Financial Engineering EC5504
Specimen Exam 2006-2007
Section B

Answer two questions.

1 (a) (i) "A strangle is a similar strategy to a straddle". Explain.

(ii) Show that the sale of a strangle is appropriate for an investor who feels that large stock price moves are unlikely.

(b) Show the profit that will be realized from a butterfly spread in different circumstances.

(c) (i) Explain two ways in which a bear spread can be created.

(ii) What is the pattern of profits from these two strategies?

(Each part carries equal weight)

2. (a) List the five factors affecting stock option prices.

(b) In a one-period, two-state economy, assume that at the end of the period, a stock, currently priced at S_0, will be worth either uS_o if the upstate occurs , or dS_o if the downstate occurs $(d < 1 < u)$.

(i) Derive the expected value and the variance of the stock price at the end of the period (assume that the probability of the upstate is $\frac{1}{2}$).

Next, consider a one-period European call option on the stock with an exercise price of X. If the upstate occurs, the call will be worth its intrinsic value of C_u; if the downstate occurs, the call will be worth C_d. Third, assume there is a risk-free security to which funds can be lent or borrowed for the period at a rate of R_f.

(ii) Show how a replicating portfolio whose outflows at the end of the period exactly match the call's outflows can be formed.

(iii) By the law of one price determine the equilibrium price of the call (C_o^*).

(c) The price of a European call which expires in 6 months and has a strike price of £30 is £2. The underlying stock price is £29, and a dividend of £0.5 is expected in 2 months and in 5 months. The term structure is flat with all risk-free interest rates being 10%. What is the price of a European put option that expires in 6 months and has a strike price of £30.

(Each part carries equal weight)

3. (a) An investor has an investment horizon of h years and contemplates investing in a coupon bearing bond.

(i) Explain analytically the types of risks that this investor faces.

(ii) Show that by setting the duration of the coupon-bearing bond equal to his/her investment horizon, the investor is immunized against moderate interest rate changes.

(iii) Explain which other factor matters for and how it affects the investor's duration-immunized position when large swings in interest rates are present.

(b) Derive and explain the equilibrium prices of default free discount bonds in an uncertain economy using the Unbiased, Return to Maturity, and Local Expectations Hypotheses.

(c) Look at the spot interest rates shown in the following Table:

Year	Spot rate
1	$Y(t, t+1) \equiv r_1 = 0.05$
2	$Y(t, t+2) \equiv r_2 = 0.054$
3	$Y(t, t+3) \equiv r_3 = 0.057$
4	$Y(t, t+4) \equiv r_4 = 0.059$
5	$Y(t, t+5) \equiv r_5 = 0.06$

Suppose that someone told you that the 6-year spot interest rate was 4.80 percent. Why would you not believe him? How could you make money if he was right? What is the minimum sensible value for the 6-year spot rate?

(Each part carries equal weight)