Derivative Securities

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Chapter - 12
DERIVATIVE SECURITIES

Concept:

Derivatives are the securities that derive their value from the underlying assets. Undering assets are those assets on which derivatives are written on. The value of derivaties depends on the value of derivative assets.

Option:

An option is a contract that gives its holder the right to buy or sell an assets at some predetermined price within a specified period of time.

One party (option writer) writes the option and sells it to another (option buyer/holder). The seller or writer has an obligation to sell or buy the underlying assets at predetermined price on the exercise of the option. But buyer or holder of the option has a choice for the exercise of option.

There are two types of options:

1. Call option (Right to Buy)

Buyer of the call option has a right to buy the underlying assets at specified price within or at the expiration date of option.

2. Put option (Right to sell)

Buyer of the put option has right to sell option writer the underlying assets at specified price before or on the expiration of the options.

* Strike price | Exercise price:

Strike price is the price at which optioned securities are bought or sold. In the case of call options, strike price specifies the price at which each of the 100 shares can be purchased.

Similarly, in the case of put option, it specifies the price at which each of the 100 shares stock can be sold to option writer. Strike price of listed option are standardized.

* Expiration Date:

Expiration date is the contract between the writer and buyer of the stock option regarding the life of the option.

For example, if the option is written on the January 1st and it expires on March 31st, then the life of the option at the time of contract is 3 months.

* Intrinsic value:

Intrinsic value is called theoritical value and fair value. Intrinsic value is just difference between stock market price and options strike price. When stock's market price is below the option stock price, the intrinsic value is zero.

• Intrinsic Value of Call option:

Call option gives the right to the holders of the option to buy an underlying assets at specified price. The intrinsic value is also called fundamental value of the call option before the expiration date is given by:

$$V_c = \text{Max}\left[0, (S-X)100\right]$$

where,

V_c = Intrinsic Value of call option

Max. = Maximum of $(S-X)100$ and 0.

S = Current price of the stock

X = Exercise / strike price

Note: We multiply by 100, it indicates that call is exercised in a 100 share lot.

- **Intrinsic value of put option:**

Put option gives the right to the holders of the option to sell an underlying assets at specified price. The intrinsic value of put option is determined by using following equation:

$$V_p = \text{Max}\,[0, (X-S)100]$$

Where,

V_p = Intrinsic value of a put option
Max. = Maximum of $(X-S)100$ and 0
S = Current price of the stock
X = Exercise / strike price

* **Time premium:**

Time premium on call = $c - V_c$
Time premium on put = $P - V_p$

Where, c = Market price of call
P = market price of put

* **Rate of Return** = $\frac{\text{Profit}}{\text{Investment}}$

Where,
profit = Value of call or put − cost (investment)

Problem 12.1

Soln

Given: Call option

Selling price / stock price (S) = Rs. 190

Exercise price / strike price (X) = Rs. 180

Market price of call (C) = Rs. 25

Value of call option (V_c) = Max [0, (S-X)]

= Max [0, (190-180)]

= Max [0, 10]

= Rs. 10

Time premium = $C - V_c$ = 25 - 10 = Rs. 15

Problem 12.2

Soln

Given: Put option:

Stock price (S) = Rs. 360

Strike price (X) = Rs. 275

Market price of put (P) = Rs. 8.50

Value of put option (V_p) = Max [0, (X-S)]

= Max [0, (275-360)]

= Max [0, -85]

= 0

Time premium = $P - V_p$ = 8.50 - 0 = Rs. 8.50

Problem 12.3

Soln

Given: Put option

Number of shares (N) = 100 shares

Exercise price (X) = Rs. 340

Current market price (S) = Rs. 330

Theoretical value of put option (V_p) = Max [0, (X-S) 100]

= Max [0, (340-330) 100]

= Max [0, 1000]

= Rs. 1000

Problem 12.4

Soln

Given: Call option:

Number of shares (N) = 100 shares

Exercise price (X) = Rs. 2310

Option premium (cost) = Rs. 5 X 100 = Rs. 500

Market price / stock price (S) = Rs. 2375

Value of call option (V_c) = Max [0, (S-X) 100]

= Max [0, (2375-2310) 100]

= Max [0, 6500]

= Rs. 6500

Profit = Value of call - cost

= 6500 - 500 = Rs. 6000

Problem 12.3

Soln

Given: Put option

Number of shares (N) = 100 shares

Exercise price (X) = Rs. 340

Current market price (S) = Rs. 330

Theoretical value of put option (V_p) = Max [0, (X-S) 100]

= Max [0, (340-330) 100]

= Max [0, 1000]

= Rs. 1000

Problem 12.4

Soln

Given: Call option:

Number of shares (N) = 100 shares

Exercise price (X) = Rs. 2310

Option premium (cost) = Rs. 5 X 100 = Rs. 500

Market price / stock price (S) = Rs. 2375

Value of call option (V_c) = Max [0, (S-X) 100]

= Max [0, (2375-2310) 100]

= Max [0, 6500]

= Rs. 6500

Profit = Value of call - cost

= 6500 - 500 = Rs. 6000

$$\text{Rate of Return} = \frac{\text{Profit}}{\text{Investment}}$$

$$= \frac{6000}{500}$$

$$= 1200\%$$

Problem 12.5

Sol^n

Given:

Purchase price = Rs. 2310

Selling price = Rs. 2375

a. Investment = 100×2310 = Rs. 231000

b. Sales proceed = 100×2375 = Rs. 237500

c. Profit = Sales proceed - Investment = $237500 - 231000$ = Rs. 6500

d. Rate of Return = $\frac{\text{Profit}}{\text{Investment}} = \frac{6500}{231000} = 2.81\%$

e. Leverage of option is very high. So, investor can earn much more by investing a small amount of investment in option. This feature of options attracts the investors to invest in options.

Problem 12.6

Soln

Given: Put option

No. of shares = 100 shares

Exercise price (X) = Rs. 1108

Option premium (cost) = 100 × 5 = Rs. 500

Current stock price (S) = Rs. 1100

a. Value of put option (V_p) = Max [0, (X-S) 100]

= Max [0, (1108 - 1100) 100]

= Max [0, 800]

= Rs. 800

Profit = Value of put - cost

= Rs. 800 - 500

= Rs. 300

b. Rate of Return = $\frac{\text{Profit}}{\text{Investment (cost)}}$

= $\frac{300}{500}$

= 60%

c. The option is out-of-money. So she did not exercise the option.

d. The maximum limit of loss on option is Rs. 500 i.e her investment.

Problem 12.7

Soln

Given: Call option

Strike price (X) = Rs. 60

Cost = Rs. 600

Current stock price (S) = Rs. 75

Value of call option (V_c) = Max [0, (S-X)100]

= Max [0, (75-60)100]

= Max [0, 1500]

= Rs. 1500

Profit = Value of call - cost

= 1500 - 600

= Rs. 900

$$HPR = \frac{\text{Profit}}{\text{Investment}} = \frac{900}{600} = 150\%$$

Problem 12.8

Soln

Given: Put option

Strike price (X) = Rs. 690

Cost = 4.50 X 100 = Rs. 450

current stock price (S) = 686.45 X

New stock price (S) = Rs. 665

a. Value of put (V_p) = Max [0, (X-S) 100]
= Max [0, (690 - 665) 100]
= Max [0, 2500]
= Rs. 2500

Profit = value of put - cost
= 2500 - 450
= Rs. 2050

Holding period Return (HPR) = $\frac{\text{Profit}}{\text{Investment}}$
= $\frac{2050}{450}$ = 455.56 %

Problem

b. If the stock price increases to Rs. 715 she will lose the cost of put investment i.e Rs. 450.

Problem 12.9

Soln.

Given: Call option
Number of shares (N) = 100 shares
Call price (cost) = 100X10 = Rs. 1000
Exercise price (X) = Rs. 1000
Current stock price (S) = Rs. 1150

a. Value of Call option (V_c) = Max [0, (S-X) 100]
= Max [0, (1150 - 1000) 100]
= Max [0; 15000]
= Rs. 15,000

b. If the stock price drops to Rs. 975

Value of Call option (V_c) = Max [0, (S-X) 100]
= Max [0, (975 - 1000) 100]
= Max [0, -2500]
= 0

c. Her maximum loss in her investment is Rs. 1000.

d. Break even point = Exercise price + Option premium
= 1000 + 10
= Rs. 1010

e. If it is a option to buy she should exercise the option even when market price of shares is in between the exercise price and break-even price. because it reduces her loss.

Problem 12.10

Sol^n

Given: Call option:

Strike price (X) = 1484.04

Current price of option (S) = 1522.25

Cost of option = 40.21

1 point = Rs. 100

a. Value of call option (V_c) = Max [0, (S-X)]

= Max [0, (1522.25 - 1484.04)]

= Max [0, 38.21]

= 38.21 points

= 38.21 X 100 = Rs. 3821

b. Time premium = Cost - V_c

= (40.21 X 100) - 3821

= Rs. 200

Problem 12.11

Sol^n

Given: Euro contracts

a. Value of contract = 2 X 30,000 X 119.45 = Rs. 7167,000

b. Total investment = 2 X 7000 = Rs. 14000

c. Value of contract after appreciation = 2 X 30,000 X 120.12 = Rs. 7207,200

d. Profit = 7207200 − 71,67,000 = Rs. 40,200

e. Rate of Return = $\frac{\text{Profit}}{\text{Investment}} = \frac{40,200}{14,000} = 287.14\%$

Problem 12.12

Soln

a. Amount received from short sell = $2 \times 5000,000 \times \frac{110}{100}$

= Rs. 11,000,000

b. Amount paid for future contract = $2 \times 5000,000 \times \frac{108}{100}$

= Rs. 10,800,000

c. profit = 11,000,000 − 10,800,000 = Rs. 200,000

d. Rate of Return = $\frac{\text{Profit}}{\text{Investment}} = \frac{200,000}{2 \times 12,000} = 833.33\%$

Problem 12.13

Soln

a. profit = (1102.84 − 1022.77) × Rs. 200 = Rs. 16,014

b. Rate of Return = $\frac{\text{Profit}}{\text{Investment}} = \frac{16,014}{8500} = 188.4\%$