Solutions to Selected Problems on Exam #2

4. The solution to this problem is based on the principle of triangular arbitrage. From the information given we know that:

$$\$1 \times \left( \frac{1}{0.66711} \right) \text{ SWF}$$

and

$$\$1 \times \left( \frac{1}{0.16499} \right) \text{ FF},$$

implying that:

$$1 \text{ SWF} \times \left( \frac{0.16499}{0.66711} \right) \text{ FF} \times 0.24732 \text{ FF}.$$

5. Multiplying the firm’s EPS (6) by the industry average P/E multiple (9) gives 54 as the estimate of the value of a share of the firm’s stock.

8. We need to calculate the price of the bond in two cases, with an interest rate of 5% and with an interest rate of 6%. If the interest rate is 5% the price of the bond is given by:

$$\text{Bond Price} = \frac{1 - \left( 1.05 \right)^{-4}}{0.05} \times 90 = 354.60.$$ 

Likewise, if the interest is 6% the price of the bond is given by:

$$\text{Bond Price} = \frac{1 - \left( 1.06 \right)^{-4}}{0.06} \times 90 = 346.51.$$ 

[Note: you should recognize that the formula for computing the PV of an ordinary annuity is used to compute the bond’s price.]

So, as the interest rate rises from 5% to 6%, the price of the bond goes from $354.60 to $346.51, i.e., if falls by $8.09.

9. From the results needed to answer question #8, it is clear that in this case the bond’s price rises by $8.09.
10. We need to find the value of $i$ that solves:

$$
\frac{900}{1000} = \frac{1000}{(1+i)^4}
$$

The solution is given by:

$$
i = \frac{1000}{900} \approx 1.1111 \approx 0.1111 \text{ or } 11.11%.
$$

11. We need to find the value of $i$ that solves:

$$
\frac{850}{1000} = \frac{1000}{(1+i)^4}
$$

The solution is given by:

$$
i = \left(\frac{1000}{850}\right)^{1/4} \approx 1.0415 \approx 0.0415 \text{ or } 4.15%.
$$

14. The current yield is given by:

$$
\text{Current Yield} = \frac{\text{Coupon Payment}}{\text{Bond Price}} = \frac{80}{850} = 0.0941 \text{ or } 9.41%.
$$

16. Given that the coupon rate is 11% and the face value is $1,000, the coupon payment received in one year equals $110. After one year the bond holder will also receive the face value. Given that the current price of the bond is $1,050, the yield to maturity for this problem, then, is the value of $i$ that solves the following equation:

$$
\frac{1050}{(1+i)} = \frac{110}{1000} \frac{1000}{(1+i)} = \frac{1110}{(1+i)}.
$$

The solution is given by:

$$
i = \left(\frac{1110}{1050}\right)^{1/4} \approx 1.0571 \approx 0.0571 \text{ or } 5.71%.
$$

18. Given that the expected growth rate of dividends is zero, the constant-growth-rate DDM implies:

$$
P_0 = \frac{D_1}{k} = \frac{1.67}{0.07} = 23.86.
$$
19. We need to solve for $k$ in the constant-growth-rate DDM:

$$ P_0 = \frac{D_1}{k \& g}, $$

where we’re given that $P_0 \approx 34.50$, $g' \approx 0.10$, and we’re given sufficient information to compute $D_1$. Since $D_0 \approx 1.60$, and $g' \approx 0.10$, we know that $D_1' = 1.60 \times 1.1 = 1.76$, so we can find the value of $k$ that solves the following equation:

$$ 34.50 = \frac{1.76}{k \& 0.10}. $$

Straightforward algebra shows that, rounding off to three decimal places, $k' = 0.151$ (or 15.1%).

21. We’re told that the earnings retention rate is 50% and the rate of return on new investments is 17%. So, applying the formula for computing the growth rate of dividends and earnings, we get:

$$ g' = 0.50 \times 0.17 = 0.085 \text{ (or 8.5%).} $$

23. We will apply the constant-growth-rate DDM, but first we need to compute both $D_1$ and $g$. First, since the earnings retention rate is 70% and the expected earnings per share is $12, we have:

$$ D_1' = 0.3 \times 12 = 3.6. $$

Next, since the earnings retention rate is 70% and the expected rate of return on future investments is 17%, we have:

$$ g' = 0.70 \times 0.17 = 0.119. $$

Given that $k' = 0.14$, we can use the constant-growth-rate DDM to compute:

$$ P_0 = \frac{3.6}{0.14 \& 0.119}, \quad \frac{3.6}{0.021}, \quad 171.43. $$

24. To compute the NPV of future investments, we will first compute the stock’s price per share under two scenarios: (I) a ‘no growth & no decline’ case; and (II) a ‘growth’ case. Then we’ll take the difference between the stock price under the two scenarios.

Case I: No Growth & No Decline

In this case the current value of earnings per share of $14 is expected to continue into the infinite future. Given this assumption, and given a market capitalization rate of 15%, we can calculate:
\[ P_0 \cdot \frac{E_1 - k}{k} = 14 \cdot \frac{0.15}{0.15} = 93.33. \]

Case II: Growth

Following the argument laid out in the explanation for Problem #23 above, we see that:

\[ D_1 = 0.4 \times 14 = 5.6, \text{ and } \]

\[ g = 0.6 \times 0.17 = 0.102. \]

So, given that \( k = 0.15 \), we see that:

\[ P_0 \cdot \frac{5.6}{0.15 - 0.102} = \frac{5.6}{0.048} = 116.67. \]

The Solution:

So, by carrying out the investment projects which are expected to earn an annual rate of return of 17%, the estimated value of the stock increases from $93.33 to $116.67, implying that:

\[ NPV \text{ of Future Investments} = 116.67 - 93.33 = 23.34. \]