CA FINAL

STRATEGIC FINANCIAL MANAGEMENT

SUPER 100 PART 2
Answers

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Question 25 to 34

Done in Class 3 of Super Hundred Series

Question 35.

We can see that, X has absolute advantage for borrowing in Fixed Euro market, Y has absolute advantage in Fixed $ market and Z has absolute advantage in floating $ market. So they will borrow in those markets where they have absolute advantage and inter-change the interest payments among them.

Gain due to doing swap

= [5.75 + 6.25 + (LIBOR + 0.75)] – [5.25 + 6.00 + (LIBOR + 0.60)] = 0.90%

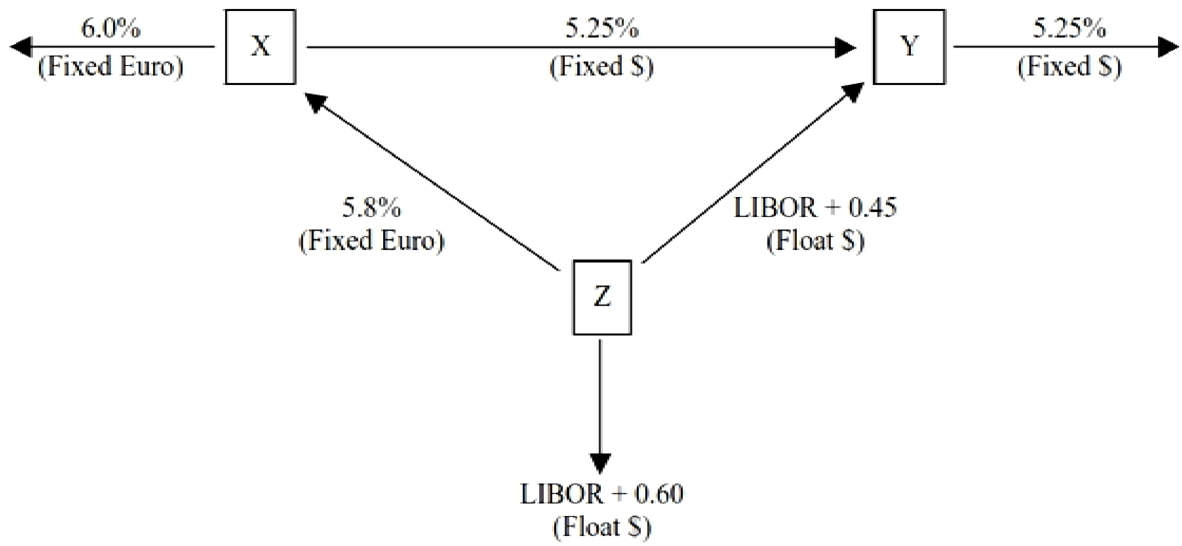
So the total gain of 0.90% will be divided among three parties equally.

Swap arrangement:

X will borrow from the market fixed Euro at 6%, pay Y fixed $ at 5.25% and receive fixed Euro at 5.8% from Z.

Y will borrow from the market fixed $ at 5.25%, receive 5.25% fixed $ from X and pay LIBOR + 0.45%, floating $ to Z.

Z will borrow from the market floating $ at LIBOR + 0.60%, receive floating $ at LIBOR + 0.45% from Y and pay fixed Euro 5.8% to X.



Cost of X = 6 + 5.25 – 5.8 = 5.45

Cost of Y = 5.25 + (LIBOR + 0.45) – 5.25 = LIBOR + 0.45

Cost of Z = LIBOR + 0.6 + 5.8 – (LIBOR + 0.45) = 5.95

Gain of X = 5.75 – 5.45 = 0.30%

Gain of Y = LIBOR + 0.75 – (LIBOR + 0.45) = 0.30%

Gain of Z = 6.25 – 5.95 = 0.30%

Question 36.

a.

Market rates	$/Euro	$/Yen	Implied Yen/Euro
Spot	0.8666	0.0076	114.03
Futures:			
March	0.8738	0.0075	116.51
June	0.8800	0.0074	118.92
September	0.8860	0.0073	121.37

The market's long-term view of euro against yen is that the yen will depreciate against euro.

b. As the market is expecting that yen will depreciate, the speculator's view is that the yen will appreciate. This means according to him yen is underpriced and euro is overpriced. So he will buy September Yen futures and sell September euro futures. He will trade in September futures, since the chances that his view will be reflected in the prices is in long term.

c. Gain from euro futures = 0.8860 – 0.8836 = $ 0.0024
Gain from yen futures = 0.00745 – 0.0073 = $0.00015
Total gain = $ (0.0024 + 0.00015) = $0.00255.

Question 37.

a. **Strip Strategy**

Buy one call at 48.50

Buy two puts at 48.50

∴ Total initial outflow = 0.30 + 2 × 0.05 = Rs.0.40

Spot price	Exercised		Profit from		Initial	Net
	Calls	Puts	Calls	Puts	outflow	inflow
47.00	No	Yes	-	3.00	0.40	2.60
47.50	No	Yes	-	2.00	0.40	1.60
48.00	No	Yes	-	1.00	0.40	0.60
48.10	No	Yes	-	0.80	0.40	0.40
48.30	No	Yes	-	0.40	0.40	0
48.50	No	No	-	-	0.40	– 0.40
48.75	Yes	No	0.25	-	0.40	–0.15
48.90	Yes	No	0.40	-	0.40	0
49.00	Yes	No	0.50	-	0.40	0.10
49.50	Yes	No	1.00	-	0.40	0.60
50.00	Yes	No	1.50	-	0.40	1.10

Break-even points are 48.30 and 48.90.

Strap Strategy

Buy two calls at 48.50

Buy one put at 48.50

∴ Total initial outflow = 2 × 0.30 + 0.05 = Rs.0.65.

Spot price	Exercised		Profit from		Initial	Net
	Calls	Puts	Calls	Puts	outflow	inflow
47.00	No	Yes	–	1.50	0.65	0.85
47.50	No	Yes	–	1.00	0.65	0.35
47.85	No	Yes	–	0.65	0.65	0
48.00	No	Yes	–	0.50	0.65	– 0.15
48.50	No	No	–	–	0.65	– 0.65
48.825	Yes	No	0.65	–	0.65	0
49.00	Yes	No	1.00	–	0.65	0.35

49.15	Yes	No	1.30	–	0.65	0.65
49.50	Yes	No	2.00	–	0.65	1.35
50.00	Yes	No	3.00	–	0.65	2.35

Break-even points are 47.85 and 48.825.

b. The buyer of strip and strap expects there will be a significant movement in the spot price. Strip strategy is more desirable if the spot price is more likely to fall than to rise and strap strategy is desirable if spot price more likely to rise. Strip will give profit if spot price falls below 48.30 or rises above 48.90. Strip will give profit if price falls below 47.85 or rises above 48.825. So, the trader will buy strip if he expects rupee to appreciate and will buy strap if he expects rupee to depreciate significantly.

Question 38.

a. Value of a call option C = SN (d_1) – Xe^{-rt} N (d_2)

Where,

S = Rs.75

X = Rs.100

r = 0.08

t = 0.50 years

s = 0.25

$$\text{and } d_1 = \frac{\ln(S/X) + \left(r + \frac{\sigma 2}{2}\right)t}{\sigma\sqrt{t}}$$

$$= \frac{\ln(75/100) + \left(0.08 + \frac{0.25^2}{2}\right)0.5}{0.25\sqrt{0.50}}$$

$$= \frac{-0.2877 + 0.05563}{0.17678}$$

$$= -1.3128$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

= – 1.3128 – 0.25 √0.5

= – 1.3128 – 0.17678 = – 1.4896

∴ N (d_1) = N(– 1.3128) = 0.50 – 0.4049 = 0.0951

and, N(d_2) = N(– 1.4896) = 0.50 – 0.4319 = 0.0681

∴ C = S N(d_1) – Xe^{-rt} N(d_2)

= 75 × 0.0951 – 100 × $e^{-0.08 \times 0.50}$ × 0.0681

= 7.1325 – 100 × 0.9608 × 0.0681 = 7.1325 – 6.5430 = Rs.0.59

b. Value of put option, P = Xe^{-rt} N$(-d_2)$ – S N $(-d_1)$

N$(-d_1)$ = N(1.3128) = 0.50 + 0.4049 = 0.9049

N $(-d_2)$ = N(1.4896) = 0.50 + 0.4319 = 0.9319

∴ P = 100 × $e^{-0.08 \times 0.50}$ × 0.9319 – 75 × 0.9049

= 100 × 0.9608 × 0.9319 – 67.8675 = 89.5370 – 67.8675 = Rs.21.67.

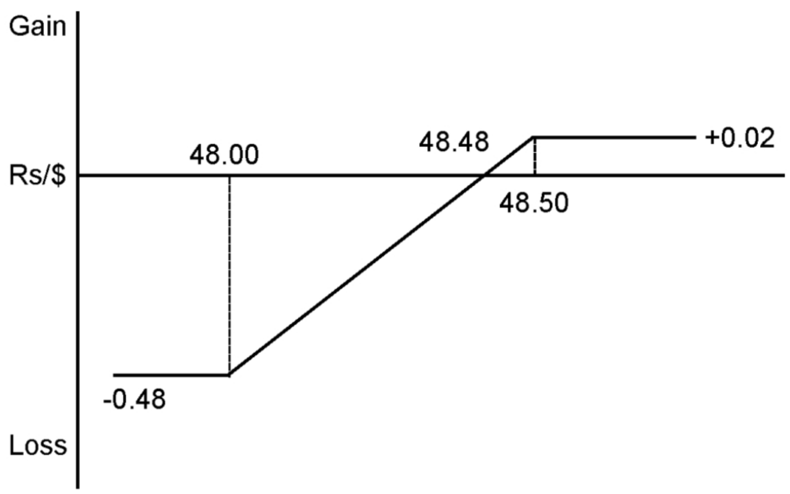
Question 39.

a. The speculator is expecting the rupee to depreciate, and dollar to appreciate. The options are available on dollar, so he/she will adopt a bullish spread using call options, so that if dollar appreciates, the strategy will give profit. In a bullish spread the speculator will buy call with low strike price and sell call with higher strike price.

b. Buy X = 48.00 (Call)
Sell X = 48.50 (Call)
Initial cash outflow = 0.60 – 0.12 = 0.48

Pay-off profile

Spot	Exercised		Profit/loss		Initial Outflow	Net gain/loss
	X = 48.00	X = 48.50	X = 48.00	X = 48.50		
47.50	No	No	—	—	0.48	–0.48
47.80	No	No	—	—	0.48	–0.48
48.00	No	No	—	—	0.48	–0.48
48.10	Yes	No	0.10	—	0.48	–0.38
48.20	Yes	No	0.20	—	0.48	–0.28
48.40	Yes	No	0.40	—	0.48	–0.08
48.48	Yes	No	0.48	—	0.48	0
48.50	Yes	No	0.50	—	0.48	+0.02
48.55	Yes	Yes	0.55	–0.05	0.48	+0.02
48.60	Yes	Yes	0.60	–0.10	0.48	+0.02
48.80	Yes	Yes	0.80	–0.10	0.48	+0.02
49.00	Yes	Yes	1.00	–0.50	0.48	+0.02



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Break-even Rate = Rs.48.48/$
Maximum profit = Rs.0.02/$
Maximum loss = Rs.0.48/$

c. If the speculator is not sure whether dollar will appreciate or rupee will appreciate he/she can adopt either long straddle or a long strangle strategy. These strategies will give profit if exchange rates fluctuate significantly.

   In a long straddle, the speculator will buy a call and a put with same exercise price and same expiry date

   In a long strangle, the speculator will buy a call at a strike price 48.50 and buy a put at 48.00.

Question 40.

a. In order to cancel the deal on July 1, 2001 (after settling the swap payments), the present value of the future cash–flows would have to be paid. The discount rate applicable should be the current rate of interest in the market i.e. 8% p.a. or 4% for 6 months.

Amount of interest to be paid as per the original contract

$$=\left(\frac{0.1}{2}\right)(10{,}000{,}000) = 500{,}000$$

Value of fixed leg =

$$\$\,500{,}000 \times \left[\frac{1}{(1.04)^1}+\frac{1}{(1.04)^2}+\frac{1}{(1.04)^3}+\frac{1}{(1.04)^4}+\frac{1}{(1.04)^5}+\frac{1}{(1.04)^6}\right]+\frac{10\times10^6}{(1.04)^6}$$

$$= \$500{,}000\ [PVIF(4\%, 1) + PVIF(4\%, 2) + PVIF(4\%, 3) + PVIF(4\%, 4) + PVIF(4\%, 5) + PVIF(4\%, 6)] + 10 \times 10^6 \times PVIF(4\%, 6)$$

$$= \$\,500{,}000\,[PVIFA(4\%,6)] + 10 \times 10^6 \times 0.790$$

$$= \$\,500{,}000\ [5.242] + 7{,}900{,}000$$

$$= \$\,10{,}521{,}068$$

Value of floating leg = $ 10 million [since interest is just paid]

Value of swap = $10,521,068 – $10,000,000 = $521,068

This amount is to be paid by the company to the bank.

b. Company should pay to the bank every six-months

$$= \$10{,}000{,}000 \times \frac{0.08}{2} = \$400{,}000$$

Question 41.

a. Fair price of futures = 7.511 + 7.511 x 0.11 x $\frac{8}{10} + 0$

= $ 8.061 per ounce.

b. Futures are now priced at $8.456 per ounce. But the fair price is only $8.061 per ounce, so the futures is over priced.

So, the strategy should be: Sell futures and buy spot.

April 27, 2001:

Cash silver : $ 7.511 / ounce

Annualized

Eurodollar Rate : 11%

Actions	Cash Flows ($)
1. On April 27, 2001	
• Sell December 2001 futures	0
• Borrow $ 7.511	+7.511
• Buy Cash Silver @ $ 7.511	-7.511
Net	0
2. On December 27, 2001	
• Deliver cash silver against futures	+8.456
• Pay-back borrowed amount with interest	– 8.061
- Net Arbitrage Profit	0.395 / ounce

Question 42.

The firm has a receivable $ 20,000,000

The firm is afraid of $ falling.

A. Hedging through DM future

As the customer has a receivable in $, he will go long in DM futures as it amounts to go short in USD i.e. buy DM futures.
Standard size of DM future is 125,000
Futures Price = $0.4623 per DM
∴ Hence the number of contracts of futures to be bought =

$$\frac{20,000,000}{0.4623 \times 125,000} = 346.1 \approx 346$$

15th December

Gain from DM future is = (0.4642 – 0.4623) x 346 x 125,000 = $ 82,175
Total $ available = 20000000 + 82,175 = $20.082175 million
Sale spot at BeFr 44.5745 getting 20.082175 × 44.5745 = BeFr 895.15 million

B. Hedging through Swiss Franc Futures

Here also as the customer has a receivable in $, it will buy CHF futures.
Standard size of the CHF future is 125,000
Futures price = $0.6253 per CHF
∴ The number of contracts of futures to be bought =

$$\frac{20,000,000}{0.6253 \times 125,000} = 255.88 \approx 256$$

∴ Gain from CHF futures = BeFr (0.6284 – 0.6253) x 256 x 125,000 = $99200
Total $ available = 20000000 + 99200 = $20.09920 million
Sale spot at BeFr 44.5745 getting 20.09920 × 44.5745 = BeFr 895.91 million

So, the company should hedge its exposure in USD through Swiss Franc futures.

Question 43.

Initial margin for 5 contracts = $10,000

Maintenance margin for 5 contracts = $7,500

Date	Future Price ($)	Daily gain/loss ($)	Margin account balance ($)	Money withdrawn	Margin Call ($)
June 05	298.20	350	10,000	350	–
June 06	297.10	–550	9,450	–	–
June 07	294.40	–1350	8,100	–	–
June 10	293.90	–250	7,850	–	–
June 11	292.70	–600	10,000	–	2,750
June 12	287.00	–2850	10,000	–	2,850
June 13	287.00	0	10,000	–	–
June 14	287.80	400	10,000	400	–
June 17	288.50	350	10,000	350	–
June 18	289.10	300	10,000	300	–
June 19	289.70	300	0	10,300	–

Gain/loss from the contract

= [Closing balance in margin account + Money withdrawn] – [Opening balance in margin account + Margin call]

= [0 + 350 + 400 + 350 + 300 + 10,300] – [10,000 + 2,750 + 2,850] = $ 11,700 – $15,600 = –$3,900

Question 44.

Writing a call option

Spot	Call at 50 exercised	Premium inflow	Net inflow	Total inflow (Rs. Mln.)
49.00	No	0.20	49.20	492.0
49.25	No	0.20	49.45	494.5
49.50	No	0.20	49.70	497.0
49.75	No	0.20	49.95	499.5
50.00	No	0.20	50.20	502.0
50.25	Yes	0.20	50.20	502.0
50.50	Yes	0.20	50.20	502.0
50.75	Yes	0.20	50.20	502.0
51.00	Yes	0.20	50.20	502.0

Buying a put option

Spot	Put at 50 exercised	Premium outflow	Net inflow	Total inflow (Rs. Mln.)
49.00	Yes	0.50	49.50	495.0
49.25	Yes	0.50	49.50	495.0
49.50	Yes	0.50	49.50	495.0
49.75	Yes	0.50	49.50	495.0
50.00	No	0.50	49.50	495.0
50.25	No	0.50	49.75	497.5
50.50	No	0.50	50.00	500.0
50.75	No	0.50	50.25	502.5
51.00	No	0.50	50.50	505.5

Writing a call and buying a put

Premium outflow = 0.50 – 0.20 = 0.30

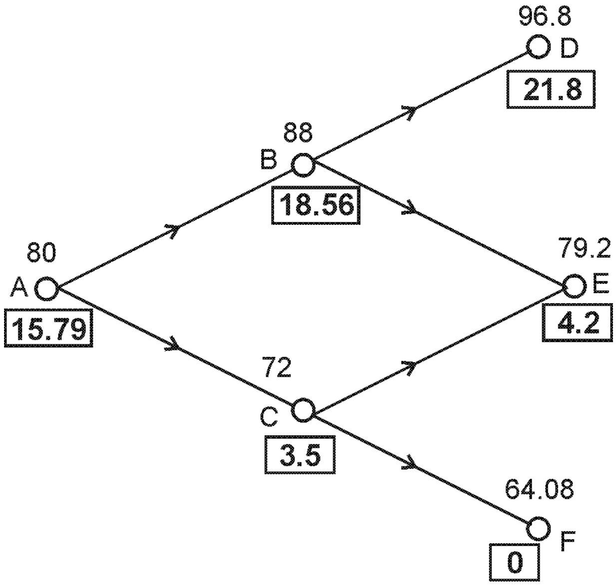
Spot	Exercised		Gain/loss on call	Gain/loss on put	Premium outflow	Inflow at spot	Net inflow	Total inflow
	Call	Put						
49.00	No	Yes	–	1.00	0.30	49.00	49.70	497.0
49.25	No	Yes	–	0.75	0.30	49.25	49.70	497.0
49.50	No	Yes	–	0.50	0.30	49.50	49.70	497.0
49.75	No	Yes	–	0.25	0.30	49.75	49.70	497.0

50.00	No	No	–	–	0.30	50.00	49.70	497.0
50.25	Yes	No	–0.25	–	0.30	50.25	49.70	497.0
50.50	Yes	No	–0.50	–	0.30	50.50	49.70	497.0
50.75	Yes	No	–0.75	–	0.30	50.75	49.70	497.0
51.00	Yes	No	–1.00	–	0.30	51.00	49.70	497.0

By writing a call maximum inflow is locked at Rs.502 million but there is downside potential for dollar values less than Rs.50. By buying a put option minimum inflow is locked at Rs.495 million and there is upside potential if rupees depreciation beyond Rs.50. By simultaneously writing a call and buying put the inflow can be locked at Rs.497 million for any values of dollar. So if the company expects that the dollar will remain around Rs.50 writing a call will be better, if it expects rupee will depreciate beyond Rs.50, buying a put is the appropriate hedging strategy, otherwise alternative (iii) is the best hedging strategy for the company as there is no downside potential.

Question 45.

The situation can be represented in the following way:



Using single-period model, the probability of price increase,

$$p = \frac{R-d}{u-d} = \frac{1.08 - 0.90}{1.10 - 0.90} = 0.90$$

∴ Probability of price decrease = 1 – 0.90 = 0.10

The value of American call option at node D, E and F will be equal to the value of European call option on these nodes.

Value at node D : 96.8 – 75 = 21.8

Value at node E : 79.2 – 75 = 4.2

Value at node F : as stock price is less than strike price, so call has zero value.

Using single-period model, the value of call option at node B is

$$C = \frac{C_u p + Cd(1-p)}{R} = \frac{21.8 \times 0.9 + 4.2 \times 0.1}{1.08} = 18.56$$

At node B pay-off from early exercise is Rs.13, which is less than the value calculated using single-period model. Hence at node B early exercise is not advisable and value of American call option will be Rs.18.56.

Value at node C is

$$C = \frac{4.2 \times 0.9 + 0 \times 0.1}{1.08} = 3.50$$

At node C, value of early exercise is zero, hence at node C value of call is Rs.3.50. Value of American call option at node A is

$$C = \frac{18.56 \times 0.9 + 3.5 \times 0.1}{1.08} = 15.79$$

The value of early exercise at node A is Rs.5, which is less than the value arrived through single-period binomial model. Hence, the value of two-year American call option is Rs.15.79.

Question 46.

Floating Leg

The value of the floating leg on the reset date is the face value of the principal.

Present value of floating leg = $\dfrac{0.9091\left(1+\dfrac{0.06}{2}\right)}{\left(1+\dfrac{0.05}{4}\right)} = \dfrac{0.9364}{1.0125} = \$0.9248 \text{ million}$

Value of floating leg in Yen = 0.9248 × 120 = ¥ 110.976 million.

Fixed Leg

Months	Cash flow (¥ in million)
3	1.50
9	1.50
15	1.50
21	1.50
27	1.50
33	1.50
39	1.50
45	1.50
51	1.50
57	1.50 + 100

Value of fixed leg 3 months from now

= 1.50 + 1.50 × PVIFA (1%, 9) + 100 × PVIF (1%, 9)

= 1.50 + 1.50 × 8.566 + 100 × 0.914

= ¥104.8490 million

∴ Present value of fixed leg = $\dfrac{104.8490}{\left(1+\dfrac{0.02}{4}\right)} = ¥\ 104.327 \text{ million}$

∴ The value of swap to the Japanese firm

= Value of foreign currency leg – Value of local currency leg

= 110.976 – 104.327 = ¥ 6.649 million

Question 47.

Constant Dollar value plan.

Stock portfolio NAV	Value of buy – hold strategy (Rs.)	Value of Conservative Portfolio	Value of aggressive Portfolio	Total value of Constant Ratio Plan	Revaluation Action	Total No. of units in aggressive portfolio
40.00	20,00,000	10,00,000	10,00,000	20,00,000	-	25000
25.00	12,50,000	10,00,000	6,25,000	16,25,000	-	25000
	12,50,000	8,12,500	8,12,500	16,25,000	Buy 7,500 units	32500
36.00	18,00,000	8,12,500	11,70,000	19,82,500	-	32500
	18,00,000	9,91,250	9,91,250	19,82,500	Sell 4965.28 units	27534.72
32.00	16,00,000	9,91,250	8,81,111	18,72,361	-	27534.72
38.00	19,00,000	9,91,250	10,46,319	20,37,569	-	27534.72
	19,00,000	10,18,784.5	10,18,784.5	20,37,569	Sell 724.59 units	26810.13
37.00	18,50,000	10,18,784.5	9,91,974.4	20,10,758.9	-	26810.13
42.00	21,00,000	10,18,784.5	11,26,025	21,44,809.5	-	26810.13
43.00	21,50,000	10,18,784.5	11,52,835	21,71,619.5	-	26810.13
50.00	25,00,000	10,18,784.5	13,40,505.8	23,59,290.3	-	
	25,00,000	11,79,645	11,79,645	23,59,290.3	Sell 3217.21 units	23592.92
52.00	26,00,000	11,79,645	12,26,831	24,06,476		23592.92

Hence, the ending value of the mechanical strategy is Rs.24,06,476 and buy & hold strategy is Rs.26,00,000.

Question 48.

a. **b. i.**

Strategy: Straddle i.e. buy a call and a put of the same strike price and maturity. The strike price of the options should be closer to current market price. Hence, the investor should buy call and put options maturing on 8.11.2001 at a strike price of Rs.110.

Pay off table from the one straddle contract is under:

Market price at T	Payoff from		Total cash inflow CF(T)	Initial cash outflow CF(O)	Net cash flow
	Call	Put			
80	Nil	30	30	12	18
86	Nil	24	24	12	12
90	Nil	20	20	12	8
94	Nil	16	16	12	4
98	Nil	12	12	12	0
107	Nil	3	3	12	–9
110	Nil	Nil	–	12	–12
112	2	Nil	2	12	–10
114	4	Nil	4	12	–8
119	9	Nil	9	12	–3
122	12	Nil	12	12	0
127	17	Nil	17	12	5
130	20	Nil	20	12	8
140	30	Nil	30	12	18

Breakeven stock prices of stock = 110 ± 12 i.e 98 and 122.

Maximum loss from the strategy = 12×1500 = Rs.18,000

ii. **Strategy:** Strangle i.e, buy an out the money call as well as an in-the-money put of same expiration day, the call option could be at-the-money option also. From the given instrument, should buy

i. Call option with expiry date 22.11.2001 and exercise price Rs.110 (at-the-money)

ii. Put option with expiry date 22.11.2001 and exercise price 120 (in-the-money).

Market price at time T	Payoff from		Total cash inflow CF(T)	Initial cash outflow CF(O)	Net cash flow
	Call	Put			
80	—	40	40	28	12
85	—	35	35	28	7
92	—	28	28	28	0
96	—	24	24	28	–4
100	—	20	20	28	–8
105	—	15	15	28	–13
110	—	10	10	28	–18
118	8	2	10	28	–18
125	15	—	15	28	–13
130	20	—	20	28	–8
138	28	—	28	28	0
140	30	—	30	28	2

Break-even stock prices = [110 – {28 – (120 – 110)} = 92 & [120 + {28 – (120 – 110)}] = 138

Maximum loss = [28 – (120 –110)] × 1500 = Rs.27,000

Question 49.

a. Yield to Maturity for Bond I

@ 8%

120 $= C_t \times$ PVIFA(8%, 4) + F $\times$ PVIF(8%, 5)

$= 13 \times 3.312 + 113 \times 0.681 = 43.06 + 76.95$

$= 120.01$

Hence, the YTM is 8% p.a.

YTM for Bond II

@ 8%

110 = 11/2 $\times$ PVIFA(4%, 9) + 105.5 $\times$ PVIF(4%, 10)

$= 5.5 \times 7.435 + 105.5 \times 0.676$

$= 112.21$

@ 10%

110 = 5.5 $\times$ PVIFA(5%, 9) + 105.5 $\times$ PVIF(5%, 10)

= 5.5 x 7.108 + 105.5 $\times$ 0.614

$= 103.87$

By interpolation: $4 + \frac{112.21 - 110.0}{112.21 - 103.87} \times 1 = 4.265\%$ for semi-annual period. i.e., 8.5% p.a.

Note : Ofcourse you are allowed to calculate YTM by the short cut approx formula.

Duration of Bond I

Year	CF	PVIF@ 8%	PV (CF)	n $\times$ PV(CF)
1	13	0.926	12.038	12.038
2	13	0.857	11.141	22.282
3	13	0.794	10.322	30.966
4	13	0.735	9.555	38.220
5	113	0.681	76.953	384.765
			120.00	488.271

$$D = \frac{488.271}{120.00} = 4.07\,\text{yrs}$$

Duration of Bond II

Period	CF	PVIF@4.265%	PV(CF)	n × PV(CF)
1	5.5	0.959	5.275	5.275
2	5.5	0.920	5.060	10.120
3	5.5	0.882	4.851	14.553
4	5.5	0.846	4.653	18.612
5	5.5	0.812	4.466	22.330
6	5.5	0.778	4.279	25.674
7	5.5	0.747	4.109	28.763
8	5.5	0.716	3.938	31.504
9	5.5	0.687	3.779	34.011
10	105.5	0.659	69.525	695.250
			109.935	886.092

Duration = $\frac{886.092}{109.935} = 8.06$ half yearly periods i.e. 4.03 years.

Yield to call for Bond I

@ 15%

120 = 13 × 0.87 + 123 × 0.756 = 11.31 + 92.99 = 104.3

@ 12%

120 = 13 × 0.893 + 123 × 0.797 = 11.61 + 98.03 = 109.64

@8%

120 = 13 × 0.926 + 123 × 0.857 = 12.04 + 105.41 = 117.45

@6%

120 = 13 × 0.943 + 123 × 0.89 = 12.26 + 109.47 = 121.73.

By interpolation:

$$6 + (8 - 6) \times \frac{121.73 - 120.00}{121.73 - 117.45}$$

$$= 6 + 2 \times \frac{1.73}{4.28} = 6 + 0.81 = 6.81\% \text{ P.a.}$$

Note : Ofcourse you are allowed to calculate YTC by the short cut approx formula.

Duration to call for Bond I

Period	CF	PV@6.81	PVCF	PV × n
1	13	0.936	12.168	12.168
2	123	0.876	107.748	215.496
			119.916	227.664

Duration to call = $\frac{227.664}{119.916} = 1.8985$ i.e. 1.90 years.

b. MD of Bond I

$$MD = \frac{D}{1+\frac{r}{p}} = \frac{4.07}{1.08} = 3.77 \text{yrs.}$$

$$\% \text{ Price change} = - MD \text{ x } \frac{\Delta BP}{100}$$

$$= -3.77 \times \frac{50}{100} = -1.88 (\text{decrease})$$

MD of Bond II

$$MD = \frac{D}{1+0.04265} = \frac{4.03}{1.04265} = 3.865$$

$$\% \text{ Price Change} = -3.865 \times \frac{50}{100} = -1.93\% \text{ (decrease)}$$

Question 50.

a. **Swap I** has been made in anticipation of a drop in long-term interest rates. The lower coupon 7.625% bond would provide more opportunity for capital gains, greater call protection and greater protection against declining reinvestment rates.

Swap II could have been done by an investor who believes that the yield spread would widen by more than 20 basis points, in which case there is a possibility of making a capital gain on the government bonds. (assuming that the yield on government bonds will decline).

The swap is also beneficial from the point of view that there is call protection available in the government bonds. So, in a scenario of declining interest rates, it makes more sense to hold the government bonds.

Swap III would have been made by an investor who anticipates a rise in interest rates. This rise in interest rates will result in increased interest income to the investor because bond is a floating rate bond. Depreciation on zero coupon bond in case of interest rates rise is also avoided.

Swap IV involves two bonds similar except in maturity, quality and yield. An investor who believed the yield spread between the two bonds to widen would have made the swap either to take a capital gain on the government bond or avoid a capital loss on the A rating bond. The swap dues, however, extend maturity another eight years and the YTM sacrifice is 210 BP. Probably the investor also anticipates a decrease in interest rates, the longer maturity of the government bond would provide greater capital gains. Investor also enjoys call protection and lower risk level.

Swap V involves swapping an equity equivalent for a long-term corporate bond. The swap would have been made for the following reasons:

i. The appreciation potential of the Bond E convertible, based primarily on the intrinsic value of Bond E's equity stock was no longer as attractive as it had been.

ii. The yields on long-term bonds were at a cyclical high; and the swap was made to take a capital gain when rates subsequently decline. While waiting for rates to decline, the swap would enable the investor to enjoy an increase in coupon income.

b. The 7.625% coupon bond provides a better call protection (in a scenario of declining interest rates). It has a lower coupon and lower price as compared to the 11.625% bond. Therefore, its YTM is marginally less than the YTM on the 11.625% Bond A.