

**ADM 4351, Fall 2020, Quiz #3 (15 points total) - grading key**

**Question 1:**

If you believe that the volatility of the stock price will increase, your speculation strategy will be:

- a) Bull spread
- b) Bear spread
- c) Straddle combination
- d) Butterfly spread
- e) None of the above

**Ans: C**

**Question 2:** Find the price of a call option with strike price of \$20 if the price of call option with strike \$15 is \$7.14, the price of call option with strike \$25 is \$2.18, and the maximum profit that you can make using a single butterfly spread is equal to \$2. All options are European options with the same time to maturity and the interest rate is zero.

**Solution:**

$2x+5-7.14-2.18=2$ , hence,  $x=(7.14+2.18+2-5)/2=3.16$

**Question 3:**

If the 6-month European call option with strike price  $X=\$40$  costs \$15; the 6-month European put option with the same strike price costs \$8; current stock price is \$44 and the risk-free interest rate is 12%. The underlying stock does not pay dividends. Under this scenario you can make an arbitrage and your arbitrage strategy, among other things, will include:

- a) Buying the underlying stock and borrowing money
- b) Buying the underlying stock and investing money
- c) Selling the underlying stock and borrowing money
- d) Selling the underlying stock and investing money
- e) None of the above

**Ans: A**

**Question 4:**

The 6-month European call option with strike price of \$50 costs \$4. The current stock price is \$47 and the stock pays no dividends. If the risk free interest rate is 12% then

- a) You cannot make an arbitrage
- b) You can make an arbitrage and your arbitrage strategy, among other things, will include buying call option and selling stock.
- c) You can make an arbitrage and your arbitrage strategy, among other things, will include selling call option and buying stock.
- d) You can make an arbitrage and your arbitrage strategy, among other things, will include buying call option and stock.

e) You can make an arbitrage and your arbitrage strategy, among other things, will include selling call option and stock.

**Ans: A**

**Question 5:**

The 6-month European call option with strike price of \$50 costs \$4. The current stock price is \$47 and the stock expects to pay \$3 dividends 4 months from now. If the risk free interest rate is 12% then

- a) You cannot make an arbitrage
- b) You can make an arbitrage and your arbitrage strategy, among other things, will include buying call option and selling stock.
- c) You can make an arbitrage and your arbitrage strategy, among other things, will include selling call option and buying stock.
- d) You can make an arbitrage and your arbitrage strategy, among other things, will include buying call option and stock.
- e) You can make an arbitrage and your arbitrage strategy, among other things, will include selling call option and stock.

**Ans: A**

**Question 6:** The call-put parity sets the lower and upper limits for the difference in American call and put option prices (C-P). What will happen to these limits if the company made a decision to pay dividends but did not announce the exact day of the dividend payment (i.e., it can be at any time before the maturity time T)?

- A) The limits will not change
- B) The upper limit will increase
- C) The lower limit will decrease
- D) The upper limit will decrease
- E) The lower limit will increase
- F) Both B and E
- G) Both C and D

**Ans: C**

**Question 7:**

Find the price of the 9-month European call option with strike price of \$50 if the price of the 9-month European put option with the same strike price is \$8; current stock price is \$60, and the risk-free interest rate is 10%. The stock pays no dividends.

**Ans:**  $8+60-50*\exp(-0.1*9/12)=$21.61$

**Question 8:**

9-month European call option with strike price of \$50 on a dividend-paying stock costs \$12 while the 9-month European put option with the same strike price costs \$8; current stock price is \$60, and the risk-free interest rate is 10%. Find the PV of the expected dividend payments.

Ans:  $60 - 50 * \exp(-0.1 * 9/12) - (12 - 8) = \$9.61$

**Question 9:**

Find a risk-neutral probability of an "up" move if the current stock price is \$60, it can be either \$75 or \$50 in 6 month and the risk-free interest rate is 10%.

Ans: 0.523

Sol:

$$u = 75/60$$

$$d = 50/60$$

$$p = (\exp(0.1 * 6/12) - 50/60) / (75/60 - 50/60) = 0.523$$

**Question 10:**

The current stock price is \$80, and it can be either \$100 or \$60 in 6 month. You want to construct the risk-free portfolio by buying  $\Delta$  shares and selling one 6-month call option with strike price of  $X = \$75$ . Find  $\Delta$ .

Ans:  $(100 - 75) / (100 - 60) = 0.625$

**Question 11:**

Find the price of a 6-month European **call** option with strike price of  $X = \$73$  if the current stock price is \$60, it can be either \$85 or \$55 in 6 month and the risk-free interest rate is 10%.

Ans: \$3.07

Sol:

$$u = 85/60$$

$$d = 55/60$$

$$p = (\exp(0.1 * 6/12) - 55/60) / (85/60 - 55/60) = 0.269$$

$$\text{price} = (p * 12 + (1 - p) * 0) * \exp(-0.1 * 6/12) = \$3.07$$

**Question 12:**

If the market price of the option is lower than the one you were supposed to find in the previous question, then you can make an arbitrage by \_\_\_\_\_

- A) buying one share of the stock and buying a certain number of options
- B) buying one share of the stock and selling a certain number of options
- C) selling one share of the stock and buying a certain number of options
- D) selling one share of the stock and selling a certain number of options

Ans: C

**Question 13:**

Find that “certain number of options” that you need to buy/sell to make an arbitrage in the previous question

**Ans: 2.5**

for a short position in 1 option you need  $\Delta=(85-73)/(85-55)=0.4$ . Hence, for one share you need  $1/\Delta=1/0.4=2.5$  options

**Question 14:**

Find the price of a 6-month European **call** option with strike price of  $X=\$45$  if the current stock price is  $\$60$ , it can be either  $\$85$  or  $\$55$  in 6 month and the risk-free interest rate is 10%.

Ans:  $\$17.19$

Sol:

$$u=85/60$$

$$d=55/60$$

$$p=(\exp(0.1*6/12)-55/60)/(85/60-55/60)=0.269$$

$$\text{price}=(p*40+(1-p)*10)*\exp(-0.1*6/12)=\$17.19$$

**Question 15:**

Find the price of a 6-month European **put** option with strike price of  $X=\$65$  if the current stock price is  $\$60$ , it can be either  $\$85$  or  $\$55$  in 6 month and the risk-free interest rate is 10%.

Ans:  $\$6.95$

Sol:

$$u=85/60$$

$$d=55/60$$

$$p=(\exp(0.1*6/12)-55/60)/(85/60-55/60)=0.269$$

$$\text{price}=(p*0+(1-p)*10)*\exp(-0.1*6/12)=\$6.95$$