Nanyang Business School

BU8201 Business Finance

Tutorial 4: Bonds and their Valuation

(Common Questions)

1) **Interest rate risk.** If interest rates rise after a bond issue, what will happen to the bond's price and YTM? Does the time to maturity affect the extent to which interest rate changes affect the bond's price? Why?

> a) Consider two bonds with an 8% annual coupon and a $1,000 par value and both issued at its par value. One bond has a 5-year maturity, while the other has a 20-year maturity. If YTM rise to 15% immediately after the issue, what would be the value of the 5-year bond and the 20-year bond?

> b) If you bought both bonds when there were issued and hold them to maturity, what yield will you get?

> c) If you bought the bonds after the YTM has increased and hold them to maturity, what yield will you get?

2) **Bond valuation. You are considering a 10-year, $1,000 par value bond. Its coupon rate is 9%, and interest is paid semiannually. If you require an "effective" annual interest rate (not a nominal rate) of 8.16%, how much should you be willing to pay for the bond?**

> Hint 1: Semi-annual bonds are bonds where the coupons are paid every semi-annually. Therefore, a 9% semi-annual coupon bond will pay $45 every half-yearly.

> Hint 2: Before you can solve for the price, you have to find semiannual rate (nominal rate/2).

3) **Yield to maturity**. Last year Chen Yi purchased a $1,000 face value corporate bond with an 11% annual coupon rate and a 10-year maturity. She paid $1,075.02 for the bond.

> a) At the time of the purchase, what was the yield to maturity?

> b) If Chen Yi sold the bond today for $1,060.49, what rate of return would she have earned for the past year (i.e., actual realiszed yield)?

Is the actual realized yields (capital gains yields and current yield) be equal to the yield to maturity in part a? Why?

4) **Bond valuation.** A 15-year, $1,000 par value bond has a 7% annual payment coupon. The bond currently sells for $925. If the yield to maturity remains at its current rate, what will the price be 5 years from now?

5) **Bond valuation**. Bond X is noncallable, has 20 years to maturity, a 9 percent annual coupon, and a $1,000 par value. Your required return on Bond X is 10 percent, and if you buy it you plan to hold it for 5 years. You, and the market, have expectations that in 5 years the yield to maturity on a 15-year annual bond with similar risk will be 8.5 percent. How much should you be willing to pay for Bond X today? (Hint: You will need to know how much the bond will be worth at the end of 5 years.)

Self-practice Question

LinQTech Company has two bond issues outstanding, both have par value of $1,000 and both sell for $806.13. The first issue has a 10% annual coupon rate and 15 years to maturity, while the second has the same YTM and only 5 years to maturity. The first issue pays coupon annually while the second pays semiannually. What is the annual coupon rate on the second issue?

Answers to self-practice question

Note that this question differs from Q4 in the main tutorial. In this question, given that the two bonds have different maturity, they cannot have the same *effective* interest rates. In this question, it states that they have the same YTM, i.e., same *nominal* interest rates, after taking into account compounding, they will have different effective interest rates.

Step 1:   Find YTM using information on first issue

$$806.13 = \frac{100}{YTM}\left[1 - \frac{1}{(1+YTM)^{15}}\right] + \frac{1,000}{(1+YTM)^{15}}$$

$YTM = 13.00\%$

Step 2: Based on calculated YTM, find coupon on second issue

$$806.13 = \frac{\frac{PMT}{2}}{0.13/2}\left[1 - \frac{1}{(1+0.13/2)^{5\times2}}\right] + \frac{1,000}{(1+0.13/2)^{5\times2}}$$

$PMT / 2 = \$38.03$

PMT = 2 x 38.03 = $76.06

Step 3: Find annual coupon rate on second issue

The annual coupon rate of the second issue is (76.06 / 1000) x 100 = 7.606%