Statistics C183/C283 Instructor: Nicolas Christou

Homework 7

Exercise 1
An investor sells a European call on a share for $4. The stock price is $47 and the exercise price is $50. When does the investor make a profit? When will the option be exercised? Draw a diagram showing the investors profit against the price of the stock at expiration.

Exercise 2
An investor buys a European put on a share for $3. The stock price is $42 and the exercise price is $40. When does the investor make a profit? When will the option be exercised? Draw a diagram showing the investors profit against the price of the stock at expiration.

Exercise 3
You want to purchase 2 puts and 1 call. The call option costs $5 and the put option costs $6. The exercise price for the call or the put is $50. Plot the profit against the stock price at the expiration date:
   a. For the 2 puts.
   b. For the call.
   c. For the combination of the 2 puts and 1 call.

Exercise 4
Consider the following strategy: You write 2 call options (each one with \( E = \$45, \ C = \$5 \)) and you buy 1 call option (with \( E = \$40, \ C = \$8 \)). Both buying and selling call options have the same expiration date. Plot the profit against the stock price at the expiration date for this strategy.

Exercise 5
Answer the following questions:
   a. One of the investing strategies using European options is the “protective put,” where the investor buys the put and buys the stock. What position in call options is equivalent to this strategy? Please explain and provide all the necessary plots to support your answer.
   b. Design a portfolio using only call options and the underlying stock with the following payoff at expiration:

   ![Diagram]

   c. Suppose data are collected for a certain stock:
      Stock price \$110
      Call price (1-year expiration, \( E = \$105 \)) \$17
      Put price (1-year expiration, \( E = \$105 \)) \$5
      Risk-free interest rate 5% per year
      Is there a mispricing of the call and put? If yes, can you exploit this mispricing to create arbitrage profit? Please provide the numerical example.

Exercise 6
Consider the box spread strategy: It is a combination of a bull call spread and a bear put spread.
Bull call spread: Buy one call with exercise \( E_1 = \$50 \) and sell one call with exercise \( E_2 = \$60 \).
Bear put spread: Buy one put with exercise \( E_2 = \$60 \) and sell one put with exercise \( E_1 = \$50 \).
   a. Complete the table that shows the payoffs for all the positions above.
   b. Construct the diagram that shows the payoff for the bull call spread, for the bear put spread, and the total (box spread).