

Homework 4

Price a lookback put with the binomial tree model. The payoff function of the lookback put is as follows.

$$\text{Payoff}_\tau = \max(S_{\max, \tau} - S_\tau, 0), \text{ where } S_{\max, \tau} = \max S_u, \text{ for } u = 0, \Delta t, 2\Delta t, \dots, \tau.$$

- Basic requirement (80 points):

(i) Implement the binomial tree model to price both European and American lookback puts.

(ii) Implement the Monte Carlo simulation to price European lookback puts.

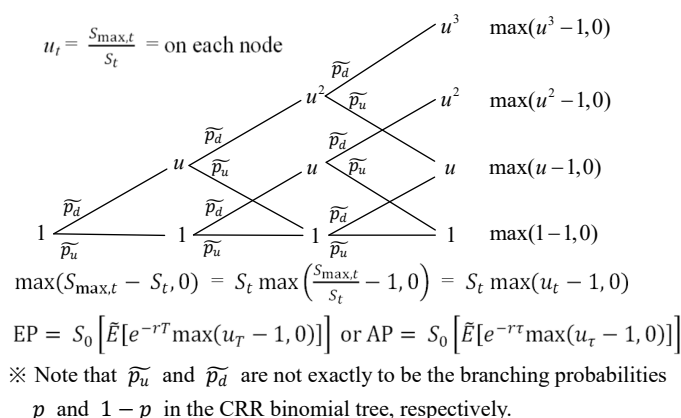
(Inputs: $S_t, r, q, \sigma, t, T, S_{\max, t}, n$, number of simulations, number of repetitions. Outputs: Option values for both methods and 95% confidence level for Monte Carlo simulation.)

- Bonus 1 (5 points):

Based on the same binomial tree framework, devise and implement a quick way to determine the S_{\max} list for each node.

- Bonus 2 (10 points):

Implement the method in Cheuk and Vorst (1997) to price European and American lookback puts.



- Reference

Cheuk and Vorst (1997), "Currency lookback options and observation frequency: a binomial approach," *Journal of International Money and Finance* 16, pp. 173–187.