ISyE 6785: Mini-project 2

(Due on 7/12/2018)

Note: For all the computations, please report the configuration of your computer (e.g. CPU type and speed, size of RAM) and the computing CPU time in seconds.

1. A spread call option on two assets S^1, S^2 with strike price K pays off max (S^1 - S^2 - K, 0); a spread put option on two assets S^1, S^2 with strike price K pays off max (K – (S^1 - S^2), 0). Suppose the asset price processes are given by the following correlated Geometric Brownian motions.

$$dS_t^1 = (r - \delta_1)S_t^1 dt + \sigma_1 S_t^1 dW_t^1$$
$$dS_t^2 = (r - \delta_2)S_t^2 dt + \rho\sigma_2 S_t^2 dW_t^1 + \sqrt{1-\rho^2}\,\sigma_2 S_t^2 dW_t^2$$

where $r = 4.5\%, \delta_1 = 2\%, \sigma_1 = 20\%, \delta_2 = 0.5\%, \sigma_2 = 25\%, \rho = 0.3$. The current prices are S^1 = \$100, S^2 =\$95.

   a. Implement a simulation approach to simulate 100 price paths of (S^1, S^2) from time 0 to T = 0.5 years.
   b. Implement the Longstaff and Schwartz (RFS, 2001) algorithm to price a ***standard American-style put*** option on S^1 with strike price K = 90 and maturity time T = 0.5 years.
   c. (Bonus question, optional) Price an American-style ***spread call*** option with strike price K = 15 and the maturity time 0.5 years.