
CLOSURE IN VALUATION: ESTIMATING TERMINAL VALUE
Problem 1

- a. Operating income in year 5 = 100 million $(1.1)^5 = \$ 161.05$ million
 Terminal value (year 5) = $161.05 * 8 = \$1288.41$ million
- b. Value/ EBIT = $(1 - t) (1 - g/ \text{ROC}) / (\text{Cost of capital} - g)$
 $8 = (1.4) (1 - .05/\text{ROC}) / (.10 - .05)$
 Solving for ROC,
 ROC = .15 or 15%

Problem 2

- Expected EBIT in year 6 = $80 (1.20)^5 (1.05) = \$209.02$ million
 Expected EBIT (1-t) in year 6 = $\$209.02 (1 - .40) = \125.41 million
 Reinvestment rate in year 6 = $g/ \text{ROC} = 5/14 = 35.71\%$
 Terminal value = $\$125.41 (1 - .3571) / (.10 - .05) = \1612.43 million

Problem 3

- a. Expected stable growth rate = $\text{ROC} * \text{Reinvestment rate}$
 $= 15\% .30 = 4.5\%$
 Expected high growth rate = $.80 * .15 = 12\%$
 EBIT (1-t) in year 5 = $(.15 * 100) (1.12)^4 (1.045) = \24.66 million
 Terminal value = $24.66 (1 - .30) / (.09 - .045) = \383.60 million
- a. If return on capital drops to 9%, you can re-estimate value by either changing the reinvestment rate (keeping growth at 4.5%) or changing the growth rate (keeping the reinvestment rate at 30%).
- If growth rate is kept fixed,
 Reinvestment rate = $4.5/9 = 50\%$
 Terminal value = $24.66 (1 - .50) / (.09 - .045) = \274 million
- If reinvestment rate is kept fixed,
 Expected growth rate = $9\% (.30) = 2.7\%$
 EBIT (1-t) in year 5 = $(.15 * 100) (1.12)^4 (1.027) = \24.24 million
 Terminal value = $24.24 (1 - .30) / (.09 - .027) = \269.33 million

Problem 4

- a. Terminal value = $500 (1.03)^{10} = \$671.96$ million

- a. After-tax operating income in year 10 = $50 (1.08)^{10} = \$107.95$ million
 Terminal Value/ After-tax operating income = $671.96/107.95 = 6.22$
- b. Value = $EBIT (1-t) (1+g)/(r - g)$
 Value/ EBIT (1-t) = $(1+g)/(r - g)$
 $6.22 = 1.03/(r - .03)$
 Solving for r, cost of capital = 13.55%

Problem 5

- a. After-tax operating income in year 6 = $20 (1.1)^5 (1.04) = \$ 33.50$ million
 Net Cap ex in year 6 = $(15-5) (1.1)^5 (1.04) = \16.75 million
 Free cashflow to the firm in year 6 = \$16.75 million
 Terminal value of firm in year 5 = $16.75/ (.12 - .04) = \$209.375$ million
- c. Reinvestment rate = $10/20 = 50%$ (in perpetuity)
 Return on capital in perpetuity = $g/ \text{Reinvestment rate} = .04/.5 = 8%$
- b. Terminal value if net cap ex is zero = $33.50/ (.12-.04) = \$ 418.75$ million
- c. Return on capital in perpetuity has to be infinite to allow growth rate to be positive while reinvestment rate is zero.

Problem 6

- a. Expected after-tax operating income in year 4 = $40 (1.07)^3(1.03) = \$50.96$
 Return on capital = $40/ 400 = 10%$
 Reinvestment rate in year 4 = $g/ \text{ROC} = 3\%/10\% = 30%$
 Value at end of year 3 = $50.96 (1 - .30)/ (.10 - .03) = \$ 509.60$ million
- b. If no growth after year 4
 Value at end of year 3 = $50.96 (1 - 0)/ (.10 - 0) = \$ 509.60$ million
- c. If expected growth rate is -5%
 Reinvestment rate = $g/ \text{ROC} = -5/10 = -50%$
 Value at end of year 3 = $50.96 (1 - (-.5))/ (.10 - (-.05)) = \$ 509.60$ million
 There is a partial liquidation of the firm each year which adds to the cashflows.
 Since the cost of capital = return on capital, the terminal value is not a function of the expected growth rate.

Problem 7

- a. Expected after-tax operating income in year 4 = $40 (1.07)^3(1.03) = \$50.96$
 Return on capital = $40/ 400 = 10%$
 Reinvestment rate in year 4 = $g/ \text{ROC} = 3\%/10\% = 30%$
 Value at end of year 3 = $50.96 (1 - .30)/ (.08 - .03) = \$ 713.44$ million

b. If no growth after year 4

Value at end of year 3 = $50.96 (1 - 0) / (.08 - 0) = \$ 637.0$ million

c. If expected growth rate is -5%

Reinvestment rate = $g / \text{ROC} = -5/10 = -50\%$

Value at end of year 3 = $50.96 (1 - (-.5)) / (.08 - (-.05)) = \$ 588$ million

Since the cost of capital < return on capital, higher stable growth rates increase terminal value.