

1. Write a program to determine the initial price of an American call and an American put option in the binomial model with the following data:

$$S(0) = 100; K = 100; T = 1; M = 100; r = 8\%; \sigma = 20\%.$$

Use the following set of u and d for your program:

$$u = e^{\sigma\sqrt{\Delta t} + (r - \frac{1}{2}\sigma^2)\Delta t}; \quad d = e^{-\sigma\sqrt{\Delta t} + (r - \frac{1}{2}\sigma^2)\Delta t}.$$

Here $\Delta t = \frac{T}{M}$, with M being the number of subintervals in the time interval $[0, T]$. Use the continuous compounding convention in your calculations (i.e., both in \tilde{p} and in the pricing formula).

Now, plot the initial prices of both call and put options by varying one of the parameters at a time (as given below) while keeping the other parameters fixed (as given above) :

- (A) $S(0)$.
 - (B) K .
 - (C) r .
 - (D) σ .
 - (E) M (Do this for three values of K , $K = 95, 100, 105$).
2. For the American put option (with $M = 5$ and other parameters being the same as given in Problem # 1 above) compute the price at all the time points and also the optimal exercise strategy.
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Submission Deadline: 24th January 2025, 11:59 PM