Mathematics and Modeling for Finance

HW4: Due on November 16, 2006

1) Numerically minimize the following functions:

a) $f(x,y) = 3x^4 + 4x^3y + 18x^2y^2 + 4xy^3 + 3y^4$

b) $f(x,y,z) = (x-1)^2 + (y-2)^2 + (z-3)^2$

2) Implement binomial lattices algorithm (direct) for valuing a European option with $S=100$, $X=102$, $\sigma=0.2$, $r=0.05$, $T-t=1$, $n=8$

3) Implement binomial lattices algorithm (bi-direct) for valuing a European option with $S=100$, $X=102$, $\sigma=0.2$, $r=0.05$, $T-t=1$, $n=8$.

4) Implement binomial lattices algorithm for valuing an American option with $S=100$, $X=102$, $\sigma=0.2$, $r=0.05$, $T-t=1$, $n=8$.

5) Implement numerical solution of a Block-Scholes equation with $\sigma=0.2$, $r=0.05$, $X=102$, $\delta S=1$, ~~and~~ $t=1$, and δt chosen so that for $S=100$ the value of the option is sufficiently stable.

SECCF, Faculty of Economics, Kamenička 6, room 409, IV floor, 11000 Belgrade
http://www.seccf.org http://www.ekof.bg.ac.yu e-mail: imqf@seccf.org
tel: (+381 11) 30 21 169, 30 21 080

6) Generate different numbers of random samples (uniform distribution) of different sizes, calculate mean values of those samples and graphically represent the distribution of mean values. Show that the distribution is normal and determine its standard deviation.

7) Using the estimated standard deviation from the previous problem, determine the needed number of samples of size 100 so that the error of the mean is 10^{-8}.

8) Using the estimated standard deviation and mean value from problem #6, find the confidence interval for the mean value corresponding to the confidence interval of 95%.

SECCF, Faculty of Economics, Kamenička 6, room 409, IV floor, 11000 Belgrade
http://www.seccf.org http://www.ekof.bg.ac.yu e-mail: imqf@seccf.org
tel: (+381 11) 30 21 169, 30 21 080