

**BBA 8<sup>th</sup> Semester**

**Financial Derivatives**

**Chapter Description**

□ Introduction

▣ Structure of Option Market

▣ Pricing of Option

▣ Binomial Option Pricing Model

▣ Black–Scholes Merton Option Pricing Model

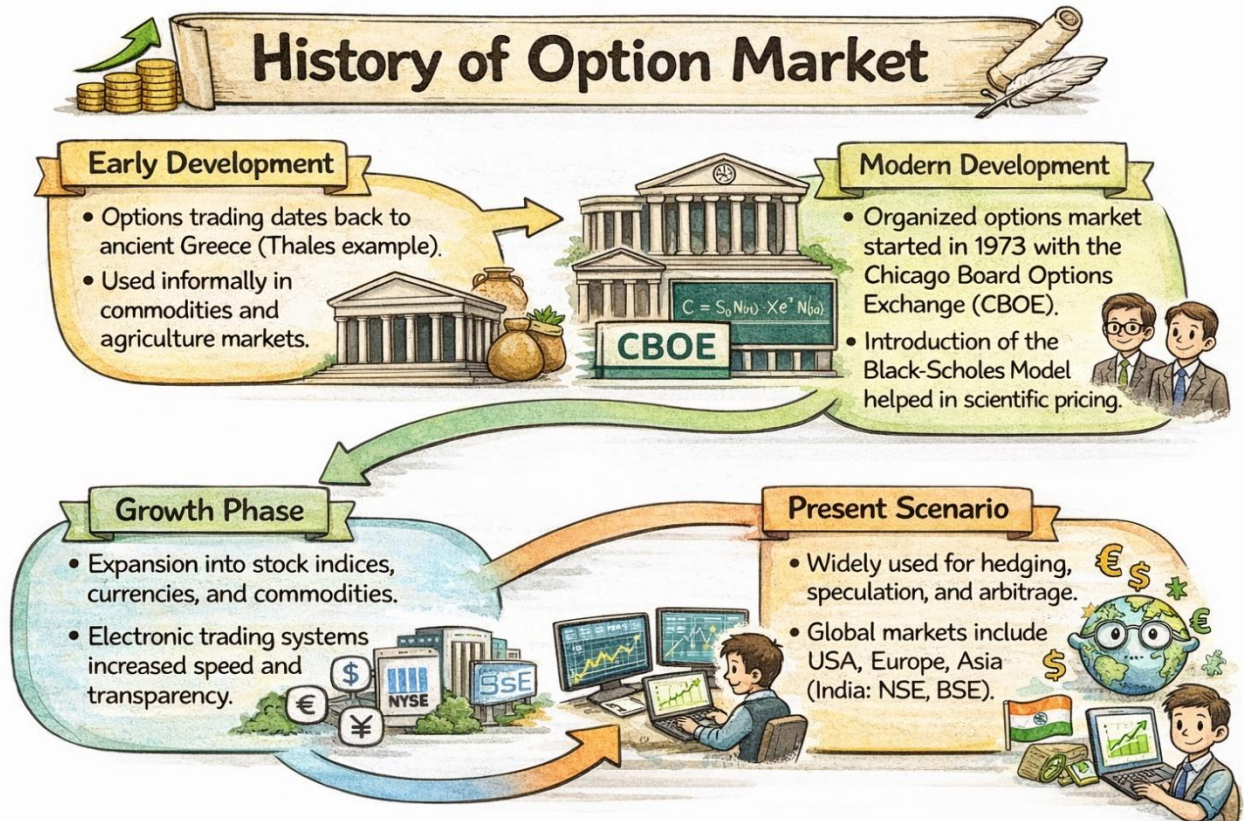
▣ Option Strategies

▣ Pricing and Valuation of Forward and Futures

▣ Swaps

▣ Financial Risk Management

## Chapter 02: Structure of Option Market



## Option Meaning

An **option market** is a type of financial market where option contracts are traded between buyers and sellers. An option is a financial derivative that gives the buyer the **right, but not the obligation**, to buy or sell an underlying asset such as shares, commodities, or indices at a predetermined price (called the strike price) within a specified period of time. Key Notes

- **Underlying Asset:** Stock, index, commodity, etc.
- **Strike Price:** Pre-agreed price
- **Expiration Date:** Contract validity period
- **Premium:** Price paid for the option

## Features of Options

- Right but not obligation
- Limited loss for buyer (premium only)
- High profit potential
- Based on underlying asset
- Fixed strike price
- Time-bound contract (expiry date)
- Premium must be paid
- Provides leverage
- Flexible strategies (hedging, speculation, arbitrage)
- Standardized contracts in exchanges
- Buyer and seller relationship (holder & writer)
- Value affected by market factors (price, time, volatility)

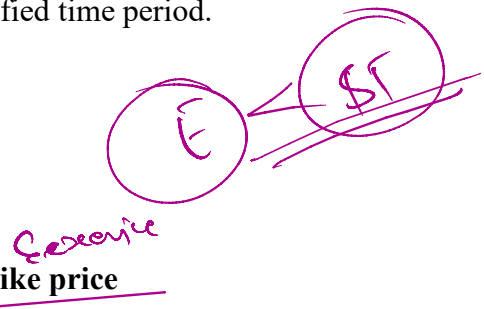
## Types of Options

### 1. Call Option

A call option is a financial contract that gives **the buyer the right, but not the obligation**, to purchase an underlying asset at a fixed price within a specified time period.

#### Key Notes

- Gives the **right to buy** an underlying asset
- Used when investor expects **price to rise**
- Buyer profits when market price is **higher than strike price**
- Loss is limited to **premium paid**



Value of call option | Instance value of call

$$C = \text{Max} [C_{ST} - E, 0]$$

Where ~~stock price~~  
 $ST \Rightarrow$  strike stock price  
 $E \Rightarrow$  exercise price  
strike price

$$C = \max [(S_T - E), 0]$$

120 - 130  
0

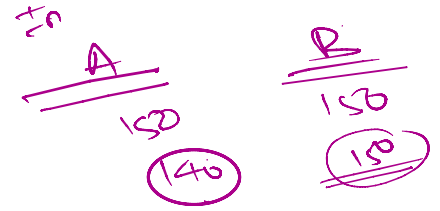
Buy long purchase  
call Long call

## 2. Put Option

A put option is a financial contract that gives **the seller to right, but not obligation**, to sell an underlying asset at a fixed price within a specified time period.

### Key Notes

- Gives the **right to sell** an underlying asset
- Used when investor expects **price to fall**
- Buyer profits when market price is **lower than strike price**



Value of put option (P)

$$P = \max [(E - S_T), 0]$$

+0

Where  
 P = value of put  
 E = exercise price.  
 S<sub>T</sub> = strike price of stock  
market

Gain or loss of call

Gross profit / loss = C - CP (call premium)

Gain or loss of put

Gain / loss = P - PP (put premium)

Break even point

BEP = C + CP or P + PP

Time value of money

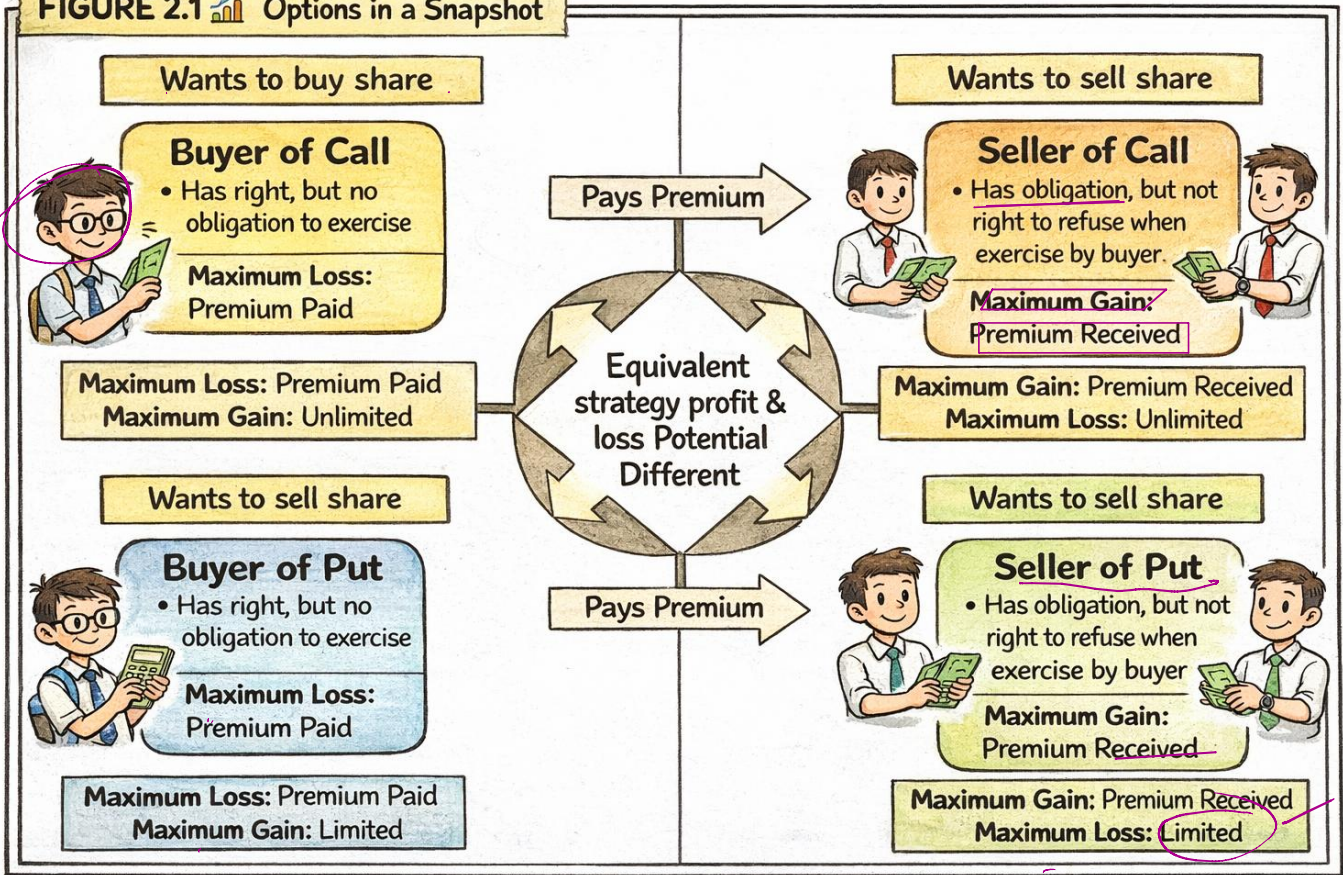
TV = option premium -

option intrinsic value.

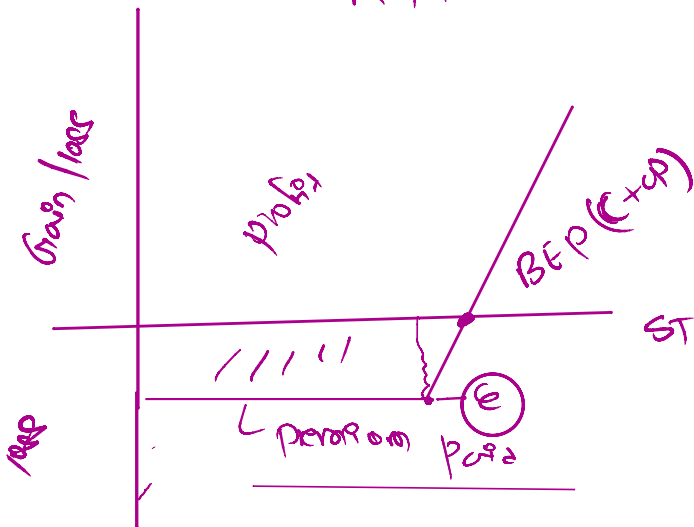
call (long)

put

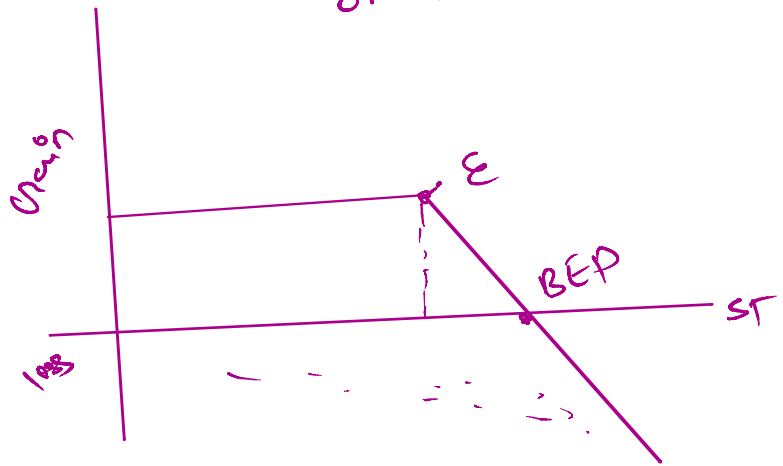
FIGURE 2.1 Options in a Snapshot



long call  
Right to buy.

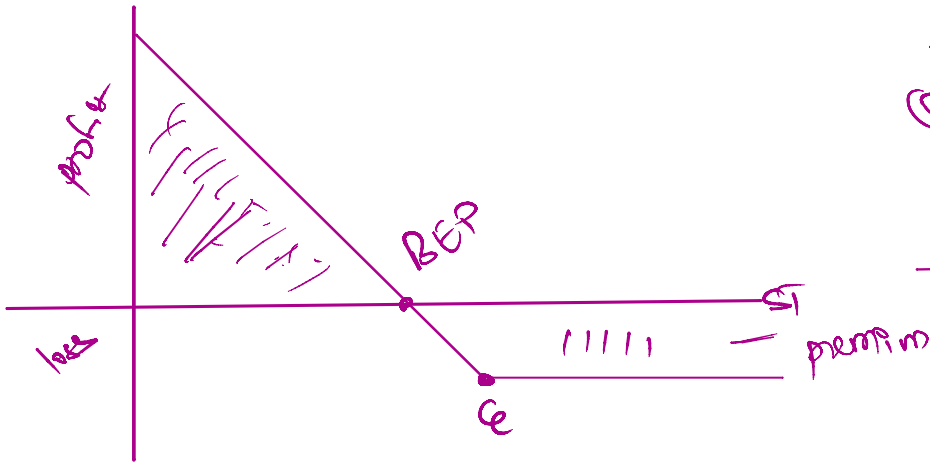


Short call  
obligational to call



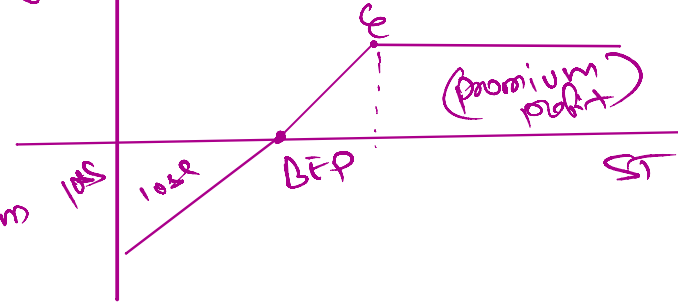
# long put

Right to sell



# Short put

Profit



①

100 shares

## Exchange-listed option trading

Exchange-listed option trading refers to the buying and selling of option contracts on organized stock exchanges, where contracts are standardized in terms of size, strike price, and expiry date, ensuring transparency, liquidity, and reduced risk

Exam

- Options are traded on **organized stock exchanges**
- Contracts are **standardized** (size, strike price, expiry)
- Provides **transparency and liquidity**
- Reduces **counterparty risk**

## Role of Clearing House

A **clearing house** acts as an intermediary between buyers and sellers in the options market, ensuring smooth and secure settlement of trades. Its main roles include:

- Trade Settlement Guarantee** – Ensures that all trades are completed even if one party defaults.
- Risk Reduction** – Minimizes counterparty risk by acting as the buyer to every seller and seller to every buyer.
- Margin Management** – Collects and monitors margin deposits from traders to cover potential losses.
- Daily Settlement (Mark-to-Market)** – Adjusts accounts daily to reflect gains and losses in open positions.
- Record Keeping** – Maintains accurate records of all trades and positions.

10/25/16

## Option Quotation

Expiration month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Call symbol	A	B	C	D	E	F	G	H	I	J	K	L
Put symbol	M	N	O	P	Q	R	S	T	U	V	W	X

I = the month of expiration is September

Fifth letter denotes the exercise price range. W denote the exercise prices of 17 1/2, 47 1/2, 77 1/2, 107 1/2 or various higher prices with one-half point fraction. In this quotation, w denotes the exercise price

## Numerical Question

### PROBLEM 2.1

#### PROBLEM 2.1

Suppose you own a call option that permits you to purchase 100 shares of the stock of Sagarmatha Company for Rs 150 per share any time in the next three months. The call premium is Rs 2 per share. Sagarmatha Company has a current market price of Rs 120 per share.

- Should you exercise the option and purchase the stock if its price increases to Rs 180? What should be your gain (loss) if you exercised the option and then immediately sold the stock?
- Should you exercise the option and purchase the stock if its price increases to Rs 130? What should be your gain (loss) if you exercised the option and then immediately sold the stock?
- Would your answer to part (b) change if the option were a put rather than a call? Remember, a put gives you the right to sell stock at a predetermined price. Assume put premium is Rs 2 per share.

a Given

No of share (N) = 100 share

Exercise price (E) = 150

market price (S) = 180

Value of call (C) = ?

Gain or loss = ?

Call premium (CP) = Rs 2

Solution

$$\begin{aligned} \text{Value of call (C)} &= \max [(S - E), 0] \\ &= \max [(180 - 150), 0] \\ &= \text{Rs } 30 \end{aligned}$$

$$\begin{aligned} \text{Gain or loss} &= (C - CP) \times N \\ &= (\text{Rs } 30 - \text{Rs } 2) \times 100 \\ &= \text{Rs } 28 \times 100 \\ &= \text{Rs } 2800 \end{aligned}$$

∴ Investor should exercise this contract because it's beneficial.

b

If market price (S) = 130

Solution

$$\begin{aligned} C &= \max [(S - E), 0] \\ &= \max [(130 - 150), 0] \\ &= 0 \end{aligned}$$

$$\begin{aligned}\text{Gain or loss} &= C - CP \\ &= 0 - 2 \\ &= -42 \text{ (loss)}\end{aligned}$$

No, because it is not beneficial.

C   Put

$$\text{Stock price (S)} = \text{£}130$$

$$\text{put premium (PP)} = \text{£}2$$

$$P = \max [C - S, 0]$$

$$= \max [C - 130, 0]$$

$$= 20$$

$$\text{Gain or loss} = (P - PP)$$

$$= 20 - \text{£}2$$

$$= \text{£}18 \text{ (exercise the contract it is beneficial)}$$

**PROBLEM 2.2**

You have taken a long position in a call option on PMC Company's common stock. The option has an exercise price of Rs 136 and PMC's stock currently trades at Rs 140. The option premium is Rs 5 per contract.

a. What is your net profit on the option if PMC's stock price increases to Rs 150 at expiration of the option and you exercise the option?

b. What is your net profit if PMC's stock price decreases to Rs 130?

Ans: a. Rs 9 per share; b. - Rs 5 per share.

**PROBLEM 2.3**

You have purchased a put option on Puma Corporation common stock. The option has an exercise price of Rs 380 and Puma's stock currently trades at Rs 400. The option premium is Rs 5 per share.

a. What is your net profit on the option if Puma's stock price does not change over the life of the option?

b. What is your net profit on the option if Puma's stock price falls to Rs 340 and you exercise the option?

$$C = \max[(S - E), 0]$$

$$C = \max[(140 - 136), 0]$$

$$C = 4$$

$$Profit = C - PP$$

$$Profit = 4 - 5 = -1$$

Gain

Exercise price (E) = Rs 80

Stock price (S) = Rs 400

Put premium (PP) = Rs 5

$$\text{Value of put} = \max[(E - S), 0]$$

$$= \max[(380 - 400), 0]$$

$$= 0$$

$$\text{Gain/Loss} = P - PP$$

$$= 0 - 5$$

$$= -5 \text{ (loss)}$$

$$\text{Stock price (S)} = \underline{\underline{Rs 340}}$$

$$\text{Gain/Loss} = ?$$

$$\text{Gain or loss} = P - PP$$

$$= 40 - 5$$

$$= \underline{\underline{Rs 35}}$$

$$P = \max[(E - S), 0]$$

$$= \max[(380 - 340), 0]$$

$$= \underline{\underline{Rs 40}}$$

Value of call

**PROBLEM 2.4**

A call option on ABC stock has an exercise price of Rs 135. It is selling for a premium of Rs 12. ABC's stock price is currently Rs 145.

- If you buy "one contract", how much will you be paying?
- What is the "intrinsic value" of the call option?
- Is the call option "in the money", or not? Explain.
- If you sell one contract, what would you be hoping for, to make your option sale a profitable one? *if the exercise fall below market than we get profit.*
- Suppose you buy the call option today and hold it until expiration. What is your profit or loss if the prices at expiration are Rs 120, Rs 135, and Rs 150.
- Suppose you sold the call option today. Assuming no exercise occurs until the expiration day, what is your profit or loss - given the same possible prices listed in part (e)?

CP  
 $\text{pay amount} = \text{CP} \times \text{NS}$   
 $= 12 \times 100$   
 $= \text{Rs } 1200$

Given  
 Exercise (E) = 135  
 Call premium (CP) = 12  
 Stock Price (ST) = 145

(a) for one contract =  $\text{CP} \times \text{NS}$   
 $= 12 \times 100$   
 $= \text{Rs } 1200$

(b)  $C = \max[(ST - E), 0]$   
 $= \max[(145 - 135), 0]$   
 $= \text{Rs } 10$

In the money	out the money
$ST > E$	$E > ST$

(c) The contract is in the money because  $ST > E$ .

(d)

ST	E	$C = \max[ST - E, 0]$	Gain or loss = $C - CP$
120	135	$(120 - 135) = 0$	$0 - 12 = -12$
135	135	$(135 - 135) = 0$	$0 - 12 = -12$
150	135	$(150 - 135) = 15$	$15 - 12 = 3$

(e)

ST	E	Profit/Loss
120	135	12
135	135	12
150	135	-3

$(ST - E)$        $C - CP$

Buyer - sell (12)  
 $(15) - 12$   
 $= 3$

$$2.5 = \max [e^{-st}]$$

P-PP

**PROBLEM 2.6**

Consider an exchange-traded call option contract to buy 500 shares with a strike price of \$40 and maturity in four months. Explain how the terms of the option contract change when there is

- a. A 10% stock dividend
- b. A 10% cash dividend
- c. A 4-for-1 stock split

Ans: a. Rs 36.36; b. Rs 40; c. Rs 10

**PROBLEM 2.7**

What adjustments to the contract terms of CBOE options would be made in the following situations?

- a. An option has an exercise price of 60. The company declares a 10 percent stock dividend.
- b. An option has an exercise price of 25. The company declares a two-for-one stock split.
- c. An option has an exercise price of 85. The company declares a four-for-three stock split.
- d. An option has an exercise price of 50. The company declares a cash dividend of \$75.

$85 \times \frac{3}{4}$   
 $100 \times \frac{2}{1}$

2.6  
Copro

No of share (N) = 500 share  
Stock price (P) = \$40

① Stock Dividend = 10-1  
No of share = 500 share (1 + 0.10)  
= 500 x 1.10  
= 550 shares.  
Stock price =  $\frac{P}{1 + \text{dividend}}$   
=  $\frac{\$40}{(1 + 0.10)}$   
= \$36.36

② 10-1 Cash Dividend.  
There is no any effect by cash dividend stock price & no of share.

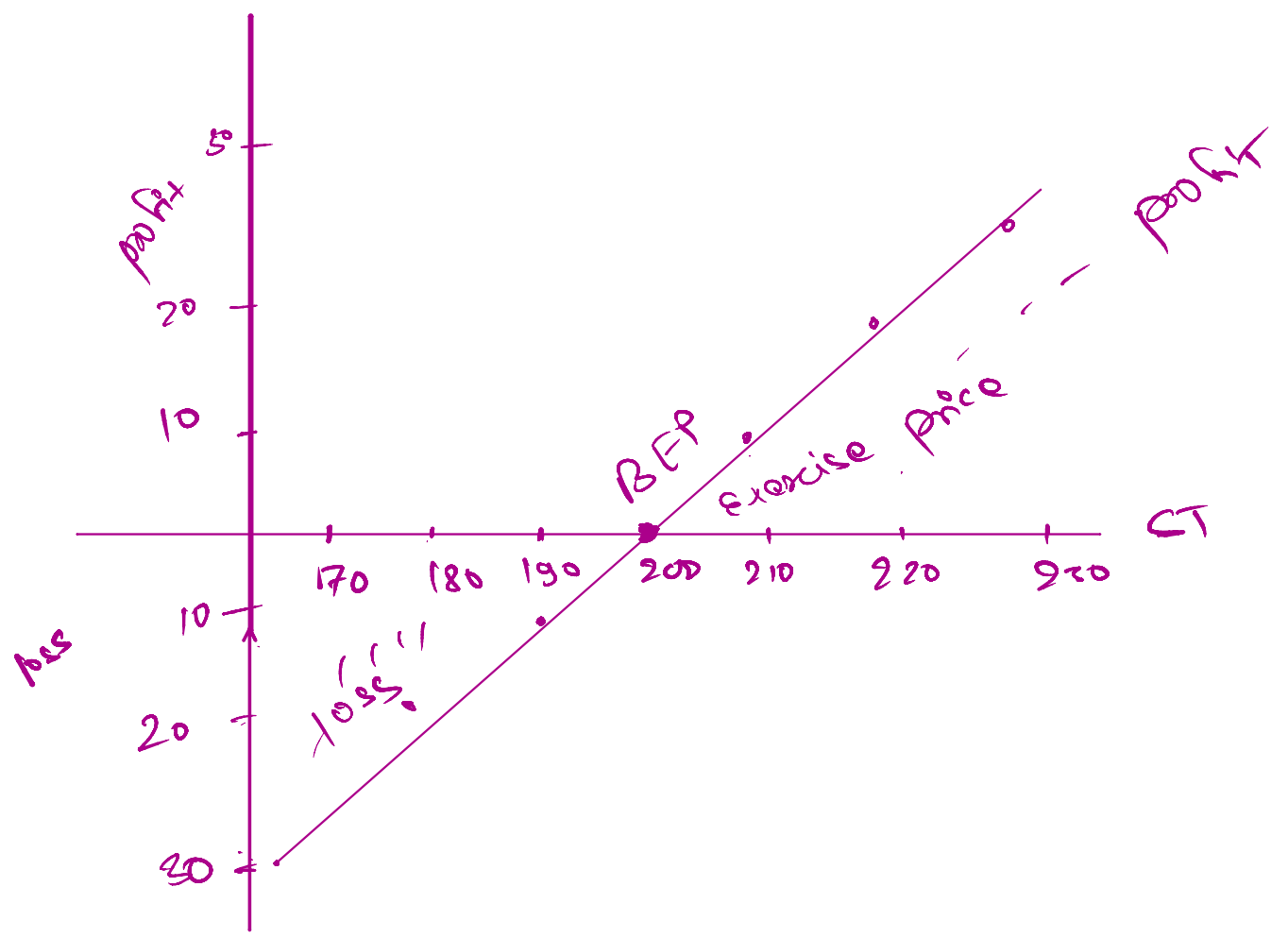
③ Stock  $\frac{4}{1}$  for  $\frac{1}{1}$  stock split (4 for 1)  
No of share =  $500 \times \frac{4}{1}$   
= 2000 shares  
price =  $P \times \frac{1}{4}$   
=  $\$40 \times \frac{1}{4}$   
= \$10

**PROBLEM 2.9**

Assume an investor sold short 100 shares of ABC Company at current market price of Rs 200 per share. You are planning to cover this short position on stock offer 3 months. At that time you should buy 100 shares from market. Calculate and graph your gain/loss after 3 months if ABC share price turned to Rs 170, Rs 180, Rs 190, Rs 200, Rs 210, Rs 220, and Rs 230.

Solution

ST	E	Gain or loss (ST - E)
170	200	170 - 200 = -30
180	200	180 - 200 = -20
190	200	190 - 200 = -10
200	200	200 - 200 = 0
210	200	210 - 200 = 10
220	200	220 - 200 = 20
230	200	230 - 200 = 30



Call (A)  
Put (10)  
Jan

Dem  
Investor

Ans: 50, 20, 10, 0, -10, -20, -30

**PROBLEM 2.10**

Study the following option quotation and answer the questions given below:

Calls	Last Sale	Net	Bid	Ask	Vol	Open Int
05 Jul Rs 50	10.00	-3	9.50	11	900	1400

- What is the exercise price of the call option?
- How many options have been traded on the day of quotation and till the quotation day?
- If you want to take the long position on the call option, what price do you have to pay for a call?
- What was the price of the call on the quotation day?
- What was the price of the call on one day before the quotation day?

Ans: (a) Rs 50 (b) 900 (c) 11 ; (d) 10; (e) 11

**PROBLEM 2.11**

From the following quotation, answer the questions given below.

Calls	Last Sale	Net	Bid	Ask	Vol	Open Int
07 Sep 80	7.5	+0.5	7.0	8.8	770	10554

- When will call expire and what is the exercise price?
- What was the price of a call on the quotation day and on day before quotation?
- What does 'Open Int' mean?
- What price an investor should pay to buy a call?
- How many options have been traded on quotation day?

Ans: (a) 2007 September and Rs 80 (b) 7.5 and 7 (c) 8.8 (e) 770 options

**PROBLEM 2.12**

+3

10 + 0.5  
10.5  
10.5 + 3  
13.5

a. The exercise price of the call option is Rs 50

b. The number of option traded in the quotation day are 900 options.

c. In long position investor price is ask price which is 11

d. The price of last call quotation day is Rs 10.

e. The price of the call option day before quotation day  $(10 + 3) = 13$

②

② 'open int' mean the total number of contract or option that is outstanding (not yet exercised) or traded.

Notes  
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Chapter - 02