

**NANYANG TECHNOLOGICAL UNIVERSITY****SEMESTER 2 EXAMINATION 2024-2025****BR2210 Financial Risk Management**

May 2025

Time Allowed: 2 hours 30 minutes

**INSTRUCTIONS**

- 1 This paper contains **TEN(10)** questions and comprises **FOUR(4)** pages.
- 2 Answer **ALL** questions.
- 3 This is a **closed-book** examination.
- 4 The number of marks allocated is shown at the end of each question.
- 5 Begin your answer to each question on a separate page of the answer book.
- 6 Answers will be graded for content and appropriate presentation.
- 7 Do **NOT** use pencils.
- 8 Do **NOT** use correction tapes.

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Note: Examination questions begin from page 2.

Question 1

Suppose that the principal assigned to the senior, mezzanine, and equity tranches is, respectively, 40%, 30%, and 30% for ABSs. Furthermore, the senior tranche of the ABS CDO accounts for 40% of the principal of the ABS mezzanine tranches, the mezzanine tranche of the ABS CDO accounts for 30% of the principal of the ABS mezzanine tranches, and the equity tranche of the ABS CDO accounts for the remaining 30%. Assume that all ABS portfolios have the same default rate. What is the loss to the mezzanine tranche of ABS CDO if the loss on the underlying assets is 48%?

(10 marks)

Question 2

A Eurodollar futures quote for the period between 5.2 and 5.45 years in the future is 97.1. The standard deviation of the change in the short-term interest rate in one year is 1.4%. Calculate the contract price of the Eurodollar futures.

(10 marks)

Question 3

An investor has just taken a long position in a two-year forward contract on a dividend-paying stock. The stock is expected to pay dividends of \$1 in 6 months and \$2 in 18 months. The current stock price is \$40. Assume the risk-free rate of interest is 5% per annum with continuous compounding for all maturities.

(a) What are the forward price and the initial value of the forward contract?

(5 marks)

(b) One year later, the price of the stock is still \$40. The expected dividend of the stock and the risk-free rate remain unchanged. What are the forward price and the value of the forward contract?

(5 marks)

(TOTAL: 10 marks)

Question 4

A stock's price is currently \$10. For the next month, it is expected to increase by 20% or reduce by 20%. The risk-free interest rate is 5% per annum compounded continuously. Use a one-period binomial tree to calculate the value of a derivative that pays off  $(S_T - 11)^+ + (11 - S_T)^+$  where  $S_T$  is the stock price in 1 month and  $(S_T - a)^+ = \max(S_T - a, 0)$ .

(10 marks)

Question 5

You are given the following information about European options on a stock. The current stock price is 228. All options have the same maturity.

Type	Strike	Premium	Delta	Gamma
Call	230	2.36	0.41447	0.04826
Call	235	0.90	0.20346	0.03527
Put	230	4.2	-0.58770	0.04930
Put	225	1.98	-0.34689	0.04437

- (a) How can the options be used to create a straddle? (3 marks)
- (b) What is the initial cash flow? (1 mark)
- (c) What is the delta of your strategy in (a)? (1 mark)
- (d) Complete the following table to show the profit and payoff for the strangle at maturity. (5 marks)

Stock Price	Payoff	Profit
$S_T \geq 235$		
$230 \leq S_T < 235$		
$225 \leq S_T < 230$		
$S_T < 225$		

(5 marks)

(TOTAL: 10 marks)

Question 6

A financial institution has the following portfolio of options on a stock:

Type	Position	Delta of Option	Gamma of Option	Vega of Option
Call	-100	0.5	2.1	1.2
Call	-500	0.8	0.6	0.4
Put	-200	-0.5	1.1	0.8

The financial institution can trade the stock and the following option:

Type	Delta of Option	Gamma of Option	Vega of Option
Call	0.5	1.6	0.4

How could the portfolio be made delta and vega neutral?

(10 marks)

Question 7

Suppose that conditional on no earlier default a reference entity has a (risk-neutral) probability of default of 20% in each of the next 2 years. Assume payments are made annually in arrears, that defaults always happen half-way through a year, and that the expected recovery rate is 40% in the first year and 20% in the second year. The risk-free zero curve is flat at 5% per annum with continuous compounding. What is the credit default swap spread?

(10 marks)

Question 8

The price of an American call option on a non-dividend-paying stock that expires in one year and has a strike price of \$30 is \$2. The underlying stock price is currently \$30. The risk-free interest rate is 5% per annum with continuous compounding. The volatility of the stock in the past 30 days is 25% per annum. If the price of a European put option that expires in one year with a strike price of \$30 is now \$1, is there an arbitrage opportunity?

(10 marks)

Question 9

It is May 1, 2025. The cheapest-to-deliver bond in a December 2025 Treasury bond futures contract is a 16% coupon bond, and delivery is expected to be made on December 31, 2025. Coupon payments on the bond are made on March 1 and September 1 each year. The risk-free rate with continuous compounding is 5% per annum for all maturities. The conversion factor for the bond is 1.5. The current quoted bond price is \$120. Calculate the quoted futures price for the contract.

(10 marks)

Question 10

A portfolio manager plans to use a Treasury bond futures contract to hedge a bond portfolio over the next six months. The portfolio is worth \$10 million and will have a duration of 15 years in six months. The 6-month Treasury bond futures contract price is \$98,234 (each contract is for the delivery of \$100,000 face value of bonds). The bond that is expected to be cheapest to deliver will have a duration of 9 years at the maturity of the futures contract.

(a) What position in futures contracts is required?

(5 marks)

(b) Suppose that all rates increase over the six months, but long-term rates increase less than short-term and medium-term rates. What is the effect of this on the performance of the hedge? Explain without calculation.

(5 marks)

(TOTAL: 10 marks)

**- END OF PAPER -**







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**BR2210 FINANCIAL RISK MANAGEMENT**

Please read the following instructions carefully:

- 1. Please do not turn over the question paper until you are told to do so. Disciplinary action may be taken against you if you do so.**
2. You are not allowed to leave the examination hall unless accompanied by an invigilator. You may raise your hand if you need to communicate with the invigilator.
3. Please write your Matriculation Number on the front of the answer book.
4. Please indicate clearly in the answer book (at the appropriate place) if you are continuing the answer to a question elsewhere in the book.