

Derivatives

Question 123

A is an investor and having in its Portfolio Shares worth ₹ 1,20,00,000 at current price and Cash ₹ 10,00,000. The Beta of Share Portfolio is 1.4. After four months the price of shares dropped by 1.8%.

You are required to determine:

1. Current Portfolio Beta and
2. Beta after four months-if A on current date goes for long position on ₹ 1,30,00,000 Nifty futures.

Show calculations in ₹ Lakhs with four decimal points.

(May 17, 5 Marks)

Solution

Current Portfolio	₹
Shares (Current Price)	1,20,00,000
Cash	10,00,000
	1,30,00,000

$$\beta_{\text{share}} = 1.4$$

$$\beta_{\text{cash}} = 0$$

Current Portfolio Beta:

$$\beta_p = \beta_{\text{share}} \cdot W_{\text{share}} + \beta_{\text{cash}} \cdot W_{\text{cash}}$$

$$= 1.4 \frac{1,20,00,000}{1,30,00,000} + 0 \frac{10,00,000}{1,30,00,000}$$

$$\therefore \beta_p = 1.2923$$

WN.1: After 4 months share price dropped by 1.8% $\beta_{\text{share}} = 1.4$

% Decrease in Nifty Futures =

$$\therefore \% \text{ Decrease in Nifty Futures} = \frac{\% \text{ decrease in share price}}{\beta_{\text{share}}}$$

$$= \frac{1.8\%}{1.4} = 1.2857\%$$

WN.2: Revised Portfolio (After 4 months)

Shares [1,20,00,000 - 1.8 %]		1,17,84,000
Cash		
Opening Balance	10,00,000	
Loss on Nifty Futures	(167,141)	
[1,30,00,000 - (1,30,00,000 - 1.285 %)]		8,32,859
		1,26,16,859

Portfolio Beta (after 4 months)

$$\therefore \beta_p = 1.4 \frac{1,17,84,000}{1,2616,859} + 0 \frac{832,859}{12,616,859}$$
$$\therefore \beta_p = 1.3076$$

Question 124

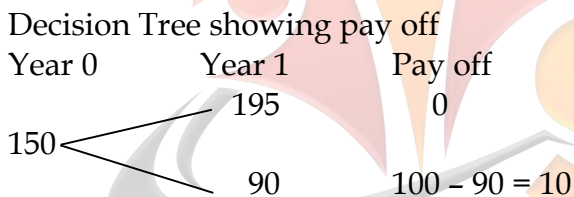
Ram Chemical is in production Line of Chemicals and considering a proposal of building new plant to produce pesticides. The Present Value (PV) of new proposal is ₹ 150 crores (After considering scrap value at the end of life of project). Since this is a new product market, survey indicates following variation in Present Value (PV):

Condition Favourable in first year	PV will increase 30% from original estimate
Condition sluggish in first year	PV will decrease by 40% from original Figures

In addition Rama Chemical has a option to abandon the project at the end of Year and dispose it at ₹ 100 crores. If risk free rate of interest is 8%, what will be present value of put option?

(May 17, 5 Marks)

Solution



First of all, we shall calculate probability of high demand (P) using risk neutral method as follows:

$$8\% = p \times 30\% + (1-p) \times (-40\%)$$
$$0.08 = 0.30p - 0.40 + 0.40p$$
$$p = \frac{0.48}{0.70} = 0.6857 \text{ say } 0.686$$

The value of abandonment option will be as follows:

Expected Payoff at Year 1

$$= p \times 0 + [(1-p) \times 10]$$
$$= 0.686 \times 0 + [0.314 \times 10] = ₹ 3.14 \text{ crore}$$

Since expected pay off at year 1 is 3.14 crore, present value of expected pay off will be:

$$\frac{3.14}{1.08} = 2.907 \text{ crore}$$

This is the value of abandonment option (Put Option).

Question 125

A call option on gold with exercise price ₹ 26,000 per ten gram and three months to expire is being traded at a premium of ₹ 1,010 per ten gram. It is expected that in three months time the spot price might change to ₹ 27,300 or 24,700 per ten gram. At present this option is at-the-money and the rate of interest with simple compounding is 12% per annum. Is the current premium for the option justified? Evaluate the option and comments.

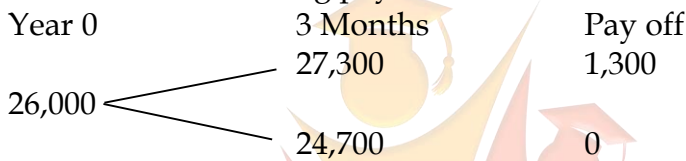
(Nov 17, 5 Marks)

Solution

To determine whether premium is justified we shall compute the value of option by using any of the following models:

By use of Binomial Model

Decision Tree showing pay off



The Delta (Δ) Ratio

$$\Delta = \frac{1300 - 0}{27300 - 24700} = 0.50$$

Replicating portfolio Buy 5 gram of gold and sell one call option.

The pay off if price goes up = $0.50 \times ₹ 27300 - ₹ 1,300 = ₹ 12,350$

The pay off if price goes down = $0.50 \times ₹ 24,700 = ₹ 12,350$

$$\text{Present Value of Pay-off} = \frac{12,350}{1.03} = ₹ 11,990$$

Current Investment = ₹ 26,000 \times 0.50 = ₹ 13,000

Value of Option = ₹ 13,000 - ₹ 11,990 = ₹ 1,010

Thus the price of option is justified.

Alternatively, by using Risk Neutral Model:

First of all we shall calculate probability of high demand (P) using risk neutral method as follows:

$$3\% = p \times 5\% + (1-p) \times (-5\%)$$

$$0.03 = 0.05 p - 0.05 + 0.05p$$

$$p = \frac{0.08}{0.10} = 0.80$$

$$\text{The value of Call Option} = \frac{1300 \times 0.8 + 0 \times 0.2}{1.03} = ₹ 1,009.71 \text{ say } ₹ 1,010$$

Thus, the price of option is justified.

Incito Academy - Final CA - Strategic Financial Management

Question 126

Bharat Bank Ltd. has entered into a plain vanilla swap through on Overnight Index Swap (OIS) on a principal of ₹ 1 crore and agreed to receive MIBOR overnight floating rate for a fixed payment on the principal. The swap was entered into on Monday, 10th July 2017 and was to commence on and from 11th July 2017 and run for a period of 7 days.

Respective MIBOR rates for Tuesday to Monday were: 8.75%, 9.15%, 9.12%, 8.95%, 8.98% and 9.15%.

If Bharat Bank Ltd. received ₹ 417 net on settlement, calculate fixed rate and interest under both legs.

Notes:

1. Sunday is a holiday
2. Work in rounded rupee and avoid decimal working
3. Consider 365 days in a year.

(Nov 17, 8 Marks)

Solution

Day	Principal (₹)	Mibor (%)	Interest (₹)
Tuesday	1,00,00,000	8.75	2,397
Wednesday	1,00,02,397	9.15	2,507
Thursday	1,00,04,904	9.12	2,500
Friday	1,00,07,404	8.95	2,454
Saturday & Sunday (*)	1,00,09,858	8.98	4,925
Monday	1,00,14,783	9.15	2,511
Total Interest @ Floating			17,294
Less: Net Received			417
Expected Interest @ fixed			16,877**
Thus Fixed Rate of Interest			0.0880015
Approx.			8.80%

(*) i.e. interest for two days.

(**) $1 \text{ crore} \times 'X' / 100 \times 7 / 365 = 16,877$

$$\text{Hence, } X = \frac{16877 \times 365 \times 100}{1 \text{ cr.} \times 7} = 8.8\%$$

Question 127

A textile manufacturer has taken floating interest rate loan of ₹ 40,00,000 on 1st April, 2012. The rate of interest at the inception of loan is 8.5% p.a. interest is to be paid every year on 31st arch, and the duration of loan is four years. In the month of October 2012, the Central bank of the country releases following projections about the interest rates likely to prevail in future.

Incito Academy – Final CA – Strategic Financial Management

- (i) On 31st March, 2013, at 8.75%; on 31st March, 2014 at 10% on 31st March, 2015 at 10.5% and on 31st March, 2016 at 7.75%. Show how this borrowing can hedge the risk arising out of expected rise in the rate of interest when he wants to peg his interest cost at 8.50% p.a.
- (ii) Assume that the premium negotiated by both the parties is 0.75% to be paid on 1st October, 2012 and the actual rate of interest on the respective due dates happens to be as: on 31st March, 2013 at 10.2%; on 31st March, 2014 at 11.5%; on 31st March, 2015 at 9.25%; on 31st March, 2016 at 9.0% and 8.25%. Show how the settlement will be executed on the perspective interest due dates.

(Nov 17, 8 Marks)

Solution

As borrower does not want to pay more than 8.5% p.a., on this loan where the rate of interest is likely to rise beyond this, hence, he has hedge the risk by entering into an agreement to buy interest rate caps with the following parameters:

- National Principal: ₹ 40,00,000
- Strike rate: 8.5% p.a.
- Reference rate: the rate of interest applicable to this loan
- Calculation and settlement date: 31st March every year
- Duration of the caps: till 31st March 2016
- Premium for caps: negotiable between both the parties

To purchase the caps this borrower is required to pay the premium upfront at the time of buying caps. The payment of such premium will entitle him with right to receive the compensation from the seller of the caps as soon as the rate of interest on this loan rises above 8.5%. The compensation will be at the rate of the difference between the rate of none of the cases the cost of this loan will rise above 8.5% calculated on ₹ 40,00,000. This implies that in none of the cases the cost of this loan will rise above 8.5%. This hedging benefit is received at the respective interest due dates at the cost of premium to be paid only once.

The premium to be paid on 1st October 2012 is 30,000 (₹ 40,00,000 × 0.75/100). The payment of this premium will entitle the buyer of the caps to receive the compensation from the seller of the caps whereas the buyer will not have obligation. The compensation received by the buyer of caps will be as follows:

On 31st March 2013

The buyer of the caps will receive the compensation at the rate of 1.70% (10.20 - 8.50) to be calculated on ₹ 40,00,000, the amount of compensation will be ₹ 68000 (40,00,000 × 1.70/100)

On 31st March 2014

The buyer of the caps will receive the compensation at the rate of 3.00% (11.50 – 8.50) to be calculated on ₹ 40,00,000, the amount of compensation will be ₹ 120000 (40,00,000 × 3.00/100).

On 31st March 2015

The buyer of the caps will receive the compensation at the rate of 0.75% (9.25 – 8.50) to be calculated on ₹ 40,00,000, the amount of compensation will be ₹ 30,000 (40,00,000 × 0.75/100).

CA Nikhil Jobanputra

On 31st March 2016

The buyer of the caps will not receive the compensation as the actual rate of interest is 8.25% whereas strike rate of caps is 8.5%. Hence, his interest liability shall not exceed 8.50%.

Thus, by paying the premium upfront buyer of the caps gets the compensation on the respective interest due dates without any obligations.

Question 128

Mr. KK purchased a 3 – month call option for 100 shares in PQR Ltd. at a premium of ₹ 40 per share, with an exercise price of ₹ 560. He also purchased a 3 – month put option for 100 shares of the same company at a premium of ₹ 10 per share with an exercise price of ₹ 460. The market price of the share on the date of Mr. KK's purchase of options, is ₹ 500.

Compute the profit or loss that Mr. KK would make assuming that the market price falls to ₹ 360 at the end of 3 months.

(May 18, 4 Marks)

Solution

Since the market price at the end of 3 months falls to ₹ 360 which is below the exercise price under the call option, the call option will not be exercised. Only put option becomes viable.

	₹
The gain will be:	
Gain per share (₹460 – ₹ 360)	100
Total gain per 100 shares	10,000
Cost or premium paid (₹ 40 × 100) + (₹ 10 × 100)	5,000
Net Gain	5,000

Question 129

Punjab Bank has entered into a plain vanilla swap through on Overnight Index Swap (OIS) on a principal of ₹ 2 crore and agreed to receive MIBOR overnight floating rate for a fixed payment on the principal. The swap was entered into on Monday, 24th July, 2017 and was to commence on 25th July, 2017 and run for a period of 7 days.

Respective MIBOR rates for Tuesday to Monday were:

8.70%, 9.10%, 9.12%, 8.95%, 8.98% and 9.10%.

If Punjab Bank received ₹ 507 net on settlement, calculate Fixed rate and interest under both legs.

Notes:

1. Sunday is a Holiday.

Incito Academy – Final CA – Strategic Financial Management

2. Workout in rounded rupees and avoid decimal working.
3. Consider a year consists of 365 days.

(May 18, 8 Marks)

Solution

Day	Principal (₹)	MIBOR (%)	Interest (₹)
Tuesday	2,00,00,000	8.70	4,767
Wednesday	2,00,04,767	9.10	4,987
Thursday	2,00,09,754	9.12	5,000
Friday	2,00,14,754	8.95	4,908
Saturday & Sunday (*)	2,00,19,662	8.98	9,851
Monday	2,00,29,513	9.10	4,994
Total Interest @ Floating			34,507
Less: Net Received			507
Expected Interest @ fixed			34,000
Thus, Fixed Rate of Interest Approx.			0.0886428 8.86%

(*) i.e. interest for two days.

Question 130

The equity share of SSC Ltd. is quoted at ₹ 310. A three months call option is available at a premium of ₹ 8 per share and a three months put option is available at a premium of ₹ 7 per share.

Ascertain the net payoffs to the option holder of a call option and a put option, considering that:

1. the strike price in both cases is ₹ 320; and
2. the share price on the exercise day is ₹ 300, 310, 320, 330 and 340.

Also indicate the price range at which the call and the put options may be gainfully exercised.

(Nov 18, 8 Marks)

Solution

Net payoff for the holder of the call option

	₹				
Share price on exercise day	300	310	320	330	340
Option exercise	No	No	No	Yes	Yes
Outflow (Strike price)	Nil	Nil	Nil	320	320
Out flow (premium)	8	8	8	8	8
Total Outflow	8	8	8	328	328
Less inflow (Sales proceeds)	-	-	-	330	340
Net payoff	-8	-8	-8	2	12

Net payoff for the holder of the put option

CA Nikhil Jobanputra

Share price on exercise day	300	310	320	330	340
Option exercise	Yes	Yes	No	No	No
Inflow (strike price)	320	320	Nil	Nil	Nil
Less outflow (purchase price)	300	310	-	-	-
Less outflow (premium)	7	7	7	7	7
Net Payoff	13	3	-7	-7	-7

The Call Option can be exercised gainfully for any price above ₹ 328 and Put Option for any Price below ₹ 313.

Question 131

A dealer quotes 'All-in-cost' for a generic swap at 6% against six months LIBOR flat. If the notional principal amount of swap is ₹ 8,00,000:

1. Calculate semi-annual fixed payment.
2. Find the first floating rate payment for (i) above if the six months period from the effective date of swap to the settlement date comprises 181 days and that the corresponding LIBOR was 5% on the effective date of swap.
3. In (ii) above, if the settlement is on 'Net' basis, how much the fixed rate payer would pay to the floating rate payer? Generic swap is based on 30/360 days basis. (4 Marks)

Solution

1. **Semi-annual fixed payment**
= (N) (AIC) (Period)

Where,

N = Notional Principal amount = ₹8,00,000

AIC = All-in-cost = 6% = 0.06

$$= 8,00,000 \times 0.06 \frac{180}{360}$$

$$= 8,00,000 \times 0.06 (0.5)$$

$$= ₹ 24,000$$

2. **Floating Rate Payment**

$$= N (\text{LIBOR}) \frac{dt}{360}$$

$$= 8,00,000 \times 0.05 \times \frac{181}{360}$$

$$= ₹ 24,000$$

3. **Net Amount**

$$= (i) - (ii)$$

$$= ₹ 24,000 - ₹ 20,111 = ₹ 3,889$$

$$\text{Or} = ₹ 24,000 - ₹ 20,120 = ₹ 3,880$$

Question 132

Mr. John established the following spread on the TTK Ltd.'s stock:

1. Purchased one 3 – month put option with a premium of ₹ 15 and an exercise price of ₹ 900.
2. Purchased one 3 – month call option with a premium of ₹ 90 and an exercise price of ₹ 1,100.

TTK Ltd.'s stock is currently selling) at ₹ 1,000. Calculate gain or loss, if the price of stock of TTK Ltd.

1. Remains at ₹ 1,000 after 3 months.
2. Falls to ₹ 700 after 3 months.
3. Raises to ₹ 1,200 after 3 months.

Assume the size of option is 200 shares of TTK Ltd.

(May 19, 8 Marks)

Solution

1. Total premium paid on purchasing a call and put option
= (₹ 15 per share ₹ 200) + (₹ 90 per share ₹ 200).
= ₹ 3,000 + ₹ 18,000 = ₹ 21,000

In this case, Mr. John exercises neither the call option nor the put option as both will result in a loss for him.

$$\text{Ending value} = - ₹ 21,000 + 0 = - ₹ 21,000$$

$$\text{i.e. Net loss} = ₹ 21,000$$

2. Since the price of the stock is below the exercise price of the call, the call will not be exercised. Only put is valuable and is exercised.

$$\text{Net Gain} = (\text{Exercise Price} - \text{Current Price}) \times \text{No of Shares} - \text{Premium Paid}$$

$$\text{Total premium paid} = ₹ 21,000$$

$$\text{Ending value} = - ₹ 21,000 + ₹ [(900 - 700) \times 200]$$

$$\therefore \text{Net gain} = ₹ 19,000$$

3. In this situation, the put is worthless, since the price of the stock exceeds the put's exercise price. Only call option is valuable and is exercised.

$$\text{Total premium paid} = ₹ 21,000$$

$$\text{Ending value} = - ₹ 21,000 + ₹ [(1,200 - 1,100) \times 200] = - ₹ 1,000$$

$$\therefore \text{Net gain} = ₹ 1,000$$

Question 133

A Rice Trader has planned to sell 22,000 kg of Rice after 3 months from now. The spot price of the Rice is ₹ 60 per kg and 3 months future on the same is trading at ₹ 59 per kg. Size of the contract is 1,000 kg. The price is expected to fall as low as ₹ 56 per kg, 3 months hence. What the trader can do to mitigate its risk of reduced profit? If he decides to make use of future market, what would be the effective realized price for

Incito Academy - Final CA - Strategic Financial Management

its sale when after 3 months, spot price is ₹ 57 per kg and future contract price for 3 months is ₹ 58 per kg?

(May 19, 8 Marks)

Solution

In order to hedge its position trader would go short on future at current future price of ₹ 59/kg. This will help the trade to realize sure ₹ 59 per kg. after 3 months.

Particulars		
a.	Quantity of Rice to be hedged	22,000 kg.
b.	Contract Size	1,000 kg.
c.	No. of Contracts to be sold (a/b)	22
d.	Future Price	₹ 59/kg.
e.	Exposure in the future market (a × d)	₹ 12,98,000

After 3 months, trader would cancel its position in the future by buying a future contract of same quantity and will sell Rice in the spot market and position shall be as follows:

Particulars		₹
a.	Price of Future Contract	58/kg.
b.	Amount bought = 22,000 × 58	12,76,000
c.	Gain (Loss) on future position (12,98,000 – 12,76,000)	22,000
d.	Spot Price	₹ 57/kg.
e.	Amount realized by selling in the spot market (22000 × 57)	₹ 12,54,000
f.	Effective Selling Amount (c + e)	₹ 12,76,000
g.	Effective Selling Price (12,76,000/22,000)	58/kg.

Question 134

Sun Limited, an Indian company will need \$ 5,00,000 in 90 days. In this connection, following information is given below:

Spot Rate - \$1 = ₹ 71

90 days forward rate of \$1 as of today = ₹ 73

Interest Rates are as follows:

Particulars	US	India
90 days Deposit Rate	2.50%	4.00%
90 days Borrowing Rate	4.00%	6.00%

A call option on \$ that expires in 90 days has an exercise price of ₹ 74 and a premium of Re. 0.10. Sun Limited has forecasted the spot rates for 90 days as below:

Future Rate	Probability
₹ 72.50	25%
₹ 73.00	50%
₹ 74.50	25%

Derivatives

Incito Academy – Final CA – Strategic Financial Management

Which of the following strategies would be the most preferable to Sun Limited:

1. A Forward Contract;
2. A Money Market hedge;
3. An Option Contract; (iv) No Hedging.

Show your calculations in each case.

(May 19, 8 Marks)

Solution

1. Forward contract:

Rupees needed in 90 days = \$5,00,000 × ₹ 73 = ₹ 3,65,00,000

2. Money market hedge:

Amount in \$ to be invested = 5,00,000/1.0250 = ₹ 4,87,805

Amount of ₹ needed to convert into \$ = 4,87,805 × 71 = ₹ 3,46,34,155

Interest and principal on ₹ loan after 90 days

= ₹ 3,46,34,155 × 1.06 = ₹ 3,67,12,204

3. Call option:

Expected Spot rate	Prem. /unit	Exercise Option	Total price per unit	Total price for \$ 5,00,000 × (4)	Prob. Pi	Pixi (5) × (6)
(1)	(2)	(3)	(4)	= (5)	(6)	(7)
72.50	0.10	No	72.60	3,63,00,000	0.25	90,75,000
73.00	0.10	No	73.10	3,65,50,000	0.50	1,82,75,000
74.50	0.10	Yes	74.10	3,70,50,000	0.25	92,62,500
						3,66,12,500
Add: Interest on Premium @ 6% (50,000 × 6%)						3,000
						3,66,15,500

* (₹ 74 + ₹ 0.10)

4. No hedge option:

Expected Future spot rate	₹ needed Xi	Prob. Pi	Pi xi
72.50	3,62,50,000	0.25	90,62,500
73.00	3,65,00,000	0.50	1,82,50,000
74.50	3,72,50,000	0.25	93,12,500

Decision: Forward Contract Strategy is most preferable strategy because it requires the least amount to arrange \$5,00,000.

Question 135

P Ltd. is contemplating to borrow an amount of ₹ 50 crores for a period of 3 months in the coming 6 months' time from now. The current rate of interest is 8% per annum but it may go up in 6 months' time. The company wants to hedge itself against the likely increase in interest rate. The Company's bankers quoted an FRA (Forward Rate Agreement) at 8.30% per annum. Compute the effect of FRA and actual rate of interest

Incito Academy - Final CA - Strategic Financial Management

cost to the company, if the actual rate of interest during considering period happens to be (i) 8.60% p.a., or (ii) 7.80% p.a. (Show your working on the basis of months)
(Nov 19, 8 Marks)

Solution

Final settlement amount shall be computed by using formula:

$$= \frac{(N)(RR - FR)(dtm / DY)}{[1 + RR(dt / DY)]}$$

Where,

- N = the notional principal amount of the agreement;
RR = Reference Rate for the maturity specified by the contract prevailing on the contract settlement date;
FR = Agreed-upon Forward Rate; and
dtm = maturity of the forward rate, specified in Months
DY = Applicable basis of months

Accordingly,

If actual rate of interest after 6 months happens to be 8.60%

$$\begin{aligned} &= \frac{(\text{₹ } 50 \text{ crore}) (0.086 - 0.083) (3/12)}{[1 + 0.086(3/12)]} \\ &= \frac{(\text{₹ } 50 \text{ crore}) (0.003) (0.25)}{1.0215} \\ &= \frac{3,75,000}{1.0215} = 3,67,107 \end{aligned}$$

Thus, *banker will pay* a sum of ₹ 3,67,107 to P Ltd. and actual interest rate for P Ltd. shall be as follows:

Interest on loan @ 8.60% for 3 months	₹ 1,07,50,000
Less: Amount Received from the bank	₹ 3,67,107
Net Amount	₹ 1,03,82,893

Effective Interest Rate

$$\begin{aligned} &= \frac{\text{₹ } 1,03,82,893}{\text{₹ } 50 \text{ crore}} \times \frac{12}{3} \times 100 \\ &= 8.31\% \end{aligned}$$

If actual rate of interest after 6 months happens to be 7.80%

$$\begin{aligned} &= \frac{(\text{₹ } 50 \text{ crore}) (0.0780 - 0.0830) (3/12)}{[1 + 0.0780(3/12)]} \\ &= \frac{(\text{₹ } 50 \text{ crore}) (-0.005) (0.25)}{1.0195} \\ &= \frac{-6,25,000}{1.0195} = \text{₹ } 6,13,046 \end{aligned}$$

Incito Academy - Final CA - Strategic Financial Management

Thus P Ltd. will pay banker a sum of ₹ 6,13,046 and actual interest rate for P Ltd. shall be as follows:

Interest on loan @7.80% for 3 months	₹ 97,50,000
Add: Amount paid to bank	₹ 6,13,046
Net Amount	₹ 1,03,63,046

Effective Interest Rate

$$= \frac{\text{₹ } 1,03,63,046}{\text{₹ } 50 \text{ crore}} \times \frac{12}{3} \times 100 = 8.29\%$$

Question 136

A future contract is available on R Ltd. that pays an annual dividend of ₹ 4 and whose stock is currently priced at ₹ 125. Each future contract calls for delivery of 1,000 shares to stock in one-year, daily marking to market. The corporate treasury bill rate is 8%.

Required:

1. Given the above information, what should the price of one future contract be?
2. If the company stock price decreases by 6%, what will be the price of one futures contract?
3. As a result, the company stock price decrease, will an investor that has a long position in one futures contract of R Ltd. realises a gain or loss? What will be the amount of his gain or loss?

(Ignore margin and taxation if any)

(Nov 19, 6 Marks)

Solution

1. **Future Price = Spot + Cost of Carry - Dividend**
 $= ₹ 125 + (\text{₹ } 125 \times 0.08) - 4 = ₹ 131$

Price of one future contract

$$= 1000 \text{ share} \times ₹ 131 = ₹ 1,31,000$$

2. **Price decrease by 6 %**

$$\text{Market Price:} = 125 \times 94\% = 117.50$$

Then, price of one future contract

$$= ₹ 117.50 + (\text{₹ } 117.50 \times 0.08) - 4 = ₹ 122.90$$

$$= ₹ 122.90 \times 1000 = ₹ 1,22,900$$

3. If the investor has taken a long position, decrease in price will result in *loss* for the investor.

Amount of loss will be:

$$= ₹ 1,31,000 - ₹ 1,22,900 = ₹ 8,100$$

Question 137

AB Ltd.'s equity shares are presently selling at a price of ₹ 500 each. An investor is interested in purchasing AB Ltd.'s shares. The investor expects that there is a 70% chance that the price will go up to ₹ 650 or a 30% chance that it will go down to ₹ 450, three months from now. There is a call option on the shares of the firm that can be exercised only at the end of three months at an exercise price of ₹ 550.

Calculate the following:

1. If the investor wants a perfect hedge, what combination of the share and option should be select?
2. Explain how the investor will be able to maintain identical position regardless of the share price.
3. If the risk-free rate of return is 5% for the three months period, what is the value of the option at the beginning of the period?
4. What is the expected return on the option?

(Nov 19, 8 Marks)

Solution

1. To compute perfect hedge, we shall compute Hedge Ratio (Δ) as follows:

$$\Delta = \frac{C_1 - C_2}{S_1 - S_2} = \frac{100 - 0}{650 - 450} = \frac{100}{200} = 0.50$$

The investor should purchase 0.50 share for every 1 call option Or, the investor should purchase 1 share for every 2 Call Option.

2. How the investor will be able to maintain his position if he purchases 0.50 share for 1 call option written.

- a) If price of share goes upto ₹ 650 then value of purchased share will be:

Sale Proceeds of Investment (0.50 x ₹ 650)	₹ 325
Loss on account of Short Position (₹ 650 - ₹ 550)	₹ 100
	₹ 225

- b) If price of share comes down to ₹ 450 then value of purchased share will be:

$$\text{Sale Proceeds of Investment (0.50 x ₹ 450)} = ₹ 225$$

3. The Value of Option, say, P at the beginning of the period shall be computed as follows:

$$(\text{₹ } 250 - P) 1.05 = ₹ 225$$

$$\text{₹ } 262.50 - 1.05P = ₹ 225$$

$$\text{₹ } 37.5 = 1.05P$$

$$P = ₹ 35.71$$

4. Expected Return on the Option

Expected Option Value

$$= (\text{₹ } 650 - \text{₹ } 550) \times 0.70 + \text{₹ } 0 \times 0.30 = ₹ 70$$

Expected Rate of Return

$$= \frac{70 - 35.71}{35.71} \times 100 = 96.02\%$$

