The University of Texas at Austin
Homework Assignment 7

M339D Introduction to Financial Mathematics

February 27, 2026

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

Arbitrage.

Problem 7.1. (5 points) Provide the definition of an *arbitrage portfolio.*

Problem 7.2. (5 points) Provide the definition of a *replicating portfolio* of a European-style derivative security.

Problem 7.3. (5 points) Consider a non-dividend-paying stock whose current price equals \$54 per share. A pair of one-year European calls on this stock with strikes of \$40 and \$50 is available in the market for the observed prices of \$4 and \$2, respectively.

The continuously compounded, risk-free interest rate is given to be 10%.

George suspects that there exists an arbitrage portfolio in the above market consisting of the following components:

- **short-sale** of one share of stock,
- a **long** \$40-strike call,
- a **long** \$50-strike call.

What is the minimum **gain** from this suspected arbitrage portfolio?

a. The above is **not** an arbitrage portfolio.
b. \$0.84
c. \$8.00
d. \$13.05
e. None of the above.

Put-call parity.

Problem 7.4. (5 points) A certain common stock is priced at \$42.00 per share. Assume that the continuously compounded interest rate is $r = 10.00\%$ per annum. Consider a \$50 −strike European call, maturing in 3 years which currently sells for \$10.80. What is the price of the corresponding 3 −year, \$50 −strike European put option?

a. \$5.20
b. \$5.69
c. \$5.04
d. \$5.84

+None of the above.

Problem 7.5. (5 points) The initial price of a non-dividend-paying stock is \$55 per share. A 6 −month, at-the-money call option is trading for \$1.89. Let the interest rate be $r = 0.065$. Find the price of the European put with the same strike, expiration and the underlying asset.

a. \$0.05
b. \$0.13
c. \$0.56
d. \$0.88
e. None of the above

Problem 7.6. (5 points) *Source: Problem #2 from the Sample IFM (Derivatives: Introductory) questions.*
You are given the following information:

- The current price to buy one share of XYZ stock is \$500.
- The stock does not pay dividends.
- The risk-free interest rate, compounded continuously, is 6%.
- A European call option on one share of XYZ stock with a strike price of K that expires in one year costs \$66.59.
- A European put option on one share of XYZ stock with a strike price of K that expires in one year costs \$18.64.

Determine the strike price K.

a. \$449
b. \$452
c. \$480
d. \$559
e. None of the above.

Problem 7.7. (5 points) Consider a European call option and a European put option on a non-dividend-paying stock. Assume:

- The current price of the stock is \$55.
- The call option currently sells for \$0.15 more than the put option.
- Both options expire in 4 years.
- Both options have a strike price of \$70.

Calculate the continuously compounded risk-free interest rate r.

a. 0.044
b. 0.052
c. 0.06
d. 0.065
e. None of the above.

Problem 7.8. (5 points) Consider a European call option and a European put option on a non-dividend paying stock S. You are given the following information:

- $r = 0.04$
- The current price of the call option $V_C(0)$ is by 0.15 greater than the current price of the put option $V_P(0)$.
- Both the put and the call expire in 4 years.
- The put and the call have the same strikes equal to 70.

Find the spot price $S(0)$ of the underying asset.

a. \$48.90
b. \$59.80
c. \$69.70
d. \$79.60
e. None of the above.

The binomial asset pricing model.

Problem 7.9. (10 points) Assume that one of the no-arbitrage conditions in the binomial model for pricing options on a non-dividend paying stock S is violated. Namely, let

$$e^{rh} \leq d < u.$$

Illustrate that the above inequalities indeed violate the no-arbitrage requirement. In other words, construct an arbitrage portfolio and show that your proposed arbitrage portfolio is, indeed, and arbitrage portfolio.