

Assignment 1

In this assignment you will solve fixed-income problems.

1. You can invest \$200,000 in a certificate of deposit (CD) offered by your bank. The CD is for two years and the bank quotes you a rate of 4%. How much will you have in two years if the 4% is:
 - (a) An EAR?
 - (b) A quarterly APR?
 - (c) A monthly APR?
2. You are trying to determine your standard of living after retirement. You make the following assumptions. First, you will earn \$100,000 for each of the next 35 years, and save 45% of that amount. Second, payments are annual and the first payment is one year from today. Third, interest rates will be 2% per year forever.
 - (a) Compute how much money you will have saved at the end of the 35th year, assuming you invest exclusively in an interest-bearing savings account.
 - (b) What is the amount you can consume during each of your retirement years? Assume that there are 20 retirement years, and that consumption takes place at the end of each year. Note: If you have not computed the answer to part (a), denote this answer by X and compute the answer to part (b).
3. You are considering buying a two-bedroom townhouse for \$700,000. You plan to make a \$200,000 down payment and take a \$500,000 30-year mortgage for the rest. The interest rate on the mortgage is 3% APR for monthly payments.
 - (a) What is the effective annual rate?
 - (b) What is the monthly payment?
 - (c) How much do you owe the bank immediately after the twentieth monthly payment?

4. Assume that spot rates are as follows:

Maturity	Spot rate (in %)
1	2.0
2	2.5
3	3.0
4	3.5

Spot rates are with annual compounding, coupon payments are annual, and par values are \$100.

Compute the prices of the following bonds:

- (a) A zero-coupon bond with 3 years to maturity.
- (b) A bond with coupon rate 1% and two years to maturity.
- (c) A bond with coupon rate 13% and four years to maturity.

5. You observe prices for the following bonds:

Bond	Coupon rate (in %)	Maturity (in months)	Price (in \$)
X	3	6	98.98
Y	4	12	98.59

Coupon payments are semi-annual.

Determine the 6-month and 1-year spot rates, both expressed as APRs with semi-annual compounding.

6. You are holding a 3-year bond with coupon rate of 5%. Coupon payments are annual and par values are \$100. Spot rates are: $r_1 = 5\%$, $r_2 = 6\%$, $r_3 = 7\%$.
- (a) Determine the bond's price and yield-to-maturity.
 - (b) Determine as many forward rates as you can, based on the spot rates above.
 - (c) You would like to get a guaranteed 3-year return on your coupon bond. Explain how this can be achieved using forward rates. Which forward rates should you use? What is your guaranteed 3-year return?