Price American Lookback Put with the Binomial Tree and Monte Carlo

1. requirement:

The payoff function of the lookback put is as follows.

Payofft = max(Smax,t − St , 0), where Smax,t = max Su, for u = 0, ∆t, 2∆t, ..., t.

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

2. Binomial Tree Algorithm :

1 Build the binomial tree

2 Record possible max price(Smax) for each node.

2.1 Insert max price for monotonic upward and downward prices.

2.2 The forward-tracking method – For a node with the stock price St ,inherit Smax' s from parents :

1. If Smax from parents ≥ St ⇒ Insert this Smax into its Smax-list
2. If Smax from parents < St ⇒ Ignore Smax and insert St into its Smax-list

3 Two Backward inductions (a/e) – Calculate early exercise at the same time for American put

Backward inductions : Try to find Smax(t) in list of Smax(t+1). If found, use the option price of the same Smax. If not, insert option values of the upward price,

which will be the maximum.

Notice : for monotonic upward price, use the option price of the next upward node if there is no same Smax.

3. Monte Carlo Algorithm :

1. Break a price path into 100/300 prices. Use the new price to calculate next mean.
2. Record the maximum price
3. Create 10000 paths and their value with 20 repetitions.