

5.8: Problems

? Problem 5.8.1

You have a preferred stock with an \$80 par value. The stock has a required return of 7% and the dividend is 6% of par value. How much should you pay for this stock?

Answer

$$P_0 = D/k = (\text{Dividend Rate} * \text{Par Value})/k$$

$$P_0 = (0.06 \times \$80)/.07$$

$$P_0 = \$4.80/.07$$

$$P_0 = \$68.57$$

? Problem 5.8.2

Stock A has an expected dividend (D_1) of \$3.50. The growth rate in dividends (g) is 4% and the required return is 13%. What is the price of this stock?

Answer

$$P_0 = D_1/(k - g)$$

$$P_0 = 3.50/(0.13 - 0.04)$$

$$P_0 = \$38.89$$

? Problem 5.8.3

Stock C just paid a dividend (D_0) of \$2. The required return is 12%. Find the price of the stock when the growth rates are

- 0%
- 5%
- 10%
- 15%,
- Does your answer seem reasonable? Explain.

Answer

Part 3a

$$P_0 = D/k$$

$$P_0 = 2.00/0.12$$

$$P_0 = \$16.67$$

Part 3b

$$P_0 = D_1/(k - g)$$

$$P_0 = (2.00 \times 1.05)/(0.12 - 0.05)$$

$$P_0 = 2.10/0.07$$

$$P_0 = \$30.00$$

Part 3c

$$P_0 = D_1/(k - g)$$

$$P_0 = (2.00 \times 1.10)/(0.12 - 0.10)$$

$$P_0 = 2.20/0.02$$

$$P_0 = \$110.00$$

Part 3d

$$P_0 = D_1 / (k - g)$$

$$P_0 = (2.00 \times 1.15) / (0.12 - 0.15)$$

$$P_0 = 2.30 / -0.03$$

$$P_0 = -\$76.67$$

Part 3e

No, the answer to part 4 does not make sense. As we can see from part 1-3, increases in the growth rate make the stock more valuable. Also, due to the limited liability feature of corporations, the lowest value a stock can take is \$0.00. Therefore, it makes no sense to say that as growth increases from 10% to 15%, the stock price not only declines, it turns negative. The problem is that the formula we developed for solving for the present value of dividends when the growth rate is constant only works if the required return is greater than the growth rate ($k > g$). If that does not hold, the formula is no longer solving for present value, but instead is generating a meaningless number.

While this may appear to be a significant flaw at first glance, it really isn't as bad as it seems. Remember that the model assumes that the growth rate will continue not for a short time, but forever. How likely is it for a company to grow at 15% forever? Since the overall economy only grows at about a 3-4% annual rate, this company would overtake the world before too long. When companies exhibit extremely high growth rates, we know that their growth must decline over time because of (A) they will have no new areas of growth after they control their entire market or (B) new competition will enter the market. Consider Wal-Mart. It is unreasonable to assume they will grow at the same rate over the next 20 years as they have over the past 20 because they don't have as many untapped markets to expand into. When companies exhibit high growth rates, we must use the non-constant dividend growth model.

? Problem 5.8.4

Price a supernormal (nonconstant) growth stock with the following information:

Current Dividend (D_0) is \$3.00

growth rate year 1 is 35%

growth rate year 2 is 25%

growth rate year 3 is 20%

growth rate years 4 through infinity is 10%

required return is 18%

Answer

Step 1 – Forecast all dividends up to and including the first year of constant growth

$$D_1 = 3.00 \times (1.35) = \$4.05$$

$$D_2 = 4.05 \times (1.25) = \$5.06$$

$$D_3 = 5.06 \times (1.20) = \$6.07$$

$$D_4 = 6.07 \times (1.10) = \$6.68$$

Step 2 – Solve for the value of all dividends during the constant growth stage

$$P_3 = D_4 / (k - g) = 6.68 / (0.18 - 0.10) = \$83.50$$

Step 3 – Solve for PV

$$CF_0 = 0$$

$$CF_1 = 4.05$$

$$CF_2 = 5.06$$

$$CF_3 = 89.57 \leftarrow \$6.07 + \$83.50$$

$$I = 18$$

$$NPV = P_0 = \$61.58$$

? Problem 5.8.5

Price a supernormal (nonconstant) growth stock with the following information:

Current Dividend (D_0) is \$1.50
growth rate year 1 is -10%
growth rate year 2 is 0%
growth rates years 3-4 are 20%
growth rate year 5 is 150%
growth rate years 6 through infinity is 3%
required return is 15%

Answer

Step 1 – Forecast all dividends up to and including the first year of constant growth

$$D_1 = 1.50 \cdot (0.90) = \$1.35$$

$$D_2 = 1.35 \cdot (1.00) = \$1.35$$

$$D_3 = 1.35 \cdot (1.20) = \$1.62$$

$$D_4 = 1.62 \cdot (1.20) = \$1.94$$

$$D_5 = 1.94 \cdot (2.50) = \$4.85$$

$$D_6 = 4.85 \cdot (1.03) = \$5.00$$

Step 2 – Solve for the value of all dividends during the constant growth stage

$$P_5 = D_6 / (k - g) = 5.00 / (0.15 - 0.03) = \$41.67$$

Step 3 – Solve for PV

$$CF_0 = 0$$

$$CF_1 = 1.35$$

$$CF_2 = 1.35$$

$$CF_3 = 1.62$$

$$CF_4 = 1.94$$

$$CF_5 = 46.52 \leftarrow \$4.85 + \$41.67$$

$$I = 15$$

$$NPV = P_0 = \$27.50$$

? Problem 5.8.6

If you planned to sell the stock described in Problem 5 immediately after the year 3 dividend was paid, how much would you expect to receive? (Assume the required returns and growth rates remain unchanged)

Answer

The key for this problem is to remember the concept that the value of the stock is equal to the present value of the remaining cash flows. The cash flows are the same as the ones we forecasted to solve for problem 5, except that we have moved through the first three years and the first three dividends are no longer associated with the stock. The person buying the stock is going to receive all of the dividends from year 4 on (but remember that since we are in year three, the year 4 dividend is only 1 year out).

$$CF_0 = 0$$

$$CF_1 = 1.94$$

$$CF_2 = 46.52$$

$$I = 15$$

$$NPV = P_3 = \$36.86$$