

Lecture 2 Solutions to Problems

Problems/questions

1. What is i) the formula used to calculate the current yield for a 15 year, 7% coupon bond with a par value of £1,000 selling for £769.40? (ii) what is the current yield? (ii) what does the current yield calculation take into account when used as a measure of assessing an investor's yield and what does not?

Solution

$$i_c = \frac{C}{P_t} = \frac{£70}{£769.40} = 9.10\%$$

i_c = current yield

C = coupon payment

P_t = price of bond at time t

The current yield considers only the coupon interest and no other source of return that will affect an investor's yield. No consideration is given to the capital gain that the investor will realize when the bond is purchased at a discount and held to maturity; nor is there any recognition of the capital loss that the investor will realize if the bond is purchased at a premium and held to maturity. The time value of money is also ignored.

2. What is (i) the formula used to calculate the Yield To Maturity (YTM) on a 20 year 10% coupon bond with a £1000 face value that sells for £2000 (ii) does the YTM incorporate the re-investment risk?

Solution

$$P = \frac{C}{(1+i)^1} + \frac{C}{(1+i)^2} + \dots + \frac{C}{(1+i)^n} + \frac{F}{(1+i)^n}$$

P = Price of coupon bond

C = Coupon payment each year

i = annual interest rate (YTM)

n = number of years

F = Face value of the bond

$$£2000 = \frac{£100}{(1+i)^1} + \frac{£100}{(1+i)^2} + \dots + \frac{£100}{(1+i)^{20}} + \frac{£1000}{(1+i)^{20}}$$

No it does not as the YTM assumes that all coupon interest can be reinvested at the YTM.

3. What is i) the formula used to calculate the Rate of Return (ROR) on bond purchased for £1000, with a coupon rate of 8%, that was sold one year later for £800 and (ii) what is the ROR?

Solution

ROR on a bond held from t to time t+1 is:

$$R = \frac{C}{P_t} + \frac{P_{t+1} - P_t}{P_t}$$

R=return holding the bond from t to t+1

P_t =price of bond at time t=£1000

P_{t+1} =price of bond at time t+1=£800

C=coupon payment=£1000x8%=£80

$$R = \frac{£80 + £800 - £1000}{£1000} = \frac{-120}{1000} = -12\%$$

4. Please fill in the table below (select =, or <, or >), so as to show the relationship between coupon rate, current yield and yield to maturity:

Bond selling at:		Relationship		Relationship	
Par	Coupon rate	=,or<,or>	current yield	=,or<,or>	yield to maturity
Discount	Coupon rate	=,or<,or>	current yield	=,or<,or>	yield to maturity
Premium	Coupon rate	=,or<,or>	current yield	=,or<,or>	yield to maturity

Solution

Bond selling at:		Relationship		Relationship	
Par	Coupon rate	=	current yield	=	yield to maturity
Discount	Coupon rate	<	current yield	<	yield to maturity
Premium	Coupon rate	>	current yield	>	yield to maturity

5. Calculate the approximate % change in the bond price if interest rates increase from 10% to 11% when you hold a 10 year 10% coupon bond, with a Macaulay duration of 6.76 years.

Solution

$$\% \Delta P \approx -\text{DUR} \times \frac{\Delta i}{1+i} = -6.76 \times \frac{0.01}{1+0.10} = -6.15\%$$

$\% \Delta P$ = %change in the price of the bond

Δi = change in interest rate

DUR = Macaulay duration (years)

i = interest rate

6. With an interest rate of 10%, the present value of \$100 received one year from now is approximately?
- £91
 - £100
 - £110
 - £95

Answer: a £91

7. With an interest rate of 4%, the present value of \$100 received one year from now is approximately?
- £104
 - £94
 - £114
 - £96

Answer: d £96

8. Which of the following \$1,000 face value securities has the highest yield to maturity?
- A 6% coupon bond selling at £1,100
 - A 8% coupon bond selling at £1,000
 - A 10% coupon bond selling at £1,000
 - A 10% coupon bond selling at £1,100

Answer: c: A 10% coupon bond selling at £1000

9. What is the yield to maturity of a zero coupon bond selling at £900 today with a face value of £1,000 in one year's time?
- 10%
 - 9%
 - 8%
 - 11%

The answer is d 11%

10. If the expected inflation is 4% next year and the yield to maturity is 10%, then the real interest rate for this bond is?

- a. 14%
- b. 6%
- c. 7%
- d. 8%

The answer is b 6%