The University of Texas at Austin
Homework Assignment 9

M339D Introduction to Financial Mathematics

October 24, 2026

Instructions: Provide your complete solution to the following problems. Final answers only, without appropriate justification, will receive zero points even if correct.

One Binomial Period.

Problem 9.1. (5 points) You are using a one-period binomial asset-pricing model to model the evolution of the price of a particular stock. Assume that, in our usual notation, $S_d < K < S_u$ for a European call option. Then, the risk-free component in the replicating portfolio of a single call option on that stock should be interpreted as lending. *True or false? Why?*

Problem 9.2. (5 points) You are using a one-period binomial asset-pricing model to model the evolution of the price of a particular stock. Assume that, in our usual notation, $S_d < K < S_u$ for a European put option. Then, the replicating portfolio of a single put option on that stock should contain a long position in the stock. *True or false? Why?*

Problem 9.3. (5 points) A put option has the strike price equal to 55 and the exercise date in one year.

You are given that:

- the current price of the underlying non-dividend-paying stock is $S(0) = 50$;
- the stock price in one year will be either 65 or 40;
- the true probability of an upward price movement is 55%;
- the continuously compounded risk-free interest rate is $r = 0.04$.

Calculate the price of the option.

a. 6.49
b. 6.94
c. 7.47
d. 7.78
e. 8.10

Problem 9.4. (5 points) A call option with the strike price $K = 42$ has the exercise date in one year.

You are given that:

- the current price of the underlying non-dividend-paying stock is $S(0) = 40$;
- the stock price in one year will be either 48 or 34;
- the true probability of an upward price movement is 60%;
- the continuously compounded risk-free interest rate is $r = 0.05$.

Calculate the price of the option.

a. 2.43
b. 3.05
c. 3.28
d. 3.42
e. 3.45

Problem 9.5. (10 points) You are using a one-period forward binomial tree to model the price of a non-dividend-paying stock. You are given that:

- the current stock price is $S(0) = 80$;
- the volatility of the stock is $\sigma = 0.25$;
- the continuously compounded risk-free interest rate is $r = 0.04$;
- the period is one year long.

Consider a one-year European put option on the above stock with strike price $K = 85$.

Calculate the price of this put option.

a. 8.48
b. 10.50
c. 10.89
d. 11.33
e. 12.10

Problem 9.6. (10 points) You are using a one-period forward binomial tree to model the price of a non-dividend-paying stock. You are given that:

- the current stock price is $S(0) = 50$;
- the volatility of the stock is $\sigma = 0.30$;
- the continuously compounded risk-free interest rate is $r = 0.05$;
- the period is six months long.

Consider a six-month European call option on the above stock with strike price $K = 52$.

Calculate the price of this call option.

a. 4.40
b. 4.85
c. 4.96
d. 5.09
e. 6.14

Problem 9.7. (10 points) A non-dividend-paying stock has the current price equal to $S(0)$. You are given that:

- the continuously compounded risk-free interest rate is $r = 0.04$;
- the price of the stock over a six-month period follows a binomial model with $u = 1.25$ and $d = 0.85$, with u and d as in the standard notation for the binomial model.

A six-month European call option on the stock with a strike price of $(S(0) + 5)$ has the price equal to 4.171.

Calculate $S(0)$.

a. 49.63
b. 56.00
c. 59.21
d. 60.00
e. 62.40