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Computational Finance and FinTech – Exercises 6.2

Exercise 1. Consider a two-step binomial tree model where, in each step, the stock price increases by 20% or decreases by 10%. The interest rate is 10% (simple compounding). The current stock price is 100.

(a) Consider a call option with strike 110 that expires after two time periods.

(i) Draw a tree showing the evolution of the stock price and the payout of the option.

(ii) Determine the option price at every node in the tree.

(iii) Calculate the option price using the method of risk-neutral pricing.

(b) Determine the price of an American put option with strike 110. Explain why the result differs from the price of a European put option.

Exercise 2. Create a function that computes the price of a call option in the CRR model. Make the parameter Δt small, while keeping all other parameters fixed and show that the call price converges to the Black-Scholes price.

Exercise 3. Create a plot of the payoff of a call option as a function of the stock price S_T at expiry and the corresponding call option price.
The parameters are: $S_0 = 100$, $\sigma = 0.25$, $r = 0.05$, $T = 1$, $K = 100$.