Derivative Instruments
Paris Dauphine University - Master IEF (272)

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Exercises Chapter 5

Exercise 1 *An investor receives $1,100 in one year in return for an investment of $1,000 now.*

Calculate the percentage return per annum with

a) annual compounding ;

b) semiannual compounding ;

c) monthly compounding ; and

d) continuous compounding.

Exercise 2 *What rate of interest with continuous compounding is equivalent to 15% per annum with monthly compounding ?*

Exercise 3 *A deposit account pays 12% per annum with continuous compounding, but interest is actually paid quarterly.*

How much interest will be paid each quarter on a $10,000 deposit ?

Exercise 4 (Done) *A bank quotes you an interest rate of 14% per annum with quarterly compounding.*

What is the equivalent rate with (a) continuous compounding and (b) annual compounding ?

Exercise 5 *The six-month and one-year zero rates are both 10% per annum. For a bond that has a life of 18 months and pays a coupon of 8% per annum (with semiannual payments), the yield is 10.4% per annum.*

(a) What is the bond's price ?

(b)What is the 18- month zero rate ?

(All rates are quoted with semiannual compounding.)

Exercise 6 *Suppose that zero interest rates with continuous compounding are as follows*

Maturity (months)	3	*6*	*9*	*12*	*15*	*18*
Rate (% per annum)	8.0	8.2	8.4	8.5	8.6	8.7

Calculate forward interest rates for the a) second ; b) third ; c) fourth ; d) fifth ; and d) sixth quarters.

Exercise 7 *Assuming that zero rates are as in Exercise 6, what is the value of an FRA that enables the holder to earn 9.5% for a three-month period starting in one year on a principal of $1,000,000 ?*

The interest rate is expressed with quarterly compounding.

Exercise 8 *Suppose that 6-month, 12-month, 18-month, 24-month, and 30-month zero rates are 4%, 4.2%, 4.4%, 4.6%, and 4.8% per annum with continuous compounding respectively.*

Estimate the cash price of a bond with a face value of 100 that will mature in 30 months and pays a coupon of 4% per annum semiannually.

Exercise 9 *A three-year bond provides a coupon of 8% semiannually and has a cash price of 104. What is the bond's yield ?*

Exercise 10 *Suppose that the 6-month, 12-month, 18-month, and 24-month zero rates are 5%, 6%, 6.5%, and 7% respectively.*

What is the two-year par yield ?

Exercise 11 *A 10-year, 8% coupon bond currently sells for $90. A 10-year, 4% coupon bond currently sells for $80.*

What is the 10-year zero rate ?

(Hint : Consider taking a long position in two of the 4% coupon bonds and a short position in one of the 8% coupon bonds.)

Exercise 12 *Show that when the yield y is expressed with a compounding frequency of m times per year we have*

$$\Delta B = -\frac{\Delta y B D}{1 + \frac{y}{m}}$$

Exercise 13 (Done) *A five-year bond with a yield of 11% (continuously compounded) pays an 8% coupon at the end of each year.*

a) What is the bond's price ?

b) What is the bond's duration ?

c) Use the duration to calculate the effect on the bond's price of a 0.2% decrease in its yield.

d) Recalculate the bond's price on the basis of a 10.8% per annum yield and verify that the result is in agreement with your answer to (c).