P/E, P/B and the Present Value of Future Dividends

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The dividend discount model (DDM) is of limited use as a valuation tool because of the restrictive assumptions it makes about dividend payout policy. But the DDM can be restated directly in terms of accounting information, with no assumption of a fixed relation between accounting data and future dividends, and with no restrictions on payout policy. The resulting model focuses on the estimation of future profitability as the fundamental determinant of firm value.

Book value and earnings have distinct roles in this model. It starts with book value—the stock of (net) assets—adjusting it upward or downward to reflect the expected profitability of those assets. The price/earnings ratio (P/E) is a function of expected changes in future profitability, and the price/book ratio (P/B) is a function of the expected level of future profitability.

The model predicts that P/B should correlate positively with future return on book value, and that P/E should correlate positively with growth in earnings. Together, the ratios reveal information about expected future profitability relative to current profitability. The evidence supports the model and indicates that different P/E-P/B combinations are associated with distinct patterns of future profitability.

The dividend discount model (DDM), the most widely accepted solution for valuing common stocks, equates a firm's price to the discounted value of its expected future dividends. Finance texts commonly recommend estimating this series by applying a constant growth rate to the current dividend (the Gordon growth model) or by partitioning the expected dividend series into discrete parts with different growth rates.

Those who incorporate accounting information into the valuation model typically do so by assuming a fixed relation between the accounting numbers and the dividends. This, however, necessitates placing such severe restrictions on the payout policy that the DDM's usefulness is severely compromised.[1] The DDM can, however, be restated directly in terms of accounting information, *without* the need to assume a fixed relation between accounting data and future dividends and without restricting payout policy.

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INCORPORATING EARNINGS AND BOOK VALUE

Using clean surplus accounting, one can replace the dividends in the DDM model with earnings and book values.[2] Price is restated in terms of earnings and book value, and the valuation problem focuses on the fundamental process of creating wealth, rather than on the distribution of wealth. Prices can then be interpreted in terms of the market's expectations of future earnings without severing the valuation link between price and future dividends.

The model incorporates distinct valuation roles for the two summary accounting numbers, earnings and book value. In setting price, one starts with book value—the stock of (net) assets—and adjusts it upward if one expects those assets to exceed average profitablity levels and downward if one expects them to fall short of average profitability. To estimate future profitability, one starts with current profitability, or earnings divided by book value (ROE).

Earnings and book values are complementary, not competing, indicators of value. It follows that

price/earnings ratios (P/Es) and price-to-book ratios (P/Bs) should provide complementary information about expected future earnings. P/E is a function of expected changes in future profitability, and P/B is a function of the expected level of future profitability. The P/E-P/B combination jointly reveals the market's expectations regarding future profitability relative to current profitability.

The empirical evidence supports the validity of the valuation model. The results also indicate, paradoxically, that eliminating dividends from the empirical tests can actually validate the role of dividends in valuation. Most importantly, the evidence confirms the primary role of earnings prediction in determining firm value.

THE UNDERLYING VALUATION MODEL

A valuation model developed in Ohlson relies on the following two key assumptions.[3] First, market price equals the present value of future dividends:

$$P_t = \frac{d_{t+1}}{1+k} + \frac{d_{t+2}}{(1+k)^2} + \; - \frac{d_{t+T}}{(1+k)^T} \tag{1}$$

where

P_t = price at time t,
k = the discount rate,
d_t = dividends paid at time t, and
T = the date the liquidating dividend is paid.

Second, the clean surplus relation in accounting holds; that is, end-of-period book value equals beginning-of-period book value plus earnings minus dividends (capital contributions are incorporated as negative dividends):

$$y_t = y_{t-1} + x_t - d_t \tag{2}$$

where

y_t = book value at time t,
x_t = earnings for period t, and
d_t = dividends for period t.

The model requires one additional concept—abnormal earnings, defined as earnings adjusted for a normal (risk-adjusted) rate of return on book value.[4] Formally:

$$x_t^a = x_t - k\, y_{t-1}. \tag{3}$$

The evolution of abnormal earnings is restricted in the following way:

$$x_t^a = \omega x_{t-1}^a + e_t \tag{4}$$

where $0 < \omega < 1$, and e_t is the surprise in abnormal earnings in period t. Whatever the firm's current earnings, competitive forces are assumed to reduce the firm's abnormal earnings over time. At some point, the firm will have only zero net present value opportunities and zero abnormal earnings. Because of this convergence property, abnormal earnings play a central role in the valuation function.

Future dividends do not appear in the valuation formula. If the return on new investments is independent of their source of financing, future earnings retained by the firm and future earnings distributed as dividends are equivalent insofar as determining firm value is concerned. It is not necessary to estimate the stream of future dividends (a problematic task, because dividends do not converge to zero). Value is determined by the *creation* of wealth, measured by aggregate accounting earnings, rather than the *distribution* of wealth, measured as dividends.

By replacing dividends in the DDM formula with the clean surplus formula and abnormal earnings, one restates price in terms of current book value and future abnormal earnings.[5] Iterative substitution of

$$d_\tau = x_\tau^a + (1+k)y_{\tau-1} - y_\tau$$

into Equation 1 for $\tau = t, t+1, \ldots,$ yields:

$$P_t = y_t + \frac{x_1^a}{(1+k)} + \frac{x_2^a}{(1+k)^2} + \frac{x_T^a}{(1+k)^T}. \tag{5}$$

The P/B Ratio

Dividing Equation 5 by book value, y_t, gives an expression for the price-to-book ratio:

$$P/B = 1 + AX^a/B,$$

where AX^a is the discounted stream of future abnormal earnings. If the firm is expected to have zero abnormal earnings in the future, its market value will equal its book value. Any premium (discount) to book value is attributable to the present value of expected abnormal growth in book value, defined as earnings in excess of a normal rate of return divided by beginning book value. Although the valuation formula, like the DDM, incorporates the sum of an infinite series, its power derives from the fact that estimating abnormal earnings over a finite horizon can generate reasonable firm valuations.[6]

The P/E Ratio

Price can alternatively be expressed as a function of capitalized current earnings plus the capitalized present value of changes in future abnormal earnings. Substituting

$$y_t = y_{t-1} + x_t - d_t$$

and

$$y_{t-1} = (x_t - x_t^a)/(k)$$

into Equation 5 and rearranging terms yields:

$$P_t = \phi \left(x_t + \frac{\Delta x_{t+1}^a}{(1+k)} + \frac{\Delta x_{t+2}^a}{(1+k)^2} \cdots + \frac{\Delta x_T^a}{(1+k)^T} \right) - d_t, \quad (6)$$

where

$$\phi = \frac{1+k}{k}$$

and

$$\Delta x_{t+\tau}^a = x_{t+\tau}^a - x_{t+\tau-1}^a$$

Dividing Equation 6 by current earnings, x_t, gives an expression for the P/E ratio.[7] P/E equals the capitalization factor plus the capitalized present value of expected growth in *abnormal* earnings. Firms selling at an average P/E ratio, or ϕ, are expected to experience only normal earnings growth (equal to k times the change in book value). A P/E above or below ϕ signals expected *changes* in future abnormal earnings or earnings growth above or below k times the change in book value. Firms with "temporarily depressed" earnings that are expected to increase in the future will have high P/E ratios, as will firms with abnormally high current earnings that are expected to increase (in excess of k times the change in book value). The earnings multiple relates directly to the expected change in abnormal earnings.[8]

Equations 5 and 6 illustrate the difference between P/B and P/E in the information they convey about future earnings. A high P/B implies above-average rates of return on book value, whereas a high P/E implies earnings growth in excess of that expected from growth in book value. The distinction between expected return on book value and expected growth in abnormal earnings is important. A firm can have high earnings growth for several periods and remain fundamentally unprofitable, while a firm with low earnings growth can be exceptionally profitable if the base-year return on equity is unusually high. P/B and P/E distinguish between the market's expectation of return on book value and its expectation of growth in abnormal earnings and together reveal the market's expectation of future profitability relative to current profitability.

Equations 5 and 6 also demonstrate the power of combining the DDM with clean surplus accounting to generate valuation formulas. Both formulas incorporate the sum of an infinite series. But a dividend series (or, alternatively, free cash flow) cannot reasonably be assumed to converge to zero, whereas, in a competitive economy, the series of abnormal earnings for a given firm will converge to zero over time.[9] Equations 5 and 6 accordingly focus on a tractable problem—the estimation of accounting earnings as the fundamental measure of value.

Table 1. Median Percentage Earnings Changes and Future ROE for Firms Ranked by P/E and P/B, 1970–84 (n = 22,741)

PANEL A: Firms Ranked by P/B Ratio

	High P/B			Medium P/B			Low P/B		
t*	P/B	P/E	ROE	P/B	P/E	ROE	P/B	P/E	ROE
0	2.25	12.68	0.17	1.07	7.86	0.13	0.65	6.14	0.09
1			0.17			0.13			0.09
2			0.16			0.13			0.10
3			0.16			0.13			0.11
4			0.16			0.13			0.11
5			0.16			0.13			0.11

PANEL B: Firms Ranked by P/E Ratio

	High P/E			Medium P/E			Low P/E		
t*	P/B	P/E	%Δ EPS	P/B	P/E	%Δ EPS	P/B	P/E	%Δ EPS
0	1.64	14.51	0.07	1.18	9.10	0.12	0.83	5.76	0.18
1			0.27			0.11			0.06
2			0.19			0.11			0.10
3			0.17			0.11			0.11
4			0.15			0.11			0.12
5			0.14			0.12			0.12

* t is the number of years following firm classification. For example, in Panel A, firms classified as high P/B in year 0 had ROE of 0.16 five years later. The results are pooled for 15 classification years, 1970–84.

VALIDITY OF THE VALUATION MODEL

The model's predictions are straightforward. P/B should correlate positively with future return on book value, and P/E should correlate positively with growth in earnings. Together, the ratios reveal information about expected future profitability relative to current profitability.

Tests of the model's validity use data from the 1989 version of the Compustat tape. No screens were applied, so the sample includes all firms/years for which data were available. The maximum sample size is 22,741, representing pooled data from 1970 through 1984. Earnings were calculated for five years following the classification date; 1984 was the last year used to classify firms.

Table 1 reports the associations between P/B and return on book value and between P/E and

Table 2. Median Percentage Earnings Changes and Future ROE for Firms Ranked Jointly by P/E and P/B, 1970–84 (n = 22,741)

		High P/E				Medium P/E				Low P/E			
	t*	P/B	P/E	%Δ EPS	ROE	P/B	P/E	%Δ EPS	ROE	P/B	P/E	%Δ EPS	ROE
	0	2.69	16.67	0.18	0.15	1.93	10.04	0.18	0.18	1.69	5.80	0.61	0.28
	1			0.20	0.16			0.11	0.17			0.05	0.23
	2			0.16	0.16			0.11	0.16			0.07	0.20
High P/B	3			0.15	0.16			0.12	0.15			0.06	0.18
	4			0.14	0.16			0.12	0.15			0.13	0.16
	5			0.15	0.16			0.14	0.15			0.14	0.17
			n=4351	(19%)			n=2651	(12%)			n=572	(3%)	
					Cell 1				Cell 2				Cell 3
	0	1.13	12.99	−0.37	0.05	1.08	8.53	0.09	0.12	1.03	6.18	0.19	0.16
	1			0.54	0.08			0.10	0.12			0.06	0.15
	2			0.24	0.11			0.10	0.13			0.08	0.14
Medium P/B	3			0.21	0.11			0.10	0.13			0.09	0.13
	4			0.13	0.12			0.10	0.13			0.12	0.13
	5			0.09	0.12			0.10	0.13			0.12	0.13
			n=1309	(6%)			n=3441	(15%)			n=2840	(12%)	
					Cell 4				Cell 5				Cell 6
	0	0.58	−0.52	−0.75	−0.01	0.70	8.77	−0.02	0.07	0.66	5.47	0.14	0.12
	1			0.86	0.03			0.16	0.09			0.07	0.11
	2			0.52	0.07			0.20	0.09			0.12	0.12
Low P/B	3			0.30	0.09			0.15	0.11			0.13	0.12
	4			0.21	0.09			0.12	0.11			0.12	0.12
	5			0.13	0.09			0.11	0.11			0.12	0.12
			n=1923	(8%)			n=1492	(7%)			n=4162	(18%)	
					Cell 7				Cell 8				Cell 9

* t is the number of years following firm classification.

earnings growth. Panel A sorts firms into three groups by their current P/B ratios and reports the median P/B and ROE for each group. The median P/B ratios correlate positively with current ROE, consistent with prior evidence that the premium (discount) on book value is associated with the firm's current accounting rate of return.[10]

Panel A also reports the median ROE for each of the three groups one to five years ahead. Although there is some evidence of mean reversion, the median ROE in each of the five years is higher for the high-P/B firms than for the low-P/B firms. As predicted by the valuation model, P/B ratios correlate positively with future return on book values.

Panel B of Table 1 sorts firms into three groups based on current P/Es and reports the median P/E and the median percentage earnings change for each group. The data confirm the previously reported negative correlation between P/E and current earnings changes.[11] High-(low-)P/E ratios are associated with lower-(higher-)than-average percentage changes in earnings.

More significantly, growth in *future* earnings differs across the three P/E groups. For the high-P/E group, earnings grow by 27% the first year, and although earnings growth falls off dramatically after that, it is still 14% in the fifth year. The low-P/E group shows much slower earnings growth, with a 6% change the first year, increasing to 12% in the fourth and fifth years. As predicted by the valuation model, the P/E ratio is correlated with growth in earnings.

P/E and P/B Interactions

Table 2 classifies firms simultaneously by P/E and P/B. The classification represents the intersection of two sorts, so the cell sizes are not equal. The upper-left-hand cell contains firms with high P/B and high P/E; cells are numbered from top left to bottom right beginning with 1 (high P/B, high P/E) and ending with 9 (low P/B, low P/E). The table reveals the incremental information content of P/E relative to P/B and P/B relative to P/E.

In Table 1, the sample of high-P/B firms had high current ROE and high ROE in the five years following classification. Sorting these firms by their current P/Es reveals more information about future earnings relative to current earnings. The pattern is clear from a comparison of Table 2's cell 1 (high P/B, high P/E) and cell 3 firms (high P/B, low P/E).

The median ROE for the high-P/E firms was 15% at the start and 16% for each of the next five years. Median earnings growth for these firms was 20% the first year and averaged 15% over the next four years. These firms are clearly high-growth firms, or firms with robust earnings for several consecutive years.

For the high-P/B, high-P/E firms, current profitability is representative of future profitability. In contrast, the low-P/E firms in cell 3 had an ROE of 28% to begin with and experienced contractions in median ROE over the next five years. Earnings grew at a rate of 7% or less in the first three years following classification. By the fifth year, earnings growth was 14% and ROE was 17%, approximately equal to the high-growth firms in cell 1. The high-P/B, low-P/E firms have above-average future profitability, but unlike the cell 1 firms are at the peak of their earnings potential at the time of portfolio classification; current profitability exceeds future profitability for these firms.

P/E also adds information about future earnings for the low-P/B firms. Firms with low P/Bs and low P/Es (cell 9) had a median ROE of 12% at time 0 and an ROE of 12% or less over the next five years. Earnings growth was modest over the period, and current profitability provided a good indication of future profitability.

In contrast, the low P/B, high P/E firms in cell 7 experienced dramatic earnings growth over the five years, as the median ROE increased from less than zero to 9%. Current profitability is not a good indicator of future profitability for these firms. They appear to be lackluster performers experiencing a particularly bad year at the time of classification. Many of these companies would likely qualify as "big bath" firms, or firms that took large write-offs in the year of classification.[12]

P/E is often cited as an indicator of transitory earnings; high P/Es are associated with unusually low current earnings and low P/Es with unusually high current earnings. Comparing cell 1 firms (high P/E, high P/B) with cell 7 firms (high P/E, low P/B) shows how the P/B ratio sorts out the firms with negative transitory earnings from the firms whose current profitability is representative of future profitability.

For cell 1 firms, the high P/E, high P/B combination is indicative of unusually high current and future profitability. In contrast, the high P/E, low P/B firms in cell 7 have extremely high earnings growth but remain fundamentally unprofitable. For those firms, the high P/E indicates negative transitory earnings. Similarly, P/B sorts the low-P/E firms into those with positive transitory earnings, or low earnings growth and high future profitability (cell 3), and those with low earnings growth and below-average future profitability (cell 9).

Risk is often cited as an important factor explaining variation in P/Es and P/Bs. Equations 5 and 6 show that differences in the required rate of return will lead to cross-sectional variation in P/Es and P/Bs independent of future earnings. Tables 1 and 2 assume all firms have the same risk. In spite of this strict assumption, future profitability varies distinctly across the nine cells. The evidence does not imply that risk is unrelated to price, but it does suggest that risk plays a subsidiary role to estimates of future earnings in explaining cross-sectional differences in P/E and P/B ratios.[13]

P/E-ROE MODEL

Table 3 presents additional evidence on the extent to which P/E-P/B combinations can reveal information about future earnings. Wilcox proposes a model relating P/B to expected growth in book value and suggests that it has practical value because historical return on equity predicts future return on equity for many firms.[14] Using Equation 6, one can restate P/B in terms of current ROE plus the capitalized value of expected changes in abnormal earnings over current book value:[15]

$$\frac{P_t}{B_t} = \phi\left(\frac{X_t}{B_t} + \sum_{t=1}^{\infty} R_F^{-\tau} E_t\left[\frac{\Delta X_{t+\tau}^a}{B_t}\right]\right) - \frac{d_t}{B_t}. \tag{7}$$

The usefulness of the P/B-ROE valuation model is not limited to cases where future ROE approximates historical ROE; deviations from the linear P/B-ROE model should correlate positively with changes in ROE.[16] Of course, as any combination of P/B and ROE implies a particular P/E, this is another way of demonstrating that P/E and P/B together reveal information about future profitability relative to current profitability.

Table 3 ranks firms into deciles by current ROE and sorts firms within each ROE decile by the sign of their residuals from a pooled regression of current P/Bs on current ROEs.[17] Firms with large positive residuals have P/Bs that are "too high" given their current ROE, and those with negative residuals have P/Bs that are "too low" given their current ROE. If we exclude the middle third of firms within each ROE decile (those with regression residuals closest to zero), Equation 7 predicts that firms with positive residuals will experience

Table 3. Probability of a Change in ROE for Firms Ranked by ROE and by Residual from Linear P/B-ROE Model, 1970–84[a]

	Firms with Largest Positive Residuals ("High-PB Firms")[b]				Firms with Largest Negative Residuals ("Low-PB Firms")[b]			
ROE Decile	Median ROE_t	P ($ROE_{t+1} > ROE_t$)[c]	Mean ΔROE_{t+1}	Median ΔROE_{t+1}	Median ROE_t	P ($ROE_{t+1} > ROE_t$)[c]	Mean ΔROE_{t+1}	Median ΔROE_{t+1}
(lowest)								
1	−0.160	0.763	0.308	0.146	−0.080	0.637	−0.036	0.021
2	0.030	0.673	0.021	0.028	0.046	0.636	−0.022	0.012
3	0.074	0.653	0.112	0.014	0.084	0.626	−0.006	0.008
4	0.097	0.655	−0.012	0.010	0.103	0.596	−0.005	0.004
5	0.114	0.650	0.000	0.007	0.119	0.520	−0.007	0.001
6	0.127	0.570	0.019	0.003	0.133	0.488	−0.010	−0.001
7	0.145	0.531	−0.392	0.001	0.149	0.434	−0.015	−0.003
8	0.166	0.500	−0.005	0.000	0.169	0.402	−0.018	−0.005
9	0.193	0.425	−0.015	−0.004	0.196	0.280	−0.034	−0.022
10	0.258	0.327	−0.106	−0.018	0.364	0.187	−0.617	−0.096
(highest)								

a. $P/B_t = \alpha + \beta ROE_t$. Firms with negative ROE and firms with ROE greater than 100% or P/B greater than 4 or less than 0.20 were omitted in the parameter estimation. The resulting regression had an R^2 of 16%, with $\alpha = 0.71$ (t = 66.92) and $\beta = 4.21$ (t = 61.30). Residuals were calculated for all firms (including those omitted in the parameter estimation) and are included in the table. Including most of the omitted firms in the parameter estimation dramatically reduced the R^2 but did not alter the fundamental result.

b. These are not firms with high (low) absolute P/B ratios, but firms with high (low) P/B ratios relative to their current ROE, as measured by the residual from the linear P/B-ROE model. The middle 33% of the firms, those with residuals closest to zero, were omitted from the table.

c. Proportion of firms showing increases in ROE_{t+1} is significantly higher for firms with positive residuals than for firms with negative residuals at a 5% confidence level.

increases in ROE and those with negative residuals will experience decreases in ROE.

The evidence in Table 3 demonstrates a pronounced tendency for the ROEs in each decile to revert to the mean regardless of the individual firm's current P/B.[18] For both positive and negative-residual firms, low-ROE firms tended to experience ROE increases and high-ROE firms tended to experience ROE decreases. But the pattern for firms with positive residuals (P/Bs "too high" given current ROE) differs from that for firms with negative residuals (P/Bs "too low" given current ROE). For all ROE deciles, firms with positive residuals are more likely to experience increases in ROE than firms with negative residuals. Mean and median changes in ROE also differ between the positive and negative-residual firms. Overall, the evidence is consistent with the conclusion that deviations from the P/B-ROE model anticipate next year's changes in return on equity.

Stability Over Time

The valuation model and the resulting expressions for P/B and P/E suggest that the stability of P/E and P/B might differ across different P/E-P/B combinations. For example, because high P/Es are associated with high earnings growth, firms with high P/Es and high P/Bs (cell 1), implying high future return on equity and high earnings growth, should retain that classification longer than firms with high P/Es and low P/Bs (cell 7), implying low future return on equity and high earnings growth. Cell 1 firms are likely to maintain high earnings growth over several years, whereas the earnings of cell 7 firms, once they recover from their current depressed state, should cease growing. Thus P/Es should be more stable for the cell 1 firms than for the cell 7 firms.

Table 4 provides evidence on the stability of P/B and P/E over time. The table shows the median P/Bs and P/Es for from one to five years after classification (classifications fixed at time 0), as well as the proportions of firms retaining their original classifications for periods of from one to five years.[19]

P/Bs are in general more stable than P/Es. About 80% of the firms classified as high-P/B firms remain so classified one year later; the corresponding proportion of high-P/E firms is 68%. Five years later, these figures are 63% and 51%, respectively. The proportions for the low-P/B and low-P/E firms also demonstrate that P/Bs are more stable than P/Es. This is to be expected; ROE is more stable over time than the earnings growth rate.[20]

The table shows that joint classification of P/B and P/E can help to predict future P/Bs and P/Es. If

Table 4. Medians of Future P/B and P/E Ratios and Proportions of Firms That Retain Their P/B-P/E Classifications Over Time for Firms Ranked by P/E and P/B Ratios, 1970–84 (n = 22,741)

		High P/E					Medium P/E				
				% Remaining in					% Remaining in		
	t*	Median P/B	Median P/E	P/B Row	P/E Column	Cell	Median P/B	Median P/E	P/B Row	P/E Column	Cell
	0	2.69	16.67	100	100	100	1.93	10.04	100	100	100
	1	2.38	13.93	87	74	72	1.73	10.05	71	56	40
	2	2.13	12.66	80	67	61	1.55	9.74	63	52	31
High	3	1.96	11.98	76	63	53	1.38	9.12	57	49	17
P/B	4	1.83	11.46	71	60	47	1.35	8.72	54	47	26
	5	1.80	121.07	69	57	44	1.33	8.77	50	45	24
		n = 4351	(19%)		Cell 1		n = 2651	(12%)		Cell 2	
	0	1.13	12.99	100	100	100	1.08	8.53	100	100	100
	1	1.06	9.02	51	55	21	1.00	7.98	65	57	45
	2	0.99	8.09	43	45	15	0.97	7.76	55	51	34
Medium	3	0.97	7.46	37	40	11	0.95	7.61	51	47	29
P/B	4	0.93	7.49	35	39	10	0.93	7.39	47	44	25
	5	0.96	7.55	38	37	10	0.93	7.40	44	40	23
		n = 1309	(6%)		Cell 4		n = 3441	(15%)		Cell 5	
	0	0.58	−0.52	100	100	100	0.70	8.77	100	100	100
	1	0.62	5.86	77	62	46	0.70	7.33	76	38	26
	2	0.66	6.14	68	47	31	0.72	6.74	69	32	18
Low	3	0.68	5.60	61	40	23	0.72	6.55	60	29	12
P/B	4	0.72	5.80	56	39	23	0.76	6.65	59	29	12
	5	0.77	6.11	54	44	24	0.81	6.79	55	29	12
		n = 1923	(8%)		Cell 7		n = 1492	(7%)		Cell 8	
	0	1.64	14.51		100		0.18	9.10		100	
	1	1.52	11.46		68		1.09	8.50		52	
	2	1.41	10.38		59		1.04	8.14		48	
Column	3	1.36	9.72		54		0.99	7.82		46	
Median	4	1.33	9.54		52		0.98	7.63		42	
	5	1.35	9.50		51		0.99	7.65		40	

(Table continued on page 30.)

the P/B "confirms" the P/E ratio (e.g., both are high, suggesting that the firm's current profitability is more permanent than transitory), it is more likely that P/B and P/E will remain high. Firms classified as high P/E, high P/B (cell 1) are more likely to retain that classification than any other combination; 87% of the firms that started in cell 1 still had high P/Bs one year later, and 74% still had high P/Es. At the end of five years, 69% still had high P/Bs, 57% still had high P/Es, and 44% could still be jointly classified as high P/B, high P/E. The information investors use to generate the valuations for these firms appears to have high serial correlation.

In contrast to cell 1 firms, firms in cells 2 and 3, with high P/Bs but medium or low P/Es, are much less likely to remain classified as high-P/B firms over the next five years; 50% and 59%, respectively, remain high-P/B firms at the end of five years. Firms in cells 4 and 7 (high P/E but not high P/B) are also less likely to remain high-P/E firms; 37% and 44%, respectively, remain high-P/E firms after five years.

For firms with low P/Bs, P/E provides less incremental information for predicting which firms will continue to sell at low multiples of book value. There is little difference between cells 7 and 9 in the percentage of firms that remain low-P/B firms; at the end of five years, about 55% of the firms in each cell are still selling at low multiples of book. There is, however, greater stability for firms *within* cell 9; after five years, about one-third of these firms are still low-P/B, low-P/E firms. In comparison, only 24% of the low-P/B, high-P/E firms in cell 7 remain there after five years, and only 12% of the low-P/B, medium-P/E firms in cell 8 remain in that cell after five years. This reinforces the point that P/Bs are more stable over time than P/Es, as return on book value is more stable than growth in earnings.

Table 4 suggests an interesting avenue for future research on the value and techniques of

Table 4. Medians of Future P/B and P/E Ratios and Proportions of Firms That Retain Their P/B-P/E Classifications Over Time for Firms Ranked by P/E and P/B Ratios, 1970–84 (n = 22,741) (continued)

Low P/E					Row Medians		
		% Remaining in					
Median P/B	Median P/E	P/B Row	P/E Column	Cell	P/B	P/E	% Remain. in P/B Row
1.69	5.80	100	100	100	2.25	5.80	100
1.51	6.78	66	52	26	2.02	11.79	80
1.42	7.56	60	40	12	1.84	11.03	72
1.31	7.66	54	32	9	1.68	10.49	68
1.37	7.95	56	28	7	1.62	10.24	65
1.47	8.85	59	25	8	1.61	7.08	63
n = 572	(3%)			Cell 3			
1.03	6.18	100	100	100	1.07	7.86	100
1.02	6.92	60	60	38	1.02	7.69	61
0.99	7.04	52	50	26	0.98	7.50	51
0.94	7.03	48	41	23	0.95	7.36	48
0.94	6.99	46	41	19	0.94	7.24	45
0.98	7.38	44	40	17	0.95	7.41	43
n = 2840	(12%)			Cell 6			
0.66	5.47	100	100	100	0.65	6.14	100
0.69	5.95	75	69	56	0.68	6.27	75
0.71	6.07	67	61	44	0.70	6.24	67
0.72	6.06	62	57	42	0.71	6.10	63
0.75	6.23	58	54	38	0.75	6.26	57
0.79	6.67	55	49	34	0.79	6.63	55
n = 4162	(18%)			Cell 9			
0.83	5.76		100				
0.84	6.39		65				
0.84	6.52		55				
0.83	6.53		49				
0.85	6.63		47				
0.90	6.99		44				

* Number of years following firm classification. 69% of firms in cell 1 would still be classified as high-P/B firms five years later, 57% as high-P/E firms, and 44% as high-P/B, high-P/E firms. For example, for firms classified as high-P/E, high-P/B at time 0, the median P/B was 1.80 and median P/E was 11.07 five years later. The results are pooled for 15 classification years, 1970–84.

fundamental analysis—specifically, what accounting information besides earnings and book values can be used to discriminate between firms in the nine cells?[21] Beyond that, is there other (nonaccounting) information that predicts the period of time a firm will sell at a particular multiple of earnings and book value?

CONCLUSION

The evidence emphasizes the premier role of earnings prediction in valuation and suggests that risk plays a secondary role in explaining observed differences between P/E and P/B ratios. P/B correlates with future return on equity and P/E with growth in earnings. A firm's P/E-P/B combination reveals the market's expectation of future profitability relative to current profitability. Perhaps most importantly, the results constitute a useful framework for introducing techniques of financial statement analysis and provide a starting point for translating accounting information into earnings forecasts.[22]

FOOTNOTES

1. Attempts to correlate future dividends with observed prices include G. Staubus, "The Association of Financial Accounting Variables with Common Stock Values," *Accounting Review*, January 1965, and P. Easton," Accounting Earnings and Security Valuation: Empirical Evidence of the Fundamental Links," *Journal of Accounting Research*, Supplement 1985.
2. Clean surplus accounting requires that all changes in own-

ers' equity other than those representing transactions between the firm and its owners flow through the income statement. If dividends are defined broadly to include dividend distributions as well as capital contributions, the clean surplus rule implies that

$$\text{Owners' Equity}_t = \text{Owners' Equity}_{t-1} + \text{Net Income}_t - \text{Dividends}_t.$$

Current accounting standards, with a few exceptions, satisfy this requirement.

3. See J. Ohlson, "Earnings, Book Values, and Dividends in Security Valuation," *Contemporary Accounting Research*, forthcoming.
4. For the purpose of this analysis, all firms are assumed to have equivalent risk. Relaxing this assumption would give sharper predictions about the relation of price to future earnings for individual firms. Even with this assumption, however, the evidence is consistent with predictions from the valuation model, as demonstrated below.
5. Development of the valuation model in terms of accounting information can also be found in E. Edwards and P. Bell, *The Theory and Measurement of Business Income* (Berkeley: University of California Press, 1961); K. Peasnell, "Some Financial Connections between Economic Values and Accounting Numbers," *Journal of Business, Finance, and Accounting*, 1982; S. Penman, "The Articulation of Price-Earnings Ratios and Market-to-Book Ratios and the Evaluation of Growth" (Working paper, University of California at Berkeley, 1992); and in particular J. Ohlson, "Earnings, Book Values, and Dividends in Security Valuation," *op. cit.*
6. One other assumption is necessary here—that the accounting is unbiased. See G. Feltham and J. Ohlson, "Valuation and Clean Surplus Accounting for Operating and Financial Activities" (Working paper, University of British Columbia and Columbia University, 1993), for development of a valuation model in the context of biased accounting.
7. Note, however, that the proper specification is price plus dividends divided by earnings. Dividends appear on the left-hand side because dividend distributions affect price but not current earnings. Empirically, the dividend adjustment is small and, consistent with common practice, is not made in the tables that follow.
8. This interpretation of the P/E ratio is similar to the "franchise factor" presented in a series of papers by M. Leibowitz and S. Kogelman: "Inside The P/E Ratio: The Franchise Factor," *Financial Analysts Journal*, November/December 1990; "The Franchise Factor for Leveraged Firms," *Financial Analysts Journal*, November/December 1991; "Franchise Value and the Growth Process," *Financial Analysts Journal*, January/February 1992. However, their model cannot be fit to firms with irregular earnings streams without first adjusting those earnings to a single perpetual return. Although their model is similar in spirit to the one presented here, the two models differ in that reported accounting earnings are not a direct input to the "franchise factor" valuation model.
9. See S. Penman, "Return to Fundamentals," *Journal of Accounting, Auditing, and Finance*, Fall 1992, for a discussion of free cash flow as an alternative to dividends in the valuation model.
10. J. Wilcox, "The P/B-ROE Valuation Model," *Financial Analysts Journal*, January/February 1984.
11. W. Beaver and D. Morse, "What Do P/E Ratios Mean?" *Financial Analysts Journal*, July/August 1978.
12. In fact, examination of the income statement line items for a subset of these firms revealed that over one-third reported a negative "special item" (the classification COMPUSTAT uses for write-offs) in year 0. For about a quarter of the firms, this item was in excess of 1% of sales. All the high-P/E firms were similar in this regard; however, the impact of the write-offs was much greater on the incomes of the low-P/B firms.
13. This conclusion is also suggested by empirical evidence in S. Penman, "An Evaluation of Accounting Rate of Return," *Journal of Accounting Auditing and Finance*, Spring 1991.
14. Wilcox, "The P/B-ROE Valuation Model," *op. cit.*
15. In Equation 6, ROE is measured as rate of return on closing equity rather than opening equity. Consistent with common practice, Table 3 uses ROE defined as earnings over opening equity. This introduces error but does not alter the fundamental result.
16. Wilcox, "The P/B-ROE Valuation Model," *op. cit.*, also makes this observation.
17. The parameters were estimated after deleting firms with negative ROE or ROE greater than 100% and firms with P/B ratios greater than 4 or less than 0.20. The resulting regression has an R^2 of 16%. Once the parameters were estimated, residuals were calculated for all observations and are included in Table 4. Including most of the omitted firms in the parameter estimation dramatically reduced the R^2 but did not alter the fundamental result.
18. This is a well documented phenomenon. See, for example, R. Freeman, J. Ohlson and S. Penman, "Book Rate of Return and the Prediction of Earnings Changes: An Empirical Investigation," *Journal of Accounting Research*, Autumn 1982, and S. Penman, "An Evaluation of Accounting Rate of Return," *op. cit.*
19. A firm's classification in a cell need not be consecutive for it to be included in the proportion retaining the original classification for a particular interval.
20. Stickells and Black conclude that price/earnings ratios are more stable than price-to-book ratios and cite this as evidence demonstrating the superiority of earnings over book value as a measure of value. See S. Stickells, "A Comparative Analysis of the Relationships of Price to Earnings and Price to Book Value" (Masters' Thesis, MIT, Boston, 1980) and F. Black, "The Magic in Earnings," *Financial Analysts Journal*, November/December 1980.
21. J. Ou and S. Penman, "Financial Statement Analysis and the Evaluation of Market-to-Book Ratios" (Working paper, University of California at Berkeley, 1993) investigate the contributions of specific ratios to the determination of P/B; P. Fairfield, R. Sweeney and T. Yohn, "Disaggregating Earnings Improves Forecasts of Future ROE" (Working paper, Georgetown University, 1993) investigate the contributions of earnings components to the prediction of future profitability.
22. I thank Trevor Harris, Stephen Penman, Leigh Riddick, Richard Sweeney, Thomas Verghese, Teri Yohn and especially James Ohlson for their helpful comments and Georgetown University and its School of Business for their research support.