**Chapter 7, Questions and Problems 4**

Here we need to find the YTM of a bond. The equation for the bond price is:

$$\mathrm{P} = \mathrm{C} \times \mathrm{PV_A}(\mathrm{r};\mathrm{t}) + \mathrm{F} \times \mathrm{DF}(\mathrm{r};\mathrm{t}) = \frac{\mathrm{C}}{\mathrm{r}}\left[1 - \frac{1}{(1+\mathrm{r})^{\mathrm{t}}}\right] + \frac{\mathrm{F}}{(1+\mathrm{r})^{\mathrm{t}}}$$

So we have $\mathrm{P} = ¥105{,}430 = ¥3{,}400 \times \mathrm{PV_A}(\mathrm{r}; 16) + ¥100{,}000 \times \mathrm{DF}(\mathrm{r}; 16)$

Notice the equation cannot be solved directly for *R*. Using a spreadsheet, a financial calculator, or trial and error, we find: $\mathrm{r} = \mathrm{YTM} = 2.97\%$

If you are using trial and error to find the YTM of the bond, you might be wondering how to pick an interest rate to start the process. First, we know the YTM has to be lower than the coupon rate since the bond is a premium bond. That still leaves a lot of interest rates to check. One way to get a starting point is to use the following equation, which will give you an approximation of the YTM:

Approximate

$$\mathrm{YTM} = \frac{\text{Annual interest payment} + \dfrac{\text{Price difference from par}}{\text{Years to maturity}}}{\dfrac{\text{Price} + \text{Par value}}{2}}$$

Solving for this problem, we get:

Approximate

$$\mathrm{YTM} = \frac{¥3{,}400 + \dfrac{(-¥5{,}430)}{16}}{\dfrac{¥105{,}430 + ¥100{,}000}{2}} = 0.0298, \text{ or } 2.98\%$$

This is not the exact YTM, but it is close, and it will give you a place to start.

**Chapter 7, Questions and Problems 20**

Initially, at a YTM of 6 percent, the prices of the two bonds are:

$\mathrm{P}_J = \$15 \times \mathrm{PV}_A(3\%; 28) + \$1{,}000 \times \mathrm{DF}(3\%; 28) = \$718.54$

$P_K = \$45 \times PV_A(3\%; 28) + \$1{,}000 \times DF(3\%; 28) = \$1{,}281.46$

If the YTM rises from 6 percent to 8 percent:

$P_J = \$15 \times PV_A(4\%; 28) + \$1{,}000 \times DF(4\%; 28) = \$583.42$

$P_K = \$45 \times PV_A(4\%; 28) + \$1{,}000 \times DF(4\%; 28) = \$1{,}083.32$

The percentage change in price is calculated as:

$\text{Percentage change in price} = (\text{New price} - \text{Original price})/\text{Original price}$

$\Delta P_J\% = (\$583.42 - 718.54)/\$718.54 = -0.1880, \text{or} -18.80\%$

$\Delta P_K\% = (\$1{,}083.32 - 1{,}281.46)/\$1{,}281.46 = -0.1546, \text{or} -15.46\%$

If the YTM declines from 6 percent to 4 percent:

$P_J = \$15 \times PV_A(2\%; 28) + \$1{,}000 \times DF(2\%; 28) = \$893.59$

$P_K = \$45 \times PV_A(2\%; 28) + \$1{,}000 \times DF(2\%; 28) = \$1{,}532.03$

$\Delta P_J\% = (\$893.59 - 718.54)/\$718.54 = 0.2436, \text{or } 24.36\%$

$\Delta P_K\% = (\$1{,}532.03 - 1{,}281.46)/\$1{,}281.46 = 0.1955, \text{or } 19.55\%$

All else the same, the lower the coupon rate on a bond, the greater is its price sensitivity to changes in interest rates.

**Chapter 7, Questions and Problems 27**

*a.* The bond price is the present value of the cash flows from a bond. The YTM is the interest rate used in valuing the cash flows from a bond. The bond price and YTM are inversely related. If the YTM increases, the bond price decreases and if the YTM decreases, the bond price increases.

*b*. If the coupon rate is higher than the required return on a bond, the bond will sell at a premium, since it provides periodic income in the form of coupon payments in excess of that required by investors on other similar bonds. If the coupon rate is lower than the required return on a bond, the bond will sell at a discount since it provides insufficient coupon payments compared to that required by investors on other similar bonds. For premium bonds, the coupon rate exceeds the YTM; for discount bonds, the YTM exceeds the coupon rate, and for bonds selling at par, the YTM is equal to the coupon rate.