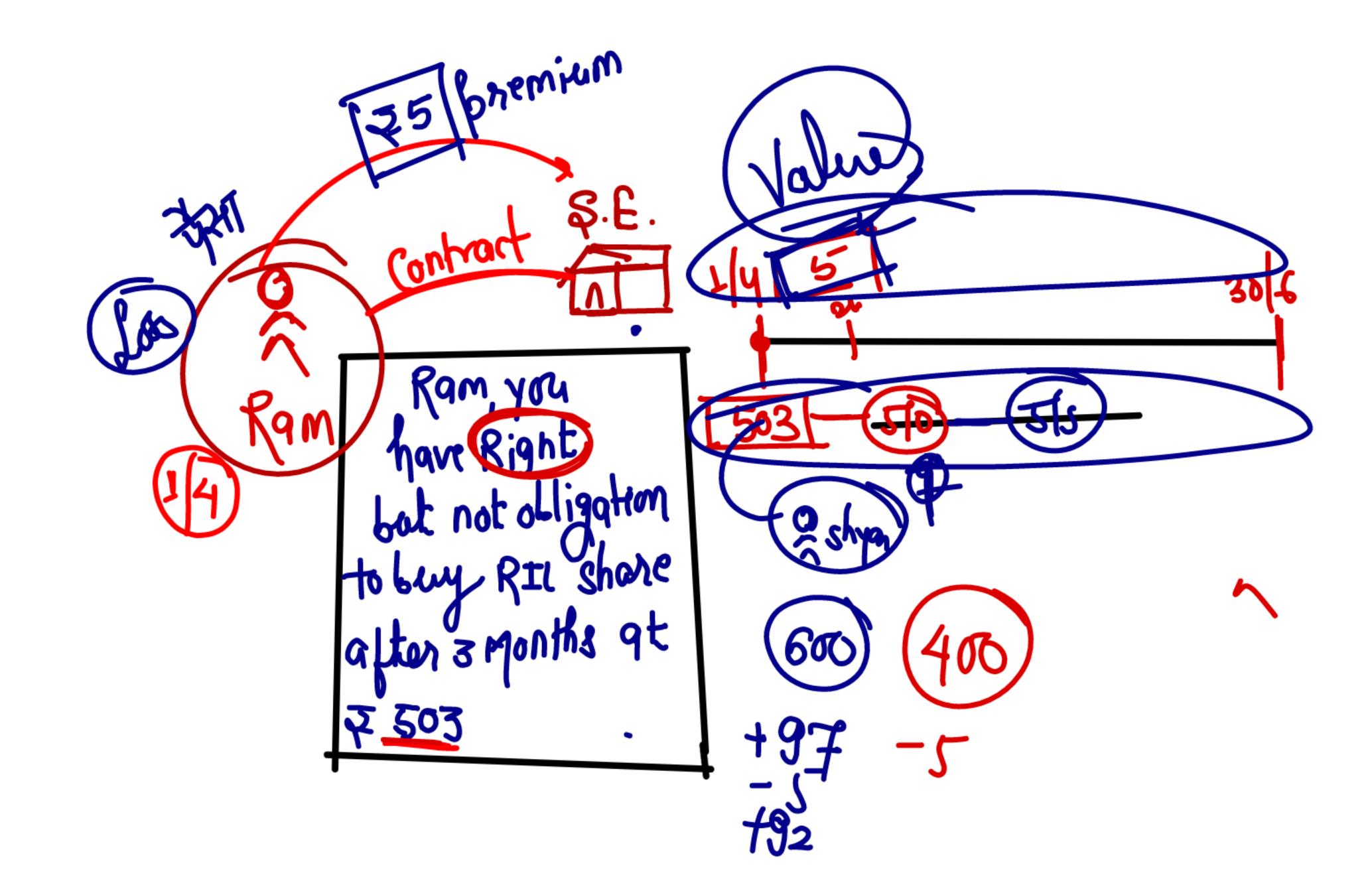
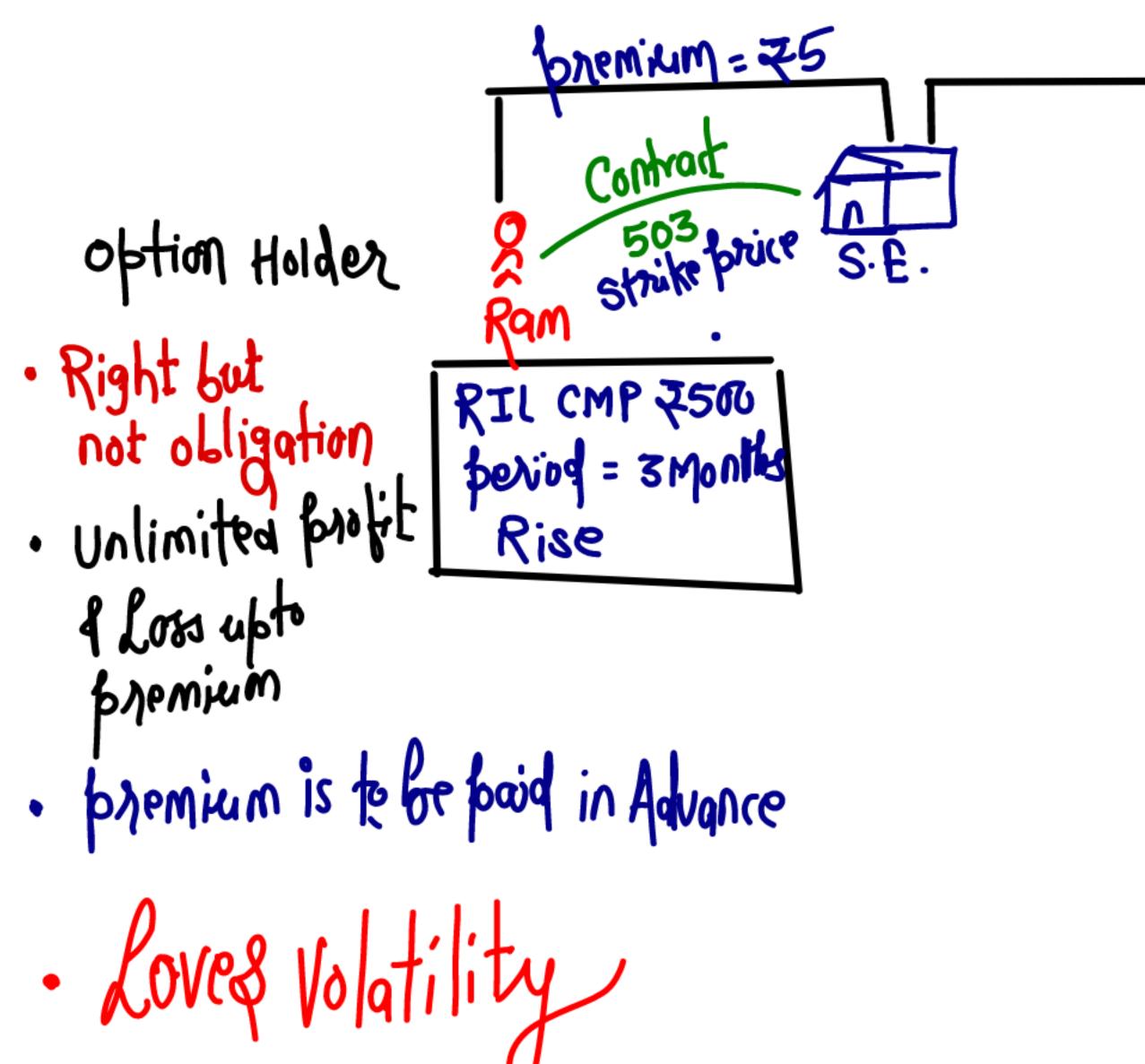
DERIVATIVES [8 to 16 Marles)

Derivative is a financial intrumenta 4 it derives its value from an underlying asset. underlying asset means share Bonds Commodity Exchange Rates Interest Rates etc.
We will discuss this chapter in following barts PART I Obtion PART II forward
PATR III future



PART I obtion

- 1. Option is a right but not obligation to buy ar Sell an underlying asset at Bredetermine brice [Exercise price or strike brice). An option premium is to be faid in Advance.
- 2. There are two barties in option contracts
 option Buyer or option Holder
 - · obtion seller or obtion Writer



shyam obtion writer obligation but not Right

- · Unlimited loss f
- brotht upto Bromium Ant Margin Money is reduired to be deposited at SE
- · Hotes Volatility

(3) There are two options

- 1. Call option
- 2. but obtion
- 1. Calloption
 Expected to Brice Rise

 - Right to buy

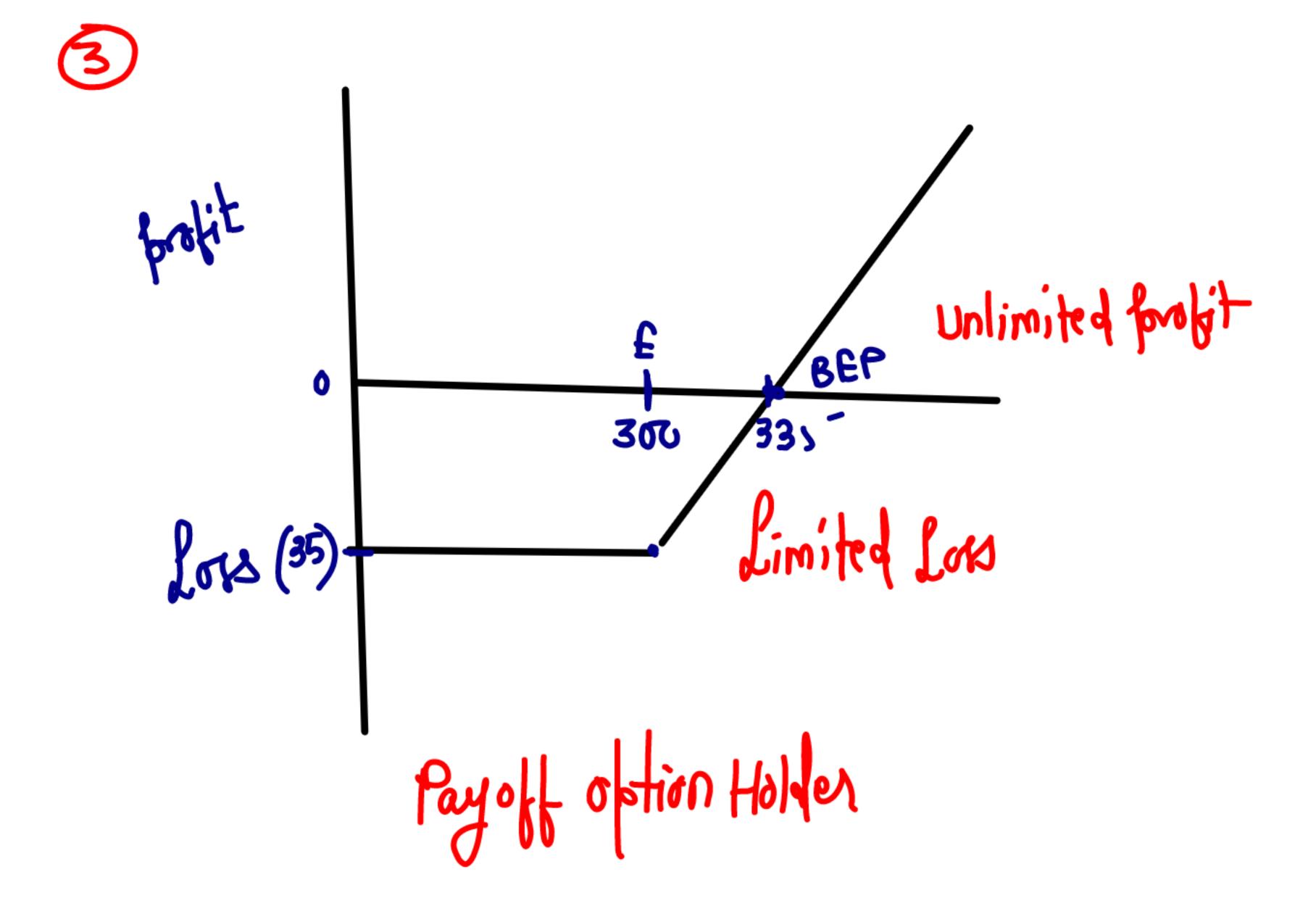
EXAMPLE - 01

Mr. E is interested in buying a share of I.T.C. He is however afraid that the price of the share may move down. Hence, he does not purchase a share but buys a call option on 1 share of I.T.C. at a strike price of ₹ 300 by paying an option premium of ₹ 35. Required:-

- (i) Determine the breakeven point price of Mr. E.
- (ii)Determine the Profit/Loss if the price on maturity is: - 250, 270, 290, 300, 320, 340, 350.
- (iii)Draw pay off for call option holder.
- (iv)Draw pay off for call option writer.

(Page No. 01)

1 BEP = EP + bremium							
	= ₹300+₹35=₹335						
	profit Lo		•				
MP	Action	Grass	premium	Net Payoff			
250	Lapsed	Ò	(35)	(35)			
270	Lapsyd	G	(35)	(35)			
296	Labsod	0	(35)	(35)			
300	Lapsed	0	(35)	(35)			
320	Exerci's 6d	20	(35)	(15)			
340	Ex.	40	(35)	5			
350	E×	20	(35)	15			
335	EX.	1 35	(31)	0			



(4) Pay oft for obtion Writer Cimited prosit 35 0 335 300 Unlimited Loso

put option Right to sel obligation to **₹503** buy obtim Writer RIL CMP 75001 B tall **+48**

but obtion

- · Expected to fall in brice
- · Right to Sell

EXAMPLE - 02

Mr. G is hoping that the price of a share of ACC is going to fall. He precesses a put option at an exercise price of ₹ 480 He pays a premium of ₹ 40.

Required:-

- (i) Determine the breakeven point to Mr. G
- (ii)Compute Profit/Loss for Mr. G if the price on maturity is- ₹ 400, 420, 440, 480, 490, 500, 530.
- (iii)Draw pay off put option holder.
- (iv)Draw pay off put option writer.

(Page No. 01)

40

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(40)

[40]

440

480

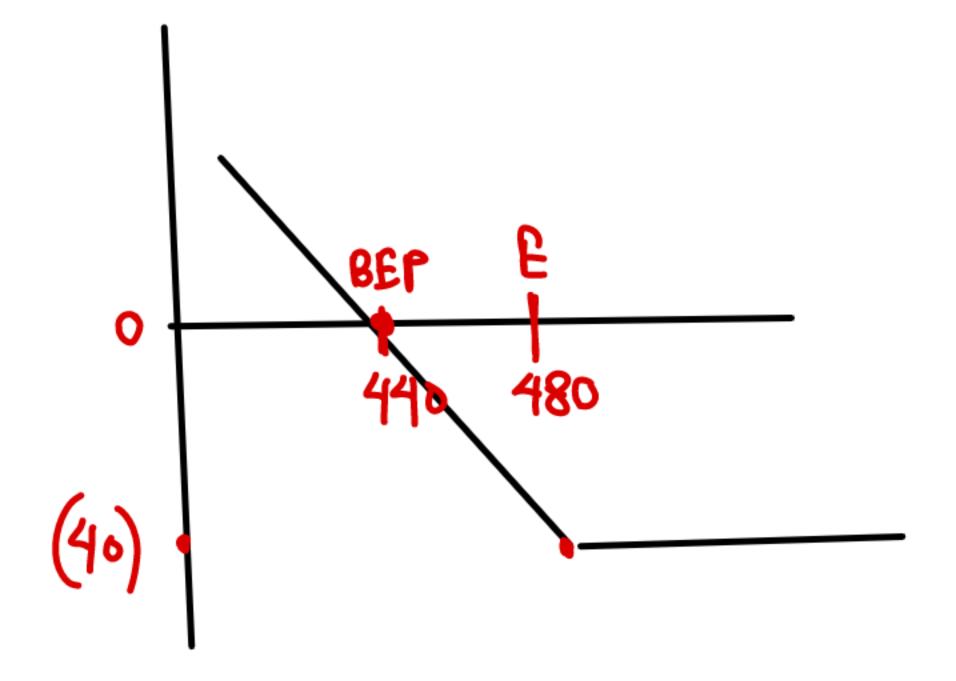
490

500

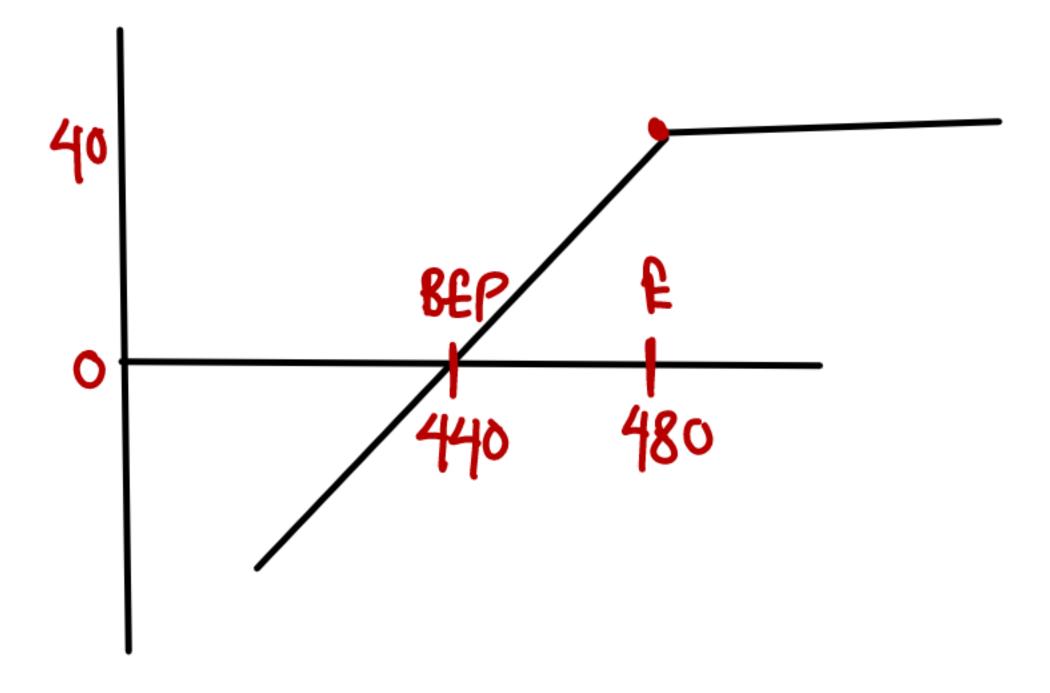
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"

3) Payoff for but option Holder



4) Payoff for but option Writer



Call 320 \ 8 But 320 \ 7

QUESTION - 01

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

- (i) The strike price in both cases is ₹ 320, and
- (ii) 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.

(Exam Nov - 2018) (Page No. 11)

Calculation of Net payoff (Call oftion Abler) 3207

MP	Action	Gross Payoff	Prem'rum	Net bayoff
300	Labsed	0	(8)	-8
310	lofsed	3	(8)	-8
320	Lapsed	0	(8)	-8
336	Exercised	10	(8)	2
340	Exercised	20	(8)	12

Call offion is gainfully exercised when force of share on maturity is more than (7320+8)=7328

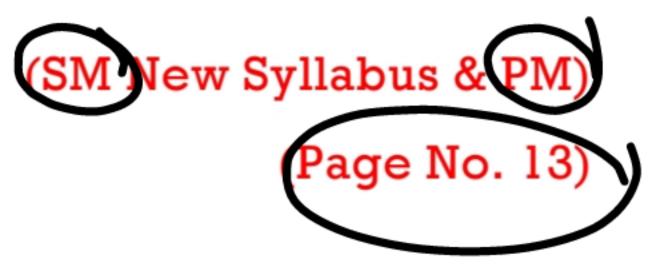
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QUESTION - 03

The equity share of VCC Ltd. is quoted at $\stackrel{?}{\underset{?}{?}}$ 210. A 3-month call option is available at a premium of $\stackrel{?}{\underset{?}{?}}$ 6 per share and a 3-month put option is available at a premium of $\stackrel{?}{\underset{?}{?}}$ 5 per share. Ascertain the net payoffs to the option holder of a call option and a put option separately.

- (i) The strike price in both cases in ₹ 220; and
- (ii)The share price on the exercise day is ₹ 200,210,220,230,240.

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



QUESTION - 04

Identify the profit or loss (ignoring dealing cost and interest) in each of the following cases:

(a) A call option with an exercise price of ₹ 200 is bought for a premium of ₹ 89. The price of underlying share is ₹ 276 at the expiry date.

(b)A put option with exercise price of ₹ 250 is bought for a premium of ₹ 42. The price of underlying share is ₹189 at the expiry date.

(c) A put option with an exercise price of ₹ 300 is written for a premium of ₹ 57. The price of the underlying share is ₹ 314 at the expiry date.

(Page No. 14)

(9) Call oftion is bought at EP 7200 4 paid premium 789. On Malurity price of share is 7276, 91 this situation Coll option will Exercise.

C) A but obtion is written at EP = 300 4 need premium 757. On Malwrity Brice of Bhare is 7 314 hence but aftim will habse Gross bayoft = 0 blemium Recd = 57 broth 57

Types of option on the basis of Maturity

1. American obtion

American obtion Can be Exercised on or before maturity.

2. European obtion

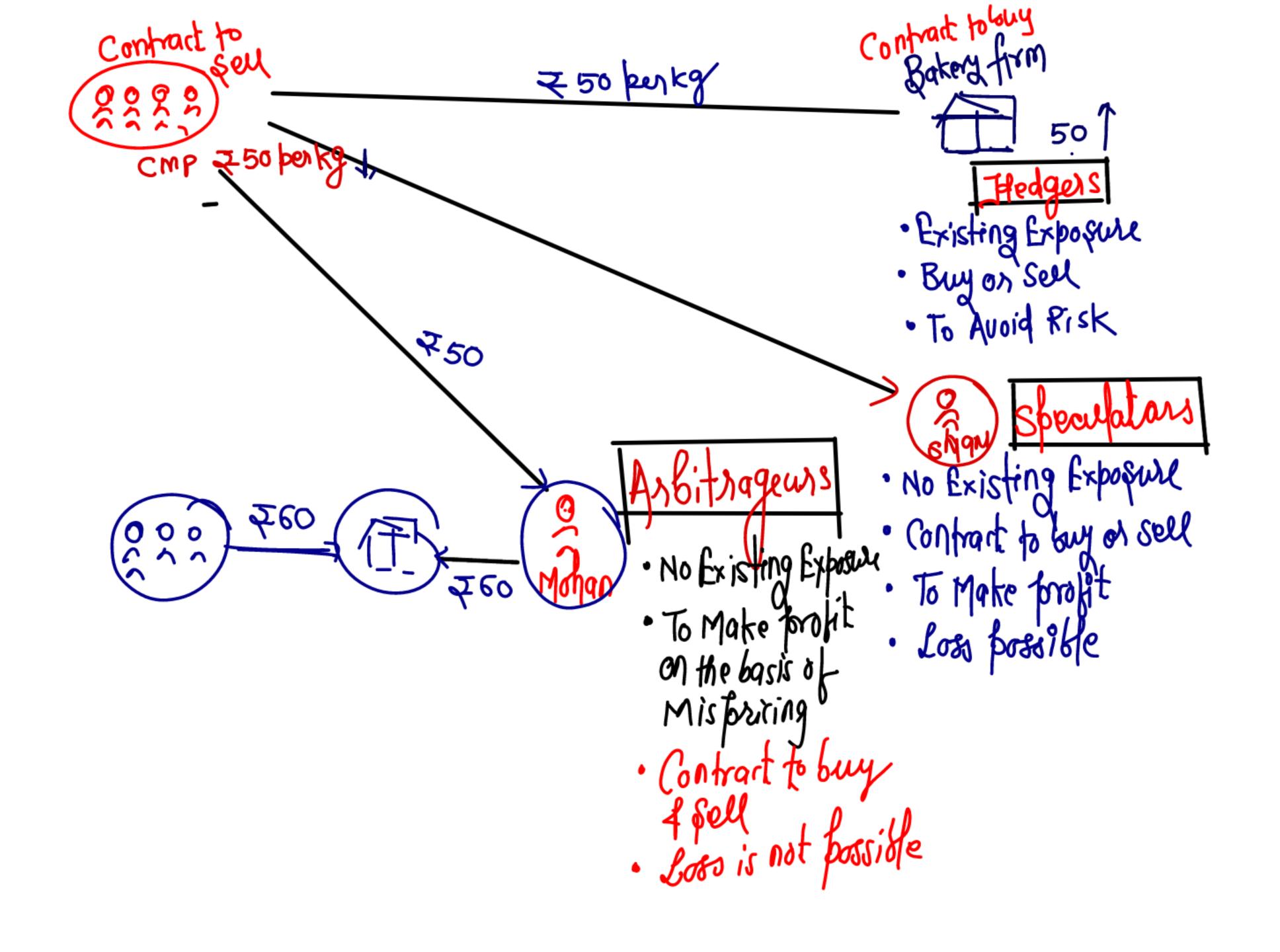
European obtion Can be Exercised only on Maturity.

Value of American obtion is more than Value of European option.

4. players in Derivative Market

There are three players in Derivative Market

- 1. Hedgers
- 2. Speculators 3. Arbitrageurs



5 In the Money, AT the Money out of the Money, Intrinsic Value & Time Value

TTM ATM OTM
Call CMP>EP CMP=EP CMP<EP
but CMP \ EP CMP=EP CMP>EP

Intringic Value & Time Value

There are two parts of option premium

- 1. Intrinsic Value
- 2. Time Value on Volatility bremium

Call obtion

- · Intrinsic Value = CMP-EP, 0
- . Time Value = premium Intrinsic Value

- · Intringic Value = EP-CMP, 0
- · Time value = premium Intrinsic Value

9t means if obtion is ITM then Intrinsic value is difference permeen CMP&EP. option is ATM or orm then I. Value will be zero of the will whole promum Amt will be time value.

EXAMPLE - 03

State whether each one of the following is In the money, At the money or Out of the money.

Option	Exercise price	Stock price
Call	1360	1340 OTN
Call	1360	1360
Call	1360	1380
Call	1360	1400 17
Put	1360	1340
Put	1360	1360
Put	1360	1380 07
Put	1360 🎝	1400

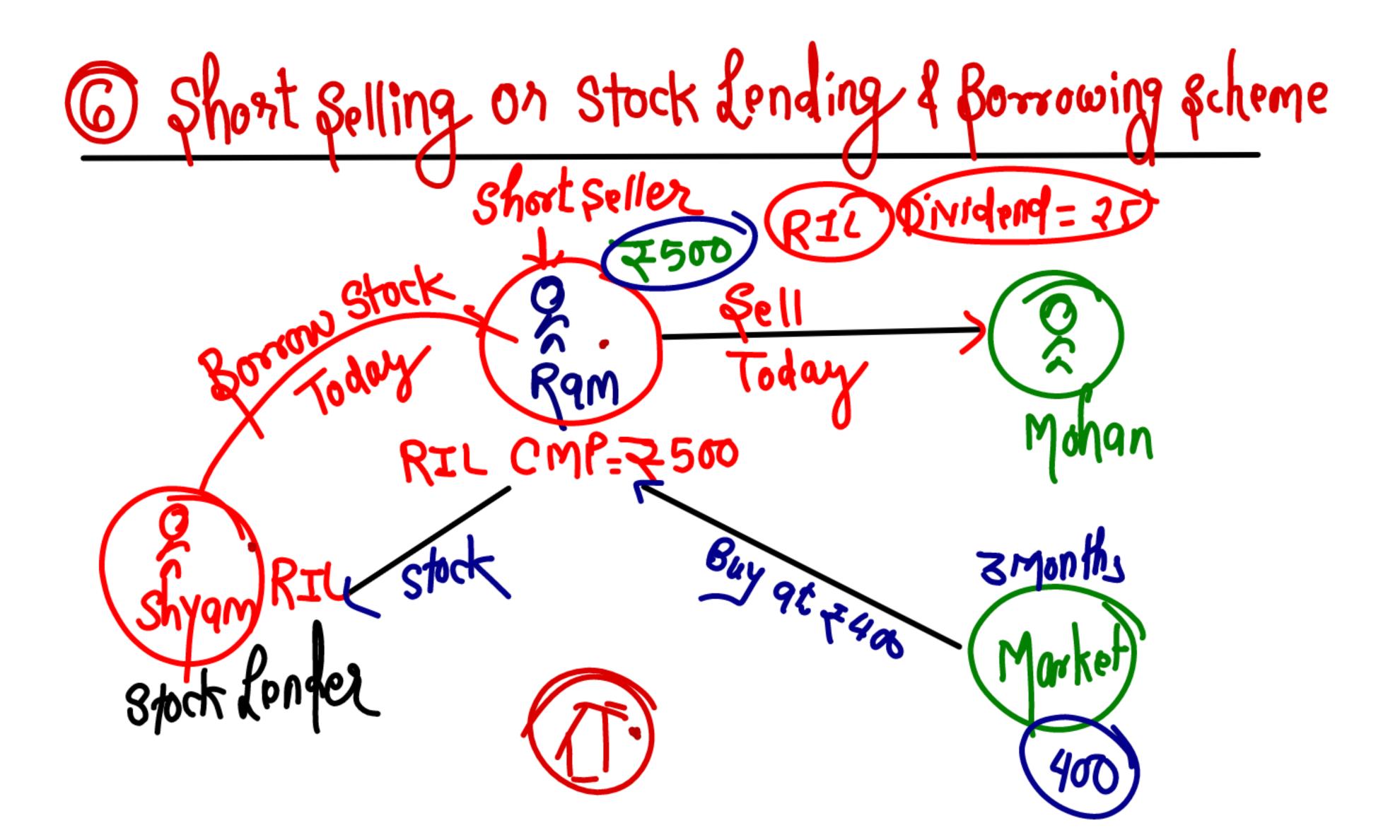
(Page No. 01)

EXAMPLE - 04

Consider the data relating to a stock contained in the following table. Determine both the intrinsic value and the time value in each of the cases.

Option	Strike price	Asset o price	Option premium	I.V.	T.V.
Call	90	100 -	15	70	5
Call	110	100	2	G	2
Put	200	100	135	7 00	35
Put	904	100	4	0	4
Put	150.	125	30	25	
Call	150	120	22		22_

(Page No. 02)



- 1. Short Selling is a speculative activity. is design to make profit on the basis of bearish brice expectation.
 - 2. In short selling, short seller borrows stock from stock Lender 4 sell it at current Market price with a view to buy Later on at lower price & return to stock londer

3. Sources of Return (Short Seller)

- . price depreclation
- · Interest Earned on short Selling Amt

4. Sources of Risk (Short seller)

- · brice appreciation
- . Lending charges
- Dividend Amt [Compensate dividend Amt by shirt soller to stork content)

QUESTION - 02

Mr. A is holding 1,000 shares of face value of ₹ 100 each of M/s. ABC Ltd. He wants to hold these shares for long term and have no intention to sell.

On 1st January 2020, M/s. XYZ Ltd. has made short sales of M/s. ABC Ltd.'s shares and approached Mr. A to lend his shares under Stock Lending Scheme with following terms:

- (i) Shares to be borrowed for 3 months from 1st January 2020 to 31st March 2020.
- (ii)Lending Charges/Fees of 1% to be paid every month on the closing price of the stock quoted in Stock Exchange and
- (iii) Bank Guarantee will be provided as collateral for the value as on 1st January 2020.

Other Information:

- (a) Cost of Bank Guarantee is 8% per annum.
- (b)On 29th February 2020 M/s. ABC Ltd. declared dividend of 25%.

(c) Closing price of M/s. ABC Ltd.'s shares quoted in Stock Exchange on various dates are as follows:

Date	Share Price in Scenario – l Bullish /	Share Price in Scenario – 2 Bearish	
1 st January 2020	1,000	1,000 -	
31st January 2020	1,020	980	
29 th February 2020	1,040	960	
31st March 2020	1,050	940	

You are required to find out:

- (i) Earnings of Mr. A through Stock Lending Scheme in both the scenarios,
- (ii) Total earnings of Mr. A during 1st January 2020 to 31st March 2020 in both the scenarios,
- (iii) What is the profit or loss to M/s. XYZ by shorting the shares using through Stock Lending Scheme in both the scenarios?

(Exam January - 2021)

(Page No. 12)

1) Earning of Mr. 1	Stock	(ending)
	Bull	Bearish
fending charges		
Jan (1% of doing)	10.20	9.80
Peb,	10.40	9.60
Feb March	10.50	9.40
(x) No. of shares	1000 31·10	28.80
farnings	`	728800
2 Total farring of M	pui	Bearish
londing income	31.10	28.80
Jording Income (7100X3)	25.00	\$2.W
6. Madalahan	100.10	53.80 (000
(x) No of shares Total farnings	1000	53800
latal Earnings	\$26100	7000

3 Porofit or Loss to MIS XXX

· V		
	Bull	Bearish
brofit Loss on short Selling	(1000-1050) -₹50	(1000 - 946) 76 0
Londing charge	-£31·10	- 28.80
Intt. on Bank Guaranter (8%)	1000×8%×3/12 - 20	1000×8%×3/12-
(x) No. of shares	(101100) 1000 (101·10)	J1.20 1000 J1200

7. Expected Value of obtion (Imp)

Experted Value of option = 2 Gross Payoff x Brobability

EXAMPLE - 05

Option = Call option

Exercise Price = ₹ 500

Period = 3 months

Price of Maturity Probability

520 0.3

530 0.2

510 0.1

490 0.3

480 0.1

Calculate Expected value of option.

(Page No. 02)

Experted Value of obtion

				<u> </u>
MP	Action	Gossbeyat	prob.	G.PxP
	Exercised	20	0.3	6
530	Ex·	30	0.2	ھ ا
510	Ex.	10	O ·T	1
490	Rabsted	0	0.3	0
	Labsed	Ò	0.1	0
				73

EXAMPLE - 06

Option = Put option

Exercise Price = ₹ 200 _

Period = 2 months

Price of Maturity Probability

170 0.15

180 0.10

200 0.05

220 0.30

160 0.40

Calculate Expected Value of option.

(1) 22.50

(Page No. 02)

QUESTION - 05

Equity share of PQR Ltd. is presently quoted at ₹ 320 The Market Price of the share after 6 months has the following probability distribution:

Market Price ₹ 180 260 280 320 400

Probability 0.1 0.2 0.5 0.1 0.1

A put option with a strike price of ₹ 300 can be written.

You are required to find out expected value of option at maturity (i.e. 6 months)

(SM New Syllabus &PM)

(Page No. 15)

Expected Value of option 3001					
MP	Action	Gorsbayoff	4	GPXP	
180	Exercise C	120	6.	12	
260	//	40	0.2	8	
280	//	20	0.5	10	
320	dapsea	0	0.1	0	
400	lapsed	0	0 ·	Ò	
	'		•		
				730	



QUESTION – 06

You as an investor had purchased a 4 month call option on the equity shares of X Ltd. of ₹ 10, of which the current market price is ₹ 132 and the exercise price ₹ 150. You expect the price to range between ₹ 120 to ₹ 190. The expected share price of X Ltd. and related probability is given below:

Expected	120	140	160	180	190
Price (₹)					
Probability	0.05	0.20	0.50	0.10	0.15

COMPUTE:

- (i) Expected Share price at the end of 4 months.
- (ii) Value of Call Option at the end of 4 months, if the exercise price prevails.
- (iii)In case the option is held to its maturity, what will be the expected value of the call option?

(MTP March – 2022, SM New Syllabus& PM)

(Page No. 16)

QUESTION - 07

You had purchased a 3 month call option on the Equity shares of Satya Ltd for a premium of ₹ 30 each the current market price of the share is ₹ 560 and the exercise price is ₹ 590 You expect the price range between ₹ 540 to ₹ 640.

The expected share price of Satya Ltd and related probability is given below:

Expected	540	560	580	600	620	640
price (₹)						
Probability	0.10	0.15	0.05	0.35	0.20	0.15

Compute the followings:

(i) Expected share price at the end of 3 months

(ii) Value of call option at the end of 3 months if the exercise price prevails,

(iii)In case the option is held to its maturity, what will be the expected value of the call option?

1 Expected Share brice

Find out the price of the shares quoted at the stock exchange to get the value of the call option as computed in (iii) above.

Exam May-2022) (Page No. 17)

(N) price of share so that
Value of call be 717

price of share: 590 + 17

= 7607

(II) Expected Value of option 5907						
MP	Action	G. Payett	P	GPXP		
540	falosed	0	0.0	0		
560	1/	0	0.15	0		
580	//	0	0.65	G		
6 1 6	Exercised	10	0.35	3.50		
620	"	30	0.20	6.00		
640	/,	50	0.15	7.50		



The Market Price of the share after 6 months has the following probability distribution.

Market Price	170	190	200	220	240
Probability	0.05	0.20	0.40	0.20	0.15

Options are available with a strike price of ₹ 200 and expiration 6 months from now.



- (i) What is the Expected value of market price per share?
- (ii) What is expected value of call option?
- (iii) What is the expected value of put option?

(Page No. 18)

8. Concept of Compounding [Imp]

Egy Mr. Ram wants to invest = 100000 for 1 year

Bank A = 12.x P.q. Compounded Annually

Bank B = 12% P.a. Compounded Semifimually

Bank c = 12% P.a. " Quarterly

Bant D = 127. P.9. " Monthly

Bant E = 12% P.9. Compounded Continuously

Calculate Amount Receivable after 1 year

₹10000 (1·12) = ₹112000 £100000 (1.00) = ±115300 $4 100000 (1.03)_1 = 4115221$ \$ 100000 (1.01) = \$ 115685 12100000×62t 12100001 x 60.15 x T 7/00000 x 1.1275 = 7112750

Calculator

0.12 0.12 0.12 0.12 0.12 1 12 times P.V. = 7500 Rate = 10% P.9. CC F.V. after 3 Months =? F.V. = 7500 x e 0.10 x 0.25 = 7500 × e0.025 = 7500 × 1.0253 - 7 512·65

CONTINUOUS COMPOUNDING, DISCRETE CASH FLOWS

	SINGLE P	AYMENT		UNIFOR	<i>_</i>		
	Compound Amount Factor	Present Worth Factor	Sinking Fund Factor	Uniform Series Factor	Capital Recovery Factor	Series Present Worth Factor	Arithmetic Gradient Series Factor
N	(F/P, r, N)	(P/F, r, N)	(A/F, r,N)	(F/A, r, N)	(A/P, r, N)	(P/A, r, N)	(A/G, r, N)
1	2:0101	0.99005	1.00000	1.0000	1.01010	0.99005	0.00000
2	.0202	0.98020	0.49750	2.0101	0.50758	1.97025	0.49750
3	.0305	0.97045	0.33001	3.0303	0.34006	2.94069	0.99333
4	0.0 <mark>1</mark> 08	0.96079	0.24626	3.0303	0.25631	3.90148	1.48750
5	.0513	0.95123	0.19602	5.1015	0.20607	4.85271	1.98000
6	1.0618	0.94176	0.16253	6.1528	0.17258	5.79448	2.47084
7	1.0725	0.93239	0.13861	7.2146	0.14866	6.72687	2.96000
8	1.0833	0.92312	0.12067	8.2871	0.13072	7.64999	3.44751
9	1.0942	0.91393	0.10672	9.3704	0.11677	8.56392	3.93334
10	1.1052	0.90484	0.09556	10.4646	0.10561	9.46876	4.41751
11	1.1163	0.89583	0.08643	11.5698	0.09648	10.36459	4.90002
12	1.1275	0.88692	0.07883	12.6860	0.08888	11.25151	5.38086
13	1.1388	0.87810	0.07239	13.8135	0.08244	12.12961	5.86004
14	1.1503	0.86936	0.06688	14.9524	0.07693	12.99896	6.33755
15	1.1618	0.86071	0.06210	16.1026	0.07215	13.85967	6.81340

Eq 3 P.V. =
$$\frac{7}{600}$$

Rate = 8 ! p.q. cc
FV after 2 years = ?

$$FV = \frac{7}{600} \times e^{0.08 \times 2}$$

$$= 600 \times e^{0.16}$$

$$= 600 \times 1.1735$$

$$= 7404.10$$

704.40

Eg4 FV after 9 Months = 7 1000

1) P.V. =
$$\frac{21000}{20.10 \times 12}$$
= $\frac{21000}{20.075}$
= $\frac{21000}{1.0779}$
= $\frac{21000}{1.0779}$
= $\frac{21000}{1.0779}$

2) P.V. =
$$1000 \times e^{-3rt}$$

= $1000 \times e^{-0.075}$
= 7100×0.9278
= 927.80

$$1.0775$$
 1.0775
 1.0775
 1.0775
 -1
 1.0775
 -1
 1.0775
 -1
 1.0775
 -1
 1.0775
 -1

Eg 6 Ln J.0672 Rate = ? 6.5%

2 Calculate Effective Annual Rate (EAR)

1.
$$10000 (1.06)^2 = 115360$$

2.
$$FAR = \frac{112360 - 10000}{10000} \times 100 = 12.36\%$$

 $FAR = (1.06)^{2} - 1 = 1.1236 = 12.36\%$

```
Investment = 710000
Rate = 12.36\%.P.9.(EAR)
   Cash Inflows after 6 Months = ? Wrong
      4 10000 × 1.0018
7100000 x (1.1236) 7 7 106000
```

Cash Outflows = 7800 Rate 10% P.q. effective Cash Inflows after 4 Months = ? LA = 4800 × (1.10)15 = 7800 × 1.0323 = ₹825.84

```
Eg Investment = 7100000

Rate = 12 × P.a. Compounded Quarterly

Cash Inflows after 9 Months = 7
```

```
Method I

7 100 000 (1.03)^3
100 000 (1.03)^3
100 000 \times 1.0927
100 000 \times (1.1255)
100 000 \times (1.0927)
100 000 \times (1.0927)
100 000 \times (1.0927)
100 000 \times (1.0927)
```

Eg Investment = 7 100000
Rate = 10% P.9. Compounded Half yearly Cash Inflows after 7 Months =? $EAR = (1.05)^{2} = 1.1025 (10.25\%)$ $FV = 100000 \times (1.1025)$ $FV = 100000 \times (1.1025)$ $= 100000 \times 1.05857$ = 3/02857

Eq (Imp)

Investment = 7100000 Cash Inflows after 1 YEAR 9k Rate

- 12% p.q. Compounded Semi Annually
- 2) 12 % P.9. Combounded Continuous
- 3 12% P.9. Elfretive Power
- (4) 12% p.9.

- (1) $100000 (1.06)^2 = 112360$
- 2) 100000×20·12 100000×1·1275 = 112750
- 3 100000 × 1·12 = 112000
- (4) $100000 \times 1.12 = 112000$

PART II Obtion Strategies

- 1) Straddles 4 Strangles —
- 2 8trib& 4 Straps
- 3 Bull & Bearish
- 3 Butterflag

Not In ICAI Module

1 Straddles 4 Strangles

1 Straddlas Strategy

An investor is hoping that wide fladuation in brice of share but he is not sure about movement i.e price goes up er goes down, hence he creates "straddles strategy" In straddle, we buy I call 4 I feet at Same EP on same asset for same maturity period.

EXAMPLE – 14

An investor expects wide fluctuations in one share of R.I.L. but he is unsure, where the movement will be, hence he buys one put and one call at a strike price of ₹700 after paying a premium of ₹35 for put &₹45 for call, having maturity of 2 months each.

Required:-

- (i) Name the Strategy
- (ii) Determine Break-Even points & compute the cost of strategy.
- (iii) Determine the Profit/Loss if the price on maturity is:-550, 600, 650, 700, 750, 800, 850

(Page No.06)

1 Name -> Straddles

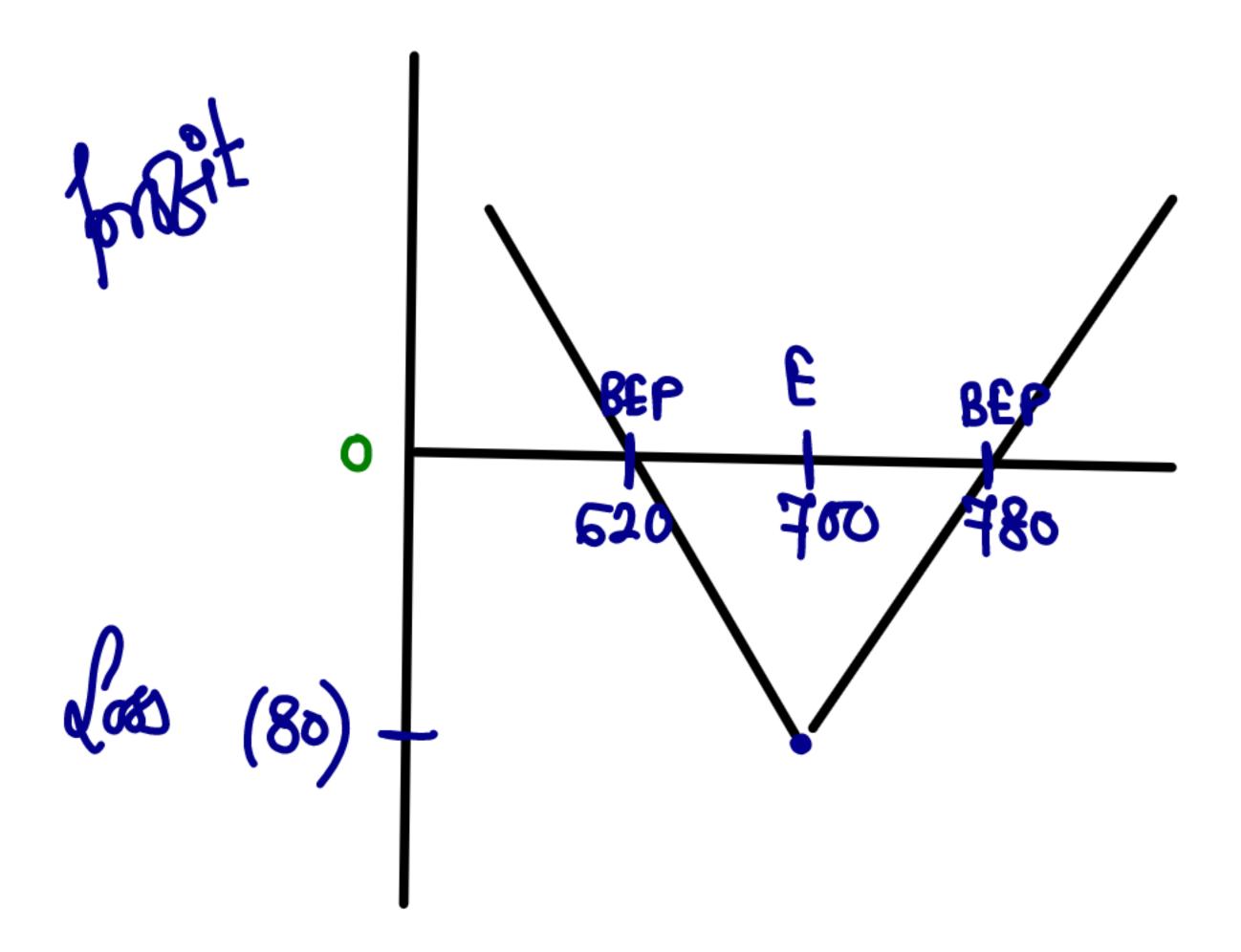
2) Cost of Strategy
= 735+745=780
BEP E 700

① BEP =
$$EP + Cast$$

= $700 + 80 = 780$
② BEP = $EP - Cast$
= $700 - 80 = 620$

(III) Calculation of brofit Loss E 700

MP	Action		Gross Post At		-last		
	cau	· put	Call	put	Cost	Net Payoff	
550	Lause	Exercised	0	150	(80)	70	
600	Labse	//	0	100	(80)	20	
650	lopse	"	0	50	(80)	-30	
700	Labse	Lopsed	0	0	(80)	- 80	
750	-	Laps 09	50	0	(80)	-36	
75° 80°	Ex.	"	100	6	(88)	26	
850	Ex	′/	110	70	(80)	70	
	•	•					
						l	



(ii) Strangles

An govestor is hoping that wide volatility in price of share but he is not sure about movement, hence he creates strangles strategy.

99 Strangles, we buy I call 4 I feet on same asset for same maturity beried at different strike brice. Cost of strangles strategy is less than cost of

straddles.

Shorger EP of Call is more than EP of but.

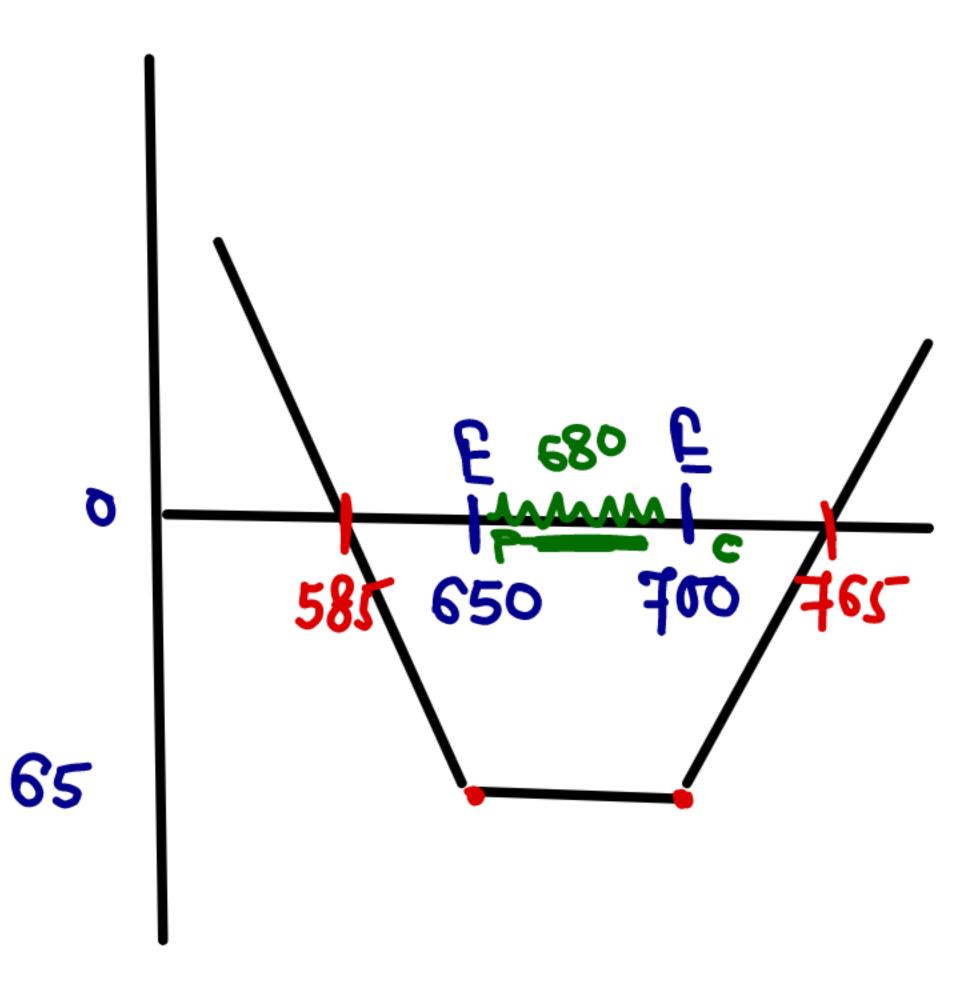
EXAMPLE – 15

Mr. G is expecting wide fluctuations in stock of RIL. He buys one call option at a strike price of ₹700 by paying ₹ 45, along with a put option at a strike price of ₹650 by paying a premium of ₹20.

Required:-

- (i) Name the strategy.
- (ii) Compute the cost of strategy & Break Even Points.
- (iii) Compute the profit/Loss if the price on maturity is-₹500, 550, 600, 650, 680, 700, 750, 800, 850.

(Page No.06)



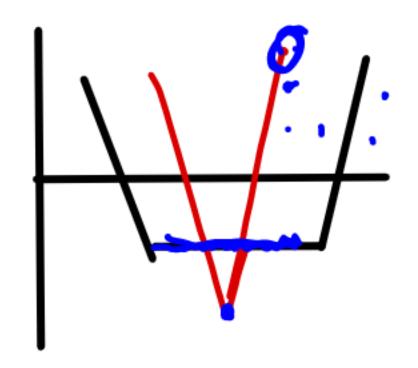
EXAMPLE – 16

Following are the options available for RIL for 3 months.

Exercise Price	Call Option	Put Option
1,000	80	25
1,100	55	40
1,200	35	55

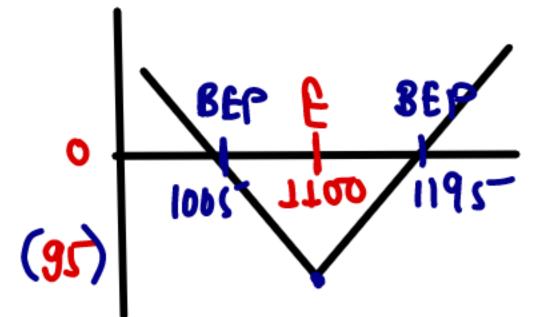
Create Straddles and Strangles Strategy.

(Page No.07)



Straddles

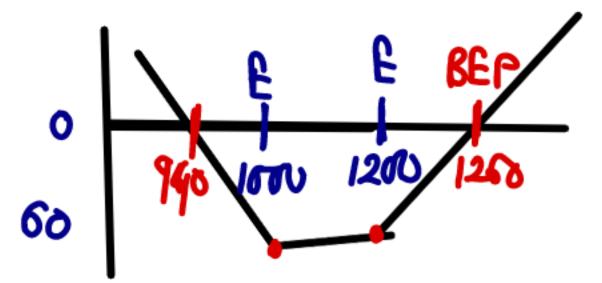
- · Buy call & but 9t E 71100
- · Cost of strategy = 55+40



Strangles

Buy 1 carl at £ 1200 + Buy 1 put at £ 1000

Cost = 25+35=760



QUESTION – 26

Mr. P established the following spread on the Coastal Corporation's stock:

- (i) Purchased one 3-month call option with a premium of ₹ 6.5 and an Exercise price of ₹ 110.
- (ii) Purchased one 3-month put option with a premium of ₹ 10 and an Exercise price of ₹ 90.

Coastal Corporation's stock is currently selling at ₹ 100. Determine profit or loss, if the price of Coastal Corporation's stock:

- (i) Remains at ₹ 100 after 3 months.
- (ii) Falls at ₹ 70 after 3 months.
- (iii) Rises to ₹ 138 after 3 months. Assume the size of option is 1,000 shares of Coastal Corporation.

(RTP May - 2022) (Page No.46)

Call option 4 poil oftion buschared and bood brem'rum 76.504 710 Total bremium bood 716.50 x 1000 ÷ **₹ 165**00 Call abtion Eb = ±710 but optim EP = 7 90 (i) 91 brice on Maturity 7 100 9nthis situation both call of ful obtions will labore Grass Payoff = 5165m £16200

11) 9/ Porice on Maturity is 770 9n this situation call will losse 4 but offin will fxercipe Gross Poyoff (90-70) x 1000 = 20113 16500 (-) prominm 3510 Not Brofit M9f brice on Maturity 7 138 In this situation call will Exorcise 4 but will have ans foyoff (7138-110) X1000 = 28000 Not brafik. 11508

QUESTION – 27

Mr. X established the following strategy on the Delta Corporation's stock:

- (1) Purchased one 3-month call option with a premium of ₹ 30 and an exercise price of ₹ 550.
- (2) Purchased one 3-month put option with a premium of ₹ 5 and an exercise price of ₹ 450.

Delta Corporation's stock is currently selling at ₹ 500.

CALCULATE profit or loss, if the price of Delta Corporation's stock:

- (i) remains at ₹ 500 after 3 months.
- (ii) falls at ₹ 350 after 3 months.
- (iii) rises to ₹ 600.

Assume the option size is 100 shares of Delta Corporation.

(MTP April – 2022, SM & PM) (Page No.48)



H-W)

QUESTION - 28

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

- (i) Purchased one 3-month out option with a premium of ₹15 and an exercise price of ₹ 900.
- (ii) Purchased one 3-month call option with a premium of ₹ 90 and an exercise price of₹1100.

TTK Ltd.'s stock is currently selling) at ₹1000. Calculate gain or loss, if the price of stock of TTK Ltd. –

- (i) Remains at ₹1000 after 3 months.
- (ii) Falls to ₹700 after 3 months.
- (iii) Raises to ₹1200 after 3 months.

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

(Exam May - 2019) (Page No.49)

QUESTION – 29

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.

(Exam <u>May - 2018</u>)

(Page No.50)

QUESTION - 30

Mr. A purchased a 3 month call option for 100 shares in XYZ Ltd. at a premium of $\stackrel{?}{\sim}$ 30 per share, with an exercise price of $\stackrel{?}{\sim}$ 550. He also purchased a 3 month put option for 100 shares of the same company at a premium of $\stackrel{?}{\sim}$ 5 per share with an exercise price of $\stackrel{?}{\sim}$ 450. The market price of the share on the date of Mr. A's purchase of options, is $\stackrel{?}{\sim}$ 500. Calculate the profit or loss that Mr. A would make assuming that the market price falls to $\stackrel{?}{\sim}$ 350 at the end of 3 months.



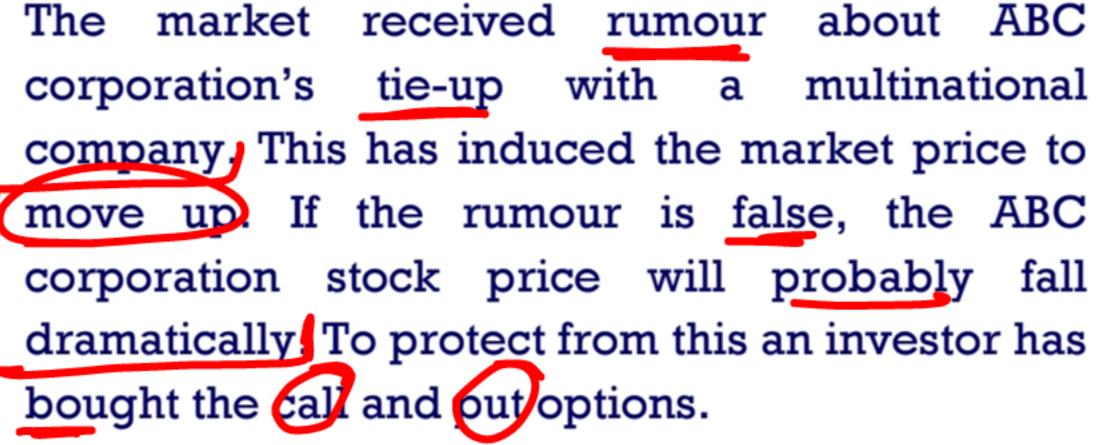
(SM New Syllabus & PM)

(Page No.50)

QUESTION - 31

(ii)

41-3=1



He purchased one 3 months call with a striking price of ₹ 42 for ₹ 2 premium, and paid ₹1 per share premium for a 3 months put with a striking price of ₹ 40.

- (i) Determine the Investor's position if the tie up offer bids the price of ABC Corporation's stock up to ₹ 43 m 3 months.
 - Determine the Investor's ending position, if the tie up program me fails and the price of the stocks falls to ₹ 36 in 3 months.

(SM New Syllabus & PM)

(Page No.51)

QUESTION – 33

Fresh Bakery Ltd.'s share price has suddenly started moving both upward and downward on a rumour that the company is going to have a collaboration agreement with a multinational company in bakery business. If the rumour turns to be true, then the stock price will go up but if the rumour turns to be false, then the market price of the share will crash. To protect from this an investor has purchased the following call and put option:

- a) One 3 months call with a striking price of ₹ 52 for ₹2 premium per share.
- b) One 3 months put with a striking price of ₹ 50 for ₹ 1 premium per share.

Assuming a lot size of 50 shares, determine the followings:

- (i) The investor's position, if the collaboration agreement push the share price to ₹53 in 3 months.
- (ii) The investor's ending position, if the collaboration agreement fails and the price crashes to ₹ 46 in 3 months time.





CMP 7132 EP ₹1501 =.0

QUESTION – 06

You as an investor had purchased a 4 month call option on the equity shares of X Ltd. of ₹ 10, of which the current market price is ₹ 10 and the exercise price ₹ 150. You expect the price to range between ₹ 120 to ₹ 190. The expected share price of X Ltd. and related probability is given below:

	D		161	B	K.	140
Expected Price (₹)		140	160	18	30	190
Probability	0.05	0.20	0.50	0.	10	0.18

COMPUTE:

- (i) Expected Share price at the end of 4 months.
- (ii) Value of Call Option at the end of 4 months, if the exercise price prevails.
- (iii) In case the option is held to its maturity, what will be the expected value of the call option?

(MTP March – 2022, SM New Syllabus & PM) (Page no.16)

PART III obtion bricing & Valuation

- 1) In this topic, we calculate value of option 4 compare with Actual premium Amount 4 decide whether officen should be burchased or not?
 - · 97 Value of oftion > premium > Underpriced Buy
 - · 97 Value of obtion < premium > Overbriced Not Buy seed

There are three methods for Valuation
Model I Binomial Model
Model II but Call barity
Model II Black Scholes Model (BSM)

Model I Binomial Model

As the name suggested, there are only Two bossible brice on maturity. One is more than CMP 4 one is There are three approaches to calculate Value of obtion as ber Binomial Model. IMP-(1) Risk Noutral probability Approach Same
(2) Delta Hedging (1) × (3) Replicating boostfolio Applach

1 Risk Neutral brobability Armach

following steps are applied to conculate value of option

Step 1 Calculate Risk Neutral brobability

$$P = \frac{R - d}{u - d}$$

Step 2 Draw Binomial Tree.

Step 3 Calculate Value of obtion



·2500

EXAMPLE - 07

Current market price = ₹500

Exercise Price = ₹510

Period = 1 year

Risk free rate = 10% p.a.

Price on maturity

Maximum price = ₹600

Minimum Price = ₹ 400

Calculate Value of call option as per binomial model.

(Page No. 03)

$$500 \times 1.10 = (500 \times 1.20 \times P) + 500 \times 0.8 (1-P)$$

$$500 \times 1.10 = 500 \times 1.20 \times P + 500 \times 0.8 - 500 \times 0.8 \times P$$

$$500 \times 1.10 - 500 \times 0.8 = P(500 \times 1.20) - (500 \times 6.8)$$

$$\frac{500 \times 1.10 - 500 \times 0.8}{500 \times 1.20 - 500 \times 0.8} = P = \frac{1.10 - 0.8}{1.20 - 0.8}$$

Step 1 Calculation of Risk neutral probability

$$P = \frac{R - d}{u - d}$$

$$K = \frac{1.10}{2500} = 1.2$$

$$d = \frac{5400}{5500} = 0.8$$

$$P = \frac{1.10 - 0.8}{1.20 - 0.8} = 0.75$$

Step 2 Binomial Tree

$$7500$$
 0.75
 $Cu = 790$
 $Cd = 0$

Stop 3 Value of Call

$$C_0 = \frac{C_0 P + C_0 (1-P)}{R} = \frac{(90 \times 0.75) + (0 \times 0.25)}{1.10}$$
 $= 761.36$

EXAMPLE - 08

Current market price = ₹ 1000

Exercise Price = ₹1100

Period = 6 months

Price on maturity

Upper price = ₹ 1300

Lower Price = ₹900

Calculate Value of Call option if

Risk free rate

Case 1-8% p.a. compounded semi annually

Case 2 - 8% p.a. compounded annually

Case 3 - 8% p.a. compounded continuously

(Page No. 03)

Case 1 8 % P.a. Compounded Semi.

$$R = L + (0.08 \times \frac{6}{12})$$

= 1.04

$$U = \frac{1300}{1300} = 1.30$$

$$d = \frac{900}{1000} = 0.90$$

step 1 Risk Neutral probability

$$P = \frac{R - d}{4 - d} = \frac{1.04 - 0.90}{1.30 - 0.90}$$

Step 2 Binomial Tree
$$E = 1100$$
?

 0.315
 0.35
 0.35
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Case 2 8% P.a. Compounded Annually Effective J

$$R = (1.08)^{12} = 1.0392$$

$$u = 1.30 d = 0.90$$

Step 1 Risk Neutral Brobability

$$P = \frac{1.0392 - 0.90}{1.30 - 0.90} = 0.3480$$

Step 2 RinoMial Tree

$$0.348$$
 0.348
 0.348
 0.652
 0.652
 0.652
 0.652

Step 3 Value

$$C_0 = \frac{(200 \times 0.3480) + (0 \times 0.652)}{1.0392}$$

Case-3 8% P.9. Combounded Continuous

$$R(e^{\gamma t}) = e^{(0.08 \times \frac{6}{12})}$$

$$= e^{0.04} = 1.0408$$

$$U = 1.30, d = 0.90$$

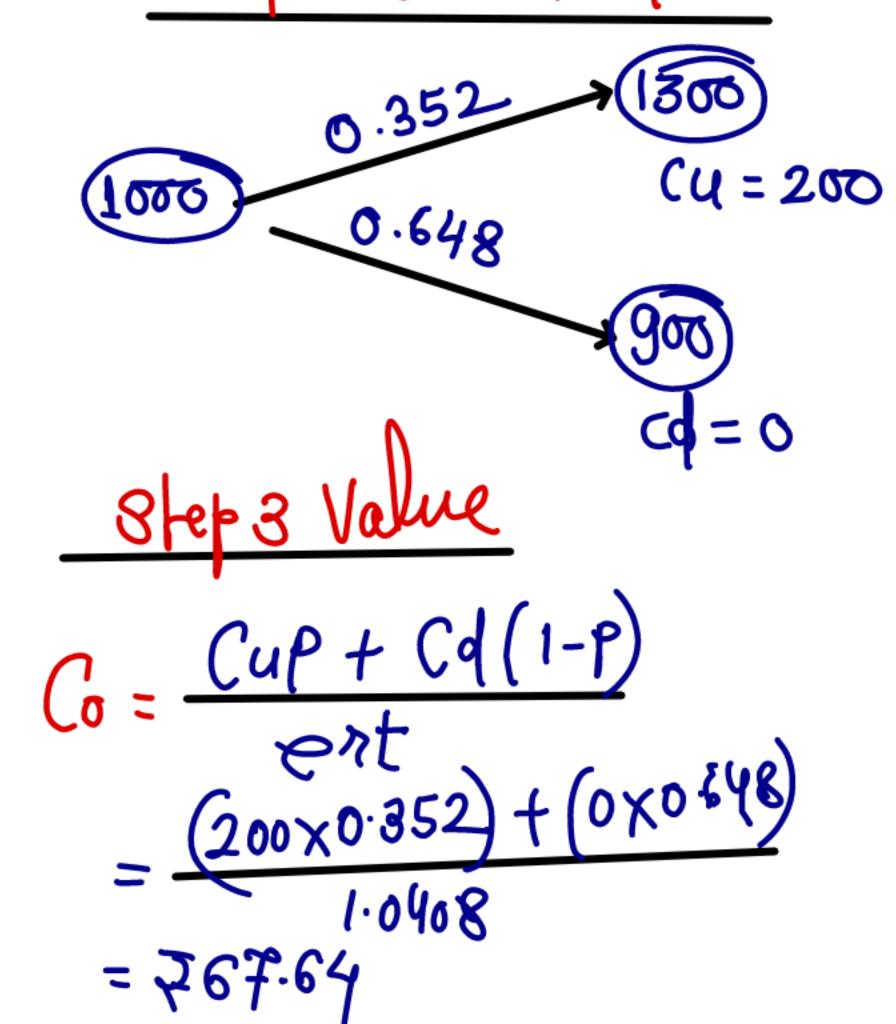
Step 1 Risk Neutral brobability

$$P = \frac{e^{ht} - d}{4 - d}$$

$$= \frac{e^{ht} - d}{1.30 - 0.90}$$

$$= \frac{1.0408 - 0.90}{1.30 - 0.90} = 0.3520$$

Step 2 Binomial Tree



EXAMPLE - 09

Current market price = ₹500

Exercise Price = ₹530

Period = 3 months

Risk free rate = 12% p.a. effective

Price on maturity

Maximum price = ₹600

Minimum Price = ₹ 400

Calculate Value of put option as per binomial model.

(Page No. 04)

E = 2301 0.5418

Step 3 Value of but

= 754.11

$$P_0 = \frac{PuP + Pd(1-P)}{R}$$

$$= \frac{(0 \times 0.5718) + (130 \times 0.4288)}{1.0287}$$

QUESTION – 09

The current market price of an equity share of Penchant Ltd is ₹ 420. Within a period of 3 months, the maximum and minimum price of it is expected to be ₹ 500 and ₹ 400 respectively. If the risk free rate of interest be 8% p.a. what should be the value of a 3 months Call option under the "Risk Neutral" method at the strike rate of ₹ 450?

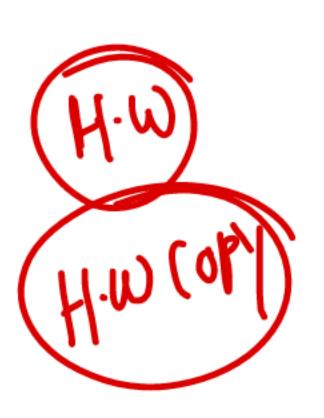
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Given $e^{0.02} = 1.0202$

(SM New Syllabus & PM)
(Page No. 19)

QUESTION - 10

The current market price of an equity share of Eagle Ltd is ₹ 950. Within a period of 3 months, the maximum and minimum price of it is expected to be ₹ 1,000 and ₹ 900 respectively. If the risk free rate of interest be 8% p.a.



COMPUTE the value of a 3 months Call option under the "Risk Neutral" method at the strike rate of ₹ 980.

Given $e^{0.02} = 1.0202$

(MTP: Sep – 2022)

(Page No. 20)

QUESTION – 11

Sumana wanted to buy shares of Ell which has a range of ₹ 411 to ₹ 592 a month later. The present price per share is ₹ 421. Her broker informs her that the price of this share can sore up to ₹ 522 within a month or so, so that she should buy a one-month CALL of ElL. In order to be prudent in buying the call, the share price should be more than or at least ₹ 522 the assurance of which could not be given by her broker.

Though she understands the uncertainty of the market, she wants to know the probability of attaining the share price ₹ 592 so that buying of a one-month CALL of EIL at the execution price of ₹ 522 is justified. Advice her. Take the risk-free interest to be 3.60% and $e^{0.036} = 1.037$.

(SM New Syllabus& PM)

(Page No. 21)

Given $R = e^{ht} = e^{0.036} = 1.037$ $U = \frac{592}{421} = 1.406$ $d = \frac{411}{421} = 0.976$

$$P = \frac{e^{7}t - d}{4 - d}$$

$$= \frac{1.037 - 0.976}{1.406 - 0.976} = \frac{1.406 - 0.976}{1.406 - 0.976}$$

$$= \frac{0.1419}{0.1419}$$

QUESTION – 12

ABC Ltd. share price as on date is ₹200. 6 months from now it is expected that the share price will be ₹178 or the price will be ₹214 per share. A call option of the share can be exercised at the end of six months at exercise price of ₹205 per share. The risk free interest rate is 10% p.a. (i.e. 5% for 6 months). Compute the value of call option per share.

 $H \cdot \omega$



(Page No. 21)

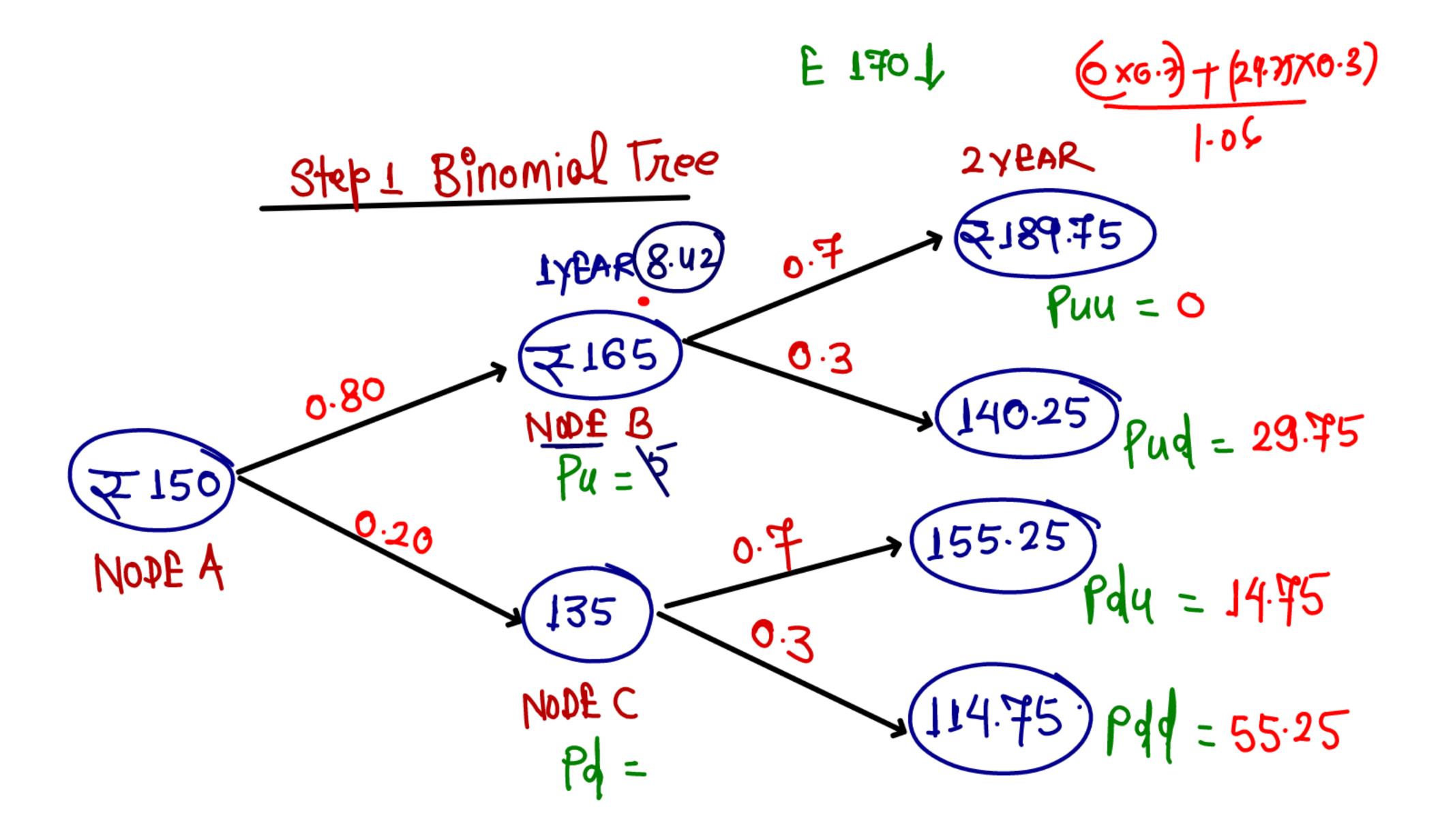
EXAMPLE – 10

The stock of a company is currently quoted in the market at ₹150. The price of the stock is expected to go up or down by 10% in next one year and by 15% in the second year. The risk-free interest rate in the economy is 6%.

Required:

Using two-step Binomial Model, find out the price of a 2-year American put option on the company's stock with strike price of ₹ 170.

(Page No. 04)



Step 2 Risk Neutral brobability

$$R = 1.06 \qquad U = 1.10 \qquad d = 0.90$$

$$P = \frac{R - d}{4 - d} = \frac{1.06 - 0.90}{1.10 - 0.90} = 0.8$$

$$R = 1.06$$
 $4 = 1.15$ $q = 0.85$

$$P = \frac{1.06 - 0.85}{1.15 - 0.85} = 0.7$$

Step 3 Value of option

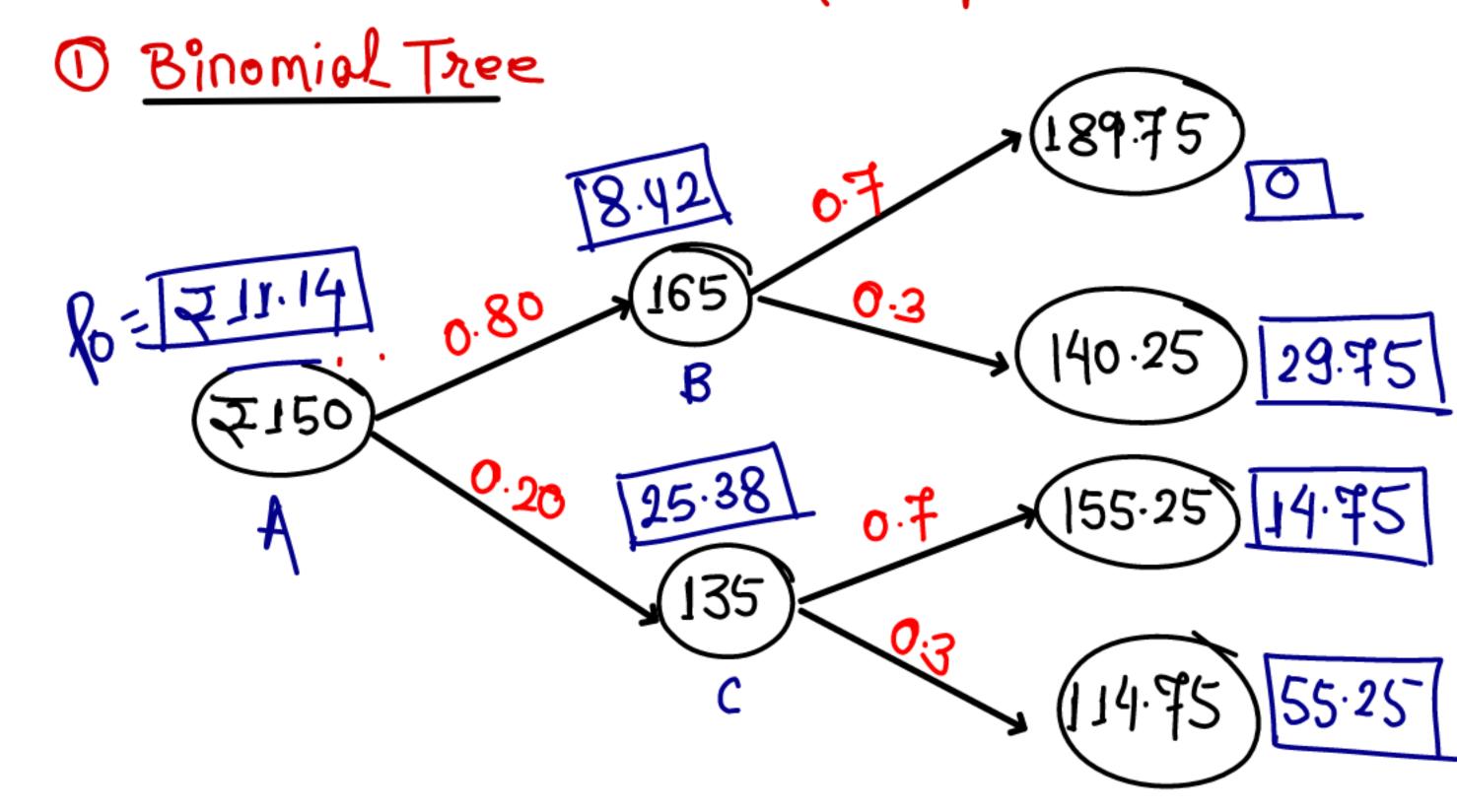
PNODE B

PNOTE Expected payoff =
$$\frac{(0 \times 0.7) + (29.75 \times 0.3)}{1.00} = 8.42$$

Thrungic value at node B = $170 - 165 = 75$

Value of option at Node B [$\frac{1}{3}$ $\frac{1}$

· Assume obtion is Eurobean



Value of oftion

Two beriod Binomial Model

In two period Binomial Model, we divide option contract in two period & calculate value of option for each node using Backward calculation.

Special care is required in American oftion. In this value of oftion should be Higher of two

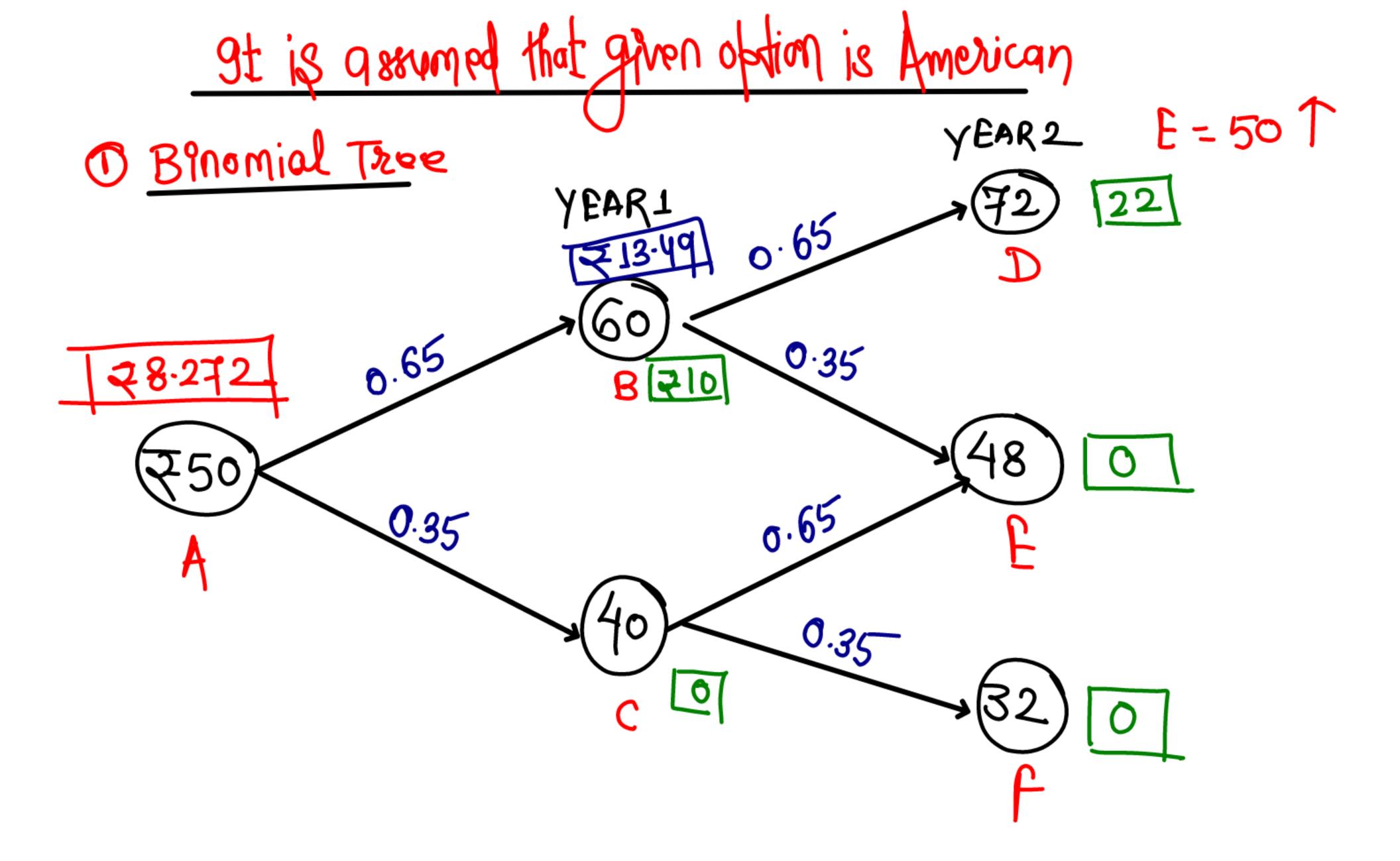
- 1. P.V. of Experted Gross Payolk
- 2. Intrinsic Value 9t that node

No Such type of cross check is negligible in European obtion.

QUESTION – 14

Consider a two-year call option with a strike price of ₹ 50 on a stock the current price of which is also ₹ 50. Assume that there are two time periods of one year and in each year the stock price can move up or down by equal percentage of 20%. The risk-free interest rate is 6%. Using binominal option model, calculate the probability of price moving up and down. Also draw a two-step binomial tree showing prices and payoffs at each node.

(SM New Syllabus & PM) (Page No. 24)



Risk Neutral probability

$$R = 6\% \qquad U = 1.20 \qquad d = 0.80$$

$$P = \frac{R - d}{4 - d} = \frac{1.06 - 0.80}{1.20 - 0.80} = 0.65$$
Value of obtim
$$\frac{(22 \times 0.65) + (0 \times 0.35)}{(0 \times 0.35)} = 0.13.49$$

NODE B =
$$\frac{(22 \times 0.65) + (0 \times 0.35)}{1.06} = 7.3.49$$
P.V. of Experted Payoff = 7.13.49
Intringic Value = 7.10
Value of obtion at Node B (Fligher) = 7.13.49

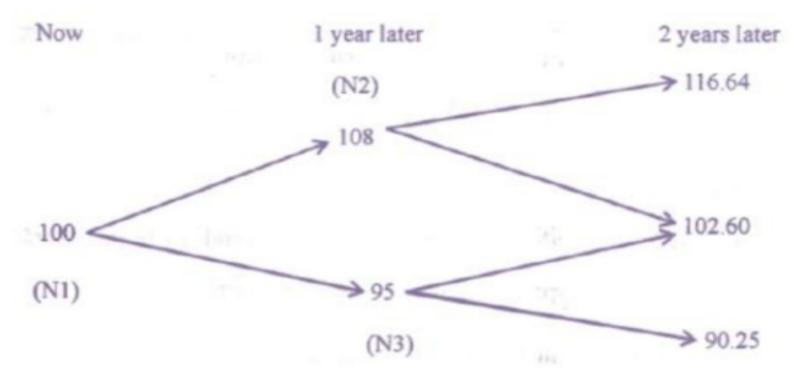
Note A =
$$(7.3.49 \times 0.65) + (0 \times 0.35) = 7.8.27$$

T. Value = $50-50=0$

Hence Value of Call obtion Today is 78.272

OUESTION – 13

A two year tree for a share of stock in ABC Ltd., is as follows:



Consider a two years American call option on the stock of ABC Ltd., with a strike price of $\stackrel{?}{_{\sim}}$ 98. The current price of the stock is $\stackrel{?}{_{\sim}}$ 100. Risk free return is 5 per cent per annum with a continuous compounding and e0.05 = 1.05127. Assume two time periods of one year each.

Using the Binomial Model, calculate:

- (i) The probability of price moving up and down;
- (ii) Expected pay offs at each nodes i.e. N1, N2 and N3 (round off upto 2 decimal points).

(Exam Nov - 2020) (Page No. 23)

(T) Risk Neutral brobability

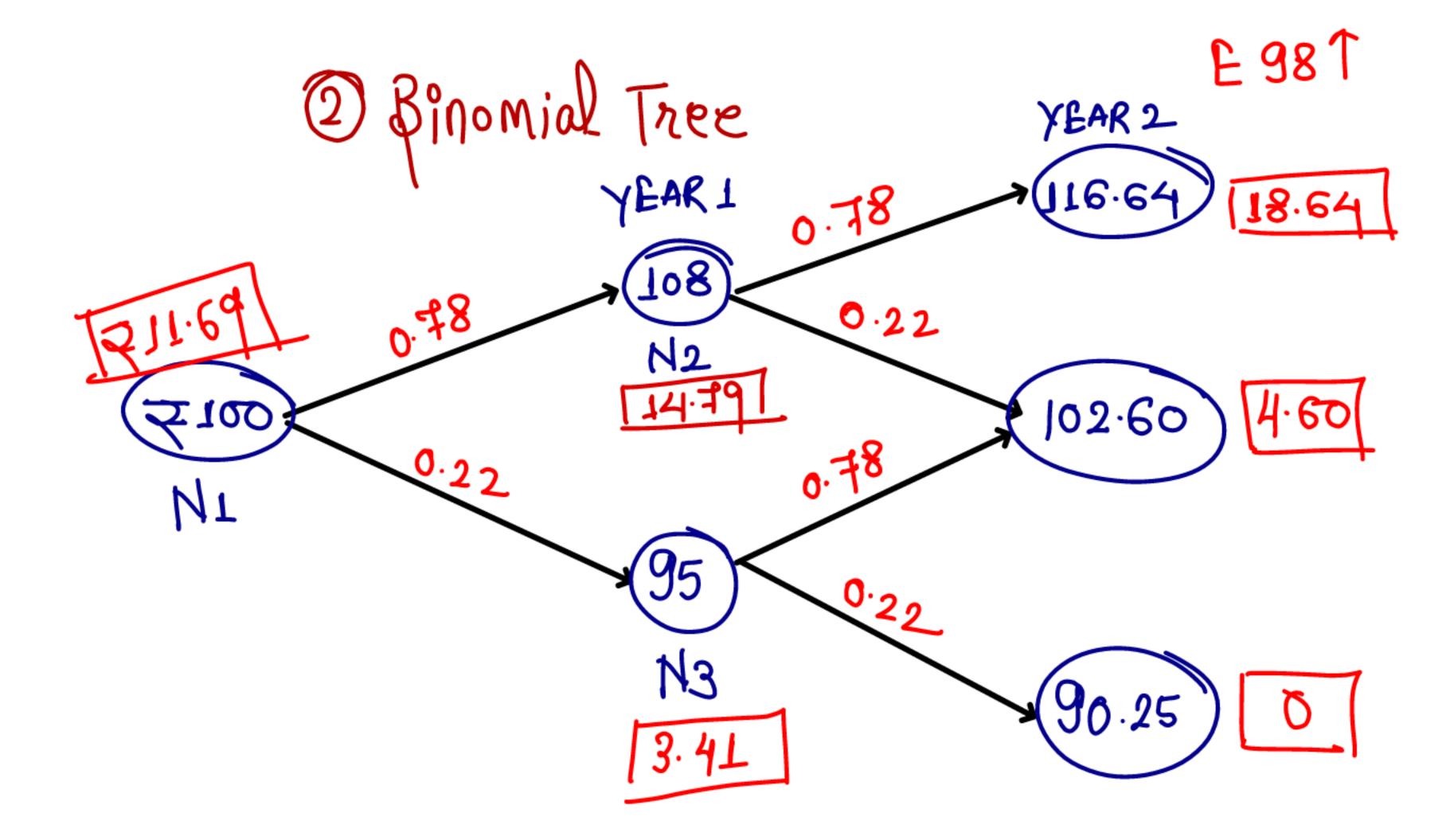
$$P = \frac{e^{rt} - d}{u - d}$$

$$e^{\eta t} = e^{0.05} = 1.05127$$

$$4 = \frac{108}{108} = 1.08$$

$$d = \frac{95}{100} = 0.95$$

$$P = \frac{1.05127 - 0.95}{1.08 - 0.95}$$



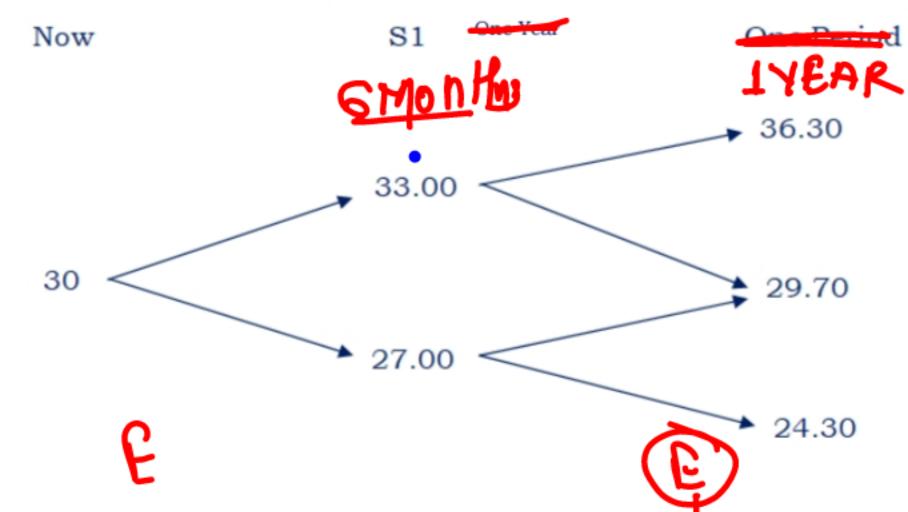
Value of obtion

N1 P.V. = (14.79 × 0.78) + (3.41 × 0.22) = 7 11.69 T. Value = 7 2 Aprile Value of Call oftim Today is 7 11.69



QUESTION – 15 ✓

Following is a two-period tree for a share of stock in CAB Ltd.:



Using the Binomial model, calculate the current fair value of a regular call option on CAB Stock with the following characteristics X = ₹ 28, Risk Free Rate = 5 % p.a. (effective). You should also indicate the composition of the implied riskless hedge portfolio at the valuation date.

(Page No. 25)

Approach II Delta Hedging or Risk free partiolio (77143) JYEAR. 1200 ₹100 E = 41700 <u>र 1000</u> হা 4০০ ₹100 Call obtion Rf = 12% P.9. (280)Step 1 Calculation of delte E change in value of obtion with respect to change in price of stock T Delta = 1 stock price of \$1-52 100-0 = 0.25 1200-800 Combination -> Write I Call & Buy 0.25 share today

Step 2 Calculation of Cash Inflows On Maturity & price is 7 1200 Call Exercise -100 Self share (1200 × 0.25) + 300 200 I price is = 800 Call lapse Self share (800 x0.78) 1200 200 $C_0 = S_0 \times \Delta - \frac{CL}{142}$ = $1000 \times 0.95 - \frac{200}{1.12} = 71.43$

EXAMPLE - 11

Current market price **=** ₹ 450

Exercise Price **=** ₹ 485

Period = 1 year

= 10% p.a. Risk free rate

Price on maturity

Maximum price ₹ 585

= ₹385 Minimum Price

Calculate: Value of call option

- (i) Using Delta hedging.
- (ii) Using Risk Neutral Probability Approach
- (iii) Using Replicating Portfolio Approach

(1) Delta Hedgi Calculation of Delta = 100-0 585-385 = 0.5 Combination > Write 1 call f Buy 0.5 share Today. Step 2 Calculation of Cash Inflows m price 385 1) brice 7 585 Call lapse (Page No. 11) Bell shall 299.50 Sell shall (385 xo.s) 192.50

Step 3 Value of Call

$$C_0 = S_0 \times \Delta - \frac{CI}{1+IL}$$

$$= 450 \times 0.5 - \frac{192.50}{1.10}$$

$$= 750$$

QUESTION – 16

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:

- (i) If the investor wants a perfect hedge, what combination of the share and option should he select?
- (ii) Explain how the investor will be able to maintain identical position regardless of the share price.
- If the risk-free rate of return is 5% for the (iii) three months period, what is the value of the option at the beginning of the period?

What is the expected return on the option? (1V)

(Exam Nov - 2019) (Page No. 27)

(1) Combination of shares & obtion

$$\mathcal{D}eltq = \frac{C_1 - C_2}{\$_1 - \$_2}$$

$$= \frac{106 - 0}{650 - 450} = 0.5$$

Write I call of Buy 0.5 share bosition (CI) on Malwity

(2) positivit (C+) of flavory
(2) positivit (C+) of flavory
(3) price =
$$\frac{2650}{2650}$$
 (1) 9f price = 450
(4) Coll labelle

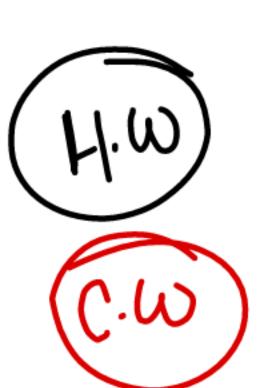
(III) Value of Call

$$C_0 = S_0 \times A - \frac{CI}{1+1}$$

$$= 500 \times 0.50 - \frac{225}{1.05}$$

(iv) Expected Return on obtion

Expected Value of oftion



QUESTION - 17

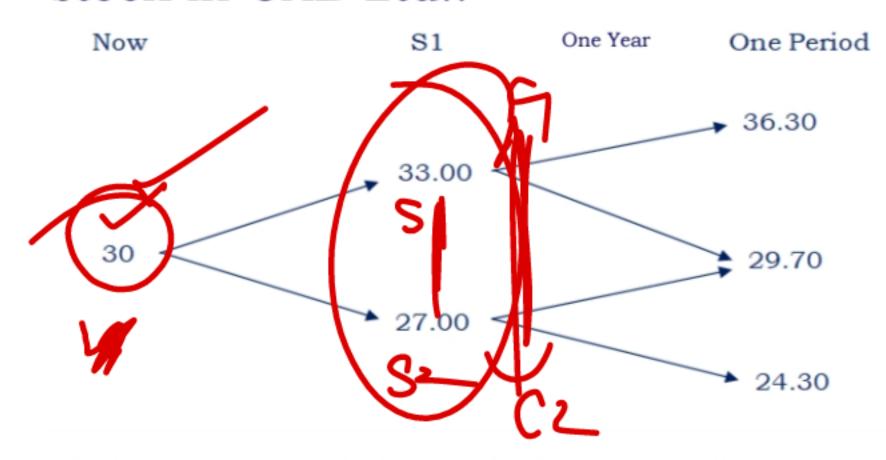
Mr. Dayal is interested in purchasing equity shares of ABC Ltd. which are currently selling at ₹ 600 each. He expects that price of share may go upto ₹ 780 or may go down to ₹ 480 in three months. The chances of occurring such variations are 60% and 40% respectively. A call option on the shares of ABC Ltd. can be exercised at the end of three months with a strike price of ₹ 630.

- (i) What combination of share and option should Mr. Dayal select if he wants a perfect hedge?
- (ii) What should be the value of option today (the risk free rate is 10% p.a.)?
- (iii) What is the expected rate of return on the option?

(SM New Syllabus & PM) (Page No. 28)

QUESTION - 15

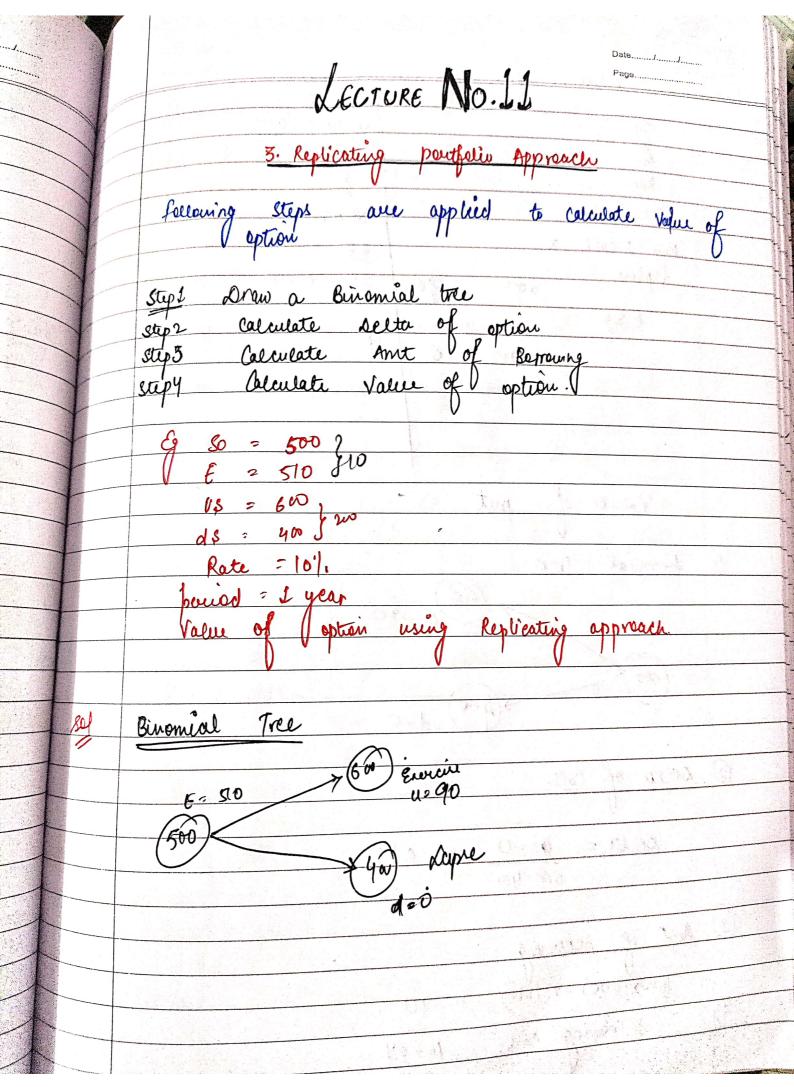
Following is a two-period tree for a share of stock in CAB Ltd.:

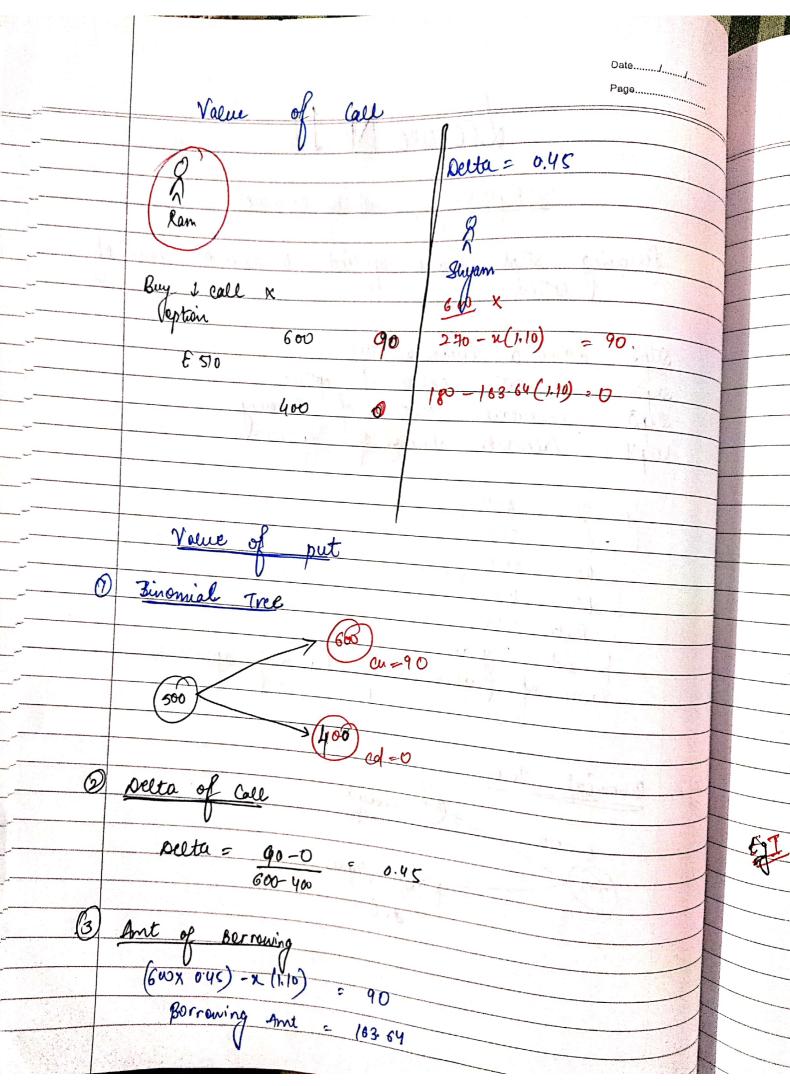


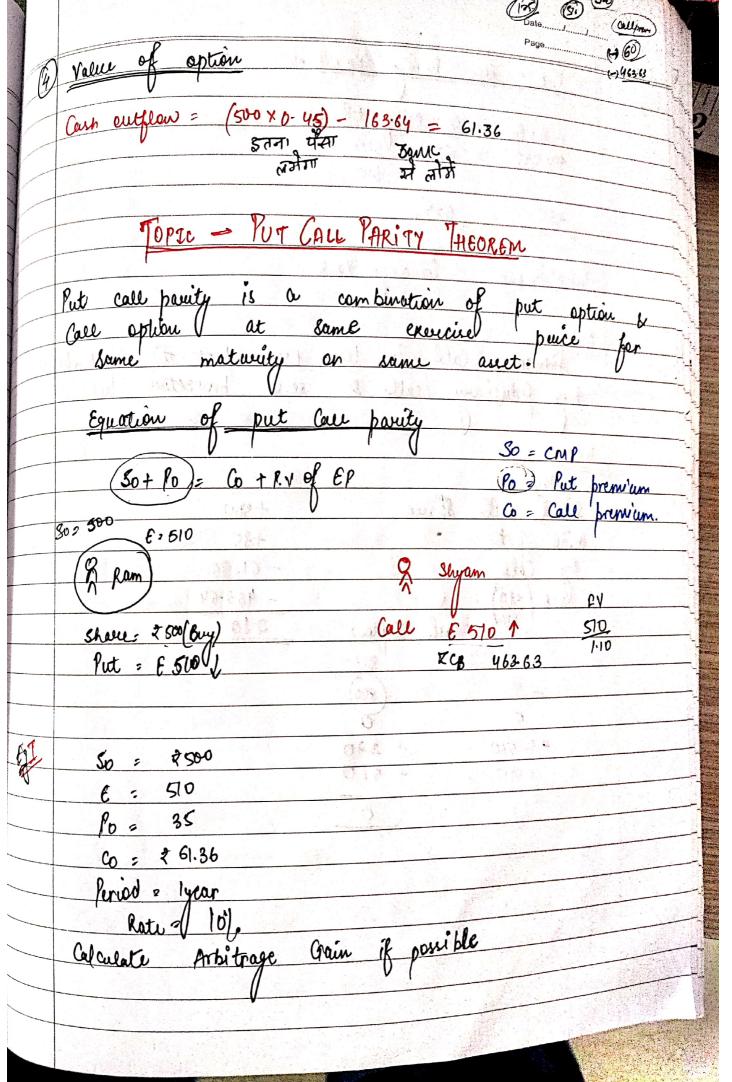
Using the Binomial model, calculate the current fair value of a regular call option on CAB Stock with the following characteristics: X = 3.8 Risk Free Rate = 5 % p.a. (effective).

You should also indicate the composition of the implied riskless hedge portfolio at the valuation date.

(Page No. 27)



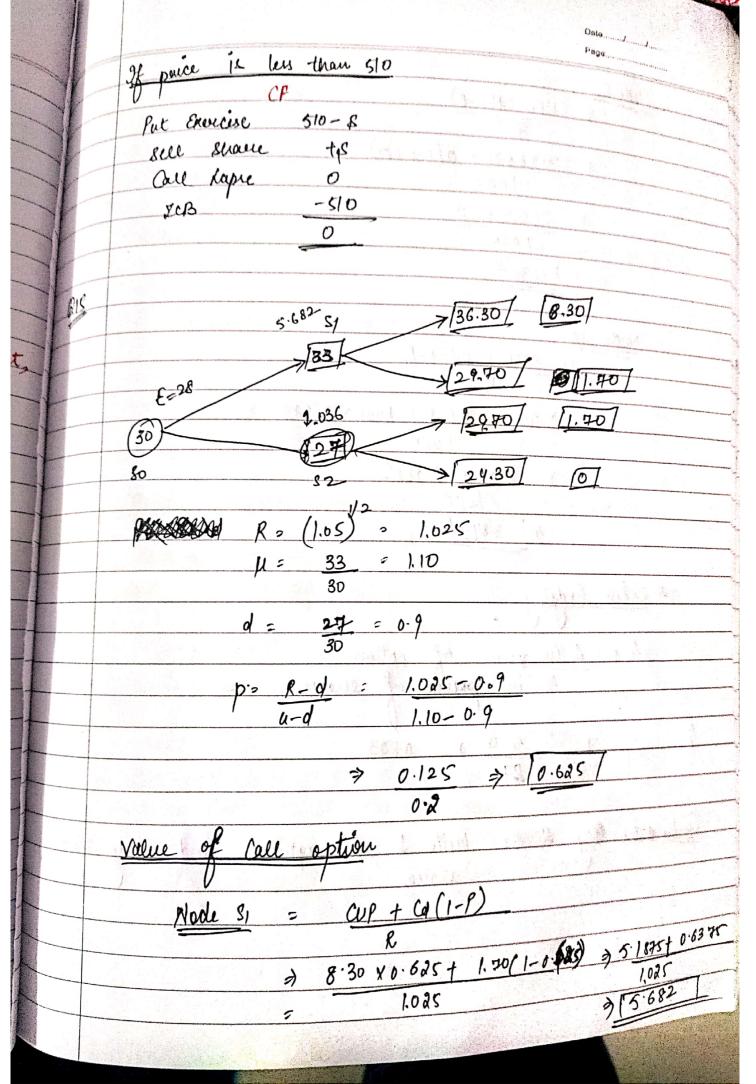


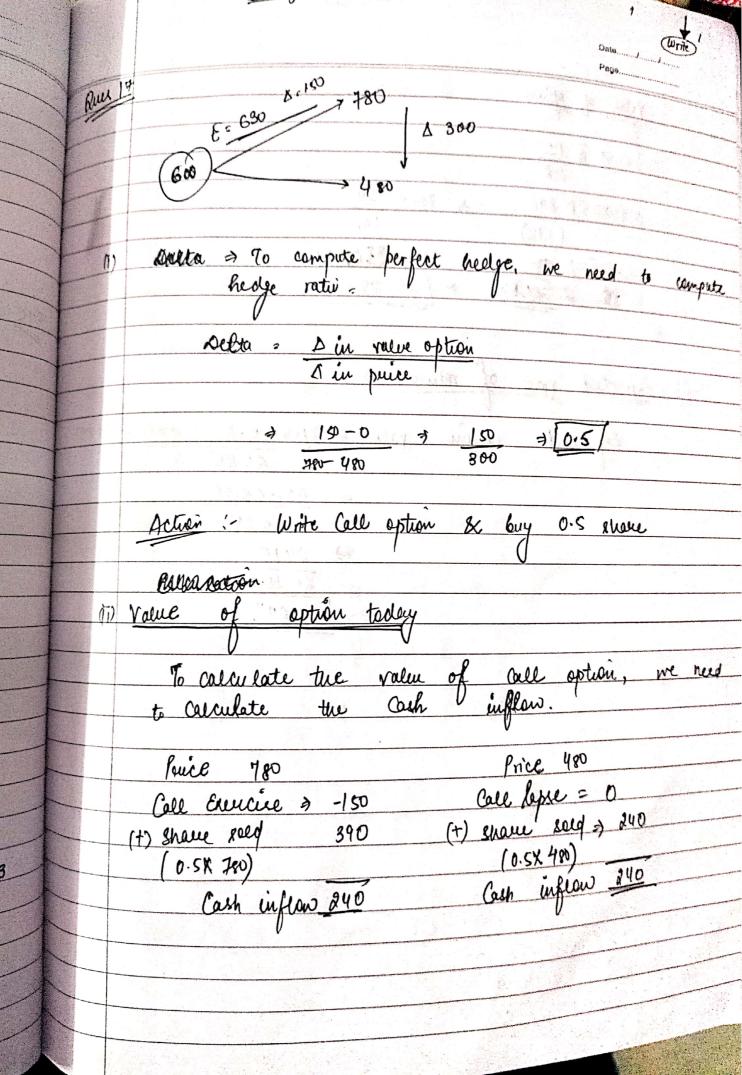


				Page
	Put Call P	mily Equation		
	500 + 35 = 61.	1.10 EP		
	535 = 52		74 94 129 1	4
	Protective put	iduciony call	a mend	
	Fiduciary Call Buy fither any	. 10	han protective	put, hence
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QUESTION - 18

The following quotes are available for 3 months options in respect of a share of P Ltd. which is currently traded at ₹310:

Strike price ₹ 300

Call option ₹ 30

Put option ₹ 20

An investor devises a strategy of buying a call and selling the share and a put option.

- (i) Draw his profit/loss profile if it is given that the rate of interest is 10% per annum.
- (ii) What would be the position if the strategy adopted is selling a call and buying the put and the share? ($e^{0.025} = 1.0253$; $e^{0.25} = 1.2840$)

(Page No. 29)

put Call foarity.

So the = Co +
$$\frac{1}{20}$$

Solution

1 Calculation of profit or Loss

Strategy -> Buy call & ZCB . Sell share & but

Cash flows Today

Buy call -30 ZCB Buy [300] -292.60 short see share +310 +20 write but

Asbitrage Gain = 7-7.40

Cakulation of boyoff on Moduly

	\$<300	\$ \ \$
Call	0	Ş-300
ZCB	300	300
Buy share	-\$	-2
but	- (300 - S)	0
	0	0

- · Sell Call 4 ZcB
 Buy share 4 put

Today Cash flows

Write call +30 +297.50 self LCB -310 Buy share

Calculation of payoff on Malwity

	\$ \\	\$>300
Call	O	—(\$-300)
ZCB	-300	—3 ₆₀
Self share	+8	+ &
but	+300-2	0
	0	0

3. Black Scholes Model (BSM)

Following steps are applied to calculator value of obtion

Step 1 Calculate de 1 4 de

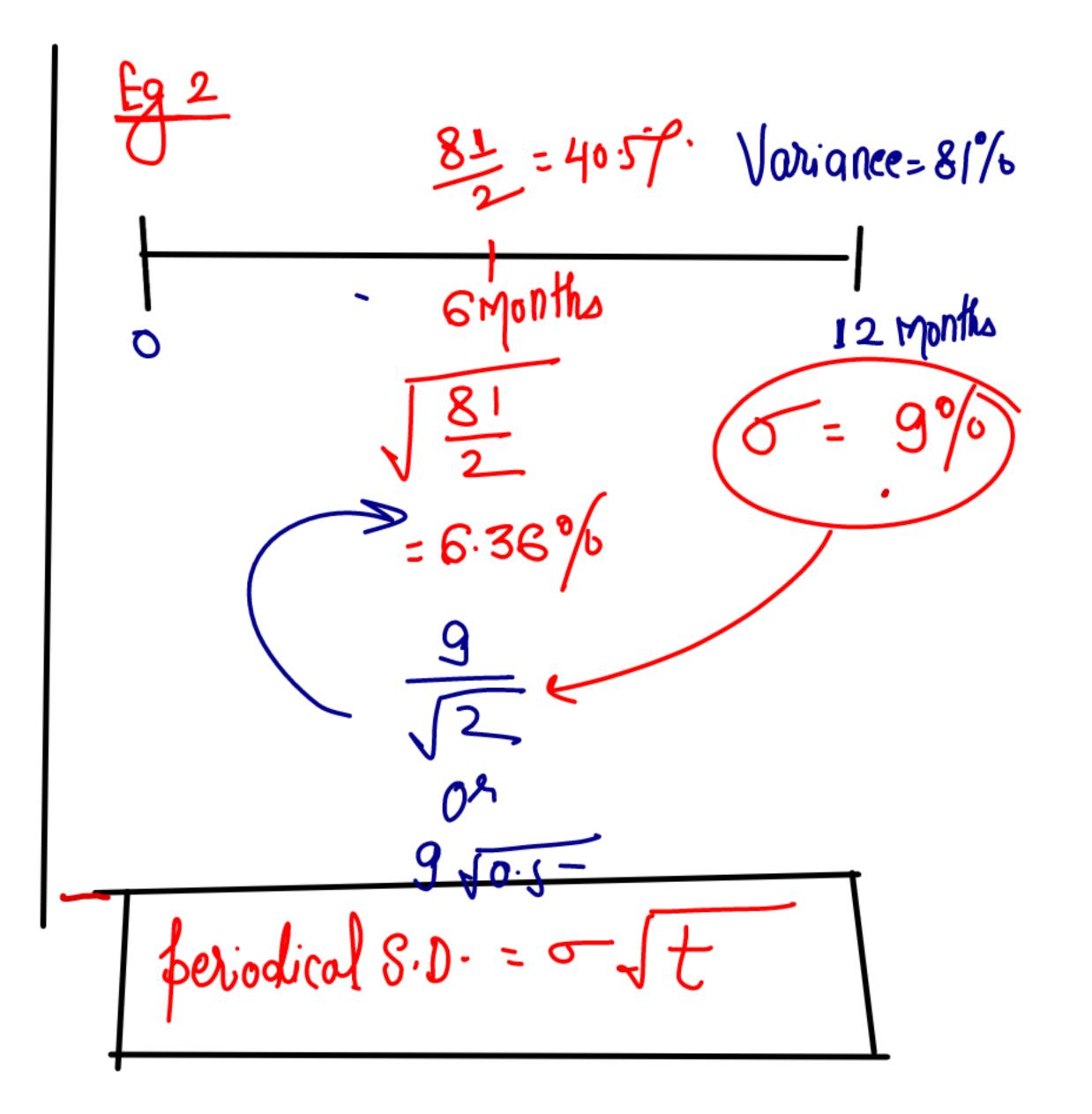
$$d_{L} = \frac{\ln \frac{s_{0}}{e} + \left(n + \frac{\sigma^{2}}{2}\right)t}{\sigma \sqrt{t}}$$

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

Step 2 Calculate n(d1) 4 n(d2)

Step 3 Calculate Value of obtion $Co = Sol(1) - \left(\frac{E}{ext}\right) n(d_2)$ $P_0 = \left(\frac{E}{ext}\right) (-d_2) - \left(\frac{E}{ext}\right) n(-d_1)$





QUESTION – 19

From the following data for certain stock, find the value of a call option:

Price of stock now 50

= ₹80

Exercise price

= ₹75

Standard deviation of continuously compounded

annual return

= 0.40

Maturity period + 50.5

= 6 months

Annual interest rate /

= 12%

Given

Number of S.D. from Mean, (z) Area of the left or right (one tail)

0.25

0.4013

0.30

0.3821

0.55

0.2912

0.60

0.2743

 $e^{0.12 \times 0.5} = 1.062$

In 1.0667= 0.0646

(SM New Syllabus & PM) (Page No. 31)

Calculation of Value of Call oftion

$$C_0 = (S_0) \times n(d_1) - (\frac{E}{e^{n_1}}) \times n(d_2)$$

$$= 780 \times 0.4199 - \frac{75}{60.12} \times 0.5 \times 0.6)76$$

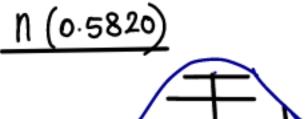
$$= 57.58 - \frac{75}{1.062} \times 0.617$$

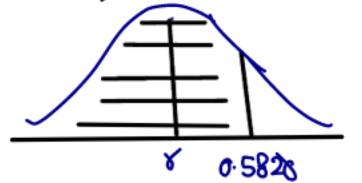
$$\frac{W.N.1. \text{ Calculation of } d_1 \cancel{4} d_2}{d_1 = \frac{\ln \frac{80}{E} + (n + \frac{\sigma^2}{2})t}{\sigma \sqrt{t}} \qquad d_2 = d_1 - \sigma \sqrt{t} \\
= \frac{\ln \frac{80}{75} + (0.12 + \frac{0.40}{2}) \cdot 5}{\ln \frac{80}{75} + (0.12 + \frac{0.40}{2}) \cdot 5} \qquad \frac{W.N.2. \text{ Calculation of } n(d_1) \cancel{4} n(d_2)}{n(0.5820)}$$

$$= \frac{\ln 1.0667 + 0.10}{0.2828}$$

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

$$= 0.5820 - 0.2828 = 0.2992$$





$$0.2912 - \left(\frac{0.0169}{0.05^{-1}} \times 0.032\right)$$

$$= 0.2803$$

$$\frac{dy 4189}{1(d1)} = 1 - 0.2863$$

$$= 0.7197$$

$$\frac{N(d_2)}{N(0.2992)}$$

$$\frac{N(d_2)}{0.0492} = 0.25$$

$$0.4013$$

$$0.30$$

$$0.0192$$

$$0.4013 - \left(\frac{0.0192}{0.05} \times 0.0492\right)$$

$$= 0.3822$$

$$N(d_2) = 1-0.8824 = 0.6176$$

QUESTION - 20

Following information is available for X Company's shares and Call option:

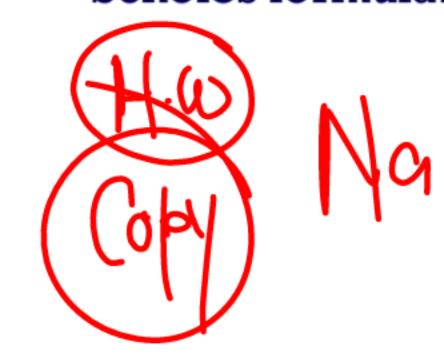
Current share price 5 ₹ 185

Risk free interest rate \nearrow 7% ?

Time of the expiry of option 3 years

Standard deviation 0.18

Calculate the value of option using Black-Scholes formula.



(Practice Manual)

(Page No. 34)

QUESTION – 21

On April 11th 2004, Ferguson system was trading at ₹ 13.62.

- (a) To value a July, 2004 call option with strike price ₹ 15, trading on the board options exchange on the same day for ₹ 2, the following are the other parameter ₹ of the options:
 - The annualize standard deviation (i) in Ferguson, system stock price over the previous year was 81%.
 - The option expiration date is (ii) Friday july 23rd 2004, there are 103 days to expiration days (year=365 days) and annualized treasury bill rate corresponding to this option is 4.63%
 - (iii) The value using normal distribution on N(d1) = 0.5085 and N(d2) was 0.3412
- Comment on the trading value as on July (b) 23rd 2004.

(a) Value of Call option

$$C_0 = S_0 \times n(d_1) - \frac{E}{e^{nt}} \times n(d_2)$$

$$= 7 \cdot 13.62 \times 0.5685 - \frac{715}{e^{0.0463} \times \frac{103}{365}} \times 0.3412$$

$$= 6.926 - \frac{15}{e^{0.0131}} \times 0.3412$$

$$=6.926-\frac{15}{1.0132}\times0.3412$$

B premium (72) is more than Value of call (71.87) hence it is overfriced.

QUESTION – 22

The Ferguson system was trading at ₹ 134 on april 3, 2009 and call option exercisable in three months' time had a strike price of ₹ 130.

The following are the other parameter of the option:

- (i) The annualized standard deviation in Ferguson system stock price over the previous year was 60%
- (ii) The annualized Treasury bill rate corresponding to this option life is 8%.

Requirements:

- Compute the value of a three month Call option on the stock of Ferguson System using Black and Scholes Model.
- (ii) What would be the value of put?
- (iii) If this call option is priced at ₹ 15 what investment strategy would you adopt?

So =
$$7.34$$

E = 7.30
t = 8 Months $(\frac{3}{12}) = 0.25$ YEAR
Collaption
 $= 0.60$

D Value of Call

$$C_0 = S_0 \times n(d_1) - \frac{E}{ext} n(d_2)$$

$$=$$
 $\frac{783.6964}{60.02} \times 0.5071$

(iv) If this put option is available in the market at ₹ 14 what investment strategy would you adopt?

Note: Extracted from the tables:

- (a) Natural Logarithm:
- (b) Ln(0.9701) = -0.0303
- (c) Ln (1.0308) = 0.0303
- (d) Value of e : $e^{-0.02} = 0.9802$, $e^{-0.016} = 0.9841$
- (e) For N(X): where X > 0: N(0.3177)

= 0.6246

(f) N(0.0177) = 0.5071

Where X < 0: N(-0.3177) = 0.3754

N(-0.0177)

= 0.4929

(Page No. 36)

W.N.1 d14d2

$$d_{1} = \frac{\ln \frac{50}{6} + (\pi + \frac{-2}{2})t}{\sigma \sqrt{t}}$$

$$= \frac{\ln \frac{134}{130} + (0.08 + \frac{0.60^{2}}{2})0.25}{0.60 \sqrt{0.25}}$$

$$= \frac{\ln 1.0308 + 0.065}{0.30}$$

$$= \frac{0.0303 + 0.065}{0.30} = 0.3177$$

$$d_{2} = \frac{1}{0.3177} = 0.3177$$

M·N·2 N(d1) 4 N(d2)

$$\frac{N(d_1)}{N(0.3177)} = 0.6246$$
 $\frac{N(d_2)}{N(0.0177)} = 0.507L$

1 Value of but

$$P_0 = \frac{E}{e^{nt}} \eta(-d_2) - S_0 \eta(-d_1)$$

=
$$130 \times 0.9802 \times n(-d_1) - 134 \times n(-d_1)$$

= $130 \times 0.9802 \times 0.4929 - 134 \times 0.3754$
= 712.50

$$n(-de)$$
 $n(-de)$
 $n(-de)$
 $n(-de)$
 $n(-de)$
 $n(-de)$
 $n(-de)$
 $= 0.4929$

Alternative

Value of but option [PCP]

$$76+134=19.08+130\times0.9802$$

Value of Call: 719.68

Since Call is underbriced, hence it should be furthasted.

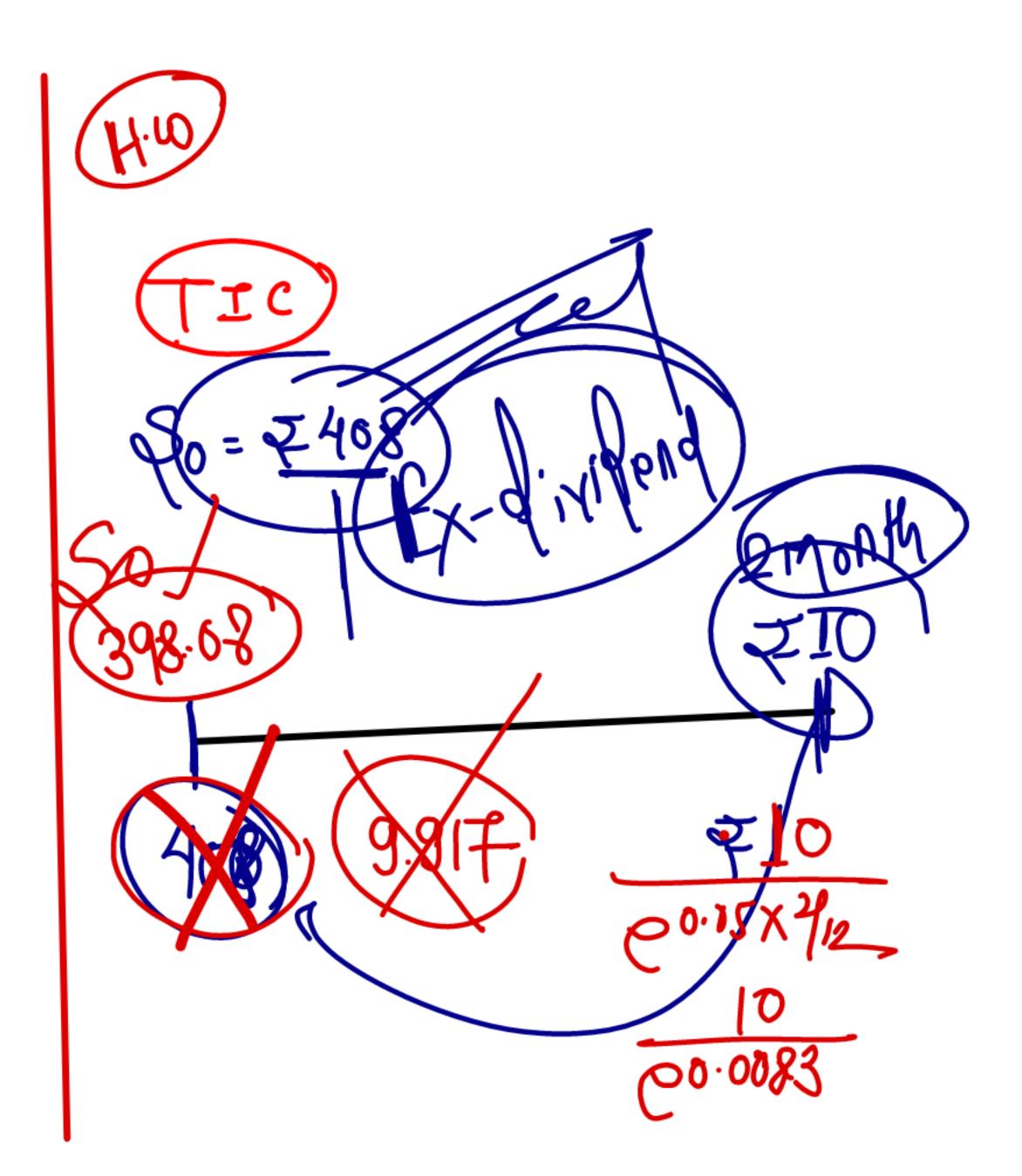
Value of but = 712.50
Value of but = 712.50

Since but is overbriced, hence it should be fold.

QUESTION - 23 (AFM)

The shares of TIC Ltd. are currently priced at ₹ 415 and call option exercisable in three months' time has an exercise rate of ₹ 400. Risk free interest rate is 5% p.a. and standard deviation (volatility) of share price is 22%.

- Based on the assumption that TIC Ltd. is not going to declare any dividend over the next three conths, is the option worth buying for \$\forall 25?
- (ii) Calculate value of aforesaid call option based on Block Scholes valuation model if the current price is considered as ₹ 380
- (iii) What would be the worth of put option if current price is considered ₹ 380.
- (iv) If TIC Ltd. share price at present is taken as ₹ 408 and a dividend of ₹ 10 is expected to be paid in the two months time, then, calculate value of the call option.



(Page No. 38)

1 Value of Call

A.N.1
$$d_1 = \frac{1}{2} + \frac{$$

$$\frac{N(N+2) - N(4) + N(42)}{N(0.5032)}$$

$$\frac{N(0.5032)}{0.05^{2} - 0.50} = \frac{0.3985}{0.055}$$

$$\frac{0.5932}{0.05} = \frac{0.2912}{0.055}$$

$$0.3085 - \left(\frac{0.0143}{0.05} \times 0.0032\right)$$

$$= 0.3044$$

$$N(41) = 1 - 0.3044 = 0.6926$$

$$\frac{N(0.3932)}{0.05}$$

$$0.3632 - \frac{0.38446}{0.05} \times 0.0432$$

$$0.3632 - \frac{0.0186}{0.05} \times 0.0432$$

Co =
$$S_0 \times N(d_1) - \frac{E}{e^{4}} N(d_2)$$

= $415 \times 0.6986 = \frac{400}{e^{0.085}} \times 0.6529$
= $287.429 - \frac{400}{1.0126} \times 0.6529$
= $7.29.52$
Pince obtion is underprised.

1 Value of Call [So = 7 380]

W. N. 1 d1 4 d2

$$\frac{d_{1} = \frac{380}{460} + (0.05 + \frac{0.22^{2}}{2})0.75^{-1}}{0.25}$$

$$= \frac{10.95 + 0.01855^{-1}}{0.22\sqrt{0.25}}$$

$$= \frac{-0.0513 + 0.01855^{-1}}{0.11}$$

$$= -0.2977$$

$$\frac{d_{1} = \frac{380}{400} + (0.05 + \frac{0.22^{2}}{2})0.75^{-1}}{0.25}$$

$$= \frac{-0.22777}{0.25}$$

$$N(-0.2977) = 0.382$$

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QUESTION – 24

The shares of TIC Ltd. are currently priced at ₹ 415 and call option exercisable in three months' time has an exercise rate of ₹ 400. Risk free interest rate is 5% p.a. and standard deviation (volatility) of the share price is 22%. The TIC Ltd. is not going to declare any dividend over the next three months.

- (i) DECIDE whether the option worth buying for ₹ 25.
- (ii) CALCULATE the value of aforesaid call option if the current price of share is considered as ₹ 380.
- (iii) CALCULATE the value of aforesaid call option if present price of share is taken as ₹ 408 and a dividend of ₹ 10 is expected to be paid in the two months' time.

Given

In (1.0375) = 0.03681, In(0.95) = -0.05129 and In (0.9952) = -0.00481

 $e^{0.0125} = 1.0126$ and $e^{0.00833} = 1.0084$

Cumulative Area of Number of S.D. from Mean (z)

Z	0.0150	0.1250	0.3933	0.5033	-0.2976	-0.4076
Area	0.5060	0.5497	0.6530	0.6926	0.3830	0.3418

(MTP: Oct – 2022)

(Page No. 42)

QUESTION - 25

Following information is available for TIC Company's shares and Call option:

Current share price = ₹415

Option exercise price = ₹400

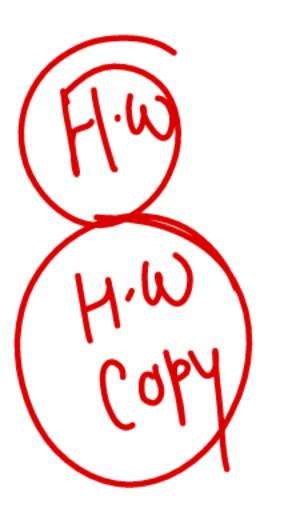
Risk free interest rate = 5%

Time of the expiry of option = three months

Standard deviation = 22%

Is the option worth buying for ₹ 25 using Black-Scholes formula?

(Page No. 45)



QUESTION - 23

The shares of TIC Ltd. are currently priced at ₹ 415 and call option exercisable in three months' time has an exercise rate of ₹ 400. Risk free interest rate is 5% p.a. and standard deviation (volatility) of share price is 22%.

- (i) Based on the assumption that TIC Ltd. is not going to declare any dividend over the next three months, is the option worth buying for ₹ 25?
- 2) 10.52 (ii) Calculate value of aforesaid call option based on Block Scholes valuation model if the current price is considered as ₹ 380.
- (iii) What would be the worth of <u>put option</u> if current price is considered ₹ 380.
- (iv) If TIC Ltd. share price at present is taken as ₹ 408 and a dividend of ₹ 10 is expected to be paid in the two months time, then, calculate value of the call option.

(Page No. 38)

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- (i) DECIDE whether the option worth buying for ₹ 25.
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- (iii) CALCULATE the value of aforesaid call option if present price of share is taken as ₹ 408 and a dividend of ₹ 10 is expected to be paid in the two months' time.

Given

In
$$(1.0375) = 0.03681$$
, In $(0.95) = -0.05129$ and In $(0.9952) = -0.00481$

$$e^{0.0125} = 1.0126$$
 and $e^{0.00833} = 1.0084$

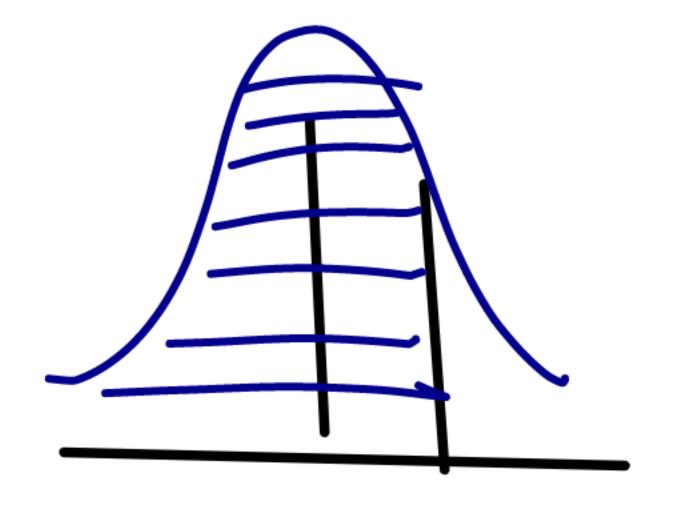
Cumulative Area of Number of S.D. from Mean

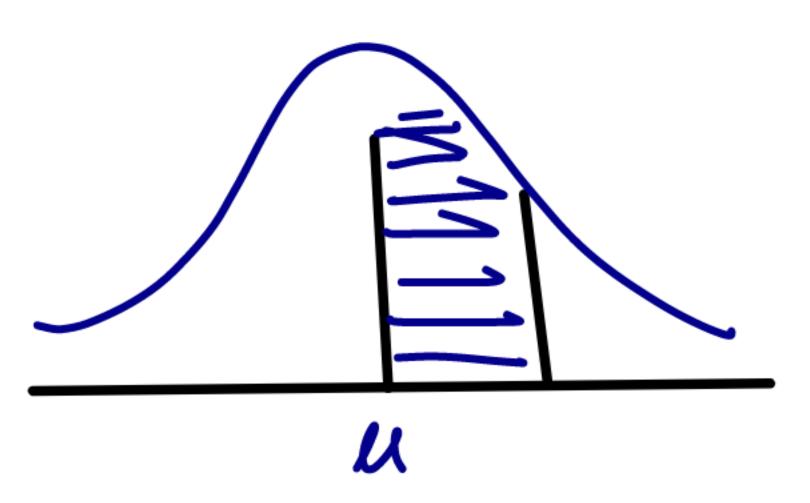
(z)

Z	0.0150	0.1250	0.3933	0.5033	-0.2976	-0.4076
_					0.3830	

(MTP: Oct - 2022)

(Page No. 42)





PART II forward & futule

forward Contract is a Contract between two fouries to buy or Sell an underlying asset at predetermined brice (forward forice).

In forward contract, forward buyer is obligated to buy 4 forward Beller is obligated to fell.

future Contract

- · future contract is just like forward contract
 - -> Traded at stock Exchange
 - -> with Margin redwirement
 - -> No Counterparty default Risk
 - > Mark to Market adjustment in margin
- · There are parties in future contract

future Buyer
Contract to Buy
Contract to Bell
upside betting
Long position
Short bosition

forward Contract vs future Contract

Forward	Future
1 Customized	O Standardized
2) Over the counter (070)	2) Exchange Traded
3 No Margin redwired	3 Margin redwred
(4) Counter party default Risk	(3) No Courter party default Kisk
3 Rollemont only on Maturity	(5) Daily adjustment in marying
6) Less lightedity	6 High lidwidy
2 Low Regulations	D'igare Regulation

Numerical

PART 1 Morgin A/c
PART 2 Future pricing
PART 3 Beta Management [Imp]
PART 4 Commodity future

There are three types of maigin

1 gnitial Margin

Initial margin means margin amount to be deposited at stock Exchange at the time of Execulation of Contract.

Maintenance Morgin is minimum morgin Amount. 9f Maintenance Morgin is less than onaintenance Morgin, them investor has to bring in Extra Amount up to Initial Margin.

Warriation Margin Call is Variation Gargin Extra Amt of Margin Call is Variation Gargin

Imp points

1) 9t Morgin balance is more than initial Margin then Margin Amt can be withdrawn.

No withdrawal.

2) If Contract is squared off (AffRT OFFRAT) then closing Balance of Margin Amt is refunded to investig

Initial Margin is given in question. 9t not given than it is calculated as under

Initial Margin = U+30

u = Average Absolute daily change in brice

- Standard deviation in price

On 31/08/2021 Mr. R has taken a Long position of Two lots of Nifty Futures at 17300.

One lot of Nifty future is 50 units.

Initial Margin required is 10% of Contract Value.

Maintenance Margin required is 80% of Initial Margin.

The closing price of 5 days are given below -

Date	Closing Price of Nifty Future
01/09/2021	17340
02/09/2021	17180
03/09/2021	16990
06/09/2021	16900
07/09/2021	17120

You are required to-

(iii)

- (i) Prepare a statement showing the daily balances in the margin account & payment on margin calls, if any.
- (ii) Compute the Gain or Loss of Mr. R, if contract squared off on 07/09/2021.

What would be the Gain or Loss if Mr. R, had taken the short position?

(Exam December - 2021) (Page No. 56)

Contract Value = 17300 x 100 units = 4143000 1430000 x10.

Mointenance Margin = 17300 x 807

Morgin A/C

Date	closing phice	profit / Low	Margin	closing Balance
348/2021	14300		_	173000
1/9/2021		(17340-17300)100 = 4000	_	177000
2/9/2021		(17340) 100 = (16000)	_	161020
3/9/2021	16996	(1e330-1418s) 100 = (13000)	_	142000
6 9 2021	16900	(16900 - 16990)100 = (9000)	40000	1730W
7/3/2021	14120	(17120 - 16900) 100 = 22000	_	195000
		`		

2) Calculation of Gain or loss

Clasing Balance 195000 or (17120-17300) x100
(-) Initial Margin 40000 = Loss 18000
(-) Morgin California = 18000

Morgin A/c

17300 J

Date	clasingbrie	brofit/Ross	Margin call	Balance
348/21	14300		_	143000
49/21	17340	(17300 - 17340) ×1000 - (4000)	_	169000
2/9/21	14180	(17340-17188) × (00 = 16000	_	185000
3921	16990	$(74180 - 16000) \times 100 = 10000$	_	204000
6 4 5T	16900	(16990 - 16900) x 100 - 9000	-	213000
		(16900 - 17/20) X100 - (22000)	_	191000
	•			

The price of March Nifty Futures Contract on a particular day was 9170. The minimum trading lot on Nifty Futures is 50. The initial margin is 8% and the maintenance margin is 6%. The index closed at the following levels on next five days:

Day

2

3<

4

) 5

Settlement Price (₹) 9380 9520 9100 8960 9140

You are required to calculate:

(i) Mark to market cash flows and daily

closing balances on account of

- (a) An investor who has taken a long position at 9170
- (b) An investor who has taken a short position at 9170
- (ii) Net Profit/Loss on each of the contract.

(Exam January - 2021) (Page No 57)

Sensex futures are traded at a multiple of 50) Consider the following quotations of Sensex futures in the 10

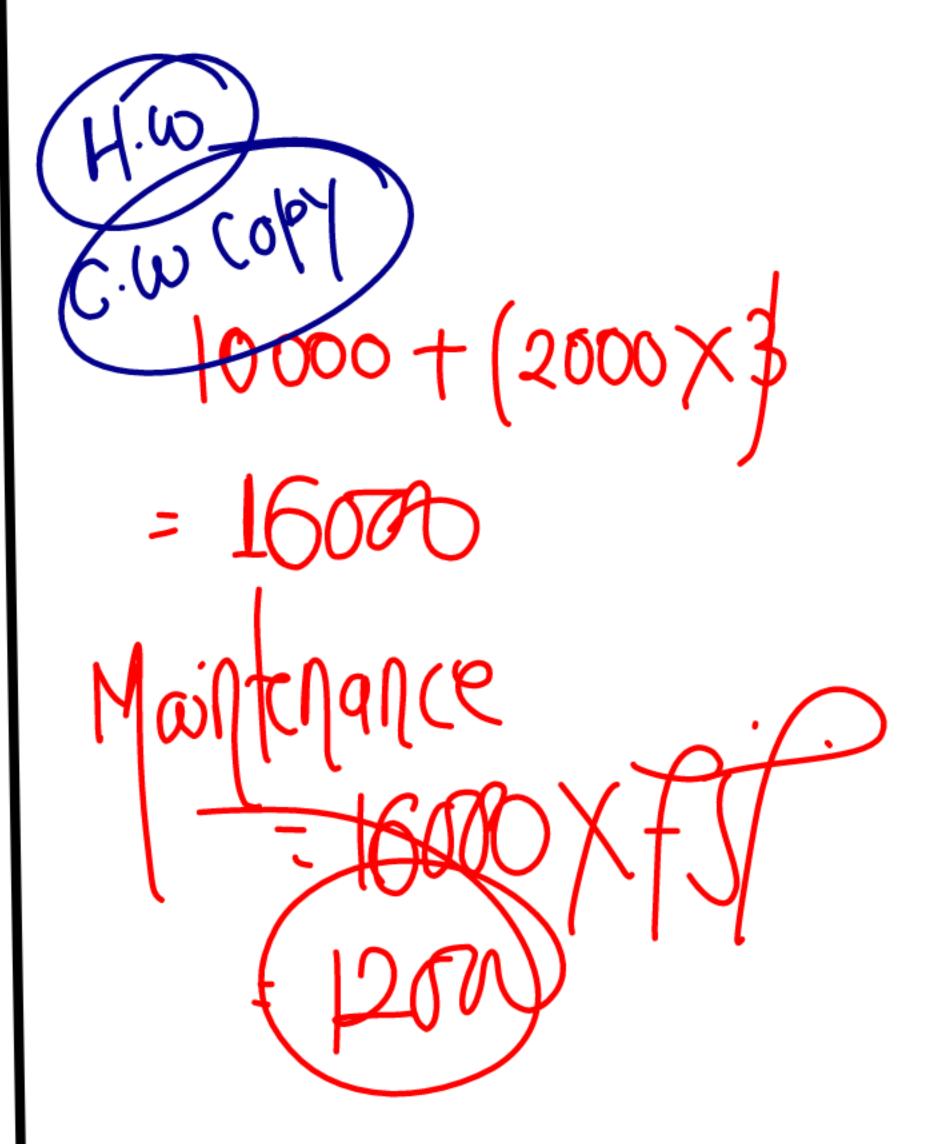
trading days during February, 2009:

Day	High	Low	Clesing
4-2-09	306.40	3290.00	3296.50
5-2-09	3298,00	3262.50	3294.40
6-2-09	3256.20	3227.00	3230.40
7-2-09	3233.00	3201.50	3212.30
10-2-09	3281.50	3256.00	3267.50
11-2-09	3283.50	8260.00	3263.80
12-2-09	3315.00	3286.30	3292.00
14-2-09	3315.00	3257 10	3309.30
17-2-09	3278.00	3249.50	3257.80
18-2-09	3118.00	3091.40	3102.60

Abhishek bought one sensex futures contract on February, 04. The average daily absolute change in the value of contract is ₹ 10,000 and standard deviation of these changes is ₹ 2,000. The maintenance margin is 75% of initial margin.

You are required to determine the daily balances in the margin account and payment on margin calls, if any.

(SM New Syllabus & PM) (Page No. 59)



PART 2 future bricing [Cost of Carry Model or Theoretical Minimum brice Model] Dividend=10%

RIL Spot brice = 7500

Ram

Fiv. = 7100

Ram

503

After 3 Months = brice

As per Cost of Carry Model, Theoretical future forice is calculated as under

F = Spot Brice + Inth Saved - Dividend foregone

EXAMPLE - 17



Calculate Theoretical Price of Future.

$$f = 8(1+1) - D$$

$$= 7500(1.05) - 20$$

$$= 7505$$

(Page No. 07)

<u> AMPLE – 18</u>

Spot Price = ₹ 500 (F.V. ₹ 100)

= 6 Months Period

Dividend Yield = 5% p.a.

Rate of Interest = 10% p.a.

Calculate fair value of Future.

Dividend:

$$7500 \times 5\% \times \boxed{\frac{6}{12}} \quad f = $0(1+7) - D$$

$$= 12.50$$

$$= 7512.50$$
(Page No. (1-7) - D)
$$= 7512.50$$

(Page No. 07)

$$f = 8 \times [1 + (n-4)t]$$

$$= 500 \times [1 + (0.10 - 0.05)\frac{6}{12}]$$

$$= 512.50$$

EXAMPLE – 19

Spot Price = ₹ 500

Period = 6 Months

Dividend Yield = 4% p.a. compounded

annually.

Rate of Interest = 12% p.a. compounded

annually.

Calculate fair value of Future.

(Page No. 07)

fair Value

$$F = S \times [1 + (n - d)^{t}]$$

$$= 7500 \times [1 + (0.12 - 0.04)]^{\frac{6}{12}}$$

$$= 7500 \times (1.08)^{\frac{6}{12}}$$

$$= 7500 \times (1.08)^{\frac{6}{12}}$$

$$= 7519.61$$

EXAMPLE - 20

Consider the following:

Current value of index - 1400 S

Dividend yield - 6% o

CCRRI - 10%

Find the value of a 3 month forward contract.

$$f = S \times e^{(n-1)t}$$
(Page No. 07)
$$= 1400 \times e^{(0.10-0.06)\frac{3}{12}}$$

$$= 1400 \times e^{(0.00-0.06)\frac{3}{12}}$$

$$= 1400 \times 1.01005$$

$$= 1414.07$$

EXAMPLE - 21

Consider a 3 months maturity forward contract on a non-dividend paying stock. The stock is available for ₹ 200. With compounded continuously risk-free rate of interest (CCRRI) of 10% per annum, what is the value of the forward contract?

AMS. - 205.06

(Page No. 08)

EXAMPLE – 23

Consider a 4 months forward contract on 500 shares with each share priced at ₹ 75. Dividend @ ₹ 2.50 per share is expected to accrue to the shares in a period of 3 months. The CCRRI is 10% per annum, what is the value of the forward contract?

Arbitrage with future

- (i) No dividend paying stock
- (ii) Dividend paying stocks

(Page No. 08)

EXAMPLE – 24

Spot Price = ₹ 500

6 Months future price = ₹ 542

No dividend paying stock

Rate of Interest = 10% p.a.

- (i) Calculate Theoretical price of future.
- (ii) Calculate arbitrage gain.

(Page No. 08)

1 Theoretical price of future

$$f = \$(1+1)$$

= ₹500(1.05) = ₹525)
Arbitrage

Action

Since Actual future price (7542)
is more than Theoretical future (575)
hence future is over priced
In this Situation Buy stock today
of contract to sell in future.

JCAI -> Since future is overbriced, honce Sell future of Buy sport.

phocess

Today

- · Bossow 7 500 9 10%. P.9.

 How 6 Months & Buy share.
- · Sell future 9t. 7542 show position

After 6 Months

Self share at fature brier = 7542

(-) Rebayonent 500 (1.05)

(1.05) = 7525

Arbitrage Gain

¥14

* 9f two brices ære given on Maturity

Suppose 2375 4 1000

We took short position at 75421

	375	100
Sell share	+375	+1000
Gain or Loss on Short position	+167	-458
Robayonent 500 (1.05)	- 525	-525
Arbitrage Gain =	17	17

<u>EXAMPLE – 25</u>

No dividend paying stock

Rate of Interest
$$= 20\%$$
 p.a.

- (i) Calculate Theoretical Price of future.
- (ii) Calculate arbitrage gain.

(Page No. 09)

1 Theoretical future price

$$f = \$(1+1)$$

$$= ₹400(1.10) = ₹440$$
2 Arbitrage

Action > Since future is underpriced hence Buy future 4 sell spot.

Arbitrage process

Today

- · Short seu share 9t 7400 I Invest 920%. P.9. FW 6 Months.
- . Buy future 9t 7 425

After 5 Months.

Investment 400(1·10) = 7440

Buy share & Return to = 7495

Stock Conder = 15

& on Maturity

Long 4257

•			
		£308	₹ 757
Buy share		-30-8	-757
Gain/Ross on Lon position Investment 400 (1.10)		-117 +440	+440 +440
		15	15
	,		1

EXAMPLE – 26

Spot Price = ₹ 500

6 Months future price = ₹ 573

Dividend per shares = ₹ 5

Rate of Interest = 20% p.a.

- (i) Calculate Theoretical price of future.
- (ii) Calculate arbitrage gain.

(Page No. 09)

1 Theurelical future price

2. 2000(83) Today

- · Borrow 7500 @ 207. P.9. for 6 Months of Buy share · Sey future 9t 7573 After 6 Months.

Self share (+) Dixidond (+) Repayment (-) Repayment 550 (1-18) Gain = 28 7573 75 550

EXAMPLE – 27

Spot Price = ₹ 400

6 Months future price = ₹ 407

Dividend per shares = 3

Rate of Interest = 20% p.a.

- (i) Calculate Theoretical price of future.
- (ii) Calculate arbitrage gain.

(Page No. 09)

1 Theoretical brice of future

$$f = S(1+1) - D$$

$$= 400(1.10) - 5 = 435$$

2) Arbitrage

Action

Bence future is underprised,

Rence Bery fature & Sell spot.

- · Short seu share 9t 7400 & Invest @ 20% P.9. for 6 months.
- · Buy future at 7 407

After 6 Months.

Investment 400 (1.10) = Buy show 4 Return to = (407, Stock conder Dividend componsation = (75) (Fair) = \frac{728}{}

40千个	
348	637
-348	-63 T
+440	+440
-59	1230
-5	-5
28	28
	348 -348 +440 -59

<u>QUESTION – 38</u>

The following data relate to Anand Ltd.'s share price:

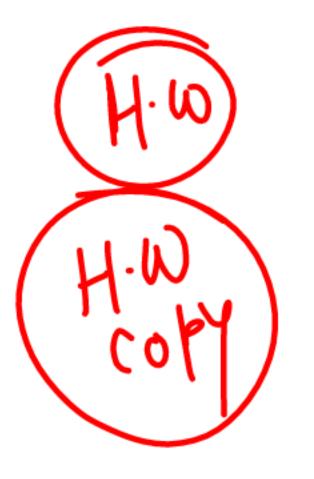
Current price per share ₹ 1,800

6 months future's price/share ₹ 1,950

Assuming it is possible to borrow money in the market for transactions in securities at 12% per annum, you are required:

- (i) to calculate the theoretical minimum price of a 6-months forward purchase; and
- (ii) to explain arbitrate opportunity.

(SM New Syllabus & PM)
(Page No. 61)



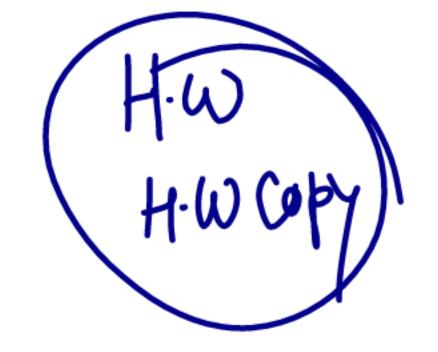
The following data relate to R Ltd.'s share price:

Current price per share ₹ 1,900

6 months future's price/share ₹ 2050

Assuming it is possible to borrow money in the market for transactions in securities at 10% per annum,

- advise the justified theoretical price of a 6months forward purchase; and
- (ii) evaluate any arbitrage opportunity, if available.



RTP May - 2021)

(Page No. 61)

The following data relate to X Ltd.'s share price:

Current price per share ₹ 2000

3 months future's price/share ₹ 2250

Assuming it is possible to borrow money in the market for transactions in securities at 6% per annum, you are required to:

(1) **CALCULATE** the theoretical minimum price of a 6-months forward purchase; and

(2) **EXPLAIN** arbitrate opportunity.

(MTP: Sep - 2022)

(Page No. 62)

The following data relate to X Ltd.'s share price:

Current price per share ₹ 2000

3 months future's price/share ₹ 2250

Assuming it is possible to borrow money in the market for transactions in securities at 6% per annum, you are required to:

- (1) **CALCULATE** the theoretical minimum price of a 6-months forward purchase; and
- (2) **EXPLAIN** arbitrate opportunity.

(MTP: Sep - 2022)

(Page No. 62)

OUESTION – 41

Calculate the price of 3 months PQR futures, if PQR (FV ₹10) quotes ₹ 220 on NSE and the three months future price quotes at ₹ 230 and the month borrowing rate is given as 15 percent per annum and the expected annual dividend is 25 percent, payable before expiry. Also examine arbitrage opportunities.

(SM New Syllabus & PM)

(Page No. 63)

Théoretical fature price

- · Borrow 7 220 @ 157. P.9. for 3 Months & Buy stock Sey future at 7 230

Self stort at fulus price = 7230 (-) Repayment 220×1.0375 228.25 (+) Dividend Affer 3 Months

OUESTION - 42

The share of X Ltd. is currently selling for ₹ 500. Risk free interest rate is 0.6% per month. A three-month futures contract is selling for ₹ 511)

DEVELOP an arbitrage strategy and show what your riskless profit will be 3 months hence assuming that X Ltd. will not pay any dividend in the next three months.

$$F = 500 \times 1.018 = 50^{\circ}$$
(Page No. 64)
$$500 \times (1.006) = 509.05$$

60x

OUESTION - 43

The share of X Ltd. is currently selling for ₹ 300. Risk free interest rate is 0.8% per month. A three month futures contract is selling for ₹ 312. Develop an arbitrage strategy and show what your riskless profit will be 3 months hence assuming that X Ltd. will not pay any dividend in the next three months.



(SM New Syllabus)

(Page No. 65)

The 6-months forward price of a security is ₹ 208.18. The borrowing rate is 8% per annum payable with monthly rests What should be the spot price?

(SM New Syllabus & PM)

$$\begin{aligned}
f &= S(1+\lambda) \\
208.18 &= S(1.0067)
\end{aligned} (Page No. 65)$$

$$\beta &= 7.200$$

On 31-8-2011, the value of stock index was ₹ 2,200. The risk free rate of return has been 8% per annum. The dividend yield on this Stock Index is as under:

Month	Dividend Paid p.a.	
January	3%	
February	4%	
March	3%	
April	3%	
May	4%	
June	3%	
July	3%	
August	4%	
September	3%	
October	3% P	Q
November	3% 3·2 57. P	٠٦,
December	3%	

Assuming that interest is continuously compounded daily, find out the future price of contract deliverable on 31-12-2011. Given: e^{0.01583} = 1.01593

Average dividend yield = \frac{3+3+4+3}{4} = 3.25 % P.9. $f = 8 \times e^{(\eta - d)t}$ $= 2200 \times e^{(0.08 - 0.0325)\frac{t}{12}}$ = マ22の× と 0.01583 = 72200 x J.01593 = 72235.046

(SM New Syllabus & PM) (Page No. 66)

The NSE-50 Index futures are traded with rupee value being ₹100 per index point. On 15th September, the index closed at 1195, and December futures (last trading day December 15) were trading at 1225. The historical dividend yield on the index has been 3% per annum and the borrowing rate was 9.5% per annum.

- Determine whether on September 15, the December futures were under-priced or overpriced?
- (ii) What arbitrage transaction is possible to gain out this mispricing?
- (iii) Calculate the gains and losses if the index on 15thDecember closes at (a) 1260 (b) 1175

Assume 365 days in a year for your calculations

(Exam November - 2019)

(Page No. 67)

1) Theoretical guture price

$$F = \$ \times [1+[n-q)t]$$
= $1195 \times [1+(0.095-0.03)\frac{91}{365}]$
= 1195×1.0162
= 1214.36

$$F = 1214.36 \times 7100 = 7121436$$
Since Actual future $(1225 \times 100) = 7122500$
is more than theoretical future, hence that is overfixed.

(ii) Since future is Overforiced, hence Buy spot 4 sell future.

(iii) Arbitrage process

Today

+ 2830.31

- · Borrow (1195 x100) = 7 119500 @ 9.5%
- · Buy a partfolio in same proportion as Hifty for 7 119500
- · Tate short position at (1225 x 100)
 = \$ 122500

After 91 days 12251			
	1260	1175	
Self stocks	126000	117500	
119500 × 102300	-122330	-122330	
Goin or loss on short position	-3500	+5000	
Dividend Income 119500 × 3% × 365		893.49	
Arbitragre Gain =	1063.79	1063.79	

Suppose current price of an index is ₹ 13,800 and yield on index is 4.8% (p.a.). A 6 months future contract on index is trading at ₹ 14,340.

Assuming that risk free rate of interest is 12%. Show Mr. X (an arbitrageur) can earn an abnormal rate of return irrespective of outcome after 6 months. You can assume that after 6 months index closes at ₹ 10,200 and ₹ 15,600 and 50% of stock included in index shall pay dividend in next 6 months. Also Calculate implied risk free rate.

(Page No. 69)

Theoretical future price

Anbitrage brocess

Today)

· Buy a partfolio of stock as Same proportion as Index

· Take short bosition on Indere at 714340

Calculation of Gain 143401			
	10200	1560	
Sell stocké	10200	<u>1</u> 5600	
Goin/Low on short position Dividend Income Buy stock to beriod)	-13800 +331·20	-1260 -13800	
Gwin	871.20	871.20	

Implied of Park = $\frac{871.20}{13800} \times 100 \times \frac{12}{6} = 12.63\% P.E.$

PART III Hedging Through future Beta Management

· Stock Index future

- · Stock Index future means future contract on stock Index. It could be sectorwise i.e. Bank Nifty I.T. Index etc. or it could be on overall market i.e. Nifty or sensore.
- gt is more lighted than Stock fulture.

· Hedging through SIF

Whenever an Investor buys 8 tock 4 expects that brice of stocks will rise but it may be possible that market may go against his expection. In this Situation, Investor should take short position on Stock Index future.

No. of Contracts is calculated as under

NOTE 9 BT is not given 98 sume "0"

· 9f Bf is not given 9849me "1" Vp = Value of portfolio

BT = Target Beta

BP = Beta of portfolio

f = future price mot

m = multiplier (contract size)

Bf = Beta of future

<u>Example – 28</u>

Consider a fund manager having a corpus of 500 lakhs as shown below:

	₹ (in Lakhs)	Beta
Bond	150	0.8
Equity	300	4
Cash	50	0
	500	

Nifty futures trade at 5750 (lot size 50)

The fund manager is expecting a market crash

- (f) Find out the beta of the portfolio and interpret the same
- (ii) How many nifty futures should be bought or sold to achieve a beta of 0.5.
- (iii) How many nifty futures should be bought or sold foe complete hedging.
- (iv)How many nifty futures should be bought or sold to achieve a beta of 3.

(Page No. 09)

1) Beta of portfolio

$$BP = \frac{(150 \times 0.8) + (300 \times 4) + (50 \times 0)}{500}$$

= 2.64

Interpretation

Bp = 2.64 Means if Mortet changes by 1% then portfolio will change by 2.64%

Substantiate

| Market = 10% |

PORTFOLIO | Market = 10% |

| Portfolio | Phort = 1070 |
| Loss = 500 x 26.4% |
| = 132 |
| Overall | Loss =
$$132 - 107 = 25$$
 |
| $6 = \frac{25}{500} \times 100 = 5\%$

Bet9 = 1 portfolio 5% = 0.5

(1) BT=3

No. of Contracts =
$$\frac{560 \times (3-2.64)}{5750 \times 50 \times 1} = \frac{180}{2.875}$$
= 63 Contracts long

PORTFOLIO (BP=2.64)

FORT (19)

Loss = (500 × 26.417?) = 132

Overall Loss : 132+18 = 150

% = $\frac{150}{500} \times 100 = 30\%$

$$B = \frac{30\%}{10\%} = 3$$

OUESTION	456)

The price of ACC stock on 31 December 2010 was ₹ 220 and the futures price on the same stock on the same date, i.e., 31 December 2010 for March 2011 was ₹ 230. Other features of the contract and related information are as follows:

Time to expiration - 3 months (0.25 year)

Borrowing rate - 15% p.a.

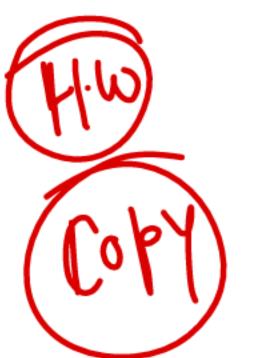
Annual dividend on the stock

- 25% payable before 31.03.2011

Face Value of the Stock - ₹ 10

- i. Based on the above information, what should be the futures price?
- ii. Show the process of arbitrage

(Page No. 84)



On April 1, 2019, Kasi has a portfolio consisting of four securities as shown below:

Security	A	K	S	P
Market Price	₹ 48.5	₹ 332.68	₹ 13.99	₹ 292.82
No. of Shares	673	480	721	358
β Value	0.74	1.28	0.54	0.46

Cost of capital is 16% p.a. compounded continuously. Kasi fears a fall in prices of shares in future. Accordingly, he approaches you for the advice to protect the interest of his Portfolio.

You can make use of the following information:

- (i) The current NIFTY Value is 9380.
- (ii) NIFTY Futures can be traded in units of 25 only.
- (iii)Futures for September are currently quoted at 9540 and Future for October are being quoted at 9820.

1 Beta of portfolio

Stocks	No. of show	MPS	NO.×MPS	Weight	В	WYB
Ą	673	48.50	32640·SO	0.106	074	0.078
K	480	332.68	15968640	0.520	1.28	0.666
S	721	13.99	10086.79	0.033	0.54	0.018
P	358	292.82	104829.56	0.341	0.46	0.157
			304243.25		Bp=	0.92

You are required to calculate:

- 1. The Beta of his Portfolio.
- Theoretical Value of Futures for contracts expiring in September & October.

Given

$$(e^{0.67} = 1.0693, e^{0.08} = 1.0833, e^{0.093} = 1.0975)$$

3. The number of NIFTY contract that he would have to sell, if he desires to hedge 150% of the Portfolio until October.

(Exam May-2019)

(Page No. 73)

 $f = 8 \times e^{(n-d)t}$ $= \pm 3380 \times 1.0833 = 10701.32$ $\frac{1}{c} = \frac{3380 \times 60.033}{3380 \times 60.033}$ $=9380 \times 1.0945 = 10294.55$

2. Calculation of Theroretical

3. No. of Contracts for Hedging

No. =
$$\frac{b \times w \times gt}{\Lambda b \times (BL-Bb)}$$

$$= \frac{460864.875 \times (0-0.92)}{9820 \times 25 \times L} = 1.727 \text{ (on hards)}$$

$$= 2 \text{ (on hards)}$$

On April 1, 2015, an investor has a portfolio consisting of eight securities as shown below:

Se	curity	Market Price		N	lo. of Shares	Value
	A		29.40	1	400	0.59
	В		318.70		800	1.32
	С		660.20		150	0.87
	D		5.20		300	0.35
	Е		281.90		400	1.16
	F		275.40		750	1.24
	G		514.60		300	1.05
	Н		170.50		900	0.76

The cost of capital for the investor is 20% p.a. continuously compounded. The investor fears a fall in the prices of the shares in the near future. Accordingly, he approaches you for the advice to protect the interest of his portfolio.

You can make use of the following information:

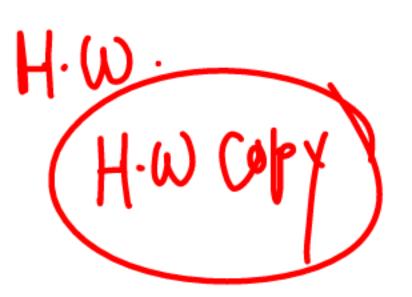
- (1) The current NIFTY value is 8500.
- (2) NIFTY futures can be traded in units of 25 only.
- (3) Futures for May are currently quoted at 8700 and Futures for June are being quoted at 8850.

You are required to calculate:

- (i) The beta of his portfolio.
- (ii) The theoretical value of the futures contract for contracts expiring in May and June. Given ($e^{0.03}$ = 1.03045, $e^{0.04}$ = 1.04081, $e^{0.05}$ = 1.05127)
- (iii) The number of NIFTY contracts that he would have to sell if he desires to hedge until June in each of the following cases:
 - (A) His total portfolio
 - (B) 50% of his portfolio
 - (C) 120% of his portfolio

(SM New Syllabus & PM)

(Page No. 71)



Details about long term portfolio of shares of an investor is as below:

Shares	No. of shares	Market Price	Beta
	(lakh)	per share	
K Ltd.	6	250	1.4
L Ltd.	8	375	1.2
M Ltd.	4	125	1.6

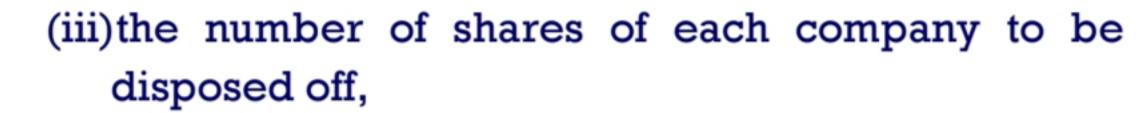
The investor thinks that the risk of portfolio is very high and wants to reduce the portfolio beta to 0.91.

He is considering below mentioned alternative strategies:

- (i) Dispose a part of his existing portfolio to acquire risk free securities, or
- (ii) Take appropriate position on Nifty Futures which are currently traded at 16,250 and each Nifty points is worth ₹ 100.

You are required to determine:

- (i) portfolio beta,
- (ii) the value of risk-free securities to be acquired,



(iv)the number of Nifty contracts to be bought/sold,

(v) the value of portfolio beta for 1% rise in Nifty.



(Exam Nov - 2022)

(Page No. 77)

Details about portfolio of shares of an investor is as below:

Shares	No. of shares (Iakh)	Price per share	Beta
A Ltd.	3.00	₹ 500	1.40
B Ltd.	4.00	₹ 750	1.20
C Ltd.	2.00	₹ 250	1.60

The investor thinks that the risk of portfolio is very high and wants to reduce the portfolio beta to 0.91. He is considering two below mentioned alternative strategies:

- (i) Dispose off a part of his existing portfolio to acquire risk free securities, or
- (ii) Take appropriate position on Nifty Futures which are currently traded at 8125 and each Nifty points is worth ₹ 200.

You are required to determine:

- (1) Portfolio beta,
- (2) The value of risk free securities to be acquired,

(7 in Law) WXB shores Weight B MPS Amk No. 500 1500 3.00 0.3 1:40 750 В 4.00 3000 250 2.50 Vp= 5000 portfolio of Risky Stock = (5000 × 0.7) = 3500 (Pist free Securities > (5000 × 0.3) = 1500 (Value of RF Spravities = \$1500L

Alternative?

$$0.91 = \frac{(5000 \times 1.30) - (2 \times 1.30) + (2 \times 0)}{5000}$$
 $4550 = 6500 - 1.30 \times$
 $2 = 1500 \text{ L}$

- (3) The number of shares of each company to be disposed off,
- (4) The number of Nifty contracts to be bought/sold; and
- (5) The value of portfolio beta for 2% rise in Nifty.

(SM New Syllabus & PM)

(Page No. 75)

(3) No. of Shares of each (0. to be disposed off

<u> </u>	113)		(200
Stock	Į,	Jeights	Amt	mps	Ho. of Shares
Ą	•	0 S·C	450	500	0.90
Ŋ	(3.60	900	750	1.20
<u>ح</u>	(OF 6	150	250	0.75
			1500		

(4) No. of Nifty Contracts to be bought or sold

No. =
$$\frac{V_{P} \times (BT - BP)}{f \times m \times Bf}$$

= $\frac{5000 \times (0.91 - 1.30)}{8125 \times 200 \times 1} = -120$
= 120 contracts 80/d

Beta of portfolio if Nifty rise by 2%

= 71950 lacs Short bosition on nifty (120×200×8195) 100000

portfolio ₹5000 L

Beta of partfolio 1.30

Gain on Long Bosition of Bortfolio,

(5000 × 1.30 × 2%)

Loss on short fosition of Nikty (1950 x 2%)

overall fain 91 L

91 x100 = 1.82% % gnorage in bortfolio = Bp = 1 in partfolio 1.82 = 0.91 C

Market 2%T BP=1.30 Market PORTFOLTO 5000 L 1950 short 5000 × 2.60% Los = 1950 × 2/8 Goin. = 1302 Overall Goin = 91 $\% = \frac{94}{5000} \times 100 = 1.82\%$

The following data relate to A Ltd.'s Portfolio:

Shares	X Ltd.	Y Ltd.	Z Ltd.
No. of shares (lakh)	6	8	4
Frice per shares (₹)	1,000	1,500	500
Beta	1.50	1.30	1.70



The CEO is of opinion that the portfolio is carrying a very high risk as compared to the market risk and hence interested to reduce the portfolio's systematic risk to 0.99. Treasury Manager has suggested two below mentioned alternative strategies:

- (i) Dispose off a part of his existing portfolio to acquire risk free securities, or
- (ii) Take appropriate position on Nifty Futures, currently trading at 8250 and each Nifty points multiplier is ₹ 210.

You are required to:

(a) Interpret the opinion of CEO, whether it is correct or not.

(b) Calculate the existing systematic risk of the portfolio,

- (c) Advise the value of risk-free securities to be acquired,
- (d) Advise the number of shares of each company to be disposed off,
- (e) Advise the position to be taken in Nifty Futures and determine the number of Nifty contracts to be bought/sold; and
- (f) Calculate the new systematic risk of portfolio if the company has taken position in Nifty Futures and there is 2% rise in Nifty.

Note: Make calculations in ₹ lakh and upto 2 decimal points.

(RTP May - 2021)

(Page No. 79)

OUESTION - 54

On January 1, 2013 an investor has a portfolio of 5 shares as given below:

Security	Price	No. of Shares	Beta
A	349.30	5,000	1.15
В	480.50	7,000	0.40
С	593.52	8,000	0.90
D	734.70	10,000	0.95
E	824.85	2,000	0.85

The cost of capital to the investor is 10.5% per annum.

You are required to calculate:

- (i) The beta of his portfolio.
- (ii) The theoretical value of the NIFTY futures for February 2013.
- (iii) The number of contracts of NIFTY the investor needs to sell to get a full hedge until February for his portfolio if the current value of NIFTY is 5900) and NIFTY futures have a minimum trade lot requirement of 200 units. Assume that the futures are trading at their fair value.

No · Price Stock Amt KXB A B - (1·10 18854860

(iv)The number of future contracts the investor should trade if he desires to reduce the beta of his portfolios to 0.6.

No. of days in a year be treated as 365.

Given: In (1.105) = 0.0998 and $e^{(0.015858)} = 1.01598$

(SM New Syllabus & PM)

(Page No. 81)

(Page No. 81)

No. of Contract BT = 0

No. =
$$\frac{Vp \times (BT - BP)}{F \times M \times BF}$$

= $\frac{18854860 \times (0 - 0.849)}{5999.24 \times 200 \times 1}$
= $13600 \text{ for any } 600$

Theoretical future price

$$f = 8 \times e^{(\pi - d)t}$$

$$= 5900 \times e^{0.105 \times \frac{58}{365}}$$

$$= 75900 \times e^{0.016685}$$

$$= 75900 \times e^{0.016685}$$

$$= 5900 \times e^{0.016685}$$

$$= 5900 \times e^{0.016858}$$

$$= 5900 \times e^{0.015858}$$

$$= 5900 \times e^{0.015858}$$

$$= 5900 \times e^{0.015858}$$

$$= 5900 \times e^{0.015858}$$

OUESTION - 64

Shyam buys 10,000 shares of X Ltd., @ ₹ 25 per share and obtains a complete hedge of shorting 400 Nifty at ₹ 1,100 each. He closes out his position at the closing price of the next day when the share of X Ltd., has fallen by 4% and Nifty Future has dropped by 2.5%.

What is the overall profit or loss from this set of transaction?

X(4)
$$10000 \times 25 = 7250000$$
 (Exam January - 2021)
Nifty $400 \times 1000 = 7240000$ (Page No. 92)
 $+ 110000$ $+ 11000$

Calculation of Overall profit Loss

Long position in X 49

10000 share ×25 = = = 250000

Short position in Nifty

400 Nifties × 1100 = = 7440000

Cross on Rong bosition of X4d

-10008

(250000 X4%)

Gain on 8horb bosition of

Nilly

(40000 X 2.5%)

Time

Time

ICAI

Cash flows Today

Cash flows at closed out

Mr. X buys 1,000 shares of HPCL at ₹190 each and obtains a complete hedge by selling 300 Nifty at 972 each. He closes his position at the closing price of the next day: at this point HPCL has dropped 5% and Nifty has dropped 4%. What is the overall Profit/Loss of this set of transactions?

2164 608

(Page No. 93)

Miss K holds 10,000 shares of IBS Bank @ 2,738.70 when I month Index Future was trading @ 6,086 the share has a Beta (β) of 1.2. How many Index Futures should she short to perfectly hedge his position. A single Index Future is a lot of 50 indices.

Justify your result in the following cases:

(i) When the Index zooms by 1%

(ii) When the Index plummets by 2%.

(Page No. 93)

ICICI - Buy 1000 shares @ 7240 Beta=2 HDFC - Short Self 800 shares @ 7 245 Beta=1.5 · Calculate Net position in Nifty for full hedge. position in cash Morket Betq position in Nighty Amt ICICI_ 240000 Long 2 1·5 480000 Short 196000 HDFC 294000 Ling 186008 Short Substantiate (Market 10%) Betg=1.5 Be19=2 TCICIBONK Long F196000 short

- 48000

+ 29400

+18600

Which position on the index future gives a speculator, a complete hedge against the following transactions:

The share of Right Limited is going to rise. He has a long position on the cash market of ₹50 lakes on the Right Limited. The beta of the Right Limited is 1.25

The share of Wrong Limited is going to depreciate. He has a short position on the cash market of ₹ 25 lakhs on the Wrong Limited. The beta of the Wrong Limited is 0.90.

(iii) The share of Fair Limited is going to stagnant. He has a short position on the cash market of ₹ 20 lakhs of the Fair Limited. The beta of the Fair Limited is 0.75.

(SM New Syllabus & PM)

(Page No. 94)

5250000 Short
2500000 Short
2500000 Short

Ram buys 10,000 shares of X Ltd. at a price of ₹ 22 per share whose beta value is 1.5 and sells 5,000 shares of A Ltd. at a price of ₹ 40 per share having a beta value of 2. He obtains a complete hedge by Nifty futures at ₹ 1,000 each. He closes out his position at the closing price of the next day when the share of X Ltd. dropped by 2%, share of A Ltd. appreciated by '3% and Nifty futures dropped by 1.5%.

What is the overall profit/loss to Ram?

(SM New Syllabus & PM)

(Page No. 95)

Calculation of Net position in Nifty

Stock	Amt	Position in Cash Market	Betq	Position in Nifty
×4d	22000	Long	1.5	330000 SUOXI
Agd	200000	short	2	400 mo Long
' '				70000 Long
Loss C	n Long for	ontracks = - of finite of the constant of the	100 pd = 100	

Mr. Careless was employed with ABC Portfolio Consultants. The work profile of Mr. Careless involved advising the clients about taking position in Future Market to obtain hedge in the position they are holding. Mr. ZZX. their regular client purchased 100,000 shares of X Inc. at a price of \$22 and sold 50,000 shares of A plc for \$40 each having beta 2. Mr. Careless advised Mr. ZZZ to take short position in Index Future trading at \$1,000 each contract.

Though Mr. Careless noted the name of A plc along with its beta value during discussion with Mr. ZZZ but forgot to record the beta value of X Inc.

On next day Mr. ZZZ closed out his position when:

- Share price of X Inc. dropped by 2%
- Share price of A plo appreciated by 3%
- Index Future dropped by 1.5%

Mr. ZZZ, informed Mr. Careless that he has made a loss of \$114,500 due to the position taken. Since record of Mr. Careless was incomplete he approached you to help him to find the number of contract of Future contract he advised Mr. ZZZ to be short to obtain a complete hedge and beta value of X Inc.

You are required to find these value.

(Page No. 85)

Calculation of Amount of Nifty future Overall Ross (-) Loss on Long position of X Inc (100000 × \$22 × 2%)) Loss on shork position $(50000 \times $40 \times 3\%)$ No-of Contracts = \$700000 = 700 (ontracts

Calculation of Beta of x Inc. Let 9 sume Beta of x Inc. be 2

	1	• •		
Stock	Amt	Position in cash mkt	Beta	position in Nifty
X Inc.	2200000	Long/	χ	2200000 Short
A Plc.	2000000	short	2	4000000 Long
				70000 Long

$$-2200000 \times +40000000 = 700000$$

$$\chi = \frac{3300000}{2200000} = 1.5$$

Following information is available for consideration:

BSE Index 25,000

Value of portfolio ₹ 50,50,000

Risk free interest rate 9% p.a.

Dividend yield on Index 6% p.a.

Beta of portfolio 1.5

We assume that a future contract on the BSE index with 4 months maturity is used to hedge the value of portfolio over next 3 months. One future contract is for delivery of 50 times the index.

Based on the above information calculate:

- (i) Price of future contract.
- (ii) Gain on short futures position if index turns out to be 22,500 in 3 months.

Note: Daily compounding (exponential) formula is not required to be used.

(RTP May - 2022, Exam July - 2021)

(Page No. 86)

1) price of future Contract (4Month) $f = S \times \left(1 + (n-d)t\right)$ $= 25000 \times \left[1+(0.09-0.06)\frac{4}{12}\right]$ 25000 × 1.01 = 725250 price of future contracts $\frac{725250 \times 50 = 71262500}{505000 \times (0-1.5)}$ No. of Contract = $\frac{505000 \times (0-1.5)}{25250 \times 50 \times 1}$ = 6 Contract Short

(ii) Goin on short position of Index future Q 2250056 Index = 25000 (spot) TWONH t= 3 252501 4m f = 25250 $+ Month f = 22500 \times [J + (0.09-0.06)]$ = 22556.25 Gain on short partion = (25250 - 22556.25) × 6 × 50 = 7808125

BSE 5000

Value of portfolio ₹ 10,10,000

Risk free interest rate 9% p.a.

Dividend yield on Index 6% p.a.

Beta of portfolio 1.5

We assume that a future contract on the BSE index with four months maturity is used to hedge the value of portfolio over next three months. One future contract is for delivery of 50 times the index.

Based on the above information calculate:

- (i) Price of future contract.
- (ii) The gain on short futures position if index turns out to be 4,500 in three months.

(SM New Syllabus & PM)

(Page No. 88)





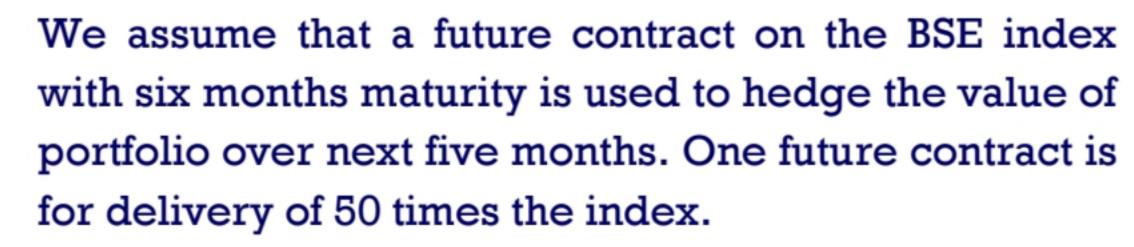
BSE 10000

Value of portfolio ₹ 12,00,000

Risk free interest rate 10% p.a.

Dividend yield on Index 5% p.a.

Beta of portfolio 1.70



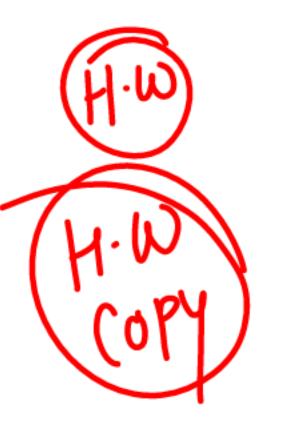
Based on the above information CALCULATE:

(1) Price of future contract.

(2) The gain on short futures position if index turns out to be 8,500 in three months.

(MTP: Sep - 2022)

(Page No. 89)



QUESTION 62

Mr. SG sold five 4-Month Nifty Futures on 1st February 2020 for ₹ 9,00,000. At the time of closing of trading on the last Thursday of May 2020 (expiry), Index turned out to be 2100 The contract multiplier is 75. Based on the above information calculate:

The price of one Future Contract on 1st February 2020.

(ii) Approximate Nifty Sensex on 1st February 2020 if the Price of Future Contract on same date was theoretically correct. On the same day Risk Free Rate of Interest and Dividend Yield on Index was 9% and 6% p.a. respectively.

(iii) The maximum Contango/Backwardation.

(ive The pay-off of the transaction.

Note: Carry out calculation on month basis.

(RTP November - 2020)

(Page No. 90)

(i) price of one future Contract

ii) Spot brice $f = S \times [1 + (1 - d)t]$ $2400 = S \times [1 + (0.09 - 0.06)]$ S = 2376.24

(iii) Maximum Contango Backwardation 9f future is more than spot, then mostret is soid to be "Contango" [सिधा कर्ला] If future is less than spot, then such Market is Called "Backwardation" [3000 017007] Basis = S-F . 97 Basis is negative = Contango 97 Basis is positive = Backwordation In this duestion, future (2400) is more than spot (2376)

hence market is contango = 2400 - 2376 = 724 ON 23.76

(iv) Calculation of bayoff

Gain on short position of Nifty =
$$(2400 - 2100) \times 75 \times 5$$

= 7112500

QUESTION – 69

Mr. X is having a portfolio of shares worth ₹ 170 lakhs at current price and cash ₹ 30 lakhs. The beta of share portfolio is 1.6. After 3 months the price of shares dropped by 3.2%.

Determine:

- (i) Current portfolio beta.
- (ii) Portfolio beta after 3 months if Mr. X on current date goes for long position on ₹ 200 lakhs Nifty futures.

(Exam July - 2021)

(Page No. 9<u>6</u>)

1 Cument bortholio Beta

$$B_{P} = \frac{(140 \times 1.60) + (30 \times 0)}{200}$$

- portfolio Beta a fler 3 months
 - · Calculation of % change in Masket

Beta of share portfolio = 1.60 % change in share = 3.2% In portfolio

$$1.60 = \frac{3.2}{100} = \frac{3.2}{1.60} = \frac{3.2}{1.60}$$

$$1.60 = \frac{3.2}{1.60} = \frac{20}{1.60}$$

· Overall profit Loss after 3 Months Share Portfolio = 170 Rong Nifty = 200 Rong Loss in Long position on shares = 5.44 L (170 x 3.2%) Loss in Long position on Nithy = 4.00 L 9.44 L Overall Loss % of $Loss = \frac{9.44 \times 100}{200} = 4.72\%$ Portfolio Beta after 3 Months = $\frac{4.72\%}{2\%}$ = 2.36

A trader is having in its portfolio shares worth ₹ 85 lakhs at current price and cash ₹ 15 lakhs. The beta of share portfolio is 1.6. After 3 months the price of shares dropped by 3.2%.

Determine:

- (i) Current portfolio beta
- (ii) Portfolio beta after 3 months if the trader on current date goes for long position on ₹ 100 lakhs Nifty futures.

(SM New Syllabus & PM)

(Page No. 97)

A Future contract on BSE Index with 4 months maturity is used to hedge the value of the portfolio over the next 3 months. One future contract for delivery is 50 times of the index.

The following information is available:

Value of the portfolio	₹ 1,16,00,000
BSE Sensex on 1 st January 2022 (Anticipated on 1 st September 2021)	58,580
BSE Sensex on 1 st January 2022 (Anticipated on 1 st December 2021)	56641.25
Dividend Yield of Index	6% p.a
181 day's treasury bills offers a rate of interests. Beta of the portfolio	est 9% p.a. 1.5
You are required to calculate	

- (i) The present value of the Sensex as on 1st September 2021
- (ii) Turned out value of the Sensex on 1st December 2021 (iii) The number of contracts to hedge the portfolio.

(i) Spot (1 [09|2021)

$$F = S \times [1 + (x - 4)t]$$

58580 = $S \times [1 + (0.09 - 0.06) \times \frac{1}{12}]$
 $S = 758000$

(ii) Spot (1 [12/2021)

56641.25 = $S \times [1 + (0.09 - 0.06) \times \frac{1}{12}]$
 $S = 756500$

(iii) No. of Contracts

No. = $\frac{VP \times BP}{F \times M}$

= $\frac{11600000 \times 15}{58000 \times 50} = 6000$

On 1 April 2015, Sunidhi was holding a portfolio of 10 securities whose value was ₹ 9,94,450, the weighted average of beta of 9 securities was 1.10.

Since she was expecting a fall in the prices of the shares in near future to hedge her portfolio she sold 5 contract of NIFTY Futures (Multiplier of 25) expiring in May 2015, which was trading at 8767.07 on 1 April.

- (a) Calculate the beta of the 10th security.
- (b) Reconcile the reasons in spite of 2% fall in the market as per Sunidhi's apprehension if she would have earned some profit on her cash position.

(B) It may be possible that (Page No. 100)

book folio may change opposite of Market due to Unsystematic Risk. In this situation she would have earned profit on how cash position if 2% fall in market.

(9) 8767.07 x 25 Ed T 4Months 3 Month Spot Divided 713 ₹500 97 = 12% p.9. berood = 4 Months Calculate Théoretical fature price. Method I f = 500(1.04) - 13(1.01) - 7506.87 $f = (500 - \frac{13}{1.03})(1.04) = 7506.87$ F = (Spot - P.Y. of dividend) (1+y) =

EXAMPLE – 22

Suppose that there is a future contract on a share presently trading at \gtrless 1,000. The life of future contract is 90 days and during this time the company will pay dividends of \gtrless 7.50 in 30 days, \gtrless 8.50 in 60 days and \gtrless 9.00 in 90 days.

Assuming that the Compounded Continuously Risk free Rate of Interest (CCRRI) is 12% p.a. you are required to find out:

- (i) Fair Value of the contract if no arbitrage opportunity exists.
- (ii) Value of Cost to Carry

[Given $e^{-0.01} = 0.9905$, $e^{-0.02} = 0.9802$, $e^{-0.03} = 0.97045$ and $e^{0.03} = 1.03045$]

P.Y. of dividend =
$$(7.50 \times 0.9905) + (8.50 \times 0.9802) + (9 \times 0.97045) = 24.49$$

$$F = (1000 - 24.49) \times 1.03045$$

$$= 1005.21$$
Value of Cost to Carry = 1005.21 - 1000 = 5.21

PART IV Commodity future

- 1) Morgin A/c No Ruestion
- 2) Theoretical future price
- 3 Hedging through future

2 Theoretical future brice

The following information is available about standard gold.

Spot Price (SP) \$\frac{15,600}{5}\$ per 10 gms.

Future Price (FP) ₹ 17,100 for one year future contract

Risk free interest Rate (R)^f 8.5%

Present Value of Storage Cost ₹ 900 per year

From the above information you are requested to calculate the Present Value of Convenience yield (PVC) of the standard gold.

(Page No. 100)

$$f = (\$ + PVSC - PVCY)(1+7)$$

 $17100 = (15600 + 900 - x)(1.085)$
 $x = 740$

The following information about copper scrap is given:

- (i) Spot price: \$10,000 per ton
- (ii) Futures price: \$10,800 for a one year contract
- (iii) Interest rate: 12 %
- (iv) PV (storage costs): \$500 per year

What is the PV (convenience yield) of copper scrap?

(Page No. 101)

3 Hedging through twhile

10000Kg 3 Months f = 82 Short on withon Rqm' 10000kg) Rice 3 Month 9 80 (cash Market) 10000 × 78 = 780000 10000 790000 = (F9)

A Rice Trader has planned to sell 22000 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 1000 kg. The price is expected to fall as low as ₹ 56 per kg, 3 months hence. Required:

- (i) To interpret the position of trader in the Cash Market.
- (ii) To advise the trader the trader should take in <u>Future Market</u> to mitigate its risk of reduced profit.
- (iii) To demonstrate effective realized price for its sale if he decides to make use of future market and after 3 months, spot price is ₹ 57 per kg and future contract price for closing the contract is ₹ 58 per kg.

O Rice Trader has blanned to Bell rice after 3 Months & Expects that brice of Rice will rise, hence Rice Trader has Long bosition in Cash Market.

Dince Rice Trader has long position in Cash Market, honce he should take short bosition in future market to avail Risk.

No. of Contract: 22000kg = 22 Contract

(RTP Nov – 2020 & MTP May - 2019)

3) Effective Realised brice

22000kg/ SR = 760 porkg -3 Month Spot Rate = 57 (Cash Market) Revenue from Sale of Rice (22000kg x 57) = \$\frac{7}{1254000}\$

Gain on short boothion of future (59-58) 22000 = \$\frac{7}{22000}\$

Revenue = \$\frac{7}{246000}\$

Guantity 258 ponts

Effective orice

QUESTION PAPER Q3 (b)

Mr. V is a commodity trader and specialized himself in trading of rice. He has 24,000 Kg of rise. The following details are available as on date:

Spot price

₹/Kg.

70 —

3 month's future is trading at

₹/Kg.

68

Expected Lower price after

3 months

₹/Kg.

64 X

Contract size

500 Kg./contract

You are required to advise to Mr. V:

Zi)

How to mitigate the risk of fall in price,

(11)

How to use the futures market.

ing for

What will be the effective realized price for his sales if, after 3 months, spot price is ₹ 69/Kg) and the 3 months future contract price is

(Marks 8)

May 2623)

H·W

QUESTION – 63

A Mutual Fund is holding the following assets in ₹ Crores:

Investments in diversified equity shares 90.00

Cash and Bank Balances

10.00

100.00

The Beta of the equity shares portfolio is 1.1. The index future is selling at 4300 level. The Fund Manager apprehends that the index will fall at the most by 10%. How many index futures he should short for perfect hedging? One index future consists of 50 units.

Substantiate your answer assuming the Fund Manager's apprehension will materialize.

(SM) New Syllabus & PM)
(Page No. 91)

No. of Contracta

QUESTION - 59 Cong

An investor buys a NIFTY futures contract for ₹ 2,80,000 (lot size 200 futures). On the settlement date, the NIFTY closes at 1,378 Find out his profit or loss, if he pays ₹ 1,000 as brokerage. What would be the amount of profit or loss, if he has sold the futures contract.

Nifty =
$$\frac{28000}{200}$$
 = 140 (Page No. 88)
 $(400 - 1378)$ $(400 - 1378)$ (400) = (400)

QUESTION – 48

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:

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

(Ignore margin and taxation, if any)

(Exam Nov - 2019)

(Page No. 70)

1 price of one future contract

Mr. X, is a Senior Portfolio Manager at ABC Asset Management Company. He expects to purchase a portfolio of shares in 90 days. However he is worried about the expected price increase in shares in coming day and to hedge against this potential price increase he decides to take a position on a 90-day forward contract on the Index. The index is currently trading at 2290. Assuming that the continuously compounded dividend yield is 1.75% and risk free rate of interest is 4.16%, you are required to determine:

(i) Calculate the justified forward price on this contract.

- (ii) Suppose after 28 days of the purchase of the contract the index value stands at 2450 then determine gain/ loss on the above long position.
- (iii) If at expiration of 90 days the Index Value is 2470 then what will be gain on long position.

Note: Take 365 days in a year and value of $e^{0.005942} = 1.005960$, $e^{0.001849} = 1.001851$.

(Page No. 83)

godays forward price $F = 8 \times e^{(r-d)t}$ = 2290 \times e^{(0.0416 - 0.0175) \frac{90}{365}} = 2290 X e 0.005942 = 2290× 1.005960 = 2303.65 11) Retermine Gain/Lors on Long booition $\frac{28 \text{ days } F}{F = 2290 \times 60.001849}$ = 2290 × 60.001849 = 2290 × 1.001851 = 2294.24 Gain on Long position = (2450-2294.24)
= \$\mathref{1}\$ = (2450-2294.24) (11) Expiration in godays Gain on Long position = (2470 - 2303.65) = \$166.85

QUESTION – 32

t=260

A call and put exist on the same stock each of which is exercisable at ₹60. They now trade for:

Market price of Stock or stock index CMP ₹ 55

Market price of call

oremium ₹9

Market price of put

₹ 1

Calculate the expiration date cash flow, investment value, and net profit from:

- (i) Buy 1.0 call
- (ii) Write 1.0 call ~
- (iii) Buy 1.0 put
- (iv) Write 1.0 put

for expiration date stock prices of ₹(50,) ₹(55) ₹(60,) ₹(65), ₹(70).

(Practice Manual)

(Page No. 52)

	① Exp	ization dat	te Cosh Flou	: = £	± eo 1	
	50	55	9	9	70	
Buy 1 carl	0	0	0	-60	-60	
Buy 1 carl Write 1 carl	0	0	0	† 6o	160	
Buy 1 put	†60	+60	0	0	0	
Buy 1 put Write 1 put	- 60	- 6D	0	0	0	
	L (ii)	nvestme	nt Value	Gross Pay	10/6	
	50	55	60	65	70	
Buy 1 call Write 1 Call Buy 1 but Write 1 but	0	0	0	5	10	_
Write 1 Call	0	0	O	-5	-10	
Buy 1 but	10	5	0	0	0	
Myse I for	-10	-5	ට	0	Ø	•
net profit						
	50	55	60	65	70	pul =
Buy 1 call Write 1 call	- 9	- 9	- 9	-4	1	
Write 1 Call	9	9	9	4	-1	
Buy 1 put	9	4	-1	-	-1	
MMIC 3 1 3m	-9	-4	1	1	'	
						_



Ram holding shares of Reliance Industries Ltd. which is currently selling at ₹ 1,000 He is expecting that this price will further fall due to lower than expected level of profits to be announced after one month. As on following option contract are available in Reliance Shares.

Strike Price (₹)			Option	Premium (₹)	
	1030		Call	40	
	10)(Çall	35	
	2000		Call .	30	
	990		Put	35	
	970		Put	20	
T	950	<u>IL</u>	Put	8	
	-030	X	Put	5	

Ram is interested in selling his stock holding as he cannot afford to lose more than 5% of its value.

Recommend a hedging strategy with option and show how his position will be protected.

(Page No. 54)

Ram holding share & coment market price of share 71000. Ram Can not afford to Lose more than 5%.

In this situation Ram
Should buy but oftion at

EP 7 950 (7 1000 × 95%)

The price is more than 7 950

but Labse

Self share

bremium

5-8

premium

950 - S + S

942

