END OF CHAPTER EXERCISES

Chapter 8 : Options Pricing

Financial Engineering : Derivatives And Risk Management

(Keith Cuthbertson, Dirk Nitzsche)

1. Would you pay more for a call option on a stock where the underlying stock had an annual return volatility of 20% p.a. rather that one which had an annual volatility of 10% p.a. ? Briefly explain.

2. Intuitively, why is an American call or put option worth more than a similar European option?

3. How would you (delta) hedge either a long call or a long put on a stock (over a small interval of time)?

4. In the BOPM, give an intuitive interpretation of the formula for premium on a put option, on a stock, with two periods to expiration :

$$P = \frac{1}{R^2}\left[q^2 P_{uu} + 2q(1-q)P_{ud} + (1-q)^2 P_{dd}\right]$$

   where q = (R-D)/(U-D), R = 1+r and r = risk-free rate.

5. What is put-call parity and why is it useful?

6. The current stock price S = 100. The stock can increase or decrease by 10% per period. The risk free rate is 5% per period. Using the BOPM show at each node of the binomial tree, the stock price and the value of a put which expires in two periods and has a strike price of K = 100. Also, calculate the hedge ratios at each node and show that the hedged portfolio has the same value at the two nodes at t=1.

7. Calculate the Black-Scholes price for a European call option on a stock with 6-months to maturity. Assume, S = 100, r = 10% p.a. (continuously compounded), K = 100 and σ = 20% p.a. What happens to the call premium if the next day the volatility increases to σ = 30% p.a. ? Use put-call parity to find the put premia.