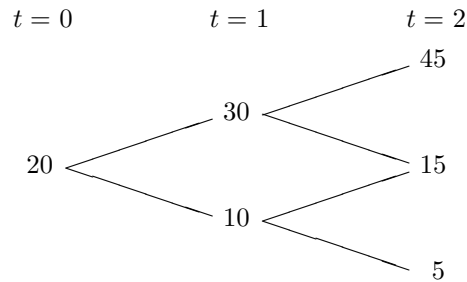


Introduction to Finance (PCP)
Exercise 2

1.

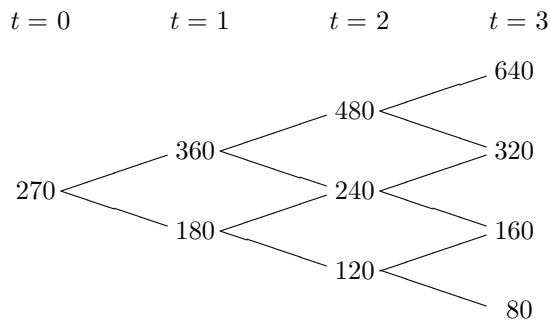
We consider the following two-period binomial model with short rate $r = 0.1$.



1. Find the distributions of S_1 and S_2 under the martingale probability.
2. Find the price process and the replicating portfolio of the (European) call option with strike price 40.
3. What is the price process of the American put option with strike price 14? In addition, when should a holder exercise the option before the maturity?

2.

Consider the following three-period binomial model with 0 short rate.



1. Let \mathbb{Q} be the martingale probability. What is $\mathbb{Q}(S_3 = 320)$?
2. Find the price process of the American call option with strike price 120.
3. Find the price process of the American put option with strike price 130.
4. For the above call and put options, confirm that there is no possibility of early exercise.

3.

Express the CRR formula for call options for T -period binomial models.

4. (Put-call parity for American options)

Consider a T -period binomial model with short rate $r \geq 0$, and American call and put options with the same strike price K . Show the following inequality:

$$S_0 - \frac{K}{(1+r)^T} \geq C_0 - P_0 \geq S_0 - K,$$

where S_0 , C_0 and P_0 are the risky asset price at $t = 0$, the call option premium and the put option premium, respectively.

5.

Consider a multiperiod binomial model with short rate $r = 0$. Show that early exercise for American put options never occur.