Homework 2

Task

Write a binomial tree program to price Bermudan put options, where early exercise is only allowed on specific dates.

Inputs

- S: stock price
- X: strike price
- r: continuously compounded annual interest rate
- s: annual volatility
- T: time to maturity in days, which is an integer and also an exercise date
- m: number of periods per day for the tree, an integer
- E: early exercise dates from now, a list of integers

Outputs

- The price of the Bermudan put option

Example

If S = 100, X = 110, r = 0.03, s = 0.3, T = 60, m = 5, and E = [10, 20, 30, 40, 50], the output is 11.248139.

- Input format (for Python codes):
  “python3 (your_file_name).py 100 110 0.03 0.3 60 5 10 20 30 40 50”
- Output format:
  "11.248139"

Supplementary information

1. There are 365 days in a year
2. The option can be exercised in any period (all m periods) within early exercise dates, but only in the last period on the maturity day.
3. During evaluation, minor discrepancies are acceptable (relative absolute error < 1%).

Private testcases (released after the deadline)

1. Inputs: 100 110 0.03 0.3 60 5 10 20 30 40 50
   Outputs: 11.248139
2. Inputs: 110 111 0.001 0.001 100 10 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95
   Outputs: 0.998753
3. Inputs: 120.5 130.55 0.05 0.001 5 100 2 3
   Outputs: 10.031939
4. Inputs: 500.1 500.1 0.1 0.1 50 5 5 7 9 11 13 15 17 19
   Outputs: 4.847072
5. Inputs: 1000 1001 0.03 0.01 100 5 95
   Outputs: 0.227498