accounting concepts (such as "measurement attributes" and definitions of assets and liabilities that absorb much of the current FASB

[8] This follows because earnings is affected by error in both the opening and closing balance sheet.

[9] Ohlson and Zhang (1998) compare income-statement and balance-sheet accounting. CEASA's White Paper No. 2 compares fair value accounting and historical cost accounting for valuation. See Nissim and Penman (2007).

[10] See Penman (2007, p. 524) for an example.

and IASB deliberation documents) to the utilitarian focus on forecasting. Vague accounting concepts such as "reliability" might then take on some bite with a focus on average ex post valuation error. Standard metrics for efficient forecasting might be exploited for the task. Fair value accounting and historical costs accounting might be evaluated with the question: How does the accounting help or frustrate the practical task of forecasting and valuation? The perspective is, of course, endorsed by the broad aims of accounting, stated in the FASB and IASB conceptual framework documents, of providing information about future cash flows.

Accounting Feature 2. With the accounting in valuation model (2) left unspecified, it is clear that the division of value between current book value and expected future earnings is also a matter of accounting: The difference between price and book value is just the amount of value that the accounting has not yet booked to book value, and that amount will differ for different accounting specifications. Book value is the accumulation of past earnings and net dividends (by the clean-surplus relation), so the accounting determines the transition from book values and past earnings and dividends to future earnings.

As a statistical model, forecasting might be represented as applying transitional parameters to current and past accounting numbers. For example, with a linear specification,

$$Earn_{t+1} = \beta_1 Earn_t + \beta_2 B_t + \beta_3 d_t + \varepsilon_{t+1} \quad (5)$$

(with e_{t+1} mean zero). The parameters are often estimated from the data. Early research (that conditioned earnings forecasts on past earnings alone) took that approach. Lintner and Glauber (1967) Ball and Watts (1972) estimated a martingale, with drift, for the earnings process and subsequent papers applied Box-Jenkins techniques, popular at the time, to earnings time series. But the process is generated by the accounting and this process should direct the forecasting. This is easily seen in the case where mark-to-market accounting for book value yields $P_t = B_t$. In this case, $\beta_1 = 0$, $\beta_2 = r$, and $\beta_3 = 0$, by construction of the accounting that yields a forecast of residual earnings for t+1 equal to zero. A martingale process in earnings (that sets $\beta_1 = 1+r$, $\beta_2 = 0$, and $\beta_3 = -r$, thus accommodating a drift term for retention) implies a valuation model where book value is

irrelevant: $P_t = \frac{(1+r)Earnings_t}{r} - d_t$, that is, the cum-dividend trailing P/E ratio = $(1+r)/r$.

More generally, the parameters in forecasting equation (5) embed accounting principles, along with the required return such. This point is made vividly in Ohlson (1995) which specifies linear dynamics dictated by the accounting, such that the earnings forecast is a weighted average of the book value forecast and the "martingale" earnings forecast above, with the weights determined by the accounting for earnings and book value. Accordingly, in the general case, the β coefficients in equation (5) involve both the required return and accounting process features.

By depicting forecasting as a process that applies parameters dictated by the accounting, we make the point of linking forecasting to accounting. However, it is unlikely that accounting numbers are generated by a stationary process. For this reason, practical forecasting usually forecasts by modeling pro forma future financial statements with interperiod relations changing period-to-period as indicated by both an analysis of the business and an analysis of the (quality of) accounting. (This is not to exclude parametric approaches to forecasting, however.) Point 3 talks to the issue of building earnings forecasts from pro forma financial statements.

Accounting Feature 3. The point that the accounting structure should be incorporated in forecasting is straightforward. Earnings and book values build, in the accounts, from more elementary numbers, and the forecaster knows that one cannot be worse off by expanding the information set (particularly when the elements tie to features of the business). The breakdown of earnings and book value in the forecasting equation (5) into components recognizes that, to constrain the β coefficients to be the same for all components losses information: Different components of earnings have different "persistence."

While the point may be obvious, it was not always so. As mentioned, researchers once carried out earnings forecasting by estimating univariate time-series models for earnings. That research concluded that it is quite difficult to develop a statistical model that "beats" a simple martingale with drift. Freeman, Ohlson, and Penman (1982) showed that, with the addition of just one predictor – book value – one could readily do so. The issue is not one of statistics, nor solely of expanding the information set, but an issue of expanding

the information set in a way that that is consistent with the structure of the accounting: Earnings and book value "articulate" as a matter of accounting and articulate to indicate future earnings and value. Exploiting this structure for both forecasting and valuation is the focus of modern financial statement analysis.[11]

Less appreciated is the point that accounting relations constrain a forecast and thus discipline speculation. In honoring the structure, a forecaster cannot go beyond an earnings number that is justified by articulated balance sheets and cash flow statements. A forecast of cash flow is disciplined by forecasted balances sheets and income statements. Disciplining speculation (in a "bubble" period, for example) must be seen as a desirable attribute.

Risk and Accounting

The observant reader will have noticed that, while the required return, *r*, appears in the valuation models, it has been swept under the rug in the discussion. When it comes to forecasting, the required return (discount rate) cannot be ignored, for the forecasting parameters in equation (5) embed not only the accounting but also the discount rate (as the special cases discussed there demonstrate). In short, one can not get very far in valuation without the specification of the discount rate, or more specifically, the risk premium required over the risk-free rate.

Practical valuation looks to asset pricing in finance to supply the risk premium. Risk in valuation is summarized by the moments of the error distribution in the forecast, and asset pricing develops models that price this distribution. Asset pricing models are based on assumptions on the form of the distribution or utility functions (as with the Capital Asset Pricing Model), or assumptions of no arbitrage (an in no-arbitrage asset pricing models). Or models are developed simply from observed correlations between attributes and returns and between assets returns and conjectured common factor-mimicking portfolios. The Fama and French three-factor model that includes factors related to size and book-to-market (as well as the market return) appears to be the premier model of this

[11] Many of the papers that incorporate accounting line items in forecasting and valuation are referenced in Penman and Zhang (2006) (which itself explicitly exploits the accounting structure to forecast earnings and to price earnings).

type. All models recognize the diversification property: Risks across assets are less than perfectly correlated so is reduced by diversification (without cost in a frictionless market); the investor is exposed only to common factors that cannot be diversified away, so covariances must be taken into account.

However, application of these models brings one to a screeching halt. Despite the important theoretical insights, asset pricing has been remarkably unsuccessful; after 50 years of endeavor, we have little faith in estimating the risk premium for a given asset.[12] From an accounting-based valuation perspective, the attribution of the risk premium to book-to-price (by Fama and French) is especially confusing given that valuation model (2) sees book-to-price as an outcome of a valuation rather than an input to determine the discount rate for that valuation.

Might accounting provide some insight and remedy? There have been some attempts. Beaver, Kettler, and Scholes (1970) estimated "accounting betas" and Rosenberg (1975) estimated "fundamental betas" based on accounting risk measures that became the initial product for the Barra firm. The Beaver, Kettler, and Scholes idea of an accounting beta is appealing. No-arbitrage asset pricing models see the risk in expected dividends in model (1) as coming from the covariance of dividends with a kernel in the economy (market-wide dividends in the CAPM, for example).[13] Applying the same idea to accounting-based valuation in (2), covariance of a firm's earnings with economy-wide earnings seemingly substitutes. Feltham and Ohlson (1999) make the substitution and (Christensen and Feltham (2009) explore the idea further.

However, an important element is missing: Accounting. Earnings and its covariance with market-wide earnings depend on how the accounting for earnings is done. A covariance between mark-to-market earnings and economy-wide mark-to-market earnings may be different from that for historical cost accounting (or the "mixed accounting model" of GAAP and IFRS). There are two cases where the accounting might work. First, if mark-to-market accounting were employed for all assets (such that $P_t = B_t$),

[12] A few years ago, I made a casual survey of textbooks and research papers for the size of the market risk premium they were estimating or suggesting that students use in application of the CAPM. The numbers ranged from 3 percent to 9.2 percent. This is a large range, with the error in any estimate multiplicatively magnified by errors in estimated betas applied to determine the required return.

[13] The reference is to the numerator covariance in the no-arbitrage valuation models discussed in footnote 1.

then and earnings equal returns. The accounting records shocks to value immediately, so is revealing of the risk to value. Second, the same applies for the (constant-balance-sheet-error) accounting where $P_t \neq B_t$ but there is no expected change in the premium over book value. Here, again, earnings equal returns, as the comparison of equations (3) and (4) indicate. Presumably neither form of accounting is practical for all assets in the economy. Historical cost accounting, as practiced, typically tends to smooth earnings (shocks) over time. Indeed, there is a tension in the structure of accounting between risk revelation and earnings forecasting. Mark-to-market accounting records shocks immediately, but earnings cannot forecast future earnings ($\beta_1 = 0$ in the forecasting equation (5)). Historical cost accounting, with its emphasis of the income statement, produces earnings that are indicative of future earnings ($\beta_1 \neq 0$). But to produce this predictability, historical cost accounting not only jeopardizes the risk-revealing property of mark-to-market accounting, but smoothes earnings overtime. Predictability is enhanced, but presumably the ability of earnings to report shocks to value is reduced.

Is there any feature of historical cost accounting that might be risk revealing? The answer is yes. What follows is conjectural, though it is backed up with some empirical evidence. A fourth accounting feature links accounting to risk:

4. Accounting defers earnings recognition under uncertainty.

The accounting principles that allocate earnings to periods embed a risk assessment with the effect that, when earnings are uncertain, they are deferred to the future. In accounting parlance, earnings are "unrealized" until certain "realization" criteria -- typically a confirmed sale in the market -- are met. Those criteria have to do with the resolution of uncertainty. Typically, "receipt of cash must be reasonably certain" and cash (or assets close to cash, like accounts receivable recognized at the same time as revenue) are low-beta assets. Deferred earnings produce growth, because interperiod allocation implies that more future earnings mean lower current earnings and thus higher future earnings relative to current earnings. Accordingly, accounting under uncertainty creates growth such that growth is an indication of risk.

Deferring income to the future rather than booking it to earnings and book value in the present is referred to as conservative accounting (and the name is warranted if the accounting is in response to risk). In applying the deferral principles, IFRS and (particularly) U.S. GAAP accounting are conservative.[14] Models of conservative accounting in Feltham and Ohlson (1995) and Zhang (2000) show how the accounting creates growth.[15] Ceteris paribus (holding real activity constant), conservative accounting reports lower current earnings and higher long-term earnings, but continued application of conservative accounting shifts earnings from the short-term to the long-term. The features are by construction of the accounting.

The idea of earnings deferral aligning with risk is merely suggestive; in a market where only systematic risk is priced, it would have to be that growth created by the accounting bears on outcomes correlated with common factors such as the market portfolio in CAPM pricing. But note that investors typically see growth as risky. "Growth" funds, for example, are deemed to yield higher expected returns than "income" funds and correspondingly are deemed to be higher risk. In valuation practice one usually regards the "terminal value" part of a valuation as relatively uncertain, based as it is on long-term growth prospects. Relative to their forecasts for the short-term, analysts' long-term growth estimates perform poorly against actual realizations, indicating they contain considerable uncertainty. And we know that leverage adds earnings growth but also adds risk.[16] The idea has currency in asset pricing in finance, though the growth referred to there is expected growth in dividends.[17]

Though the idea is conjectural, two papers support it.

First, Ohlson (2008) shows that one can, in principle, design an accounting where earnings growth is fully revealing of risk and the required risk premium. The model is an

[14] For example, (risky) research and development and brand-building expenditures are expensed immediately rather than capitalized in book value and amortized against income in the future. Liabilities tend to be booked while (intangible) assets are omitted from the balance sheet. The practice of "recognizing losses early" while deferring gains (in the application of the lower-of-cost-or-market rule, for example) is a hallmark of conservative accounting. All create growth, ceteris paribus.

[15] The accounting effects are demonstrated with examples in Penman (2007, Chapter 16).

[16] For a demonstration, see Penman (2007, Chapter 13).

[17] See, for example, Menzly, Santos and Veronesi (2004) and Lettau and Ludvigson (2005).

elucidation of the permanent income model where $\beta_1 = 1+r$, $\beta_2 = 0$, and $\beta_3 = -r$ in equation (5), but where the accounting defers earnings such that the growth rate in earnings is equal to the risk premium in r and, correspondingly, that growth rate indicates the covariance of unexpected earnings, ε_{t+1} in equation (5) with the economy-wide common return. The model predicts that price-to-book indicates expected returns (positively) rather than book-to-price as in the Fama and French correlations. As growth and the risk premium cancel in the accounting model, valuation cannot admit growth the adds to price: the discount rate becomes the risk-free rate. The model has significant appeal at the aggregate level. In the Fed Model for valuing equities, earnings yields on stocks are compared to than on long-term government bonds with the implicit assumption that growth in an earning/price ratio for a stock is offset by the risk premium for stocks over bonds (so the earnings yield equals the risk-free rate).At the aggregate level, that model arguably works well for evaluating overpriced and underpriced stock markets.

The second paper, Penman and Reggiani (2008) is an empirical paper that confronts the idea that book-to-price (B/P) indicates risk. The paper makes the point that B/P, with book value in the numerator, is an accounting phenomenon, so if B/P is to indicate risk, it must be due to the accounting. The point of departure is again the case of $P_t = B_t$. A risk-free money market fund has the same B/P as a risky hedge fund because of mark-to-market accounting, so B/P in that case cannot differentiate risk. If B/P $\neq$ 1 is to indicate risk, it must be by construction of the accounting that departs from mark-to-market accounting. That accounting necessarily involves deferral of earnings, and deferral creates growth.

The residual earnings valuation model again provides the starting point for relating B/P to growth and risk. Stating the model in its constant growth form,

$$P_t = B_t + \frac{Earnings_{t+1} - rB_t}{r - g} \tag{6}$$

where g represents expected residual earnings after date t+1 expressed as a growth rate applied to expected t+1 residual earnings. Here value is divided into three components, current book value, B_t, value added from forward earnings, $Earnings_{t+1}$, and value from "long-term growth", g. Setting $g = 0$ in equation (6),

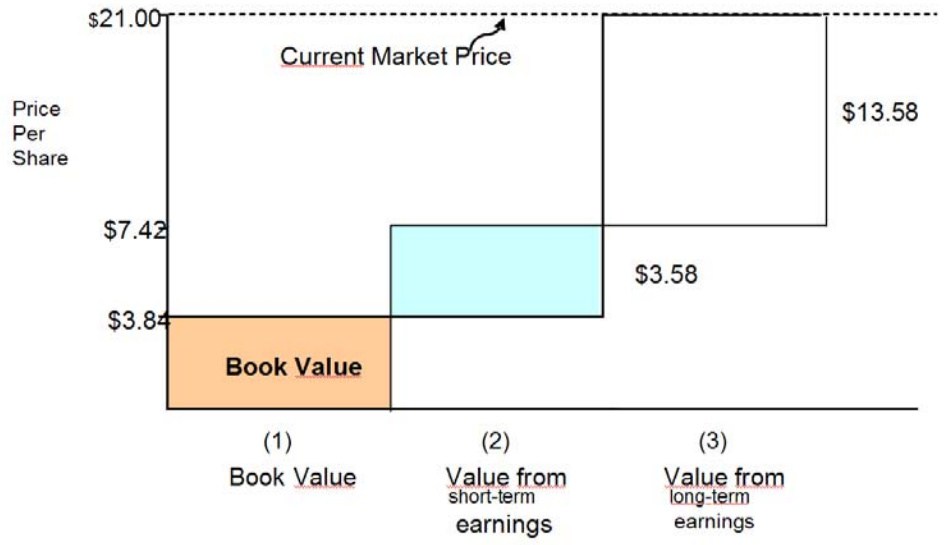
$$P_t = B_t + \frac{Earnings_{t+1} - rB_t}{r} \tag{7}$$

But book value cancels here, such that

$$P_t = \frac{Earnings_{t+1}}{r} \tag{8}$$

Thus, with no expected long-term growth expected, price equals capitalized earnings, and the forward earnings yield indicates the required return: $Earnings_{t+1}/P_t = r$. Further, as model (7) holds for all B/P, book-to-price cannot add further to the evaluation of r. Accordingly, if B/P is to add to the assessment of r, it must be because it indicates growth that is risky.

To clarify the picture, the figure below breaks the $21 price of a Cisco Systems share into three components, book value per share ($3.84), value expected to be added by short-term forward earnings ($3.58), and the remaining part of the price attributable to long-term growth ($13.58).



Components of the share price for Cisco Systems, Inc. in 2004

The short-term component is from analysts' forward earnings forecast of $0.89, converted to residual earnings (with a required return of 12%) and capitalized as a perpetuity without growth at the 12% rate. The sum of the first two components of $7.42 is thus given by equation (7). But note that this value is also given by capitalized forward earnings, according to equation (8): $0.89/0.12 = $7.42 (and earnings/price = $0.89/$7.42 = 12%, the required return).

With this picture, the tests in Penman and Reggiani (2008) introduce book-to-price. Conditioning on earnings/price (that indicates *r* without growth), the paper ask whether B/P further explains stock returns. Referring to the figure above, one can see that, for given earnings and price, a *lower* book-value means higher value from the growth component relative to the value to be added to book value in the short-term. A higher the long-term component relative to the short-term component amounts to long-term growth over the short term and, if growth is risky, that growth, indicated by B/P would yield higher returns.

The table below summarizes the results from data using all U.S. listed stocks from 1963-2006.

		E/P Portfolio				
		1	2	3	4	5
	1	4.3%	10.9%	14.2%	17.1%	19.7%
B/P	2	8.8	9.1	13.0	16.0	22.1
Port-	3	14.4	8.5	12.1	17.0	21.6
folio	4	15.5	13.4	14.7	18.0	24.3
	5	26.4	20.1	20.2	22.6	30.0

To prepare this table, firms were ranked on their earnings/price (E/P) ratios each year and grouped into the five portfolios indicated. Then, within each E/P portfolio, firms were grouped into five B/P portfolios. Returns are then observed over the following 12 months. The table reports the average annual returns for each portfolio from replicating

these positions in each of the 44 years. Although significance tests have not been reported here, it is clear that E/P ranks returns (across rows) as equation (7) suggests. However, earnings are added in the long-term as well as the short term. The table also reports that, for a given E/P, the higher the long-term component of the price relative to the short-term, as indicated by the B/P ratio (down columns), the higher the average return.

One can always attribute the result to market inefficiency, of course, but a "rational" interpretation can also be put on the table. The result for E/P suggests that short-term earnings are at risk and the market prices them as such: more expected earnings (relative to price) mean higher risk, consistent with the risk-return tradeoff. This is not difficult to swallow. Investors surely see earnings at risk and casual evidence, let along much research, suggests that when firms' actual earnings differ from expectation, stock prices are shocked. The results for B/P further suggests that additional long-term earnings are also at risk, consistent with the notion that growth is risky but also consistent with the idea that accounting defers earnings to the future under uncertainty.[18]

The results also explain the Fama and French B/P effect in stock returns and in a way that reconciles B/P as a risk attribute to accounting-based valuation. B/P is correlated with E/P – the average rank correlation is 0.31 – so part of the B/P effect is due to short-term earnings risk. But B/P also indicates growth at risk. Note, however, that the growth is quite different from the growth typically attributed to B/P, where a low B/P (rather than a high B/P) is deemed to be "growth" (as opposed to "value").

Synthesis

The discussion has provided a synthesis of forecasting and accounting. Financial forecasting for valuation involves accounting for the future, for accounting both specifies what is to be forecasted and how the forecaster transitions from the present to the future. The point opens up a number of research questions, most importantly the issue of what is the appropriate accounting for the future.

The discussion on accounting, risk, and asset pricing is more conjectural. The reader is asked to consider that accounting for the future that involves earnings deferral has

[18] The E/P and B/P stock screen has long been trolled by value-growth investors. The interpretation here suggests that this trading strategy comes with risk.

something to do with risk. (Accountants have no problem with the idea.) It opens the question as to whether asset pricing models might be developed from the idea that earnings and earnings growth are at risk. This is not an unreasonable suggestion, for investors "buy earnings", and typically see that earnings are at risk. The discussion here has added some provocative accounting reasons to adopt this perspective.

Moreover, the perspective is supported by empirical research, reported here, that provides an accounting rationale for the book-to-price effect in stock returns which has so mystified researchers in asset pricing. Asset pricing models have been developed based on the empirical regularity of the book-to-price effect. Without an explanation of the effect, these models are ad hoc. The explanation provided in Penman and Reggiani (2008) raises the question of whether a pricing model can be developed from the notion that earnings and earnings growth are at risk, but in a way that is consistent with the theory of no-arbitrage asset pricing. If so, both aspects of valuation – forecasting and the discount for risk – will be seen as a matter of accounting for the future.

Bringing together the ideas above, one appreciates that forecasting is a matter of accounting and that accounting has the potential to be revealing about risk. All depends on the accounting principles. As accounting is by design, it can be rubbish. For a given accounting process, how does the forecasting and risk revelation help in valuation? Deficiencies call for redesign, as standard setters well appreciate. It is often said that accounting principles should represent the economics of the business. From a valuation point if view, that means that accounting might represent the risk and return to the business that facilitates valuation.

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