

Economics 136: Financial Economics
Section Notes for Week 7

1 Concepts

$$\begin{aligned}D_{t+1} &= (1 - B) * E_{t+1} \\G &= ROE * B \\P_t &= \frac{D_{t+1}}{R - G} = \frac{(1 - B) * E_{t+1}}{R - ROE * B} \\E_{t+1} &= K_t * ROE \\K_{t+1} &= K_t + E_{t+1} * B = K_t(1 + ROE * B)\end{aligned}$$

where B is the plowback or retention ratio, ROE is the return on equity, and K is the firm's capital stock.

No growth value = $\frac{E_{t+1}}{R}$

$$PVGO = \frac{D_{t+1}}{R - G} - \frac{E_{t+1}}{R} = \frac{(1 - B) * E_{t+1}}{R - ROE * B} - \frac{E_{t+1}}{R}$$

2 Examples

2.1 Question 1: Plowback Rate

Consider a company, CBA, whose stock pays an initial dividend per share next year of \$100 and has expected dividend growth rate of 6% per year. The discount rate is 8% per year.

(a) What is the price of a share of CBA?

ans:

$$P_t = \frac{D}{R - G} = \frac{100}{.08 - .06} = \$5,000$$

(b) If expected dividend growth falls to 4%, what would happen to the share price?

ans:

$$P_t = \frac{D}{R - G} = \frac{100}{.08 - .04} = \$2,500$$

(c) Now go back to the assumption of 6% dividend growth. CBA has the expected dividend growth of 6% because its return on equity is 10% and management retains three-fifths of earnings. What is the earnings per share of CBA next period? What is the present value of growth opportunities per share of CBA?

ans:

$$E_{t+1} = \frac{D_{t+1}}{1 - B} = \frac{100}{1 - .6} = \$250$$

ans:

$$PVGO = \frac{D_{t+1}}{R - G} - \frac{E_{t+1}}{R} = \frac{100}{.08 - .06} - \frac{250}{.08} = \$5,000 - \$3,125 = \$1,875$$

2.2 Question 2: Multi-Stage Growth Model

Imagine that you have a technology company with current earnings per share of \$55 (E_0). The company reinvests all of these earnings into its own capital. This company's ROE for the next 5 years is 14%, and it retains all earnings for the next 5 years. Suppose that after these 5 years, ROE falls to 7% and the company starts to pay out all earnings as dividends starting year 6. The annual discount rate is 8%. Our goal is to value this company.

(a) If the price of one share of this company in year 5 is P_5 , what is the price today (i.e., express P_0 using P_5).

ans:

$$P_0 = \frac{P_5}{(1 + R)^5} = \frac{P_5}{1.08^5} = \frac{P_5}{1.469}$$

(b) What is the rate of earnings growth during the first five years of the company? Express E_5 as a function of E_0 and $ROE = 14\%$. Calculate E_5 .

$$\begin{aligned} G &= ROE * B = 0.14 * 1 = 14\% \\ E_5 &= E_0 * (1 + ROE)^5 = 55 * (1.14)^5 = \$105.90 \end{aligned}$$

(c) What is the rate of capital growth during the first five years of the company? Express K_5 as a function of K_0 and $ROE = 14\%$. Calculate K_5 .

ans:

$$\begin{aligned} K_0 &= \frac{E_1}{ROE} = \frac{E_0 * (1 + ROE)}{ROE} = \frac{\$55 * 1.14}{0.14} = \$447.86 \\ G &= ROE * B = 0.14 * 1 = 14\% \\ K_5 &= K_0 * (1 + ROE)^5 = \$447.86 * (1.14)^5 = \$862.32 \end{aligned}$$

(d) Calculate E_6 , keeping in mind that ROE falls to 7% after year 5.

ans: $E_6 = K_5 * ROE = \$862.32 * 0.07 = \60.36

(e) Calculate D_6 using the fact that the company pays out all earnings starting year 6. Given that all earnings are paid out, what is the growth rate of dividends from year 6 on?

ans: $D_6 = E_6 = \$60.36$

ans: $G = ROE * B = 0.07 * 0 = 0$

(f) Calculate P_5 , the price in period 5.

ans:

$$P_5 = \frac{D_6}{R - G} = \frac{\$60.36}{8\% - 0} = \$754.53$$

(g) Calculate P_0 , the stock price today.

ans:

$$P_0 = \frac{P_5}{(1 + R)^5} = \frac{\$754.53}{1.469} = \$513.63$$