CHAPTER 8
STOCK VALUATION

Answers to Concepts Review and Critical Thinking Questions

5. The common stock probably has a higher price because the dividend can grow, whereas it is fixed on
the preferred. However, the preferred is less risky because of the dividend and liquidation
preference, so it is possible the preferred could be worth more, depending on the circumstances.

7. Yes. If the dividend grows at a steady rate, so does the stock price. In other words, the dividend
growth rate and the capital gains yield are the same.

11. Presumably, the current stock value reflects the risk, timing and magnitude of all future cash flows,
both short-term and long-term. If this is correct, then the statement is false.

Solutions to Questions and Problems

1. The constant dividend growth model is:

\[ P_t = D_t \times (1 + g) / (R - g) \]

So the price of the stock today is:

\[ P_0 = D_0 (1 + g) / (R - g) \]
\[ P_0 = $1.95 (1.04) / (.105 - .04) \]
\[ P_0 = $31.20 \]

The dividend at Year 4 is the dividend today times the FVIF for the growth rate in dividends and
four years, so:

\[ P_3 = D_3 (1 + g) / (R - g) \]
\[ P_3 = D_0 (1 + g)^4 / (R - g) \]
\[ P_3 = $1.95 (1.04)^4 / (.105 - .04) \]
\[ P_3 = $35.10 \]

We can do the same thing to find the dividend in Year 16, which gives us the price in Year 15, so:

\[ P_{15} = D_{15} (1 + g) / (R - g) \]
\[ P_{15} = D_0 (1 + g)^{16} / (R - g) \]
\[ P_{15} = $1.95 (1.04)^{16} / (.105 - .04) \]
\[ P_{15} = $56.19 \]

There is another feature of the constant dividend growth model: The stock price grows at the
dividend growth rate. So, if we know the stock price today, we can find the future value for any time
in the future we want to calculate the stock price. In this problem, we want to know the stock price in
three years, and we have already calculated the stock price today. The stock price in three years will be:

\[ P_3 = P_0(1 + g)^3 \]
\[ P_3 = 31.20(1 + .04)^3 \]
\[ P_3 = 35.10 \]

And the stock price in 15 years will be:

\[ P_{15} = P_0(1 + g)^{15} \]
\[ P_{15} = 31.20(1 + .04)^{15} \]
\[ P_{15} = 56.19 \]

2. We need to find the required return of the stock. Using the constant growth model, we can solve the equation for \( R \). Doing so, we find:

\[ R = \left( \frac{D_1}{P_0} \right) + g \]
\[ R = \left( \frac{2.04}{37} \right) + .045 \]
\[ R = .1001, \text{ or } 10.01\% \]

3. The dividend yield is the dividend next year divided by the current price, so the dividend yield is:

Dividend yield = \( \frac{D_1}{P_0} \)
Dividend yield = \( \frac{2.04}{37} \)
Dividend yield = .0551, or 5.51%

The capital gains yield, or percentage increase in the stock price, is the same as the dividend growth rate, so:

Capital gains yield = 4.5%

5. The required return of a stock is made up of two parts: The dividend yield and the capital gains yield. So, the required return of this stock is:

\[ R = \text{Dividend yield} + \text{Capital gains yield} \]
\[ R = .059 + .039 \]
\[ R = .0980, \text{ or } 9.80\% \]

8. The price of a share of preferred stock is the dividend divided by the required return. This is the same equation as the constant growth model, with a dividend growth rate of zero percent. Remember, most preferred stock pays a fixed dividend, so the growth rate is zero. Using this equation, we find the price per share of the preferred stock is:

\[ R = \frac{D}{P_0} \]
\[ R = \frac{3.50}{85} \]
\[ R = .0412, \text{ or } 4.12\% \]
15. Here we have a stock that pays no dividends for 10 years. Once the stock begins paying dividends, it will have a constant growth rate of dividends. We can use the constant growth model at that point. It is important to remember that general constant dividend growth formula is:

\[ P_t = \left[ D_t \times (1 + g) \right] / (R - g) \]

This means that since we will use the dividend in Year 10, we will be finding the stock price in Year 9. The dividend growth model is similar to the PVA and the PV of a perpetuity: The equation gives you the PV one period before the first payment. So, the price of the stock in Year 9 will be:

\[ P_9 = D_{10} / (R - g) \]
\[ P_9 = 14 / (.125 - .039) \]
\[ P_9 = 162.79 \]

The price of the stock today is simply the PV of the stock price in the future. We simply discount the future stock price at the required return. The price of the stock today will be:

\[ P_0 = 162.79 / 1.125^9 \]
\[ P_0 = 56.40 \]

17. With supernormal dividends, we find the price of the stock when the dividends level off at a constant growth rate, and then find the PV of the future stock price, plus the PV of all dividends during the supernormal growth period. The stock begins constant growth in Year 4, so we can find the price of the stock in Year 4, at the beginning of the constant dividend growth, as:

\[ P_4 = D_4 (1 + g) / (R - g) \]
\[ P_4 = 2.75(1.05) / (.12 - .05) \]
\[ P_4 = 41.25 \]

The price of the stock today is the PV of the first four dividends, plus the PV of the Year 4 stock price. So, the price of the stock today will be:

\[ P_0 = 13 / 1.11 + 9 / 1.12^2 + 6 / 1.12^3 + 2.75 / 1.12^4 + 41.25 / 1.12^4 \]
\[ P_0 = 51.02 \]

18. With supernormal dividends, we find the price of the stock when the dividends level off at a constant growth rate, and then find the PV of the future stock price, plus the PV of all dividends during the supernormal growth period. The stock begins constant growth in Year 4, so we can find the price of the stock in Year 3, one year before the constant dividend growth begins as:

\[ P_3 = D_3 (1 + g) / (R - g) \]
\[ P_3 = D_0 (1 + g_1)^3 (1 + g_2) / (R - g) \]
\[ P_3 = 2.15(1.30)^3(1.04) / (.11 - .04) \]
\[ P_3 = 70.18 \]

The price of the stock today is the PV of the first three dividends, plus the PV of the Year 3 stock price. The price of the stock today will be:

\[ P_0 = 2.15(1.30) / 1.11 + 2.15(1.30)^2 / 1.11^2 + 2.15(1.30)^3 / 1.11^3 + 70.18 / 1.11^3 \]
\[ P_0 = 60.23 \]
We could also use the two-stage dividend growth model for this problem, which is:

\[ P_0 = \frac{D_0(1 + g_1)}{(R - g_1)} \left[ 1 - \left( \frac{1 + g_1}{1 + R} \right)^t \right] + \frac{D_0(1 + g_2)}{(R - g_2)} \left[ \frac{1 + g_2}{1 + R} \right]^t \]

\[ P_0 = \frac{2.15(1.30)}{(.11 - .30)} \left[ 1 - \left( \frac{1.30}{1.11} \right)^3 \right] + \frac{(1 + .30)}{1 + .11} \left( \frac{2.15(1.04)}{.11 - .04} \right) \]

\[ P_0 = 60.23 \]

19. Here we need to find the dividend next year for a stock experiencing supernormal growth. We know the stock price, the dividend growth rates, and the required return, but not the dividend. First, we need to realize that the dividend in Year 3 is the current dividend times the FVIF. The dividend in Year 3 will be:

\[ D_3 = D_0 (1.30)^3 \]

And the dividend in Year 4 will be the dividend in Year 3 times one plus the growth rate, or:

\[ D_4 = D_0 (1.30)^3 (1.20) \]

The stock begins constant growth in Year 4, so we can find the price of the stock in Year 4 as the dividend in Year 5, divided by the required return minus the growth rate. The equation for the price of the stock in Year 4 is:

\[ P_4 = D_4 (1 + g) / (R - g) \]

Now we can substitute the previous dividend in Year 4 into this equation as follows:

\[ P_4 = D_0 (1 + g_1)^3 (1 + g_2) (1 + g_3) / (R - g) \]

\[ P_4 = D_0 (1.30)^3 (1.20) (1.06) / (.10 - .06) \]

\[ P_4 = 69.86D_0 \]

When we solve this equation, we find that the stock price in Year 4 is 69.86 times as large as the dividend today. Now we need to find the equation for the stock price today. The stock price today is the PV of the dividends in Years 1, 2, 3, and 4, plus the PV of the Year 4 price. So:

\[ P_0 = D_0(1.30)/1.10 + D_0(1.30)^2/1.10^2 + D_0(1.30)^3/1.10^3 + D_0(1.30)^4(1.20)/1.10^4 + 69.86D_0/1.10^4 \]

We can factor out \( D_0 \) in the equation and combine the last two terms. Doing so, we get:

\[ P_0 = D_0 \{ 1.30/1.10 + 1.30^2/1.10^2 + 1.30^3/1.10^3 + [ (1.30)^4(1.20) + 69.86 ] / 1.10^4 \} \]

Reducing the equation even further by solving all of the terms in the braces, we get:

\[ \$86 = D_0 \{ 1.30/1.10 + 1.30^2/1.10^2 + 1.30^3/1.10^3 + [ (1.30)^4(1.20) + 69.86 ] / 1.10^4 \} \]

\[ \$86 = 53.75D_0 \]

\[ D_0 = \$86 / 53.75 \]

\[ D_0 = \$1.60 \]

This is the dividend today, so the projected dividend for the next year will be:

\[ D_1 = \$1.60(1.30) \]

\[ D_1 = \$2.08 \]
20. The constant growth model can be applied even if the dividends are declining by a constant percentage, just make sure to recognize the negative growth. So, the price of the stock today will be:

\[ P_0 = D_0 \left( 1 + g \right) / (R - g) \]

\[ P_0 = 10.25(1 - .03) / [(0.095 - (-.03))] \]

\[ P_0 = 79.54 \]

21. We are given the stock price, the dividend growth rate, and the required return and are asked to find the dividend. Using the constant dividend growth model, we get:

\[ P_0 = 68 = D_0 \left( 1 + g \right) / (R - g) \]

Solving this equation for the dividend gives us:

\[ D_0 = 68(1.11 - .0375) / (1.0375) \]

\[ D_0 = 4.75 \]

22. The price of a share of preferred stock is the dividend payment divided by the required return. We know the dividend payment in Year 20, so we can find the price of the stock in Year 19, one year before the first dividend payment. Doing so, we get:

\[ P_{19} = 20.00 / .0535 \]

\[ P_{19} = 373.83 \]

The price of the stock today is the PV of the stock price in the future, so the price today will be:

\[ P_0 = 373.83 / (1.0535)^{19} \]

\[ P_0 = 138.87 \]

24. We can use the two-stage dividend growth model for this problem, which is:

\[ P_0 = \left[ D_0 \left( 1 + g_1 \right)/(R - g_1) \right] \left[ 1 - \left[ \left( 1 + g_1 \right)/(1 + R) \right]^{t} \right] + \left[ \left( 1 + g_1 \right)/(1 + R) \right]^{t} \left[ D_0 \left( 1 + g_2 \right)/(R - g_2) \right] \]

\[ P_0 = \left[ 1.55(1.27)/(.12 - .27) \right] \left[ 1 - \left( 1.27/1.12 \right)^{8} \right] + \left( 1.27/1.12 \right)^{8} \left[ 1.55(1.035)/(.12 - .035) \right] \]

\[ P_0 = 74.33 \]

25. We can use the two-stage dividend growth model for this problem, which is:

\[ P_0 = \left[ D_0 \left( 1 + g_1 \right)/(R - g_1) \right] \left[ 1 - \left[ \left( 1 + g_1 \right)/(1 + R) \right]^{t} \right] + \left[ \left( 1 + g_1 \right)/(1 + R) \right]^{t} \left[ D_0 \left( 1 + g_2 \right)/(R - g_2) \right] \]

\[ P_0 = \left[ 1.94(1.16)/(.10 - .16) \right] \left[ 1 - \left( 1.16/1.10 \right)^{11} \right] + \left( 1.16/1.10 \right)^{11} \left[ 1.94(1.04)/(.10 - .04) \right] \]

\[ P_0 = 88.02 \]
31. To find the target stock price, we first need to calculate the growth rate in earnings. We can use the sustainable growth rate from a previous chapter. First, the ROE is:

\[
\text{ROE} = \frac{\text{Net income}}{\text{Equity}} \\
\text{ROE} = \frac{\$875,000}{\$7,300,000} \\
\text{ROE} = .1199, \text{ or } 11.99\%
\]

We also need the retention ratio, which is one minus the payout ratio, or:

\[
b = 1 - \frac{\text{Dividends}}{\text{Net income}} \\
b = 1 - \frac{\$345,000}{\$875,000} \\
b = .6057, \text{ or } 60.57\%
\]

So, the sustainable growth rate is:

\[
\text{Sustainable growth rate} = \frac{\text{ROE} \times b}{1 - \text{ROE} \times b} \\
\text{Sustainable growth rate} = \frac{.1199 \times .6057}{1 - .1199 \times .6057} \\
\text{Sustainable growth rate} = .0783, \text{ or } 7.83\%
\]

Now we need to find the current EPS, which is:

\[
\text{EPS}_0 = \frac{\text{Net income}}{\text{Shares outstanding}} \\
\text{EPS}_0 = \frac{\$875,000}{125,000} \\
\text{EPS}_0 = $7.00
\]

So, the EPS next year will be:

\[
\text{EPS}_1 = \text{EPS}_0(1 + g) \\
\text{EPS}_1 = $7.00(1 + .0783) \\
\text{EPS}_1 = $7.55
\]

Finally, the target share price next year is:

\[
P_1 = \text{Benchmark PE ratio} \times \text{EPS}_5 \\
P_1 = 16($7.55) \\
P_1 = $120.77
32. We are asked to find the dividend yield and capital gains yield for each of the stocks. All of the
stocks have a required return of 15 percent, which is the sum of the dividend yield and the capital
gains yield. To find the components of the total return, we need to find the stock price for each stock.
Using this stock price and the dividend, we can calculate the dividend yield. The capital gains yield
for the stock will be the total return (required return) minus the dividend yield.

W: \[ P_0 = \frac{D_0(1 + g)}{(R - g)} = \frac{3.75(1.10)}{.15 - .10} = 82.50 \]
Dividend yield = \[ \frac{D_1}{P_0} = \frac{3.75(1.10)}{82.50} = .05, \text{ or } 5\% \]
Capital gains yield = .15 – .05 = .10, or 10\%

X: \[ P_0 = \frac{D_0(1 + g)}{(R - g)} = \frac{3.75}{.15 - 0} = 25.00 \]
Dividend yield = \[ \frac{D_1}{P_0} = \frac{3.75}{25.00} = .15, \text{ or } 15\% \]
Capital gains yield = .15 – .15 = 0\%

Y: \[ P_0 = \frac{D_0(1 + g)}{(R - g)} = \frac{3.75(1 - .05)}{.15 + .05} = 17.81 \]
Dividend yield = \[ \frac{D_1}{P_0} = \frac{3.75(.95)}{17.81} = .20, \text{ or } 20\% \]
Capital gains yield = .15 – .20 = -.05, or –5\%

Z: \[ P_0 = \frac{D_0(1 + g)}{P_0} = \frac{D_0(1 + g_1)(1 + g_2)}{(R - g_2)} \]
\[ P_0 = \frac{3.75(1.20)^2(1.05)}{.15 - .05} = 56.70 \]
\[ P_0 = \frac{3.75 (1.20)}{1.15} + \frac{3.75 (1.20)^2}{(1.15)^2} + \frac{56.70}{(1.15)^2} = 50.87 \]
Dividend yield = \[ \frac{D_1}{P_0} = \frac{3.75(1.20)}{50.87} = .088, \text{ or } 8.8\% \]
Capital gains yield = .15 – .088 = .062, or 6.2\%

In all cases, the return is 15 percent, but the return is distributed differently between current income
and capital gains. High growth stocks have an appreciable capital gains component but a relatively
small current income yield; conversely, mature, negative-growth stocks provide a high current
income but also price depreciation over time.