

END OF CHAPTER EXERCISES

Chapter 16 : Complex Derivatives

Financial Engineering : Derivatives And Risk Management

(Keith Cuthbertson, Dirk Nitzsche)

1. How might an investment manager speculate using a basis swap?
2. Who might hedge using an Asian option on FX?
3. Why do we not price an Asian option using a closed form (analytic) expression such as the usual Black-Scholes model?
4. Calculate the price of an *average price* Asian call option on a stock, using a two-period binomial model. Take $S_0 = 100$ and the stock can go up 15% or down 10% per period. The risk-free rate $r = 5\%$ each period and $K = 95$. Count the current price in determining the average price.
(It is instructive to set the problem up in Excel or other software to check your answers.)
5. You have been asked to price an Asian average rate call option using Monte Carlo simulation MCS. You are given the following information. Current stock price $S_0 = 100$, the drift rate of stock price, $\mu = 5\%$ p.a., the risk free rate $r = 0.05$ (continuously compounded), the volatility of stock returns $\sigma = 20\%$ p.a., $K = 105$ and the time to maturity $T = 1$ year. Assume that $\Delta t = 0.01$ years (i.e. approximately 3.5 days) for the length of each timestep in the MCS. Set out the steps you would take (You should also set up the problem in Excel or some other convenient software).
6. It is the 1st January 2001 and you enter into a 2-year equity swap on a notional principal of \$1m, where you pay LIBOR and receive the percentage return on the S&P500 index less 0.5% p.a. Payments are every 6 months. LIBOR is currently at 5% and the S&P500 stands at 1500. Assume LIBOR turns out to be 6% (1st July, after 18 days), 5% (1st January + 184 days) and 5.5% (on 1st July 2002 + 181 days) while the S&P500 is 1550 (+3.3%) after 181 days, 1589 (+2.5%) after a further 184 days and 1645 (+3.5%) after further 181 days. Assume payoffs are determined using a 360-day year. What are the payments in the swap?
7. What might make an investor buy a (i) down-and-out call (ii) up-and-out put?