Corporate Finance **Homework 3**

> *Beware of little Expenses: a small Leak will sink a great Ship.*
>
> Ben Franklin

NOTE: Compute all dollar-denominated answers to the nearest dollar unless otherwise specified, and compute all other answers to four decimal places (*i.e.*, .0001). Unless otherwise stated, all interest rates or rates of return are annual (effective) rates. Excel/calculator function hints are given in brackets. For the multiple choice questions, give the correct choice and very briefly explain your answer.

1. The real interest rate is 2% a year, and the inflation rate is 3.4% a year. What is the present value of a $10,000 *nominal* payment received next year (rounded to the nearest $10)?

   (a) $10,140

   (b) $9,860

   (c) $9,480

   (d) $8,992

2. The YTM on a bond:

   (a) Assumes that interim coupons are invested at the coupon rate.

   (b) Equals the current yield (CY) plus the holding period return.

   (c) Is below the coupon rate when the bond is selling at a discount, and above the coupon rate when the bond is selling at a premium.

   (d) Is the discount rate that if applied to compute the present value of all the payments will result in the price today.

3. What is the current price of a 10-year, zero-coupon bond with a face value of $1,000 if the YTM is 3.85%?

4. You have decided to purchase a *coupon* paying U.S. government bond.

   (a) Very briefly describe three risks you face with this bond.

   (b) What risk do you *not* face with this bond that you would if you purchased a coupon paying bond of Telsa?

   (c) What can you do to mitigate (at least one of) those risks in (a) while still only considering investing in U.S. government securities?

5. You own a five-year bond with a 5% annual coupon that sells at a YTM of 7% and has a face value of $1,000.

(a) Is the bond a discount or premium bond?

(b) If interest rates remain constant, one year from today, the price of the bond will be (choose the correct answer and very briefly explain):

    i. Higher

    ii. Lower

    iii. The same

    iv. Par (Face)

(c) If interest rates increase, what will happen to the price of the bond?

6. This problem demonstrates the potential source of dollar return (and risk) when you purchase a bond with coupons. Your friendly brother-in-law broker calls and offers to sell you a Treasury 5-year, 2% coupon bond (annual) for only $96–he tells you that he got a great "discount" on the bond. The face value of the bond is $100.

(a) What is the future value of $96 invested for 5 years at 2.87% p.a.? $[FV]$

(b) What's the bond's YTM? [You can use either *Rate* or *Yield*, but if you use *Yield*, use 1/1/20 for the settlement date and 1/1/25 for the maturity date.

(c) What is the total value of the coupon payments you will receive? [Multiplication!]

(d) At maturity, what is the capital gain or loss you will realize? (It's the difference between par and purchase price.)

(e) What is the total nominal value of the income earned from reinvesting the coupons if the interest rate is the YTM from above? [Calculate the FV of the coupons and then subtract the 5 coupon payments. Note, the number is quite small.]

(f) What is the total return–the sum of the interest, coupon, and capital gain/loss– from holding the bond? How does this value compare to the value in (a)?

(g) If the reinvestment rate is greater than the YTM, will the total return from holding the bond be greater or less than the YTM?

7. You observe the following zero-coupon spot rates:

Year	Spot Rate
1	$r_{\bar{1}} = 1.5\%$
2	$r_{\bar{2}} = 2.0\%$
3	$r_{\bar{3}} = 3.5\%$

(a) Calculate the forward rates for each period ($r_{0,1}$, $r_{1,2}$, $r_{2,3}$).

(b) Calculate the price and YTM of each of the following Treasury notes (assume annual coupons and $1,000 par value):

  i. 3% coupon, 2-year note

  ii. 3% coupon, 3-year note

  iii. 5% coupon, 3-year note

(c) Briefly explain why the YTM on the 5% note is less than the YTM of the 3% note of the same maturity.

(d) If you were to buy a $50,000, 3-year annuity (3 equal payments of $50,000 starting one year from today), what would be the annuity's YTM? *Hint: First determine the PV of the annuity and then the annuity's YTM.*

8. Assume that one-year rates are 5% and you purchase a one-year government bill for $1,000 that will pay a 5 % coupon plus the principal (a total of $1,050) one year from today. Immediately after you purchase the bill, interest rates rise to 10%.

(a) What will be the price of the bill now?

(b) Have you made or lost money?

(c) If you don't sell the bill, is your loss realized or unrealized?

(d) As many of your eager classmates pointed out, you can continue to hold the bill to maturity and you will receive the promised $1,050. Therefore if you don't sell you won't suffer any financial losses. I responded that although it was true that you would receive $1,050, you still suffered an economic loss. Briefly explain why your classmate were mistaken. To show this, you may wish to consider and compare the financial results of a person who purchases the same bill at the new price and holds it to maturity.

9. You just purchased a 3% (assume annual coupons), 30-year government bond, with a face value of $100 and a YTM of 3% . Note, Excel has both Modified Duration (*MDuration*) and Macaulay Duration (*Duration*) functions.

(a) What is the bond's modified duration? [Use use 1/1/20 for the settlement date and 1/1/50 for the maturity date.]

(b) If the YTM increases by 100 basis points, what is the percentage change in the bond's price?

(c) If the YTM decreases by 100 basis points, what is the percentage change in the bond's price?

(d) Same as above. What's the percentage change in price predicted by the bond's modified duration?

(e) Why doesn't the bond's modified duration do a good job of predicting the percentage price change of a 100 bp movement in the YTM?

(f) If you have an equal amount of liabilities with the same modified duration as the bond, very briefly explain why (e) is a potentially a problem?