

Suggested Problem Solutions
Investment Valuation – Damodaran

Lecture 4 – Estimating Growth and Terminal Value

CHAPTER 11 – ESTIMATING GROWTH

1. a) Historical Growth Rates:

Year	EPS	Growth
1989	1.28	
1990	1.42	10.94%
1991	1.58	11.27%
1992	1.78	12.66%
1993	1.98	11.24%
1994	2.30	16.16%
Arithmetic Average:		12.45%
Geometric Average:		12.44%

$$\bar{g}_{Geometric} = \left(1 + \frac{2.30 - 1.28}{1.28}\right)^{\frac{1}{5}} - 1 = 12.44\%$$

The two estimates are very similar. The geometric average will be lower than the arithmetic average whenever there is volatility in the growth rate from year to year. The geometric average will generally give a more reasonable estimate. However, the geometric average can be very sensitive to the starting and ending dates chosen.

2. Fundamental growth in EPS

- a) The expected growth rate in earnings per share equals:

$$20\% * (1-.37) = 12.6\%$$

- b) The expected growth rate in earnings per share if ROE changes equals:

$$.25 (1-.37) + (.25-.20)/.20 = 40.75\%$$

3. Fundamental growth in Net Income

$$ROE = 150/1000 = 15\%$$

$$Equity\ Reinvestment\ Rate = \frac{Net\ Capex + Change\ in\ WC - Net\ Debt\ Issued}{Net\ Income} = \frac{(160 - 100) + 40 - 40}{150} = 40\%$$

$$Expected\ Growth = 15\% \cdot 40\% = 6\%$$

4. Fundamental Growth in Operating Income

a) Expected growth with no change in ROC:

$$ROC = 100 / 800 = 12.5\%$$

$$Reinvestment\ Rate = \frac{Net\ Capex + Change\ in\ WC}{EBIT(1 - T)} = \frac{25 + 15}{100} = 40\%$$

$$Expected\ Growth = 12.5\% \cdot 40\% = 5\%$$

b) Expected growth when ROC is changing:

$$Expected\ Growth = (Reinvestment\ Rate \times ROC) + \Delta ROC = (15\% \cdot 40\%) + \frac{15\% - 12.5\%}{12.5\%} = 26\%$$

CHAPTER 12 – ESTIMATING TERMINAL VALUE

2. Expected EBIT in year 7 = $80 (1.20)^6 (1.05) = \$250.823$ million

Expected EBIT (1-T) in year 7 = $\$250.823 (1 - .40) = \150.494 million

Reinvestment rate in year 7 = $g / ROC = .05 / .14 = 35.71\%$

Free Cash Flow in year 7 = $\$150.494(1 - .3571) = \96.753 million

Terminal Value₆ = $\$96.753 / (.10 - .05) = \$1,935.05$ million

3.

a) Expected stable growth rate = $ROC * Reinvestment\ rate = 15\% \times 30\% = 4.5\%$

Expected high growth rate = $.80 * .15 = 12\%$

EBIT (1-t) in year 5 = $(.15 * 100) (1.12)^4 (1.045) = \24.66 million

Free Cash Flow in year 5 = $\$24.66 \times (1 - 30\%) = \17.262 million

Terminal value = $17.262 / (.09 - .045) = \383.6 million

- b) If return on capital drops to 9%, the firm has two choices. It can continue to grow at the same rate, but with a higher required reinvestment rate, or it can keep reinvestment the same and grow at a slower rate (or some combination of these two choices). We 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 the growth rate is kept fixed, we get:

$$\text{Reinvestment rate} = 4.5/9 = 50\%$$

$$\text{Free Cash Flow} = 24.66(1-.5) = \$12.33 \text{ million}$$

$$\text{Terminal value} = 12.33/ (.09 - .045) = \$274 \text{ million}$$

If the reinvestment rate is kept fixed, we get:

$$\text{Expected growth rate} = 9\%(.30) = 2.7\%$$

$$\text{EBIT (1-t) in year 5} = (.15 * 100) (1.12)^4(1.027) = \$24.24 \text{ million}$$

$$\text{Free Cash Flow in year 5} = 24.24(1-.3) = \$16.968 \text{ million}$$

$$\text{Terminal value} = 16.968/ (.09 - .027) = \$269.33 \text{ million}$$

5.

- a) After-tax operating income in year 6 = $20 (1.1)^5(1.04) = \$ 33.50 \text{ million}$
 Net CapEx in year 6 = $(15-5) (1.1)^5(1.04) = \$16.75 \text{ million}$
 Free Cash Flow to the Firm in year 6 = $33.5 - 16.75 = \$16.75 \text{ million}$
 Terminal Value of firm in year 5 = $16.75/ (.12 - .04) = \$209.375 \text{ million}$

- b) We are assuming that after-tax earnings, capital expenditures, and depreciation all grow at the same rate over time. We are therefore assuming a constant reinvestment rate over time. The future reinvestment rate will equal the current reinvestment rate or:

$$\text{Reinvestment rate} = (15 - 5)/20 = 50\% \text{ (in perpetuity)}$$

$$\text{ROC} = g/\text{Reinvestment rate} = .04/.5 = 8\% \text{ (in perpetuity)}$$

- c) If Net Capex equals zero, then Free Cash Flow in year 6 will equal the full amount of after-tax operating income, or \$33.50 million. We then have:

$$\text{Terminal Value (with Net Capex=0)} = 33.50/ (.12 - .04) = \$ 418.75 \text{ million}$$

- d) If the reinvestment rate is zero and cash flows are still expected to grow at 4% per year in perpetuity, the ROC would have to be infinite. It is simply not possible for the firm to grow in perpetuity with no reinvestment.