UNIVERSITY OF TEXAS AT AUSTIN

HW Assignment 5

European call options.

Please, provide your **complete solutions** to the free-response problems. Final answers only, without the justification, will earn zero points.

Problem 5.1. (2 points) An agent is **only** allowed to write options on an underlying asset if he/she already owns units of the underlying. *True or false?*

Problem 5.2. (5 points) The initial price of the market index is $900. After 3 months the market index is priced at $920. The nominal rate of interest convertible monthly is 4.8%.
The premium on the long call, with a strike price of $930, is $2.00. What is the profit or loss at expiration for this long call?

Problem 5.3. (5 points) The current price of stock a certain type of stock is $50. The premium for a 3−month, at-the-money call option is $2.74. Let the continuously compounded, risk-free interest rate be 0.04. What is the break-even point of this call option?

(a) $50
(b) $52.71
(c) $52.77
(d) $52.85
(e) None of the above.

Problem 5.4. (8 points) *Source: FM(DM) sample problem #42.*
An investor purchases one share of a non-dividend-paying stock and writes an at-the-money, T-year, European call option in this stock. The call premium is denoted by C. Assume that there are no transaction costs. The continuously compounded, risk-free interest rate is denoted by r. Let the argument s represent the stock price at time T.

(i) (6 points) Determine an algebraic expression for the investor's profit at expiration T in terms of C, r, T and the strike K.
(ii) (2 points) In particular, how does the expression you obtained in (i) simplify if the call is in-the-money on the exercise date?

Problem 5.5. (15 points) The primary ingredient for a certain jeweler is gold which she intends to buy in exactly one year. She considers all of her other production-related expenses to be negligible.

The jeweler uses exactly one ounce of gold to produce every one of her pieces, and will able to sell every piece for $1,000.

The jeweler models he market price of gold in one year as follows:

Gold price in one year	Probability
750 per ounce	0.2
850 per ounce	0.5
950 per ounce	0.3

The jeweler hedges the price of gold by buying a 1−year call option with an exercise price of $900 per ounce. The option costs $100 per ounce now.

The continuously compounded risk-free interest rate is 5%.

Calculate the expected profit of the **hedged** portfolio per piece of jeweley produced.

Problem 5.6. (15 points) *Source: Sample MFE (Intro) Problem #15.*
The current price of a non-dividend paying stock is \$40 and the continuously compounded risk-free interest rate is 8%. You enter into a short position on 3 call options, each with 3 months to expiry, a strike price of \$35, and an option premium of \$6.13. Simultaneously, you enter into a long position on 5 call options, each with 3 months to expiry, a strike price of \$40, and an option premium of \$2.78. All 8 options are held until maturity. Calculate the range of the profit for the entire option portfolio.

(a) $[-4.58, 3.42]$

(b) $[-10.42, 4.58]$

(c) $[-10.42, \infty)$

(d) $(-\infty, 4.58]$

(e) None of the above.