FIN104 Tutorial Answers - Week 5

1. **Bond Yields. A 30-year Treasury bond is issued with face value of $1,000, paying interest of $60 per year. If market yields increase shortly after the T-bond is issued, what happens to the bond's: (CH6.Q2)**
   a. coupon rate?
   b. price?
   c. yield to maturity?
   d. current yield?

   a. Coupon rate = 6%, which remains unchanged. The coupon payments are fixed at $60 per year.

   b. When the market yield increases, the bond price will fall. The cash flows are discounted at a higher rate.

   c. At a lower price, the bond's yield to maturity will be higher. The higher yield to maturity for the bond is commensurate with the higher yields available in the rest of the bond market.

   d. Current yield = coupon rate/bond price
   As the coupon rate remains the same and the bond price decreases, the current yield increases.

2. **Bond Pricing. A 30-year-maturity bond with face value of $1,000 makes semiannual coupon payments and has a coupon rate of 8%. What is the bond's yield to maturity if the bond is selling for: (CH6.Q11)**
   a. $900?
   b. $1,000?
   c. $1,100?

a. To compute the yield to maturity, use trial and error to solve for r in the following equation:

$$\$900 = \$40 \times \left[\frac{1}{r} - \frac{1}{\mathrm{r} \times (1+r)^{60}} \right] + \frac{\$1{,}000}{(1+r)^{60}} \Rightarrow r = 4.483\%$$

Using a financial calculator, compute the yield to maturity by entering
n = 60, PV = (–)900, FV = 1,000, PMT = 40; compute i = 4.483%.

Verify the solution as follows:

$$\mathrm{PV} = \$40 \times \left[\frac{1}{0.04483} - \frac{1}{0.04483(1.04483)^{60}} \right] + \frac{\$1{,}000}{1.04483^{60}} = \$900.02$$

(difference due to rounding)

Therefore, the annualized bond equivalent yield to maturity is:

$4.483\% \times 2 = 8.966\%$

b. Since the bond is selling for face value, the semiannual yield = 4%.

Therefore, the annualized bond equivalent yield to maturity is $4\% \times 2 = 8\%$.

c. To compute the yield to maturity, use trial and error to solve for r in the following equation:

$$\$1{,}100 = \$40 \times \left[\frac{1}{r} - \frac{1}{r \times (1+r)^{60}} \right] + \frac{\$1{,}000}{(1+r)^{60}} \Rightarrow r = 3.592\%$$

Using a financial calculator, compute the yield to maturity by entering
n = 60, PV = (–)1,100, FV = 1,000, PMT = 40; compute i = 3.592%.

Verify the solution as follows:

$$\mathrm{PV} = \$40 \times \left[\frac{1}{0.03592} - \frac{1}{0.03592(1.03592)^{60}} \right] + \frac{\$1{,}000}{1.03592^{60}} = \$1{,}099.92$$

(difference due to rounding)

Therefore, the annualized bond equivalent yield to maturity is:

$3.592\% \times 2 = 7.184\%$

3. Bond Returns. A bond has 10 years until maturity, a coupon rate of 9%, and sells for $1,100. Interest is paid annually (CH6.Q17).

a. If the bond has a yield to maturity of 9% 1 year from now, what will its price be at that time?
b. What will be the rate of return on the bond?
c. If the inflation rate during the year is 3%, what is the real rate of return on the bond?

a. $$\text{Price} = \$90 \times \left[\frac{1}{0.09} - \frac{1}{0.09(1.09)^9} \right] + \frac{\$1{,}000}{1.09^9} = \$1{,}000$$

b. $$\text{Rate of return} = \frac{\$90 + (\$1{,}000 - \$1{,}100)}{\$1{,}100} = -0.91\%$$

c. $1 - .0091 = (1 + .03) \times (1 + \text{real})$
real $= -3.8\%$

4. Interest Rate Risk. Consider two bonds, a 3-year bond paying an annual coupon of 5% and a 10-year bond also with an annual coupon of 5%. Both currently sell at face value. Now suppose that the market interest rate rises to 10% (CH6.Q25).

a. What is the new price of the 3-year bond?
b. What is the new price of the 10-year bond?
c. Do you conclude that long-term or short-term bonds are more sensitive to a change in interest rates?

a. $$PV = \$50 \times \left[\frac{1}{0.10} - \frac{1}{0.10 \times (1.10)^3} \right] + \frac{\$1{,}000}{1.10^3} = \$875.66$$

b. $$PV = \$50 \times \left[\frac{1}{0.10} - \frac{1}{0.10 \times (1.10)^{10}} \right] + \frac{\$1{,}000}{1.10^{10}} = \$692.77$$

c. Long -term bonds are more sensitive to interest rate changes. The average cash flow is received later, thus the present value of those coupons are reduced by more than near -term cash flows.

5. Credit Risk. Sludge Corporation has two bonds outstanding, each with a face value of $2 million. Bond A is a senior bond; bond B is subordinated. Sludge has suffered a severe downturn in demand, and its assets are now worth only $3 million. If the company defaults, what payoff can the holders of bond B expect? (CH6.Q36).

Bonds are repaid in order of seniority. Bond A owners will first receive $2 million. The remaining $1 million will be paid to Bond B owners.