

Homework 4

Task

Write a least-squares Monte Carlo program to price an American-style Asian put, and use 1 , x , x^2 as the basis functions. Note that the put's payoff, when exercised early, uses the running average.

Inputs

- S : stock price, which is a float
- X : strike price, which is a float
- T : time to maturity in days, which is an integer, and there are 365 days in a year
- r : continuously compounded annual interest rate, which is a float
- s : annual volatility, which is a float
- n : number of time steps in T , which is an integer
- N : number of simulation paths, which is an integer

Outputs

- Price of the put
- Delta of the put (calculated by $S \times 1.01$ and $S \times 0.99$)

Example

If $S = 100$, $X = 100$, $T = 365$, $r = 0.05$, $s = 0.3$, $n = 100$, and $N = 10000$, the outputs are 5.483093 and -0.407075.

- Input format (for Python codes):
"python3 (your_file_name).py 100 100 365 0.05 0.3 100 10000"
- Output format:
"5.483093, -0.407075"

Supplementary information

As randomness is inherent, minor errors are acceptable (relative absolute error < 20%).

Private testcases (released after the deadline)

1. Inputs: 100 100 365 0.05 0.30 100 10000
Outputs: 5.458674, -0.403204
2. Inputs: 10 105 100 0.10 0.25 90 10000
Outputs: 94.971479, -0.99941
3. Inputs: 100 110 500 0.03 0.35 110 10000
Outputs: 13.994858, -0.611603

(Note that the answers of the testcases are based on the average values of students' outputs, excluding the 10 highest and 10 lowest values.)