### Exercise 1

Consider a bond paying a yearly coupon of £60 for 15 years. The face value is £900. The YTM is 7%. What is the present value of the bond at issuance? What if the YTM is 4%? 10%? Comment on the relationship between YTM and bond prices.

## Exercise 2

Consider the following government coupon bond: Per value = £1000 Coupon = 6% p.a. (paid every 6 months, i.e. £30) Maturity = 10 years What is the price if the semi-annual yield is r=5%?

## Exercise 3

At year 0, Company Z issues a bond paying  $\pounds 50$  in year 1 and  $\pounds 1050$  in year 2. The default risk is zero and the spot rate is 7% for all maturities. At year 1, the spot rates have a 60% chance of dropping to 5% and a 40% chance of jump up to 10%.

- i. What is the price of the bond if it is non callable?
- ii. What is the price of the bond if it is callable at the end of year 1, and the call price is  $\pounds 970$ ?
- iii. What coupon should the callable bond have such that its price is equal to that of the non callable bond?
- iv. Why do companies issue callable bonds?

## Exercise 4

Consider a company issuing at t=0 a convertible bond with a face value of £1000 a t=3. The annual coupon is 3.5% of the face value. The required annual yield on 3-year straight bonds of similar risk level is 6.5%.

If the convertible bonds are traded at  $\pounds 994$  at t=0, what is the value of the conversion option at t=0?

## Exercise 5

1) The 1-year spot rate on US treasury bonds is 7%, the 2-year spot rate is 8% and the 3-year spot rate is 9%.

- a) Calculate the implied 1-year ahead, 1-year forward rate,  $f_{12}$ . Explain why a 1-year forward rate of 10% could not be explained by the market.
- b) Calculate the forward rates  $f_{23}$  and  $f_{13}$ . What is the link between  $f_{12}$ ,  $f_{23}$ ,  $f_{13}$ ?

#### Exercise 6

A bank offers to borrow £1000 from you at an interest rate applicable between the end of year 1 and the end of year 2 at a rate of 9% (i.e. the forward rate). The spot rates for 1-year and 2-year are currently 7% and 9% respectively. Explain whether you would take the bank's offer.

#### Exercise 7

Consider that the spot yield on government bonds are 3%, 4% and 5% for 1-year, 2-year and 3-year maturity respectively. For corporate BBB bonds, the spot yields are 6%, 8% and 11% respectively. If the recovery rate is 0%, what is the implied cumulative probability that companies issuing BBB bonds will default after 3 years? What if the recovery rate is 10%?

#### Exercise 8

Two banks can borrow from the corporate sector on the following terms :

	<u>Bank A</u>	<u>Bank B</u>
Fixed-rate loans	9.5%	8.75%
Floating-rate loans	LIBOR+1%	LIBOR+0.75%

- i. Design a suitable interest rate swap between the two banks.
- ii. What is the maximum size of the swap that can be made between the two banks?
- iii. What is the risk involved in swap transactions?

#### Exercise 9

The performance of five portfolios last year was as follows:

Portfolio	Return (%)	Standard deviation of return (%)	Beta
Α	12	4	1
В	6	2	0.5
С	9	4	0.7
D	13	6	1.3
Е	11	3	1.7

The riskless interest rate is 4%, and the return of the market is 8%

- i. Rank the portfolios using Sharpe's measure
- ii. Rank the portfolios using Treynor's measure
- iii. Rank the portfolios using Jensen's measure
- iv. With reference to your calculations, how well was portfolio E managed?

v. How can you explain the differences in the ranking of the portfolios?

# Exercise 10

Suppose that the current market price of a stock is \$60. Next year price will be either \$70 or \$50. Suppose that investors can borrow at 8%. What is the value of a call option on that stock?