

Question Paper
Derivatives: Analysis & Valuation (CFA630) : January 2009
Section A : Basic Concepts (30 Marks)

- This section consists of questions with serial number 1 - 30.
- Answer all questions.
- Each question carries one mark.
- Maximum time for answering Section A is 30 Minutes.

1. A long stock position can be created by investing in a pure discount bond with face value equal to the forward price of the stock along with [<Answer>](#)
- (a) A short position in a forward contract for one stock
 - (b) A short position in a futures contract for one stock
 - (c) A short position in a call option contract for one stock
 - (d) A long position in put option contract for one stock
 - (e) A long position in a forward contract for one stock.
2. Basis risk can be reduced by [<Answer>](#)
- I. Netting the receivables.
 - II. Matching cash and futures obligations.
 - III. Using near month futures contract.
 - IV. Hedging with a futures contract that has a high price correlation.
- (a) Both (I) and (II) above
 - (b) Both (II) and (III) above
 - (c) (I), (II) and (III) above
 - (d) (II), (III) and (IV) above
 - (e) All (I), (II), (III) and (IV) above.
3. How many Eurodollar futures contracts are needed to hedge a long \$100 million position in 6-month US T-Bills? (size of each Eurodollar futures contract = \$1 million) [<Answer>](#)
- (a) Short 50
 - (b) Short 100
 - (c) Short 200
 - (d) Long 100
 - (e) Long 200.
4. Which of the following statements are **true** pertaining to features of forward contracts? [<Answer>](#)
- I. They are traded directly between participants.
 - II. They are traded between participants on an organized exchange.
 - III. It is based on standardized terms and conditions.
 - IV. It is based on mutually agreed terms.
 - V. It will perfectly hedge an exposure.
- (a) Both (I) and (IV) above
 - (b) Both (II) and (III) above
 - (c) (I), (III) and (V) above
 - (d) (I), (IV) and (V) above
 - (e) (II), (III) and (V) above.
5. Currently the stock index is at 14,250 and the annualized risk free rate is 9%. If the annualized dividend yield on the index is 4%, the theoretical price of the current 3-month stock index futures is [<Answer>](#)
- (a) 14,285.14
 - (b) 14,302.50
 - (c) 14,404.45
 - (d) 14,425.68
 - (e) 14,450.29.

6. Equity shares of Cygnus Ltd. are currently trading at a price of Rs.265 each; the April option series has exactly three months until expiration. Currently, the April 270 call sells for Rs.5, and the April 270 put sells for Rs.2.25. The annual interest rate implied in the option prices is approximately [<Answer>](#)
- (a) 12.36%
 - (b) 11.10%
 - (c) 10.25%
 - (d) 9.58%
 - (e) 8.81%.
7. For Paramount Airlines, the various alternatives available to hedge against increase in Aviation Turbine Fuel (ATF) prices are [<Answer>](#)
- I. Taking short position in put options on ATF.
 - II. Taking long position in call options on ATF.
 - III. Taking long position in put options on ATF.
 - IV. Taking long position in ATF futures contract.
- (a) Both (I) and (IV) above
 - (b) Both (II) and (III) above
 - (c) Both (III) and (IV) above
 - (d) (I), (II) and (IV) above
 - (e) (II), (III) and (IV) above.
8. In a derivative exchange, scalpers are [<Answer>](#)
- (a) Brokers who execute orders on others' account
 - (b) Traders who are ready both to buy and sell
 - (c) Traders who execute trade on their own account
 - (d) Traders who execute trade on account of others only
 - (e) Traders who execute trade on their own account and on account of others.
9. With respect to a particular futures contract, the initial margin requirement is Rs.25,000 and maintenance margin requirement is Rs.13,500. If the balance in margin account is Rs.13,000, the amount to be deposited to meet the margin call is [<Answer>](#)
- (a) Nil
 - (b) Rs. 500
 - (c) Rs. 5,000
 - (d) Rs.11,500
 - (e) Rs.12,000.
10. The value of an American put option is positively related to the following factors except [<Answer>](#)
- (a) Dividends
 - (b) Time to expiration
 - (c) Strike price
 - (d) Volatility
 - (e) Risk-free rate.
11. Mr. Singh, CFO of National Textiles Ltd., has covered dollar receivable by purchasing put options on dollar at Rs.48.85 by paying a premium of 50 paise per dollar. If on the date of realization, the spot price turned out to be Rs.48.75/\$, the net rupee amount realized per dollar is [<Answer>](#)
- (a) Rs.48.25
 - (b) Rs.48.35
 - (c) Rs.48.55
 - (d) Rs.48.75
 - (e) Rs.48.85.

12. The standard deviation of change in spot rupee-dollar exchange rate is 11.75% and standard deviation of change in rupee-dollar futures contract is 6.65%. The coefficient of correlation between the returns from spot and futures is 0.77. The minimum variance hedge-ratio for hedging through futures contract is [<Answer>](#)

- (a) 0.44
- (b) 0.63
- (c) 1.36
- (d) 1.87
- (e) 2.56.

13. Mr. Anil is managing a portfolio of stock worth Rs.2.8 million with a beta of 1.25. On January 1, 2009, he writes fifteen call option contracts on NIFTY 3650 expiring in the month of February, at a premium of Rs.50 each, when the index was trading at 3600. The size of each contract is 50. If at expiration, NIFTY turns out to be 3680, the value of total portfolio is approximately [<Answer>](#)

- (a) Rs.2.800 million
- (b) Rs.2.812 million
- (c) Rs.2.862 million
- (d) Rs.2.893 million
- (e) Rs.2.996 million.

14. Which of the following statements is **not true** with respect to delta? [<Answer>](#)

- (a) Delta approaches -1 when the put option is deep-in-the-money
- (b) Delta approaches 0 when the put option is deep-out-of-the-money
- (c) Delta approaches -1 when the call option is deep-out-of-the-money
- (d) Delta tends to approach 1 when the call option is deep-in-the-money
- (e) Delta of a call will be most sensitive to change in the stock prices, when the underlying stock price approaches the exercise price.

15. Mr. Alan has gone short on T-bond futures. In order to make delivery, he has identified the following five bonds to choose one among them: [<Answer>](#)

Bond	Quoted Price	Conversion factor
A	115-06	1.144
B	119-25	1.1875
C	115-02	1.143
D	117-15	1.166
E	114-24	1.141

Assuming that the current futures settlement price is 100-16, the Cheapest-to-Deliver bond (CTD) to be selected by Mr. Alan for delivery is

- (a) A
- (b) B
- (c) C
- (d) D
- (e) E.

16. Considering the following options on the shares of JP Ltd.: [<Answer>](#)

Particulars	Exercise Price (Rs.)	Premium (Rs.)	Expiration
Call option	143	2	February
Put option	149	4	February

Mr. Ankit, a retail investor creates a strangle strategy using above call and put options. If at expiration, spot price turns out to be Rs.151, the gain/(loss) to the investor is

- (a) (Rs.8)
- (b) (Rs.2)
- (c) Rs.2
- (d) Rs.6
- (e) Rs.8.

17. Which of the following is **not** an assumption underlying the Black-Scholes model?

[<Answer>](#)

- (a) No dividend payments during the life of the option
- (b) Security trading is continuous
- (c) The risk-free rate is same for all maturities
- (d) Short selling of securities is not permitted
- (e) Absence of transaction costs and taxes.

18. An option whose pay-off depends on the average price of the underlying asset during a pre-specified period is known as

[<Answer>](#)

- (a) Look back Option
- (b) Rainbow Option
- (c) Compound Option
- (d) Asian Option
- (e) Bermudan Option.

19. Other things remaining constant, which of the following types of call option experiences accelerating time decay as expiration approaches?

[<Answer>](#)

- (a) Deep-out-of-the-money option
- (b) Deep-in-the-money option
- (c) At-the-money-option
- (d) Out-of-the-money option
- (e) In-the-money option.

20. A US exporter has decided to hedge £10 million receivable through £ futures. The current spot rate is \$1.72/£ and futures quote is \$1.75/£. The number of futures contracts required to hedge the receivable is (each contract size = £62,500)

[<Answer>](#)

- (a) 200
- (b) 160
- (c) 125
- (d) 93
- (e) 90.

21. Currently, the equity shares of Opto India are trading at a price of Rs.175 each. It is expected that price of the stock in one year time period may go up to Rs.210 or it may go down to Rs.140. If the risk free rate is 8%, the probability of price decrease is

[<Answer>](#)

- (a) 10%
- (b) 30%
- (c) 45%
- (d) 70%
- (e) 90%.

22. Which of the following statements regarding implied volatility is **not true**?

[<Answer>](#)

- (a) The volatility arrived from the quoted price of the option is called the implied volatility
- (b) Implied volatility remains constant across exercise prices
- (c) The calculation of implied volatility is not direct and it should be arrived at by trial and error
- (d) If the price of the option derived using Black-Scholes model is the same as the quoted price, assumed volatility is same as the implied volatility
- (e) One should buy option with the lowest volatility and sell one with the highest in order to make a profit.

23. The following data pertains to the structure of an asset-backed security transaction:

[<Answer>](#)

Particulars	Rs.(in million)
Senior tranche	1,125
Subordinate tranche A	175
Subordinate tranche B	25

The value of the collateral for the structure is Rs.1,350 million. Subordinate tranche B is the first loss tranche. The amount of the loss for tranche B, if losses due to default over the life of the structure total to Rs.50 million, is

- (a) Rs.75 million
- (b) Rs.50 million
- (c) Rs.25 million
- (d) Rs.10 million
- (e) Nil.

24. In which of the following swaps, the fixed rate payer has the right to terminate the swap at any time before the maturity? [<Answer>](#)

- (a) Extendible swaps
- (b) Forward swaps
- (c) Deferred rate swaps
- (d) Callable swaps
- (e) Puttable swaps.

25. The following information is available with respect to put options on the equity shares of PLR Ltd.: [<Answer>](#)

Particulars	Put option A	Put option B
Strike price	Rs.150	Rs.185
Premium	Rs.10	Rs.14
Expiry	January 29, 2009	January 29, 2009

As compared to put option A, put option B will have

- (a) The higher breakeven price and lower profit potential
- (b) The higher breakeven price and greater profit potential
- (c) The lower breakeven price but same profit potential
- (d) The lower breakeven price and lower profit potential
- (e) The lower breakeven price and greater profit potential.

26. Riversdale Inc. and BP Plc. require funds to the extent of £100 million and \$200 million respectively. They can borrow these currencies at the following interest rates: [<Answer>](#)

Firms	Sterling	Dollars
Riversdale Inc.	4.50%	4.30%
BP Plc.	4.20%	4.35%

The quality spread differential is

- (a) 0.05%
- (b) 0.20%
- (c) 0.35%
- (d) 0.50%
- (e) 0.95%.

27. Theoretical value of a call option is Rs.5.80 and the vega of the option is 20.25. If volatility increases by 2%, the revised theoretical value of the option is [<Answer>](#)

- (a) Rs.6.05
- (b) Rs.6.21
- (c) Rs.6.64
- (d) Rs.7.01
- (e) Rs.7.23.

28. A person expects the market to decline sharply in near future. He will require put options with [<Answer>](#)

- (a) Positive delta, positive rho
- (b) Positive gamma, positive theta
- (c) Negative delta, positive gamma
- (d) Negative vega, positive theta
- (e) Negative gamma, positive delta.

29. Third-party guarantees, a form of external credit enhancement for asset-backed securities, protect against losses up to a particular fixed level. Such external credit enhancement technique is available in the form of [<Answer>](#)

- I. Corporate guarantee.
- II. Letter of credit.
- III. Bond insurance.
- IV. Senior structures.

- (a) Both (I) and (II) above
- (b) Both (III) and (IV) above
- (c) (I), (II) and (III) above
- (d) (I), (II) and (IV) above
- (e) (II), (III) and (IV) above.

30. Consider a swap to pay US \$ floating and receive AUS \$ floating. What type of swap would be combined with this swap to produce a plain vanilla swap in AUS \$? [<Answer>](#)

- (a) Pay US \$ fixed, receive AUS \$ fixed
- (b) Pay AUS \$ fixed, receive US \$ fixed
- (c) Pay AUS \$ floating, receive US \$ floating
- (d) Pay AUS \$ floating, receive US \$ fixed
- (e) Pay AUS \$ fixed, receive US \$ floating.

END OF SECTION A

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Section B : Problems/Caselet (50 Marks)

- This section consists of questions with serial number 1 – 6.
- Answer all questions.
- Marks are indicated against each question.
- Detailed workings/explanations should form part of your answer.
- Do not spend more than 110 - 120 minutes on Section B.

1 Mr. Alex, treasurer of Morellato Inc., expects to have a surplus of £25 million after 3 months from now. He intends to park the surplus funds in 6-month euro sterling deposit whose rate is hovering at 4.5% currently. However, in order to protect against falling interest rates, he is planning to use a 3/9 Forward Rate Agreement (FRA) contract of notional principal of £25 million and agrees on a rate of 4.25%.

[<Answer>](#)
≥

You are **required** to

- a. Explain how Mr. Alex can make use of 3/9 FRA to hedge its exposure. marks
(2)
- b. Compute the annualized return, if on expiration, the 6-month euro sterling deposit rate turns out to be
 - i. 3.75%.
 - ii. 4.75%.marks
(6)

2. Mr. Udyan, a speculator, is expecting that in the next two-three months rupee will not fluctuate much from the current spot rate against dollar. Currently, rupee-dollar spot rate is Rs.45.95/\$. The following call options are available in the market: [<Answer>](#)

Call Option	Strike price (Rs./\$)	Premium (Rs.)	Maturity
A	45.75	0.21	3 months
B	46.00	0.12	3 months
C	46.25	0.05	3 months
D	46.50	0.01	3 months

The speculator wants to make a profit from his view by adopting an option strategy using all the four call options given above, and would like to limit his maximum potential loss.

You are **required** to suggest a strategy to the speculator and prepare pay-off profile indicating maximum profit, maximum loss, and range of prices for which the strategy will give profit. Also draw the pay-off diagram for the strategy.

(9 marks)

3. Three companies, Lambda, Theta and Sigma require \$500 million each for next five years. The following are the requirements and the costs of borrowings faced by them in different markets: [<Answer>](#)

Company	Requirement	PLR	US \$ 6-month LIBOR	Fixed \$
Lambda	PLR based \$ funds	PLR + 0.50%	US \$ 6-month	4.05%

(10marks)

Theta	US \$ 6-month LIBOR funds	PLR + 0.10%	LIBOR + 0.55% US \$ 6-month LIBOR + 0.35%	4.00%
Sigma	Fixed \$ funds	PLR + 0.10%	US \$ 6-month LIBOR + 0.20%	3.86%

Lambda, Theta and Sigma, not being satisfied with the costs of borrowings at the markets of their choice, have come together to reduce their interest burden.

You are **required** to arrange a swap between three parties in such a way that the benefit of swap is equally divided among the three parties. Also calculate the effective cost of borrowing to each party, after the swap.

[<Answer>](#)

4. Mr. Nicholas, a portfolio manager of an asset management company based in US, keeps track of major developments in Power Industry. According to him, the signing of nuclear deal between US and India appears to be a positive sign and is likely to benefit the major players in this sector, especially in India. However, in an environment where economic growth is slowing down and many Indian companies are cutting production, NTPC as an investment, appears to be a good investment opportunity and offers decent growth that could boost overall returns of the portfolio on a long term basis. As such, he is planning to buy 50,000 shares of NTPC. The current price of the stock quoted in Bombay Stock Exchange (BSE) is Rs.140.

However, Mr. Nicholas is concerned about recent volatility in Rs./\$ exchange rates. The current exchange rate is Rs.47.70/\$. In case, Indian currency continues to depreciate against dollar, this would negatively affect the portfolio returns. As such, he is contemplating of taking position in \$ futures in India to hedge his return. The appropriate \$ futures contract is currently trading at Rs.48.25. The contract size of each \$ futures contract is \$1000.

You are **required** to construct a position using \$ futures contracts and evaluate how the investment will perform if after second month, the stock price turns out to be Rs.165, the spot exchange rate is Rs.48.10/\$ and the futures price is Rs.48.44/\$. Also determine the rate of return available to Mr. Nicholas from the combined position at the end of second month.

(7 marks)

Caselet

Read the caselet carefully and answer the following questions:

5. Compare the construction and payoff of covered call strategy with covered put strategy. Also state the expectations underlying the two strategies.
6. Discuss the benefits of using covered call strategy and covered put strategy.

[<Answer>](#)

(8 marks)

[<Answer>](#)

(8 marks)

Options are financial derivatives traded on organized exchanges. Option is a derivative financial instrument whose market is growing fast. It is a contract between a buyer and a seller. Option gives a buyer the right (but not the obligation to buy or sell the contract) while the seller has an obligation to honor the contract.

Calls are called covered by owning the underlying security and puts are called covered with a short position in the underlying security while owning the asset. In other words, it is called covered position when option position is opened by selling an option and at the same time owning an equivalent position in the underlying security.

Covered call and covered put are the main types of covered options. A 'Covered Call' is an option contract, where an investor owns a security and sells call options on the same security. They are covered calls as long as the investor owns sufficient number of shares of the security for each call that is sold. The sold calls are covered because they can be exercised by selling the security to the covered call option holder at the strike price of call options.

Under the covered call option strategy, an investor writes a call option contract while at the same time owns the same number of shares of the underlying stock. Covered call option is the most essential and commonly used strategy combining the flexibility of listed options with stock ownership and ensuring pre-decided price for the sold shares.

A covered call option is a combination of owning shares of a stock or other securities and selling (or writing) a call option on those shares in corresponding amounts. Mostly, covered call option has same payoffs as a short put option on the stock, and thus it should essentially have the same price (or premium) as that of a short put option.

A 'Covered Put' is an option contract where an investor has a short position in a security and sells puts on that short security; they are covered puts as long as the investor is short on sufficient number of shares of the security for each put that is sold. The sold puts are covered because they can be exercised by buying the security to close out the short position to the covered put option holder at the strike price of the put options. Under cover put strategy an investor writes a put option contract while simultaneously owning an equivalent number of shares of the underlying stock.

Strategy for covered call provides some income, but it does not eliminate the downside risk of stock ownership. Unfortunately, this strategy sometimes is marketed as being 'safe' or 'conservative', even though the flaws in this marketing logic have been well-known. The covered put strategy and covered call strategy are opposite to each other. Investors sell short the stock to cover the put which is written. Strategy for covered put is a neutral to bearish strategy because the investor is expecting the stock to go down or stay constant. When the stock decreases, the investor will have the stock put to them at the short put strike price. This covers the obligation of the shares of stock which were shorted. It is important that the investor should have a negative opinion of the stock's short-term potential and to select stocks that are going down.

END OF CASELET

END OF SECTION B

Section C : Applied Theory (20 Marks)

- This section consists of questions with serial number 7 - 8.
- Answer all questions.
- Marks are indicated against each question.
- Do not spend more than 25 -30 minutes on Section C.

7. a. What factors distinguish a forward contract from a futures contract? What do forward and futures contract have in common? What advantages each have over the other? [<Answer>](#)
(5 marks)

b. Explain how the option on the futures becomes the same as an option on the asset.
(5 marks)

8. 'A swap bank has to entail certain risks, which are inherent to the swap business and are interrelated.' Explain the risks involved in the swap business. [<Answer>](#)
(10 marks)

END OF SECTION C

END OF QUESTION PAPER

Suggested Answers

Derivatives: Analysis & Valuation (CFA630) : January 2009

Section A : Basic Concepts

Answer	Reason
1. E	A synthetic owning of a stock can be created by investing in a pure discount bond with face value equal to the forward price of the stock along with a long position in a forward contract for one stock. < TOP >
2. E	By using all the alternatives, possibility of variation in spot and futures price can be reduced. < TOP >
3. C	Since duration of T-Bills to be hedged is 2-times the duration of futures contract, the number of contracts to be sold = $(100/1) \times 2 = 200$. < TOP >
4. D	The correct answer is < TOP > • Forward contracts are traded directly between participants, • The terms and conditions are mutually agreed and • The contract will perfectly hedge an exposure.
5. D	Based on the cost-of-carry model, the theoretical price of a futures contract is < TOP > determined as follows: $FP_{t,T} = CP_t + CP_t \times (R_{t,T} - D_{t,T}) \times (T - t) / 365$ Where, $FP_{t,T}$ = Price of the stock index futures contract. CP_t = Price of the cash index at a time t. $R_{t,T}$ = Annualized financing rate for period $(T - t)$ $D_{t,T}$ = Expected average annual dividend. $T - t$ = Carrying period or number of days due to next dividend or maturity. Applying the above formula, $FP_{t,T} = 14,250 + 14,250 \times (0.09 - 0.04) \times 90 / 365$ $= 14,425.68.$
6. A	As per put call parity, < TOP > $C - P = S - K / (1 + R)^T$ $5 - 2.25 = 265 - 270 / (1 + R)^{0.25}$ $270 / (1 + R)^{0.25} = 265 - 2.75$ $270 / (1 + R)^{0.25} = 262.25$ $1.02955 = (1 + R)^{0.25}$ $R = 12.36\% \text{ (approx)}$
7. D	The airline company is short in gasoline, so it can hedge through the following ways: < TOP > i. Taking long position in call option ii. Taking short position in put option iii. Taking long position in futures contract.
8. B	In a derivative exchange, scalpers are traders who are ready to both buy and sell. < TOP >
9. E	Since the balance in the margin account is below the maintenance margin requirement, the amount required to meet the margin call = $\text{Rs.}(25,000 - 13,000) = \text{Rs.}12,000$ < TOP >
10. E	The value of an American put option is negatively related with risk free interest rate. < TOP > All the other alternatives are positively related.

11. B As spot price is less than exercise price ($S < E$), put option is exercised [< TOP >](#)
 Net rupee amount realized per dollar is = (exercise price – premium outflow) = $(48.85 - 0.50) = \text{Rs.}48.35$.
12. C The Minimum variance hedge ratio is obtained as under: [< TOP >](#)

$$h = \rho_{\Delta S, \Delta F} \cdot \frac{\sigma_{\Delta S}}{\sigma_{\Delta F}}$$
 where h = Hedge ratio
 $\rho_{\Delta S, \Delta F}$ = Coefficient of correlation between ΔF_t and ΔS_t
 $\sigma_{\Delta S}$ = Standard deviation of ΔS .
 $\sigma_{\Delta F}$ = Standard deviation of ΔF .
 ΔF_t = Change in future prices during the period of hedging
 ΔS_t = Change in the spot price during the period of hedging.
 Therefore, $h = 0.77 \times 0.1175 / 0.0665 = 1.36$ (approx)
13. D The index rises by 2.22%. Therefore, the portfolio should rise by $(1.25)(2.22\%) = 2.775\%$ [< TOP >](#)

Stock: Rs.2.8 million x 1.02775	=	2,877,700
Option premium: 15 x 50 x Rs.50	=	37,500
Cash settlement: $(3680 - 3650) \times 50 \times 15$	=	<u>(22,500)</u>
		<u>Rs.2,892,700</u>
Value of total portfolio		<u>Rs. 2.893 million</u>

 (approximately)
14. C Delta approaches 0 when the call option is deep-out-of-the money. [< TOP >](#)
15. E The cheapest-to-deliver bond is the one for which [< TOP >](#)
 Quoted Price – (Futures settlement price × Conversion factor) is least.
 The computation of CTD is as follows:
 Bond A: $115.1875 - 1.144(100.50) = \0.2155
 Bond B: $119.7813 - 1.1875(100.50) = \0.4376
 Bond C: $115.0625 - 1.143(100.50) = \0.191
 Bond D: $117.469 - 1.166(100.50) = \0.286
 Bond E: $114.75 - 1.141(100.50) = \0.0795
 So, the CTD is Bond E.
16. C Initial outflow = $2 + 4 = \text{Rs.}6$ [< TOP >](#)
 If spot price is Rs.151, the call will be exercised and put will not be exercised.
 Gain or loss = $(151 - 143) + 0 - 6 = \text{Rs.}2$.
17. D The assumptions underlying the Black-Scholes model are: [< TOP >](#)
 i. Short selling of securities is permitted.
 ii. Absence of transaction costs and taxes.
 iii. No dividend payments during the life of the option.
 iv. No arbitrage opportunity.
 v. Security trading is continuous.
 vi. The risk-free rate is 'r' and is constant for all maturities.
 vii. European exercise terms are used.
18. D An Asian option's pay-off depends on the average price of the underlying asset during a pre-specified period of the life of the option, or in other words, on the averaging period. [< TOP >](#)

19. C The longer the time to expiration, the greater is the value of a call option. The lesser the time to expiration, the lesser is the time for the market to move in a direction that is favorable to the option holder before the date of expiry. Therefore, the option loses its time value. This process of losing the time value is known as time value decay. At-the-money options have greater time value decay.
- The greater the difference between the exercise and the stock prices, i.e., if the call is deep-in-the-money or deep-out-of-the-money, the lower will be the time value of the call.
20. B
- $$\text{The number of futures contracts required to hedge the receivable} = \frac{\text{£ 10,000,000}}{\text{£ 62,500}} = 160.$$
21. B According to the binomial option pricing model, the probability of the price increase
- $$\frac{R - d}{u - d} \quad \text{Where, } u = \frac{210}{175} = 1.20 \quad d = \frac{140}{175} = 0.80$$
- $$= \frac{1.08 - 0.80}{1.20 - 0.80} = 0.70$$
- ∴ The probability of price decrease = $1 - 0.70 = 0.30 = 30\%$.
22. B One unusual feature of implied volatility is that it does not appear to be constant across exercise prices. That is, if the value of the underlying asset, the interest rate and the time to expiry are fixed, the prices of options across exercise prices should reflect a uniform value for the volatility. But in practice, this is not the case, even puts and calls give slightly different implied volatilities.
- The calculation of implied volatility is not direct and it should be arrived by trial and error. On an initial assumption of a particular value of volatility, the option price is calculated using Black-Scholes formula. If the calculated price is the same as the quoted price, then assumed volatility is the implied volatility; if not, the same procedure is repeated with another volatility data until we arrive at a value for which the calculated price equals the quoted price.
23. C The amount of overcollateralization is the difference between the value of the collateral, Rs.1,350 million, and the par value for all the tranches, Rs. (1125+175+25) = Rs.1,325 million. In this structure, it is Rs.25 million.
- If the losses total Rs.50 million, out of this, the loss of Rs.25 million is absorbed by overcollateralization. Remaining Rs.25 million is totally absorbed by subordinate tranche B.
24. D A callable swap gives the holder, i.e. the fixed rate payer, the right to terminate the swap at any time before its maturity. Should the interest rates fall, the fixed rate payer exercises his right and terminates the swap since the funds will be available at a lower rate now.
25. B The breakeven price in case of put option A is $(150-10) = \text{Rs.140}$ and in case of put option B is $(185-14) = \text{Rs.171}$. For put option the profit is maximized when the stock price is zero at the expiration. So the maximum profit will be Rs.140 and Rs.171 respectively for both the options. Thus the put option B with the higher exercise price has the higher breakeven price and greater profit potential.
26. C Here Riversdale Inc. has comparative advantage in Dollar market while BP Plc. Has comparative advantage in Sterling market. Therefore, quality spread differential is $[(4.50-4.20) + (4.35-4.30)] = 0.35\%$.
27. B If an option has a vega of 20.25, it implies that for each percentage increase (decrease) in volatility, the option will gain (lose) $\text{Rs.}20.25 \times 0.01 = \text{Re.}0.2025$ in theoretical value. Therefore, if volatility increases by 2%, the revised theoretical value of the option is $(5.8 + 2 \times 0.2025) = \text{Rs.}6.205 \approx \text{Rs.}6.21$

28. C A person expects the market to decline sharply in the near future. He will want put options with negative delta, positive gamma since when stock price decreases the value of a put which is having negative delta will increase and for puts, positive gamma means that their delta will become more negative and move toward -1.00 when the stock price falls. [< TOP >](#)
29. C Third-party guarantees is available in the form of [< TOP >](#)
- Corporate guarantee.
 - Letter of credit.
 - Bond insurance.
30. E A plain vanilla swap on any currency means a fixed-to-floating swap on that currency. [< TOP >](#)
Here, as per original swap the company is paying US \$ floating and receiving AUS \$ floating. In order to form a plain-vanilla swap in AUS \$, it should combine this swap with a swap in which it pays AUS \$ fixed and receives US \$ floating. By entering into this swap, it will receive US \$ floating as well as pay US \$ floating, which will sum up to zero payment on US \$. On AUS \$, it will pay fixed rate and receive floating rate.

Section B : Problems

- 1.a. A forward rate agreement (FRA) is a tailor-made, over-the-counter financial futures contract on [≤](#) short-term deposits. A FRA transaction is a contract between two parties to exchange payments on a [TOP](#) deposit, called the notional amount, to be determined on the basis of a short-term interest rate, [≥](#) referred to as the reference rate, over a predetermined time period at a future date.

FRA transactions are entered as a hedge against interest rate changes. The buyer of the contract locks in the interest rate in an effort to protect against an interest rate increase, while the seller protects against a possible interest rate decline. At maturity, no funds exchange hands; rather, the difference between the contracted interest rate and the market rate is exchanged. The buyer of the contract is paid if the reference rate is above the contracted rate, and the buyer pays to the seller if the reference rate is below the contracted rate.

A company that seeks to hedge against a possible increase in interest rates would purchase FRAs, whereas a company that seeks an interest hedge against a possible decline of the rates would sell FRAs. Hence, Mr. Alex, who is afraid of interest rates falling, will sell a 3/9 FRA contract.

- b. In case of FRA, the payoff typically occurs on the expiration date. The amount paid, however, is then discounted to reflect the deferred payment.

Current rate = 6-month deposit rate 4.5%

Notional Principal = £ 25 million

Duration of deposit = 6 months

- i. **If the 6-month deposit rate is 3.75%**

Interest amount receivable on deposit = £ 25 million $\times$ 0.0375 $\times$ 180/360 = £ 468,750

Since the treasurer has sold the FRA, he will now gain from the fall in reference rate.

$$\text{Payoff from FRA} = \frac{25,000,000(0.0375 - 0.0425) \times 180 / 360}{(1 + 0.0375 \times \frac{180}{360})} = -£ 61,349.69 = £ 61,350.$$

$$\text{Value of payoff after 6-months} = £ 61,350 \left(1 + 0.0375 \times \frac{180}{360} \right) = £ 62,500$$

Net proceeds received after 6 months from the date of deposit = interest + gain from FRA =
£(468,750 + 62,500) = £ 531,250

$$\text{Annualized return} = \frac{531,250}{25,000,000} \times \frac{360}{180} \times 100 = 4.25\%.$$

- ii. **If the 6-month deposit rate is 4.75%**

Interest amount receivable on deposit = £ 25 million $\times$ 0.0475 $\times$ 180/360 = £ 593,750

Since the treasurer has sold the FRA, he has bear loss as the reference rate has increased.

$$\text{Payoff from FRA} = \frac{25,000,000(0.0475 - 0.0425) \times 180 / 360}{(1 + 0.0475 \times \frac{180}{360})} = £ 61,050.$$

$$\text{Value of payoff after 6-months} = £ 61,050 \left(1 + 0.0475 \times \frac{180}{360} \right) = £ 62,500$$

Net proceeds received after 6 months from the date of deposit = interest + loss from FRA £(593,750 - 62,500) = £ 531,250

$$\text{Annualized return} = \frac{531,250}{25,000,000} \times \frac{360}{180} \times 100 = 4.25\%.$$

2. The condor spread strategy is a suitable strategy for the speculator. Condor spread can be created by [≤](#) buying two options at strike price of Rs.45.75 and Rs.46.50, and selling two options at Rs.46.00 and [TOP](#) Rs.46.25. [≥](#)

Initial outflow = Rs.[0.21 + 0.01 - (0.12 + 0.05)] = Rs.0.05

Payoff Profile

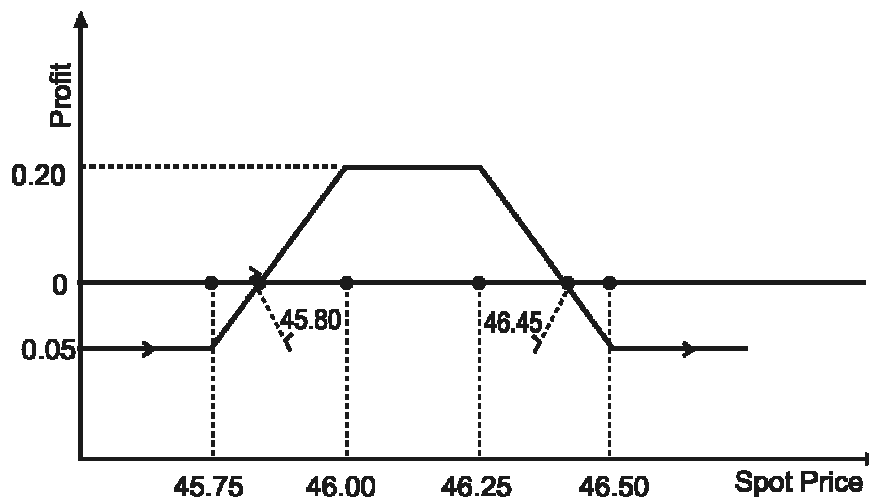
Spot price	Payoff				Initial cash flow	Net gain/loss
	(+) C = 45.75	(-) C = 46.00	(-) C = 46.25	(+) C = 46.50		
45.70	0	0	0	0	-0.05	-0.05
45.75	0	0	0	0	-0.05	-0.05
45.80	0.05	0	0	0	-0.05	0
45.90	0.15	0	0	0	-0.05	0.10
46.10	0.35	-0.10	0	0	-0.05	0.20
46.20	0.45	-0.20	0	0	-0.05	0.20
46.35	0.60	-0.35	-0.10	0	-0.05	0.10
46.45	0.70	-0.45	-0.20	0	-0.05	0
46.60	0.85	-0.60	-0.35	0.10	-0.05	-0.05
46.70	0.95	-0.70	-0.45	0.20	-0.05	-0.05

Maximum profit = 0.20

Maximum loss = 0.05

Break-even points = Rs.45.80 and 46.45

The strategy will give profit if the rupee-dollar exchange rate lies between Rs.45.80/\$ and Rs.46.45/\$.



3. Sigma has absolute advantage in LIBOR and fixed \$ funds market. In PLR based market, both Sigma $\leq$ and Theta have the absolute advantage. Sigma has comparative advantage in the LIBOR market $\geq$ against Theta by 0.15% and against Lambda 0.35% which is more than the comparative advantage in Fixed \$ funds market. Also Theta has absolute advantage in PLR market which is more than the comparative advantages in LIBOR and Fixed \$ market.

Now Lambda has comparative advantage in Fixed \$ market as difference with Sigma is 0.19% and with Theta is 0.05%, which is less than the difference in interest rates in other markets. Hence, Lambda will borrow in Fixed \$ market, Theta in PLR market and Sigma in the LIBOR market.

Total cost of funds for three parties before the swap

$$= (\text{PLR} + 0.50\%) + (\text{LIBOR} + 0.35\%) + 3.86\% \\ = \text{PLR} + \text{LIBOR} + 4.71\%$$

Total cost of funds after the swap

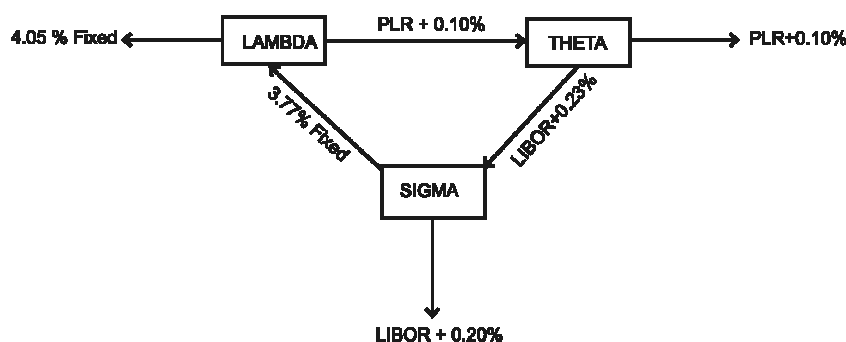
$$= 4.05\% + (\text{PLR} + 0.10\%) + (\text{LIBOR} + 0.20\%) \\ = \text{PLR} + \text{LIBOR} + 4.35\%$$

Therefore, gain due to swap

$$= (\text{PLR} + \text{LIBOR} + 4.71\%) - (\text{PLR} + \text{LIBOR} + 4.35\%) = 0.36\%$$

This gain of 0.36% will be distributed among the three parties equally.

The structure of swap:



Lambda will borrow Fixed \$ 4.05% from the market, pays PLR + 0.10% to Theta and receive Fixed \$ 3.77% from Sigma.

Theta will borrow PLR + 0.10% from the market, receives PLR + 0.10% from Lambda and pays LIBOR + 0.23% to Sigma.

Sigma will borrow LIBOR + 0.20% from market, pays Fixed \$ 3.77% to Lambda and receives LIBOR + 0.23% from Theta.

Effective cost of Lambda = $4.05\% + \text{PLR} + 0.10\% - 3.77\%$

= $\text{PLR} + 0.38\%$ as against the initial cost of $\text{PLR} + 0.50\%$

Effective cost of Theta = $\text{PLR} + 0.10 + \text{LIBOR} + 0.23 - (\text{PLR} + 0.10\%)$

= $\text{LIBOR} + 0.23\%$ as against the initial cost of $\text{LIBOR} + 0.35\%$

Effective cost of Sigma = $\text{LIBOR} + 0.20\% + 3.77\% - (\text{LIBOR} + 0.23\%)$

= 3.74% as against the initial cost of 3.86% .

So, cost of each party has been reduced by 0.12%.

4. Investment required to be made = $50,000 \times 140 = \text{Rs.} 70,00,000$

Equivalent dollar amount required at the current exchange rate of $\text{Rs.} 47.70/\$ = \text{Rs.} 70,00,000 / 47.70 = \text{\$} 146,750$

The portfolio manager needs to buy \$ futures since he is afraid of \$ getting strong against Rs.

Number of contracts required to be purchased = $\text{\$} 146,750 / 1,000 = 146.75 \approx 147$ contracts

So he will buy 147 futures contract at $\text{Rs.} 48.25$.

After two months, the gain from futures contract = $\text{Rs.} (48.44 - 48.25) \times 147 \times 1,000 = \text{Rs.} 27,930$

Gain on stock = $\text{Rs.} (165 - 140) \times 50,000 = \text{Rs.} 12,50,000$

Total proceeds = $\text{Rs.} 70,00,000 + \text{Rs.} 12,50,000 + \text{Rs.} 27,930 = \text{Rs.} 82,77,930$

Value of total proceeds in dollar at an exchange rate of $\text{Rs.} 48.10/\$ = 82,77,930 / 48.10 = \text{\$} 172,098.34$

Gain from the combined position = Total proceeds received - initial investment made = $\text{\$} 172,098.34 - \text{\$} 146,750 = \text{\$} 25,348.34$

Therefore, rate of return = $25,348.34 / 146,750 \times 100 = 17.27\%$

5.

Comparison of Covered Call and Put Strategy	
Covered Call	Covered Put
- Buy the stock - Collect premium on write of call - Risk is if stock goes down - If called deliver stock owned - Maximum Profit: Limited - Maximum Loss: Substantial	- Short the stock - Collect premium on write of put - Risk is if stock goes up (because of shorting) - If assigned deliver stock to pay short - Maximum Profit: Unlimited - Maximum Loss: Limited Strike Price – (Stock Purchase Price + Premium)

• Upside Profit at Expiration if Not Assigned: Any Gains in Stock Value + Premium Received • BEP: Stock Purchase Price – Premium Received • If Volatility Increases: Negative Effect • If Volatility Decreases: Positive Effect • Passage of Time: Positive Effect	Paid) • Upside Profit at Expiration: Gains in Underlying Share Value Since Purchase – Premium Paid • BEP: Stock Purchase Price + Premium Paid • If Volatility Increases: Positive Effect • If Volatility Decreases: Negative Effect • Passage of Time: Negative Effect
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Generally in any market condition covered call can be used but it is mostly used when the investor feels that its market value will experience a little high over the lifetime of the call contract, while being optimistic on the underlying stock. Covered put option is most often employed when the investor feels that its market value will experience little range below the lifetime of the call contract, while being bearish on the underlying stock. The investor might have concerns about unknown, downside market risks in the near-term and wants some protection for the gains in share value.

6. Benefit of Covered Call

This option creates income because the shareholder keeps the premium received from writing the call. This strategy can offer limited protection from a decrease in price of the underlying stock and narrow profit with an increase in stock price. Simultaneously, the investor can appreciate all kind of gains of underlying stock ownership, such as voting rights and dividends, unless he is assigned an exercise notice on the written call and is required to sell his shares. Generally, the covered call option strategy is regarded as a conventional strategy because it decreases the risk of stock ownership.

Benefit of Covered Put

Covered put investor retains all benefits of continuing stock ownership (dividends, voting rights, etc.) during the lifetime of the put contract, unless he sells his stock. At the same time, this covered put option serves to limit downside loss in unrealized gains accrued by the purchase of underlying stock. It does not matter how much the underlying stock decreases in value during the option's lifetime, the put guarantees the investor the right to sell his shares at the put's strike price until the option expires. If there is a sudden, significant decline in the market price of the underlying stock, a covered put option's owner has the luxury of time to react.

Section C: Applied Theory

7. (a) While both forward and futures contracts are agreements to purchase a good at a future date, a futures contract provides liquidity by having a central marketplace and standardized contract terms. This allows holders of futures contracts to sell them in the market at any time prior to expiration. Futures trading is governed by the formal regulations of the futures exchange. Most important, the losses incurred by futures traders are guaranteed by the clearinghouse, which requires the daily settlement of gains and losses. That is, the holders of profitable contracts do not have to worry about whether their gains will be paid by the holders of losing contracts. Forward contracts, however, are subject to default risk. Forward contracts can be tailored to the unique needs of firms. For example, a firm may need to execute a hedge in which the expiration is a specific date. Futures contracts expire only on certain dates, which may not fit the needs of the firm.
- (b) In an option on a futures contract, the underlying is a futures contract. Thus, if the holder exercises a call option on a futures it creates a long position in a futures contract, and if the holder exercises a put option on a futures it creates a short position in a futures contract. As in options on assets, an option on a futures requires that the buyer pay the premium up front. There are two expirations, the expiration of the option and the expiration of the underlying futures, though for some contracts, these expirations are the same. In that case, exercise of the option on the futures creates a futures contract that immediately expires, thereby turning into the spot asset and making the option on the

futures the same as an option on the asset.

8. While the earnings of the swap bank are from the bid-ask spread of swaps and the fees charged (upfront fees), it has to entail the following risks, which are inherent to the swap business and are mostly inter-related: [< TOP >](#)
1. **Interest Rate Risks:** Interest rate risk arises mostly on fixed rate legs of swaps. While the floating rate interest can be periodically adjusted to the prevailing interest rates, the fixed rate in the market not accompanied by a change in the yield of debt instruments of the same time period as the interest rates will entail interest rate losses to the bank. Unless the swap bank is fully hedged, losses will be incurred.
 2. **Currency Exchange Risk:** Currency exchange risks happen when there is an exchange rate commitment given to one party and there is a steep change in the exchange rate between the currencies in the swap. If the swap bank is not able to match the counterparty well in time, it will incur losses due to the exchange rate difference.
 3. **Market Risks:** Market risks occur when there is difficulty in finding counterparty to a swap. Usually, longer maturity swaps have less takers and vice versa. Lower the number of takers, higher the risks of losses.
 4. **Credit Risks:** Credit risks are those risks which the swap bank has to bear in case the counterparty to a swap defaults on payment due to bankruptcy or any other defaults, legal or otherwise. The bank continues to be obliged to pay the other party of the swap, irrespective of the fact whether the former party defaulted or not. Market risks and credit risks together amount to default risks of the bank.
 5. **Mismatch Risk:** Mismatch risks take place when the swap bank comes across mismatches in the requirements of both counterparties to the swap. Usually, banks have a pool of swaps and have no difficulty in finding matches, but if no party is found, the risk of mismatch losses is there. This risk is further aggravated in case one of the parties defaults.
 6. **Basis Risks:** Basis risks take place mostly in floating-to-floating rate swaps, when both the sides are pegged to two different indices the sides are pegged to two different indices and both the indices are fluctuating and there is no proper correlation between both.
 7. **Spread Risk:** Spread risks happen when the spread changes over the time period the parties are matched. The spread risk is not the same as interest rate risk, as spreads may change as a result of change in basis points, while the interest rate may still remain constant.
 8. **Settlement Risk:** Settlement risks take place when the payments of currency swaps are made at different times of the day mainly because of different settlement hours in capital markets of two countries involved in the currency swap. If a limit on the size of the settlement is placed for each day, this risk is minimized.
 9. **Sovereign Risk:** Sovereign risks are those risks that can take place if a country changes its rules regarding currency deals. It mostly happens in the underdeveloped or developing countries which tend to have more political instability than the developed world.

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