

NPTEL
INDUSTRIAL AND MANAGEMENT ENGINEERING DEPARTMENT, IIT KANPUR
QUANTITATIVE FINANCE
ASSIGNMENT-4 (2015 JULY-AUG ONLINE COURSE)

NOTE THE FOLLOWING

- 1) There are five questions and you are required to answer all of them.
- 2) Deadline for submission is Saturday; 15th August, 2015
- 3) The total marks is 50.
- 4) To get full credit do your calculations carefully.

Question 1:

- a) Consider you are given the following information for a 11 month forward contract on a stock with a price of Rs. 130, paying dividends of Rs. 5 per share after four and eight month. According to the contract which has been signed the delivery price has been negotiated at Rs. 135. The continuously compounded risk free interest rate is 8% per annum.
 - (i) According to the information furnished are you of the opinion the contract signed is normal? Is so why and if not then also why? Give valid explanations and show calculations for your answer.
 - (ii) If such a contract was available to you what would your strategy be and why? Explain.
 - (iii) What change in the value of delivery price will make this abnormality go and make this contract a normal one?
- b) The data in the table given below shows the monthly change in the price per barrel of fuel and the change in the futures price of contract for fuel. A company knows that it will need ten million barrels of fuel in eight months. One future contract is worth 25,000 barrels of fuel.

ΔS	+0.45	+0.38	+0.36	-0.25	+0.69	-0.33	-0.51	+0.07
ΔF	+0.62	+0.55	+0.52	-0.27	+0.70	-0.29	-0.44	-0.06

 - (i) Calculate the optimal hedge ratio for the fuel.
 - (ii) How many contracts should the company sign for hedging?

Question 2:

- a) Consider you bought a call option of value Rs. 10 on a stock X with a strike price of Rs. 100 and simultaneously sold a call option (on the same stock X) of value Rs. 5 with a strike price of Rs. 120. Both the options have the same expiration date.
 - (i) If at the expiration date the stock price is Rs. 90, what is your total payoff considering both the options?

- (ii) If at the expiration date the stock price is Rs. 105, what is your payoff, what is your payoff considering both the options?
- (iii) If at the expiration date the stock price is Rs. 110, what is your payoff, what is your payoff considering both the options?
- (iv) If at the expiration date the stock price is Rs. 115, what is your payoff, what is your payoff considering both the options?
- (v) If at the expiration date the stock price is Rs. 130, what is your payoff, what is your payoff considering both the options?
- (vi) Draw the graph of the total payoff against the stock price (S_T).

b)

- (i) Explain very briefly
 - Basis
 - Rollover basis
 - Cost of carry
- (ii) A trader buys a European put on a share for Rs. 3. The stock price is Rs. 42 and the strike price is Rs. 40. Under what conditions does the trader make a profit. Under what circumstances will the option be exercised? Draw a diagram showing the variation of the trader's profit with the stock price at the maturity of the option.
- (iii) A trader buys a call option with a strike price of Rs. 45 and a put option with a strike price of Rs. 40. Both options have the same maturity. The call costs Rs. 3 and the put costs Rs. 4. Draw a diagram showing the variation of the trader's profit with the asset price.

Question 3:

- a) A trader enters into a short wheat futures contract when the futures price is Rs. 32 per kilogram. The contract is for the delivery of 1,00,000 kilograms of wheat. How much does the trader gain/lose if the wheat price at the end of the contract is (i) Rs. 31.45 per kilogram; (ii) Rs. 32.75 per kilogram?
- b) A trader sells a European call on a share for Rs. 4. The stock price is Rs. 50 and the strike price is Rs. 55. Under what circumstances does the trader make a profit? Under what circumstances will the option be exercised? Draw a diagram showing the variation of trader's profit/loss with the stock price at the maturity of the option.

Question 4:

a) The table given below illustrates the operation of the margin account for a possible sequence of futures prices for a trader. Assume the maintenance margin is Rs. 1000 (Rupees one thousand only) and the initial margin is Rs. 2000 (Rupees two thousand only). There are fifty (50) contracts which have been entered into by the trader. You must consider the following, (i) if the total amount in the margin account is more than the total initial margin value then the excess amount is withdrawn and (ii) if the amount in the margin account falls to or below the maintenance margin, then the investor gets margin call so as to bring back the value to the initial margin value of Rs. 2000.

Day	FutureDaily Price (in Rs.)	Cumulative Gain/Loss (in Rs.)	Margin A/C Gain/Loss (in Rs.)	Margin Call (in Rs.)	Balance (in Rs.)
	100				
Jan 1	95				
Jan 2	92				
Jan 3	90				
Jan 4	95				
Jan 5	100				
Jan 6	95				
Jan 7	90				
Jan 8	85				
Jan 9	90				
Jan 10	95				

- (i) If at the end of the day on 10th January the trader closes his/her position what is his/her cumulative gain/loss in Rs?
- (ii) At any point of time during the trade did the trader receive any margin call(s) and if so what is/are the amount(s) and at which date(s)?
- (iii) At any point of time during the trade did the trader with draw money from his/her margin account and if so what is/are the amount(s) and at which date(s)?

Question 5:

(a) Consider you undertake the following transactions:

- Buy one call option for Rs. 5, the strike price of which is Rs. 50.
- Sell two call options for Rs. 10 each, the strike price of each of the option is Rs. 75.
- Buy one call option for Rs. 15, the strike price of which is Rs. 100.

Then:

- (i) What is the payoff matrix (depending on the stock price, S_T) for the above three transactions you undertook?
- (ii) Draw the cumulative payoff graph vs S_T for the above three transactions you undertook.

(b) Consider you undertake the following transactions:

- Sell a call option for Rs. 10, the strike price of which is Rs. 100.
- Sell a put option for Rs. 15, the strike price of which is Rs. 100.
- Buy a call option for Rs. 20, the strike price of which is Rs. 150.
- Buy a put option for Rs. 25, the strike price of which is Rs. 150.

Then:

What is the payoff matrix (depending on the stock price, S_T) for the above four transactions you undertook?