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 = \((1-t) (1-g/ROC)/(\text{Cost of capital} - g)\)
   \[ 8 = (1.4) (1-.05/ROC)/(.10 -.05) \]
   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 = \(g/ROC = 5/14 = 35.71\%\)
Terminal value = $125.41 \((1-.3571)/(.10-.05)\) = $1612.43 million

Problem 3
a. Expected stable growth rate = ROC* 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
Dividend Discount Models

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 = \(\text{EBIT} (1-t) (1+g)/ (r -g)\)
   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) \((1.1)^3 (1.04)\) = $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/ 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/ 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/ 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/ 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 \( \frac{(1-0)}{(0.08 - 0)} \) = $637.0 million

c. If expected growth rate is –5%
Reinvestment rate = \( \frac{g}{ROC} \) = \( \frac{-5}{10} \) = -50%
Value at end of year 3 = 50.96 \( \frac{(1-(-0.5))}{(0.08 - (-0.05))} \) = $588 million
Since the cost of capital < return on capital, higher stable growth rates increase terminal value.