Homework 5
Greek Letters and Delta Hedging

I. Basics (15%) Derivation
End-of-Chapter exercise 15.15

II. Hedging Performance (55%)

(i) (40%) Delta Hedging
Please use the settings in Table 19.2 and Table 19.3 to simulate the performance of delta hedging. The performance measure is the ratio of the standard deviation of the cost of hedging the option to the theoretical price of the option. In this problem, please use the Black-Scholes model to compute the theoretical price of the option. Please set the number of trials (sample paths of stock prices) as 1000. Change the time between hedge rebalancing and try to duplicate similar results as those in Table 19.4.

(ii) (15%) Stop-loss Strategy
Please use the same settings to simulate the performance of the stop-loss strategy. Change the time between hedge rebalancing and try to duplicate results similar to as those in Table 19.1.

III. Greek Letters (30%)
Consider a non-dividend-paying stock with current stock price S_0 =\$50, volatility σ =0.3, strike price K=\$52, time to maturity T=2 years, and interest rate r=5%.

(i) (10%) Please use the closed-form solutions from the Black-Scholes model to compute the Greek letters of the European put option, including delta, theta, gamma, vega, and rho. You may find the closed-form solutions in Table 19.6.

(ii) (20%) Please use the binomial model to compute the Greek letters of this European put options. Please set the time step as 1 day, i.e., Δt =1 day (252*T steps). While computing vega and rho, please set the change of σ and r as one basis point (0.01%).

Matlab function and syntax:
1. std(): Standard deviation

*You have to submit your homework and **programs by e3**. Your computer program is part of this assignment.