Discussion of

Accounting Data and Value: The Basic Results

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1. **Introduction**

As the title suggests, Ohlson [2008] presents the basic results from at least two decades of Jim Ohlson's highly influential work. This work is the essential foundation for both theoretical and empirical studies of the valuation relations among the balance sheet (principally book value), the income statement (principally earnings), dividends, and firm/stock value. The paper outlines eight basic results that are (and most likely will be) at the core of any accounting-based-valuation study.

Ohlson [2008] focuses on the essential ingredients of the basic results underscoring the necessary and sufficient conditions and the regularity conditions underpinning them: the paper does not provide proofs. The reader is encouraged to attempt these proofs (in my view, this is an essential step to ensuring complete understanding of the basic results) and to refer to earlier papers for further details and to check these proofs. The paper is a pedagogical thesis, which, in my view, should be used in the very early stages of the study of Ohlson's work. This work has evolved over time to its current state, where the central role of earnings (and the income statement) has become particularly evident. Ohlson [2008] emphasizes and clarifies this role. I will also emphasize this role in this discussion.

I have written this discussion for a target reader who is a Ph.D. student embarking on a study of Jim Ohlson's work. I will step back even further than Ohlson [2008]; rather than providing all of the essential ingredients that underpin the basic results, I will focus on the conceptual notion at the core of each of these results. My aim is to provide a sense of the intuition that supports the central concepts that are the back-bone of the basic results. I hope that this will form a useful starting point for reading and fully understanding Ohlson's work.

I recommend that after reading this discussion, the student should read Ohlson [2008] patiently and carefully; perhaps several times. I hasten to add that students at a later stage in their career might comfortably move straight to Ohlson [2008] without the need to read this discussion. In any event, the aim of this discussion, and the effect of Ohlson [2008] is to provide a primer for the scholar who is interested in fully understanding, penetrating and, perhaps, extending Jim Ohlson's extensive work. In addition to this understanding, the scholar of Ohlson's work will have a sound intuitive understanding of the way empirical studies of the relation between accounting data and security price/returns should be structured. I do not mean to suggest that the empiricist should look to Ohlson's work for empirically testable hypothesis; rather his work should always be borne in mind when the empiricist analyzes any relation between accounting data and stock prices/returns.

Each of the eight basic results is based on a core concept. I will discuss, illustrate, and elaborate on each of the concepts. Some of these concepts will be illustrated via an example.

2. The Basic Building Blocks

2.1 The Savings Account

The savings account sets the stage for an understanding of the relations among current prices, current earnings and dividends and, future earnings and dividends.

In a certainty setting (referred to as the “savings account”) earnings evolve over time according to the dynamic shown in Figure 1, where p_t is the amount deposited in the savings account, x_t is earnings (the dollar amount of the interest on the savings account deposit) for period t, r is the rate of interest on the savings account deposit, and d_t is the dividend paid to the owner of the savings account (the amount that the depositor chooses to withdraw) at time t.

Notice that if *none* of the interest from period t is retained (re-invested) in the savings account (that is, $d_t = x_t$), the earnings (that is, the dollar amount of interest) in period $t+1$ (that is, x_{t+1}), will be the same as the dollar amount of interest in period t (that is, x_t). But if only a portion of the earnings of period t are withdrawn (that is, $d_t < x_t$), earnings in period $t+1$ will be higher because the depositor will also receive interest (at interest rate r) on these retained earnings.

2.1.1 The Earnings Dynamics

As an example to illustrate this concept, consider the savings account that earns interest of \$4.16 in 2006, \$1.23 of which is withdrawn. Retention of interest will lead to an additional savings account investment of \$2.93. If this savings account earns interest of \$4.39 in 2007 and the interest rate is the same for both 2006 and 2007, the interest rate on this account must have been 7.9%. That is, the earnings for 2007 are comprised of \$4.16 from the initial savings account investment and \$0.23 from retention of some of the 2006 interest income in the savings account.

That is, \$4.39 = \$4.16 + r (\$4.16 - \$1.23)

r = 7.9%

or, in Ohlson [2008] notation: $x_{t+1} = x_t + r\,(x_t - d_t)$

2.1.2 The Relation between Price and Earnings

Notice that the amount invested in the savings account at the beginning of 2007 (end of 2006) is equal to capitalized 2007 earnings (regardless of the expected withdrawal (dividend) at the end of 2007), that is $\$55.60 = \frac{\$4.39}{7.9\%}$ (that is, $p_t = \frac{x_{t+1}}{r}$ in Ohlson [2008] notation) and the earnings capitalization construct is $\frac{1}{r}$.[1] Also note that the cum-dividend value at this time (that is, the amount invested in the savings account plus the amount withdrawn (\$1.23)) is $\$55.60 + \$1.23 = \frac{1+7.9\%}{7.9\%}\$4.16$ (that is, $p_t + d_t = \frac{1+r}{r}x_t$ in Ohlson [2008] notation) and the earnings capitalization construct (that is, the mapping from earnings to cum-dividend value) is $\frac{1+r}{r}$.

The example and the algebra in Figure 1 lay out the three equivalent ways of characterizing earnings in the certainty setting: (1) the earnings dynamics, (2) the relation between price and next period earnings, and (3) the relation between price and earnings of the current period. Using these characterizations as a foundation, Ohlson [2008] introduces uncertainty; bear in mind that the certainty setting must always hold as a special case.

2.2 Permanent Earnings and the Introduction of Uncertainty

The concept of permanent earnings provides the vehicle for the introduction of uncertainty into valuation. Figure 2 shows how both permanent earnings and dividends evolve over time. These are the simplest forms for the time-series evolution of earnings

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[1] When checking these calculations, allow for rounding error. In this calculation, for example, 2007 expected earnings are \$4.3915.

and dividends inasmuch as earnings and dividends for period t+1, that is, ($\tilde{x}_{t+1}$ and $\tilde{d}_{t+1}$) are a function only of earnings and dividends in period t (x_t and d_t) plus random disturbance terms ($\tilde{\varepsilon}_{1t+1}$ and $\tilde{\varepsilon}_{2t+1}$).

2.2.1 Permanent Earnings Dynamics and Uncertainty in Valuation

Notice that period t+1 earnings has two components: (1) the (permanent) earnings part that was known in the certainty (savings account) setting (that is, $x_t + r[x_t - d_t]$), and (2) a random disturbance term $\tilde{\varepsilon}_{1t+1}$, which introduces uncertainty into the valuation.

In the savings account example, we saw that the interest rate was 7.9%. Now, in the uncertainty setting, for the sake of illustration, we will retain this rate as the expected rate of return and expected (that is, permanent) earnings for 2007 is still \$4.39. Realized earnings may be higher or lower and dividends may or may not be paid in 2007. A surprise of \$0.05 in 2007 earnings would raise earnings to \$4.44 but, of course, this will not affect the valuation as at the beginning of 2007. The valuation will not be affected by the unexpected portion of 2007 earnings or 2007 dividend payments; the value is \$55.60, which is equal to $\frac{\$4.39}{7.9\%}$. In other words, permanent earnings (\$4.39) "explain" *value*.

2.2.2 Dividend Dynamics and the Irrelevance of Dividends in Valuation

The key point to notice with respect to the dividend dynamics is that the dividend policy parameters: θ_1, which maps from current earnings to future dividends, and θ_2, which maps current dividends into future dividends, do not affect the valuation relation between price and earnings (that is, $p_t + d_t = \frac{1+r}{r} x_t$). In other words, dividend policy is irrelevant to valuation and earnings explain value; notice that, if dividends are moved to the left-hand-side of this valuation relation (as I have done here) we see that earnings explains the value that is distributed to shareholders at date t (d_t) and the present value of expected future dividends (p_t).

2.3 Economic Earnings

Economic earnings are equal to price change plus dividends. Economic earnings require that price is equal to book value. Figure 3 captures the essential ingredients of economic earnings; (1) economic earnings explain *change in value*, and (2) if "earnings" are economic earnings, book value is all we need to know to value the stock.

Returning to the example where 2007 earnings are \$4.44, \$4.39 of which is permanent earnings and \$0.05 of which is a surprise. If 2007 dividends are \$1.41, price at the end of 2007 will be \$58.63 (including a \$0.05 unexpected price increase), and economic earnings are \$4.44 = \$58.63 - \$55.60 + \$1.41. In short, economic earnings include the surprise of \$0.05, permanent earnings do not. Notice that permanent earnings are sufficient for valuation at the beginning of 2007, $\left(\$55.60 = \dfrac{\$4.39}{7.9\%}\right)$, economic earnings are not.

2.4 Goodwill

The concept of economic earnings requires that market value and book value are equal (that is, goodwill is zero); of course, this is rare as a practical matter. On the other hand, if earnings are permanent, the difference between expected price and expected book value (referred to as goodwill) will be the same for all future periods; this may not be rare as a practical matter. That is, if earnings are permanent:

$$\mathrm{E}_t[\tilde{g}_{t+\tau}] = g_t \; all \, \tau \geq 1$$

Developing the numerical example further, suppose that book value at the end of 2006 is \$20.16; that is goodwill is \$55.60 - \$20.16 = \$35.44. Recall that permanent earnings are \$4.39 for 2007 and dividends are expected to be \$1.41. It follows that the expected clean surplus book value at the end of 2007 (assuming the accounting records permanent earnings) is \$23.14 = \$20.16 + \$4.39 - \$1.41 and the expected amount of goodwill at the end of 2007 is, again, \$35.44 = \$58.58 - \$23.14. This example illustrates the "cancelling error" property of permanent earnings, which may loosely be stated as follows: if the error ("improper valuation of assets and liabilities") in two consecutive balance sheets (book values) is the same, we can still rely on the income statement (permanent earnings) for valuation. In other words, value is captured by capitalized permanent earnings, $\left(\$55.60 = \dfrac{\$4.39}{7.9\%}\right)$.

2.5 Growth

Growth is more than growth through the retention of earnings. The dynamics of permanent earnings show that permanent earnings grow through earnings retention and through the surprise in earnings (in the numerical example, permanent earnings for 2007 grow to \$4.39 from permanent earnings in 2006 (\$4.16) due to the retention of \$2.93 of 2006 earnings). The base for growth in the next year will again be due to earnings retention (\$4.39 plus the surprise of \$0.05 minus the dividend of \$1.41). But growth is more than this and it follows that, in the presence of this "superior" growth, expected forward earnings (which will not be equal to permanent earnings) will not be sufficient for valuation; growth beyond earnings retention will also play a central role in valuation. The essential ingredients for the richer concept of growth are shown in Figure 4.

As a pre-cursor to understanding the role of growth, Ohlson [2008] shows that two accounting-based valuation formulae may be derived as alternative representations of the dividend capitalization model (denoted PVED).

2.5.1 Introducing Book Value and Earnings into Valuation

The "zero-sum" series is the essential step for introducing accounting variables (either book value ($y_t = b_t$) or capitalized accounting earnings $y_t = \frac{E_t \tilde{x}_{t+1}}{r}$) into valuation. The algebra shown in Figure 4 begins with the dividend capitalization model [PVED]. Adding equations [PVED] and the "zero-sum" series (1) and collecting terms yields the valuation relation, $p_0 = y_0 + \sum_{t=1}^{\infty} \frac{z_t}{(1+r)^t}$. The variable z_t is residual income if y_t is book value (see Figure 4a) and capitalized abnormal growth in accounting earnings if y_t is capitalized forward accounting earnings (see Figure 4b). Notice that positive z_t may be interpreted as growth from the book value or capitalized forward earnings base.

2.5.2 Introducing Long-Term Growth

Long-term growth is introduced via the parameter γ, which is (one plus) the rate at which z_t grows over time and the valuation relation becomes $p_0 = y_0 + \frac{z_1}{1+r-\gamma} = y_0 + \frac{y_1 + d_1 - (1+r)y_0}{1+r-\gamma} = y_0 * \frac{\left[\frac{y_1 + d_1}{y_0} - \gamma\right]}{1+r-\gamma}$.

2.5.3 Growth in book value

If y_t is book value, z_t is residual income, γ is growth in residual income and the residual income valuation model may be written as $p_0 = b_0 * \frac{\left[\frac{b_1 + d_1}{b_0} - \gamma\right]}{1+r-\gamma}$. This is not the familiar form of the residual income valuation model.[2] This form highlights growth in book value – both short-term and long-term.

The firm in our example is Proctor and Gamble. Proctor and Gamble shares were trading at \$55.60 and the end of 2006 and the book value per share was \$20.16. Bloomberg's estimate of the expected rate of return on P&G was 7.9%. Value Line forecasted earnings for 2007 of \$2.99 and dividends for 2007 of \$1.41. These forecasts imply a forecast of book value at the end of 2007 of \$21.74 = \$20.16 + \$2.99 - \$1.41 (assuming clean surplus). The implied long-term growth in residual income, γ, is 3.96%. The relations between prices, book value, and growth in book value are illustrated in Figure 5.

Notice that the price-to-book ratio of 2.76 is greater than one; that is, the balance sheet is conservative. This conservative accounting is associated with short-term growth in (dividend-adjusted) book value (14.8%) and long-term growth in residual income of 3.96%;[3] the observation that the expected short-term rate of growth in dividend-adjusted book value growth (that is, the expected return on equity) of 14.8% is greater that the expected dividend-adjusted change in market value (7.9%) shows that the 2007 accounting is beginning to "correct' for the conservatism in the 2007 balance sheet. The long-term growth rate in residual income of 3.96% shows that more growth is expected in future accounting earnings to complete the "correction" for conservatism.

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[2] The form of the residual income model discussed in valuation texts such as Penman [2007] is $p_0 = b_0 + \frac{x_1 - rb_0}{1 + r - \gamma}$. In this form of the model, the adjustment to book value is additive; the alternate form differs in that the adjustment is multiplicative.

[3] The rate of growth in dividend adjusted book value is equal to the expected return on equity $\frac{\$2.99}{\$20.16}$. In other words, $\left(1 + \frac{\$2.99}{\$20.16}\right) = \left(\frac{\$21.74 + \$1.41}{\$20.16}\right)$.

2.5.4 Growth in earnings

If y_t is capitalized earnings, z_t is capitalized abnormal earnings growth, γ is (one plus) change in abnormal earnings growth and the abnormal earnings growth model may be written as $p_0 = \frac{x_1}{r}\left[\frac{\frac{(\Delta x_2 + rd_1)}{x_1} - (\gamma - 1)}{1 + r - \gamma}\right]$. Again, this is not the familiar form of the abnormal earnings growth model.[4] This form highlights growth in earnings – both short-term and long-term.

The relations between P&G's prices, earnings, and growth in earnings are illustrated in Figure 6 (in addition to data seen before we now note that Value Line's forecast of P&G's 2008 earnings was \$3.41). Notice that the forward earnings to price ratio of 0.054 is less than r (7.9%); that is, the income statement is conservative. This conservative accounting is associated with short-term growth in (dividend-adjusted) earnings of 17.8% and long-term growth/decay from this high base-level of abnormal earnings growth, -13.1%.

As an aside, the idea of growth in abnormal earnings growth causes some confusion; perhaps the confusion is reduced if we note that this is the rate of change in the level of abnormal earnings growth. To gain an intuitive sense of the meaning of this rate of change, notice that abnormal earnings growth for P&G is \$3.41 + 7.9% (\$1.41) – 1.079(\$2.99) = \$0.295; that is, the 2007 "correction" for the conservatism in accounting is $\$3.74 = \frac{\$0.295}{7.9\%}$. The "correction" must decrease in the future (by a geometric average

[4] The form of the abnormal growth in earnings valuation model discussed in valuation texts such as Penman [2007] is $p_0 = \frac{x_1}{r} + \left[\frac{x_2 + rd_1 - (1+r)x_1}{r(1 + r - \gamma)}\right]$. Again, as with the residual income valuation model, the adjustment to capitalized earnings in this form of the model is additive; the alternate form differs in that the adjustment is multiplicative.

rate of -13.1%) in order for the present value of capitalized abnormal earnings growth to equal the difference between price and capitalized forward earnings.

2.6 **Why Focus on Earnings?**

Earnings play the central role in valuation; if we know forward earnings and short- and long-term growth in earnings, book value will not add to our understanding of the value of the stock. In other words the abnormal growth in earnings valuation is more general than the residual income valuation model.

To see this note that abnormal earnings growth is equal to change in residual income. It follows that, if abnormal earnings growth is changing at a (one-plus) rate of γ, change in residual income is also growing at γ and, thus, residual income is growing at γ.

In order to illustrate this point via the P&G example, notice that we showed that expected long-term growth in residual income is 3.96% whereas the expected long-term rate of change in abnormal earnings growth is expected to be -13.1%. This is due to the fact that in the calculation of the long-term rate of change in abnormal growth in earnings, we have relied on expected abnormal earnings growth for 2008 ($0.295), which, in turn relies on expected earnings of $3.41. The calculation of the long-term growth in residual income does not rely on the 2008 forecast; rather the base for growth is the forecast of 2007 earnings.

If the calculated rate of growth in residual income from the 2007 base was used to forecast earnings for 2008, this forecast would be $3.17 and the implied long-term rate of change in abnormal earnings growth would be 3.96%. In other words, with this adjustment to the forecast of 2008 earnings, residual income is expected to grow at 3.96% and abnormal earnings growth is also expected to change at a rate of 3.96%. In other words, we have modified the example so that "steady state" has been reached; at this point a 3.96% geometric rate of change in abnormal earnings growth is sufficient to explain the difference between price and capitalized forward earnings and a 3.96% rate of change in residual income is sufficient to explain the difference between price and book value. Note that at this point book value does not contribute to our understanding of value; all that we need to know is the forecast of next period earnings ($2.99 for P&G), short term cum-dividend earnings growth ([$3.17+$1.41]/$2.99) and long term earnings growth (now 3.96%).

2.7 Conservatism and the Information Dynamics

Growth (and hence conservatism) is modeled via the introduction of a variable ν_{1t}, which pays a central role in forecasting growth. In view of the observation in section 2.6 that forecasted future earnings play the central role in valuation, I will focus in this discussion on the role of information in the earnings-dynamics and in the abnormal earnings growth valuation framework.

The role of information and growth is captured in Figure 7. Notice that growth γ is introduced via the information dynamics $\left(\tilde{\nu}_{1t+1} = \gamma\nu_{1t} + \tilde{\varepsilon}_{2t+1}\right)$, and, most importantly, growth beyond retained earnings can only occur if $\gamma > 1$. This is captured in the valuation relation $p_t = \mathrm{E}_t \dfrac{[\tilde{x}_{t+1}]}{r} + \left[\dfrac{1}{r} + \dfrac{1+r}{1+r-\gamma}\right]\nu_{1t}$ where it is evident that the other information ν_{1t} and the mapping of this other information (which may be seen as a depiction of the factors that affect the firm at time t) to other information at time t+1 is central to understanding the difference between price and capitalized future earnings. We have seen already that this difference is a manifestation of conservative accounting. We have also seen that short-term earnings growth and long-term earnings growth explain this difference. Now, notice that ν_{1t} increases (grows) with t only if $\gamma > 1$. It follows that growth, captured in the information dynamics via γ, and conservative accounting are "two sides of the same coin".

In the P&G example, ν_{1t} captures all information (financial statement information and non-financial statement information) other than current earnings that helps us understand P&G's current value beyond that implicit in current earnings. The mapping from this information to the future informs us about growth in future earnings. Figure 7 illustrates this point for P&G; in the presence of conservative accounting, where current earnings do not explain all of cum-dividend price, we need only ν_{1t} and γ to complete the valuation.

2.8 Accounting May be Conservative Asymptotically

As the future time horizon extends to infinity, we might reasonably expect price to exceed book value and we might reasonably expect the forward earnings to price ratio to exceed the expected rate of return. To see this notice that the information dynamics shown in Figure 7 apply to any period t; if $\gamma > 1$, growth is expected in all future periods and it is this growth that will cause the accounting to continue to be conservative.

Intuitively, this continued conservatism comes from two sources. First, firms may invest in positive NPV projects, which will affect their market value, but the accounting will not capture the change in value until the benefits of these investments are realized. For example, the late-2005 P&G acquisition of Gillette may have been seen by the market as a non-zero NPV project (as an illustration of this point, Warren Buffet, then Gillette's largest single shareholder, called the combination "a dream deal" and said he planed to buy another 6.4 million of P&G shares). The positive NPV effect of this acquisition will be captured in market prices but this cannot affect the accounting numbers until the deal is executed and the costs and benefits of the acquisition are recognized in the future (in this case some, but not all, of the effects of the Gillette acquisition would have been captured on the 2006 balance sheet). Second, conservative accounting arises because of measurement/recognition rules (the obvious example for P&G is the fact that GAAP requires expensing rather than capitalization of R&D). The effects of the measurement/recognition rules and the effects associated with non-zero NPV projects are the same: price will exceed book value and we might reasonably expect the forward earnings to price ratio to exceed the expected rate of return.

3. Where now?

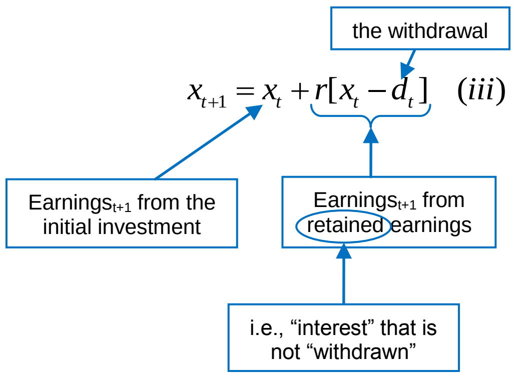
My aim in this discussion has been to highlight and illustrate the basic building blocks that are central to the architecture of Jim Ohlson's work. I hope that this will help the student who is beginning the journey toward understanding this body of work, which is and will be at the core of any theory or empirical analysis of the relation between accounting data and value. Fully understanding this work involves much careful reading; enjoy!

References

Ohlson, J. 2008. "*Accounting Data and Value: The Basic Results." Contemporary Accounting Research:* this issue.

Penman, S. 2007. *Financial Statement Analysis and Valuation.* McGraw Hill.

__Figure 1: The Savings Account__



$$\left. p_t = \frac{x_{t+1}}{r} \right\} \text{Valuation based on future earnings}$$

$$\left. p_t + d_t = \frac{1+r}{r} x_t \right\} \text{Valuation based on current earnings}$$

Figure 2: Permanent Earnings and the Introduction of Uncertainty

The permanent earnings dynamic:

disturbance term

$$\tilde{x}_{t+1} = \underbrace{x_t + r[x_t - d_t]}_{\text{relevant for forecasting – the permanent portion of earnings}} + \tilde{\varepsilon}_{1t+1}$$

uncertainty in valuation

The dividend dynamic:

$$\tilde{d}_{t+1} = \theta_1 x_t + \theta_2 d_t + \tilde{\varepsilon}_{2t+1}$$

dividend policy parameters

irrelevant for valuation

$$p_t = \frac{1+r}{r} x_t - d_t$$

earnings explain *value*

Figure 3: Economic Earnings

Economic earnings require $p_t = b_t$

$$\underbrace{x_t = \Delta p_t + d_t}_{\text{earnings explains } \textit{change in value}} = \Delta b_t + d_t$$

$$\tilde{x}_{t+1} = r * \underset{\substack{\uparrow \\ \text{book value suffices for valuation}}}{b_t} + \tilde{\varepsilon}_{1t+1}$$

Figure 4: Introducing Accounting-based Valuation

Dividend capitalization: $p_0 = \sum_{t=1}^{\infty} \frac{E[\tilde{d}_t]}{(1+r)^t}$ [PVED]

Introduction to the "zero-sum" series

$$0 = y_0 + \frac{(y_1 - [1+r]y_0)}{1+r} + \frac{(y_2 - [1+r]y_1)}{(1+r)^2} + ... \qquad (1)$$

adding [PVED]* and (1) yields: $p_0 = y_0 + \sum_{t=1}^{\infty} \frac{z_t}{(1+r)^t}$

where $z_t \equiv y_t + d_t - (1+r)y_{t-1}$

Figure 4a: $y_t = b_t$

$$\begin{aligned} p_0 &= b_0 + \sum_{t=1}^{\infty} \frac{\left(b_t + d_t - [1+r]b_{t-1}\right)}{(1+r)^t} \\ &= b_0 + \sum_{t=1}^{\infty} \frac{\left(x_t - r * b_{t-1}\right)}{(1+r)^t}, \text{ assuming clean-surplus accounting} \end{aligned}$$

Figure 4b: $y_t = \frac{x_{t+1}}{r}$

$$\begin{aligned} p_0 &= \frac{x_{t+1}}{r} + \sum_{t=1}^{\infty} \frac{\frac{x_{t+1}}{r} + d_t - \frac{(1+r)x_t}{r}}{(1+r)^t} \\ &= \frac{x_{t+1}}{r} + \frac{1}{r} \sum_{t=1}^{\infty} \frac{x_{t+1} + rd_t - (1+r)x_t}{(1+r)^t} \end{aligned}$$

Figure 5: Growth in book values

Book value as the anchor: $y_t = b_t : z_t =$ residual income

$$p_0 = b_0\left[\frac{1+roe_1-\gamma}{1+r-\gamma}\right]$$

$$p_0 = b_0\left[\frac{\frac{(b_1+d_1)}{b_0}-\gamma}{1+r-\gamma}\right]$$

1+ROE=1.148

growth in residual income

	2006	2007
x_t	2.63	2.99
d_t	1.23	1.41
b_t	20.16	21.74
p_t	55.60	

$$55.60 = 20.16\left[\frac{\frac{21.74+1.41}{20.16}-1.0396}{1.079-1.0396}\right]$$

M/B=2.76

Figure 6: Growth in earnings

Capitalized earnings as the anchor, $y_t = \frac{x_{t+1}}{r}$: $z_t =$ abnormal earnings growth

	2006	2007	2008
x_t		2.99	3.41
d_t		1.41	
p_t	55.60		

$$p_0 = \frac{x_1}{r}\left[\frac{\frac{\Delta x_2 + rd_1}{x_1} - \gamma - 1}{1 + r - \gamma}\right]$$

Short-term growth=17.8%

Long-term growth/decay = -13.1%

$$55.60 = \frac{2,99}{7.9\%}\left[\frac{\frac{3.41 - 2.99 + 7.9\% * 1.41}{2.99} - (-0.131)}{1.079 - (1 - 0.131)}\right]$$

$$p_0 = \frac{x_1}{r} + \left[\frac{x_2 + rd_1 - (1+r)x_1}{r(1 + r - \gamma)}\right]$$

Abnormal earnings growth: 3.41+7.9%*(1.41)-1.079*(2.99)=$0.295

Figure 7: Conservatism may be understood via the information dynamics

$$x_{t+1} = (1+r)x_t - rd_t + \nu_{1t} + \tilde{\varepsilon}_{1t+1}$$

$$\nu_{1t+1} = \gamma \nu_{1t} + \tilde{\varepsilon}_{2t+1}$$

information

growth

$$p_t = \frac{E_t x_t}{r} + \left[\frac{1}{r} + \frac{1+r}{1+r-\gamma}\right]\nu_{1t}$$

$$\$55.60 = \frac{2.99}{7.9\%} + \left[\frac{1}{7.9\%} + \frac{1.079}{1.079-\gamma}\right]\nu_{1t}$$