

Final Exam
Academic Year Choose an item.- Second Semester

Exam Information معلومات الامتحان		
Course name	Financial Derivatives	
Course Code	ACTU 471	
Exam Date	2024-05-26	1445-11-18
Exam Time	12: 00 AM	
Exam Duration	3 hours	ثلاث ساعات
Classroom No.		
Instructor Name	Souhail Chebbi	

Student Information معلومات الطالب		
Student's Name		
ID number		
Section No.		
Serial Number		

General Instructions:

- Your Exam consists of PAGES (except this paper)
- Keep your mobile and smart watch out of the classroom.

- عدد صفحات الامتحان صفحة. (باستثناء هذه الورقة)
- يجب إبقاء الهواتف والساعات الذكية خارج قاعة الامتحان.

هذا الجزء خاص بأستاذ المادة
This section is ONLY for instructor

#	Course Learning Outcomes (CLOs)	Related Question (s)	Points	Final Score
1	Explain fundamental concepts of financial derivatives dealing with forward contracts, future contracts, call and put option, swaps contracts			
2	Describe some models of financial derivatives.			
3	Perform calculations relating to financial derivatives.			
4	Quantify, evaluate and solve problems of investment and risk management using financial derivatives.			
5	Study, learn and work constructively			
6	Encourage students to pass IFM exam.			
7				
8				

Exercise 1. [4]

A one-year forward contract on a stock has a price of \$75. The stock is expected to pay a dividend of \$1.50 at two future times, six months from now and one year from now, and the annual effective risk-free interest rate is 6%. Calculate the current stock price.

Answer

Exercise 2. [5]

Judy decides to take a **short** position in 20 contracts of S&P 500 futures. Each contract is for the delivery of 250 units of the index at a price of 1500 per unit, exactly one month from now. You are given that:

- The initial margin is 5% of the notional value,
- the maintenance margin is 90% of the initial margin,
- Judy earns a continuously compounded risk-free interest rate of 4% on her margin balance,
- the position is marked-to-market on a daily basis.

The value of the index for the coming two trading days are:

Day	Value of the index
1st trading day marking-to-market	1498
2nd trading day marking-to-market	X

Given that on the 2nd trading day marking-to-market Judy is not required to add anything to the margin account. Calculate the largest possible value of X.

Answer

Exercise 3. [3]

A customer buys a 50-strike put on an index when the market price of the index is also 50. The premium for the put is 5. Assume that the option contract is for an underlying 100 units of the index and the risk-free interest rate $r = 0$.

Calculate the customer's profit if the index declines to 45 at expiration.

Answer

Exercise 4. [5]

i) Give the graph of the following:

a) Payoff of a long call options as a function of the index price.

b) Profit of a long put option as a function of the index price.

ii) You can buy a 6-month 40-strike European call for 7.30 and a 6-month 40-strike European put on the same stock for 4.31. The continuously compound risk-free rate is 5%.

What value must the stock have in 6 months for the call payoff to equal the put profit.

Answer

Exercise 5. [5]

The current value of a stock is 30. It pays a continuously compounded dividend rate of $\delta = 0.01$. The continuously compounded risk-free rate is $r = 0.04$.

For an exercise price of $K = 30$, you can buy a 3-month European call on the stock for 1.60 and a 3-month European put for 1.40.

Describe an arbitrage strategy which leads to an arbitrage profit of \$0.024.

Answer

Exercise 6. [8]

The current value of an S&R index is 1000 and the index has no dividends. You are given the following information about options prices on this index with three months to expiry.

Strike	Call Price	Put Price
975	77.716	43.015
1000	64.595	
1025	53.115	67.916

- i) Find the continuously compounded annual interest rate r .
- ii) Find the fair price of the put option with strike 1000.
- iii) An investor holds the index and buys a 975-strike put
 - a) What is the name of this strategy?
 - b) What is his minimum profit?
- iv) An investor buys a 975-strike put and 975-strike call:
 - a) What is the name of this strategy?
 - b) What is his minimum profit?

Answer

Exercise 7. [5]

The current price of a non-dividend paying stock is 40 and the continuously compounded risk-free interest rate is 8%. The following table shows call and put option premiums for three-month European of various exercise prices:

Strike	Call Premium	Put Premium
35	6.13	0.44
40	2.78	1.99
45	0.97	5.08

A trader interested in speculating on volatility in the stock price is considering two investment strategies. The first is a 40-strike straddle. The second is a strangle consisting of a 35-strike put and a 45-strike call. Determine the range of stock prices in 3 months for which the strangle outperforms the straddle.

Answer

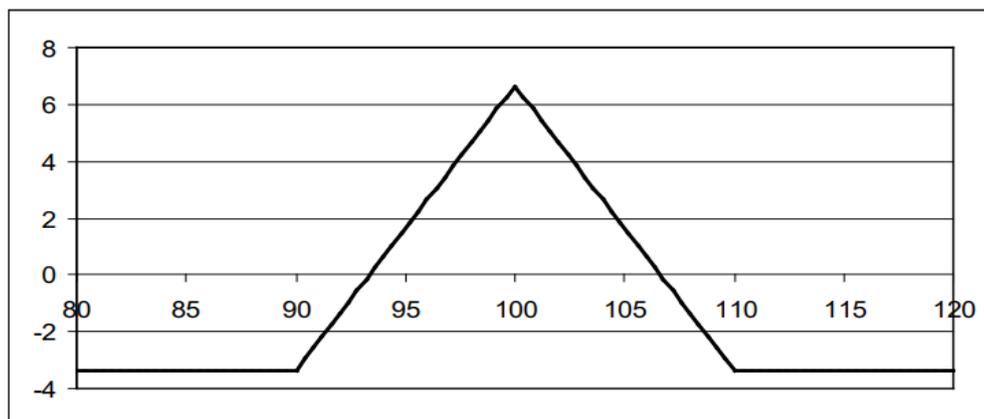
Exercise 8. [5]

Stock ABC has the following characteristics:

- The current price to buy one share is 100.
- The stock does not pay dividends.
- European options on one share expiring in one year have the following prices:

Strike	Call Premium	Put Premium
90	14.63	0.24
100	6.80	1.93
110	2.17	6.81

A butterfly spread on this stock has the following profit diagram.



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

Determine which of the following will **NOT** produce this profit diagram.

- A) Buy a 90 call, buy a 110 call, sell two 100 calls.
- B) Buy a 90 put, sell a 100 put, sell a 100 call, buy a 110 call.
- C) Buy one share of the stock, buy a 90 call, buy a 110 put, sell two 100 puts.

Answer

EXTRA PAGE