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.