

USING COMPARATIVE FINANCIAL RATIOS TO CALCULATE INVESTMENT VALUE

Constant Earnings (No growth)

Assume that the company expects to receive annual earnings of **E** in perpetuity.

Present Value of a Perpetuity (a perpetual annuity):

$$P = \frac{E}{k} \quad \text{where } k \text{ is the } \mathbf{\textit{capitalization rate}} \text{ (} k < 1 \text{)}$$

Formula 1

Calculating Implied Market Capitalization Rate

Restate Formula 1:

$$k = \frac{1}{(P/E)}$$

Formula 2

Look at comparable corporations whose stock is publicly traded

P/E ratio: the relation between reported earnings and current trading price

Assuming that these companies also are not expected to grow, the reciprocal of the P/E ratio is the implied market capitalization rate (Formula 2).

Use Formula 1 to calculate P, the present value of a perpetuity of E, discounted at the implied market capitalization rate of comparable companies (k)

Constant Perpetual Growth

Assume that the company had earnings of E in its last reported fiscal year, and that its earnings are expected to grow at a constant annual rate of **g** ($g < k$)

Present Value of a Perpetuity of E, growing at a rate of g, capitalized at the rate of k ($g < k < 1$):

$$P = \frac{E}{k-g}$$

Formula 3

Use Formula 3 and comparable public companies P/E ratios and growth rates (g) to calculate implied market capitalization rates (k).

Calculating g and k for comparable companies

Calculate ROE (return on equity):

$$\text{ROE} = \frac{\text{Earnings}}{\text{Book Value}}$$

Formula 4

Calculate Plowback ratio (ratio of earnings retained and not paid out as dividends)

$$\text{Payout Ratio} = \frac{\text{Dividends}}{\text{Earnings}}$$

$$\text{Plowback Ratio} = 1 - (\text{Payout Ratio})$$

Calculate growth rate

$$g = (\text{Plowback Ratio}) \times \text{ROE}$$

Formula 5

Rearrange Formula 3 to express k in terms of P, E and g:

$$k = \frac{1}{(\text{P/E})} + g$$

Formula 6

Use comparable public companies P/E ratios and growth rates to calculate the implied market capitalization rates, k using Formula 6

Use Formula 3, the implied market capitalization rate and the expected growth rate of the Company to calculate P

Example: Use comparative numbers for "Average" of Other Drugstore Chains from tables at page 179 of the text.

Average

P/E ratio: 16.0

ROE: 15.6%

Payout ratio: 25.8% → Plowback ratio: 100 - 25.8 = 74.2 (%)

Implied growth rate (Formula 5):

$$g = .742 \times .156 = .1157 \text{ (11.6 \%)}$$

Implied market capitalization rate (Formula 6):

$$k = \frac{1}{16.0} + .116 = .0625 + .1157 = .1782 \text{ (17.8\%)}$$

Annual growth rate of Smith Drugstores earnings (from tables at page 178 of text):

Year	EPS	g
10	2.70	.055
9	2.56	.250
8	2.00	.053
7	1.90	.232
6	1.46	-.131
5	1.68	.167
4	1.44	.200
3	1.20	.200
2	1.00	.250
1	0.80	---

Last 3 years (8 - 10): Total growth rate: $(2.70 - 1.90) / 1.90 = .421$
 Average growth rate: $.421 / 3 = .140$

Last 5 years (6 - 10): Total growth rate: $(2.70 - 1.68) / 1.68 = .607$
 Average growth rate: $.607 / 5 = .121$

Years 1 - 10: Total growth rate: $(2.70 - 0.80) / 0.80 = 2.375$
 Average growth rate: $2.375 / 9 = .264$

Average Annual Earnings, Smith Drug stores

$$(2.70 + 2.56 + 2.00) / 3 = 7.26 / 3 = 2.42$$

Estimated Price per share (Formula 3) using 3-year average growth rate:

Using E = 2.70 (Year 10)

$$P = 2.70 / (.178 - .14) = 2.70 / .038 = \$71.053 \text{ per share}$$

Using E = 2.42 (average of last 3 years):

$$P = 2.42 / (.178 - .14) = 2.42 / .038 = \$63.684 \text{ per share}$$

Estimated Price per share (Formula 3) using 5-year average growth rate:

Using E = 2.70 (Year 10)

$$P = 2.70 / (.178 - .121) = 2.70 / .057 = \$47.368 \text{ per share}$$

Using E = 2.42 (average of last 3 years):

$$P = 2.42 / (.178 - .121) = 2.42 / .057 = \$42.456 \text{ per share}$$

Derivation of Formula 5: $g = (\text{Plowback Ratio}) \times \text{ROE}$

$$\text{ROE} = \frac{\text{Earnings}}{\text{Book Value}} \quad \rightarrow \text{Earnings} = \text{ROE} \times (\text{Book Value})$$

$$\text{Payout Ratio} = \frac{\text{Dividends}}{\text{Earnings}}$$

$$\text{Plowback Ratio} = 1 - (\text{Payout Ratio})$$

$$\begin{aligned} \text{Additional Book Value} &= \text{Earnings plowed back} = (\text{Plowback Ratio}) \times \text{Earnings} \\ &= (\text{Plowback Ratio}) \times \text{ROE} \times (\text{Book Value}) \end{aligned}$$

$$\begin{aligned} \text{This Year's Earnings} &= \text{ROE} \times [(\text{Book Value}) + (\text{Additional Book Value})] \\ &= \text{ROE} \times [(\text{Book Value}) + \{ (\text{Plowback Ratio}) \times \text{ROE} \times (\text{Book Value}) \}] \\ &= \text{ROE} \times (\text{Book Value}) \times [1 + \{ (\text{Plowback Ratio}) \times \text{ROE} \}] \end{aligned}$$

$$\text{Last Year's Earnings} = \text{ROE} \times (\text{Book Value})$$

$$\begin{aligned} \text{Additional Earnings} &= (\text{This Year's Earnings}) - (\text{Last Year's Earnings}) \\ &= (\text{ROE} \times (\text{Book Value}) \times [1 + \{ (\text{Plowback Ratio}) \times \text{ROE} \}]) - (\text{ROE} \times (\text{Book Value})) \\ &= \text{ROE} \times (\text{Book Value}) \times [1 + \{ (\text{Plowback Ratio}) \times \text{ROE} \} - 1] \\ &= \text{ROE} \times (\text{Book Value}) \times [(\text{Plowback Ratio}) \times \text{ROE}] \end{aligned}$$

$$\begin{aligned} \text{growth rate (g)} &= \frac{\text{Additional Earnings}}{\text{Last Year's Earnings}} = \frac{\text{ROE} \times (\text{Book Value}) \times (\text{Plowback Ratio}) \times \text{ROE}}{\text{ROE} \times (\text{Book Value})} \\ &= (\text{Plowback Ratio}) \times \text{ROE} \end{aligned}$$