

## MA50196: Sheet 10

- Suppose the interest rate  $r$  is 7 per cent per annum, compounded continuously. What is
  - The present value of a 1.5 year zero-coupon bond paying 50 pounds.
  - The present value of a four-year bond with face value 100, redeemable at par with and coupon rate 10 per cent compounded annually.
  - The present value of a four-year bond with face value 100, redeemable at par with coupon rate 8 per cent compounded semiannually.
- Suppose a two-year bond with face value 1 pound, redeemable at par and with coupon rate 9% payable annually, is on sale for 1.03 pounds. What is the yield on this bond?
- Suppose a 1-year bond with face value 1 pound, redeemable at par and with coupon rate 6% payable semiannually, is on sale for 0.98 pounds. What is the yield on this bond?
- The following bonds are assumed to be available from the Government with no chance of default.
  - Suppose a 0.5 year zero-coupon bond is available with principal amount (i.e. payoff) 100 pounds and the price of the bond is 97 pounds. Find the zero-coupon yield  $Z(0, 0.5)$ .
  - Suppose a 1 year zero-coupon bond is available with principal amount 100 pounds, and its price is 94 pounds. Find  $Z(0, 1)$ .
  - Suppose (in addition to the information above) that a 1.5 year coupon-bearing bond is available with face value 100 and redemption at par, and with coupon rate 5 per cent payable semiannually, at a price of 96 pounds. Find  $Z(0, 1.5)$ .
  - Suppose (in addition to the information above) that a 2 year coupon-bearing bond is available with face value 100 and redemption at par, and with coupon rate 9 per cent payable semiannually, at a price of 103 pounds. Find  $Z(0, 2)$ .
- Suppose the spot interest rates with continuous compounding (i.e. the zero-coupon rates) are as follows:

Time to maturity (years)	Rate (% per annum)
1	12.0
2	13.0
3	13.7
4	14.2
5	14.5

Calculate forward interest rates for the second, third, fourth and fifth years.

- Suppose zero coupon bond prices  $P(t)$  for bonds of principal amount £100 and maturity  $t$  are as follows in Sterling:

$$\begin{aligned}
 P(0.25) &= 97.53 & P(0.5) &= 95.00 & P(0.75) &= 92.57 \\
 P(1.0) &= 90.17 & P(1.25) &= 87.81 & P(1.50) &= 85.49
 \end{aligned}$$

- Compute the zero-coupon yield curve, i.e. compute  $Z(0, t)$  for  $t = 0.25, t = 0.5, t = 0.75, t = 1.0, t = 1.25$ , and  $t = 1.5$  (with yields compounded continuously)
- Compute the forward rates  $f(0, 1, 1.25)$  and  $f(0, 0.25, 0.75)$ .
- Consider a 1-year interest rate swap with principal amount £100 and quarterly payments versus LIBOR. What is the swap rate (compounded quarterly), i.e. on the basis of what rate of interest should the fixed-rate payments each quarter be computed so as to make the swap have initial value of zero?