PREFACE

This summary notes doesn't guarantee passing the exam.

It is only meant to condense the huge content of ICMAI.

One needs to have a visualisation of connected questions with every concept studied here.

The visuals come only when you have practiced the connected sums at least 3 times after understanding the logic behind the concepts.

For effortless understanding of logic and practice of sums once, Join full classes of SFM with Satish Sir.

Exclusively taught as per CMA Final Course.
ICMAI Material Covered with all practicals and theories.

You will fall in love for finance, for sure

"I believe in - showing students how to cook rather than to give the food. Specially, I have also given sessions for preparing summary notes, where I am showing the process of how to summarise the big chapters. This would help you in all other subjects." - Satish Sir

Reviews of our regular classes of SFM

The books were great with regards to the content and coverage that has been provided. I really liked the numerous variation of sums that were provided to us in the entire course. I really loved the flow of the classes and the content was very well covered.

Thanking You.

Dipti Saraf

The content in the book is very good and well organized, there is extra space for page numbers and what is new is very useful and saves time for study, also the quality of the book is very good including the quality of paper and binding of the book.

Anjali Kumari Shaw

Options

OPTIONS

- Types of Options
- Moneyness of Options
- Pay off Profile
- Option strategies
- Option Greeks
- Option Pricing

1. Types of Options

- **American**: Exercised anytime before expiry
- **European**: Exercised only at the time of maturity
- **Call**: Right but not an oblign to buy
- **Put**: Right but not an oblign to sell

Chart

Type	Position	Belief	Oblign Level	Premium	When it Earns	Max Pft	Max loss
C+	Call buyer	Bullish	Right to buy	Pay	AP > EP	Unltd	Premium Paid
C−	Call Write	Bearish	Oblign to sell, if C+ claims	Rec.	AP < EP ↓ C+ will not exercise	Prem Recd	Unltd

P+	Put buyer	Bearish	Right, but not an oblig^n to sell	Pay	AP<EP	EP−Prem	Prem
P−	Put Seller	Bullish	Oblig^n to buy if P+ claims	Receive	AP>EP & P+ will not exercise	Prem Rec	EP−Prem

2. Moneyness of Options

In the Money (ITM)	At the money (ATM)	Out of money (OTM)
Gain ↓		
Call ⇒ AP>EP (C+)	AP = EP	AP<EP
Put (P+) ⇒ AP<EP	AP = EP	AP > EP

(view from C+ & P+)

Break Even Point ⇒ Net O/f or I/f = Nil

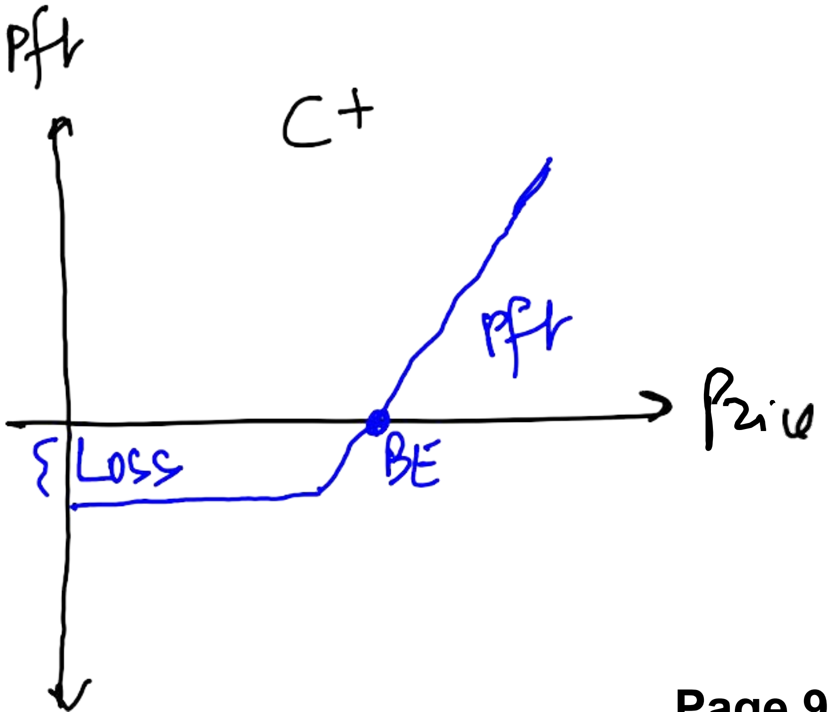
C^+ BEP ⇒ when AP = EP + Premium
(same for C^-)

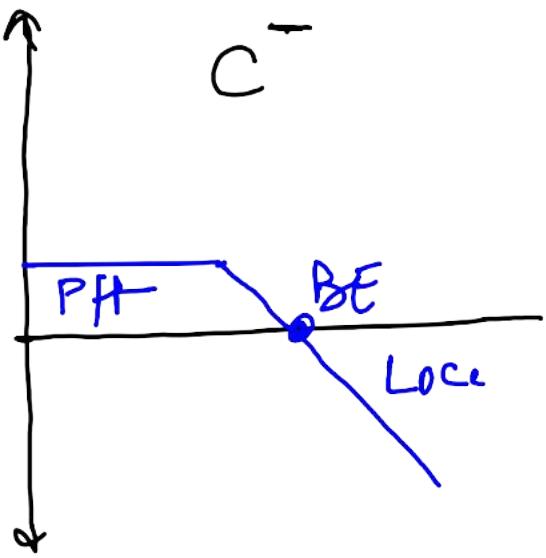
P^+ BEP ⇒ when AP = EP − Premium
(same for P^-)

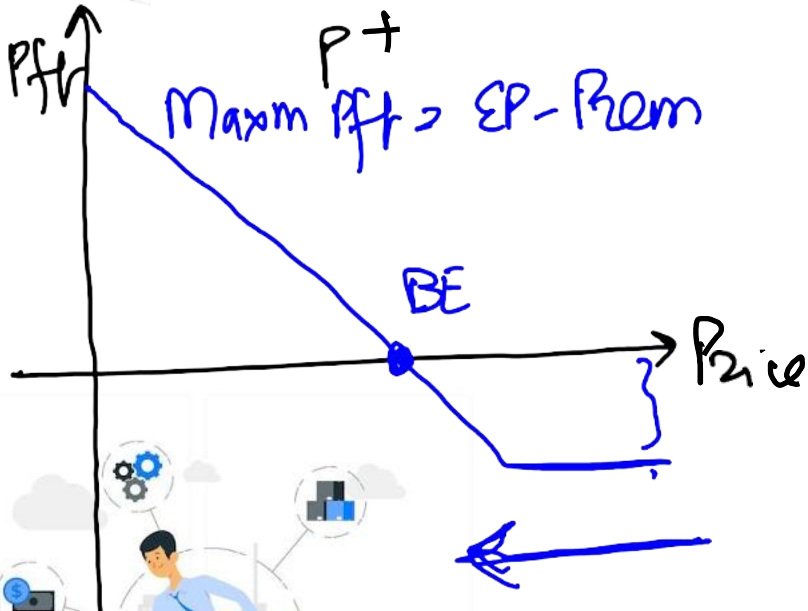
For high volatility : C^+
Low " = P^-
No " = F^+
(Bullish)

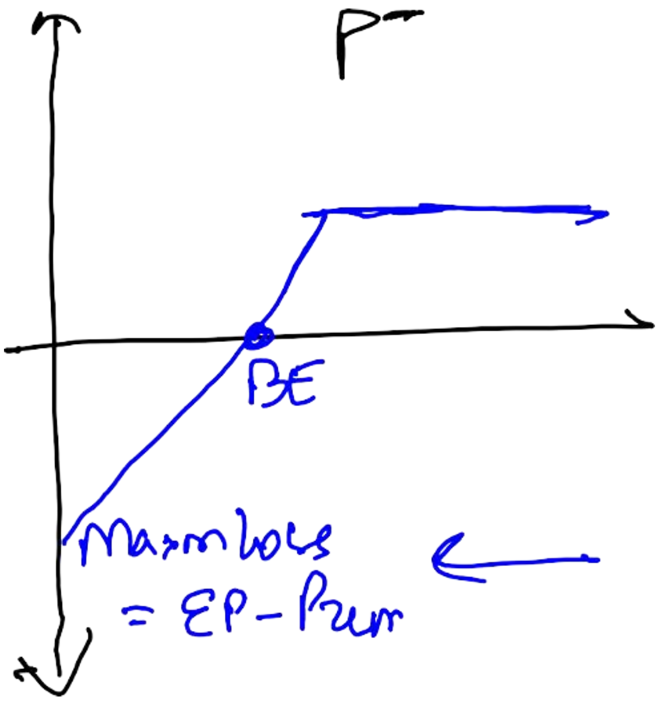
---

3. Pay off Profile Diagrams









4. Option strategies

To lock certain income – By combining diff types of contracts

- **Synthetic** → Stock + Options
- **Spread** → Only Call or Only Put with diff expiries or strike prices
- **Combination** → Call & Put are combined

Synthetic

Protective Put or Married Put

S^+, P^+

Put is like an insurance against fall in price.

Covered Call Writing

C^-, S^+

↓

at higher exercise price

↓

Prem recd from C^- reduces the cost of S^+

⇓

BEP = [Stock Price − Prem Recd]

Any other combination of stock & options can be created and all will be <u>Synthetic</u>

Spread

Bull Spread

Call ⇓

C^+ at E_L & C^- at E_H

Put ⇓

P^+ at E_L & P^- at E_H

Bear Spread

Call ⇓

C^- at E_L & C^+ at E_H

Put ⇓

P^- at E_L & P^+ at E_H

Box Spread

Butterfly Spread

Long ⇓

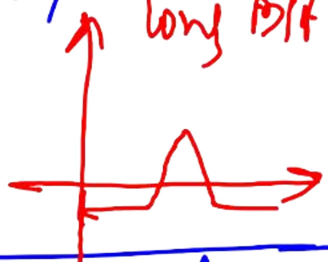
Low volatility

⇓

Buy a B/F

⇓

Buy Wings, Sell body
Wings, Body



Short ⇓

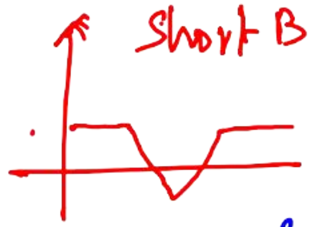
High Volatility

⇓

Sell a B/F

⇓

Sell Wings, Buy body



SJC Institute

	Wing 1	Body	Wing 2
Call,	C^+ at E_1,	$2C^-$ at E_2,	C^+ at E_3
Put,	P^+ at E_1,	$2P^-$ at E_2,	P^+ at E_3

⇓

BEP = Middle EP ± Max Gain

	Wing 1	Body	Wing 2
Call	C^- at E_1,	$2C^+$ at E_2,	C^- at E_3
Put	P^- at E_1,	$2P^+$ at E_2,	P^- at E_3

⇓

BEP = Middle EP ± Max loss

→ There are 2 BEP in a B/F Spread

→ Spread = $E_2 - E_1 = E_3 - E_2$ (not $E_3 - E_1$)

→ Both loss & Pft are Ltd in all spreads

→ for all Spreads

Case	I Prem	Max Loss	Max Gain
1	O/F (Net)	Initial O/F	Spread - Initial O/F
2	I/F (Net)	Spread - Initial I/F	Initial I/F

SJC Institute

Combination Strategies

Combination of Call & Put

- **Straddle**
  - Long: P^+, C^+ at same E
  - Short: P^-, C^- at same E
- **Strangle**
  - Long: P^+ at E_L & C^+ at E_H
  - Short: P^- at E_L & C^- at E_H
- **Strip**
  - Long: $2P^+$ & C^+ at same E
  - Short: $2P^-$ & C^- at same E
- **Strap**
  - Long: P^+ & $2C^+$ at same E
  - Short: P^- & $2C^-$ at same E

	Combin	B/F Spread
High volatility	Long	Short
Low volatility	Short	Long

SJC Institute

Option Pricing & Valuation

Time Value & Intrinsic Value	Max Value & Min Value	Valuation Models

Step 1: IV

(Think on C^+, P^+)

Gain at T_0 (AP of Stock)

$C^+ = AP - EP$

$P^+ = EP - AP$

Step 2: TV (Expected Gain over the period)

Act Premium − Intrinsic Value

IV or TV cannot be negative

IV > 0 ⇒ Exercise

TV at expiry = 0 (always)

[Q27]

		Max	Min (IV)
American	C^+	S_t	Max $(0, S_t - PV \text{ of } X)$
	P^+	X	Max $(0, X - S_t)$
European	C^+	S_t	Max $(0, S_t - PV \text{ of } X)$
	P^+	$PV \text{ of } X$	Max $(0, PV \text{ of } X - S_t)$

$$PV \text{ of } X = \frac{FV}{(1+r)^t}$$

or

$$\frac{FV}{e^{rt}}$$

S_t = Act Price

X = Exer Price

If

Act Prem ≠ Min value of option

Arbitrage possibility exists

Act Prem < Min value = Underpriced

Act Prem > Min value = Over priced

[Q28]

Call Option

	Underpriced	Overpriced
T_0	C^+ I^+ Rf Inv	C^- I^- = Borr
T_n	C^- I^- Redeem	C^+ I^+ = Repay

Fiduciary Call

Put Option

	Underpriced	Overpriced
T_0	P^+ S^+	P^- S^-
T_n	P^- S^-	P^+ S^+

Married Put

Valuation Models

- Put Call Parity
- Binomial Model
- Delta Route
- Black Scholes Merton Model

Model 1 : Put Call Parity (European Options)

$$\boxed{P_0^+ + S_0^+ = C_0^+ + Rf\ Inv^+}$$

P_0 or C_0 must be given

P_0, C_0 = same Exercise Price

Rf Inv : PV of E = $E \times \frac{1}{e^{rt}}$

S_0 : Current stock price = Ex dividend

$= \left[S_0 - \frac{D}{e^{rt}}\right]$ or $\left[S_0 \times \frac{1}{e^{yt}}\right]$ y : Div Yield rate

- P_0 or C_0 ⇒ obtained are Theoretical price of Options
- Act Price ≠ Theoretical price ⇒ Arbitrage is possible

• Arbitrage

Step1: Theoretical price of Put / Call

Step2: Compare Th Price & Act Price

Step3: Say, Put is overpriced / Call is underpriced

$P^- \; S^-$ & $C^+, \; I^+$

Put is underpriced / Call is overpriced

$P^+ \; S^+$ & $C^-, \; I^-$

Model 2 :- Binomial Model

Step (A) Single Stage

1. Binomial Tree

S_0 : -

E =

Call / Put –

Expiry =

Rf : —

US = ✓

DS = ✓

Payoff

✓

✓

Step2 PB

$$P_u = \frac{Rff - DSF}{USF - DSF}$$

$$P_d = 1 - P_u$$

$Rff = e^{rt}$

USF = 1 + % rise

DSF = 1 - % fall

Step 3 Expected Pay off $= \Sigma px$

Step 4 PV of Exp Pay off $= \dfrac{\text{Exp Pay off}}{e^{rt}}$

(B) Two Stage

Steps

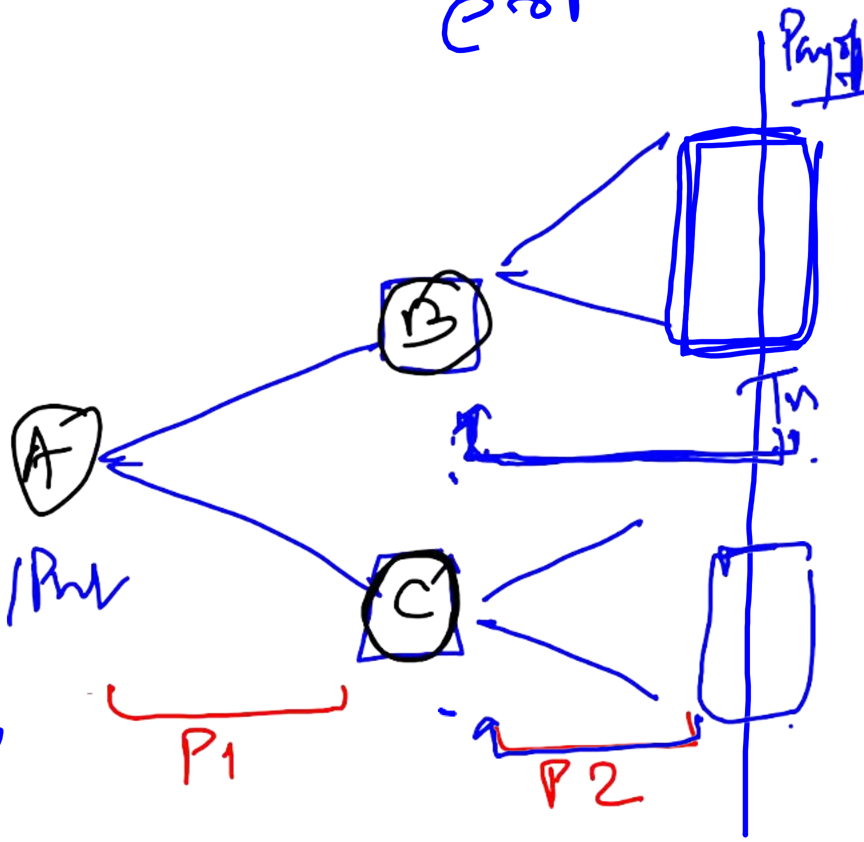
1. Binomial Tree

S_0

E

Call / Put

R_f



2. $P_u = \dfrac{Rff - DSF}{USF - DSF}$

If USF & DSF are diff in 2 periods, then we have to find Pb separately for each period

3. Exp Pay off Node B $= \Sigma px$.

4. $\dfrac{\text{PV of Exp Pay off}}{\text{PV of Node B}}$.

SJC Institute

Node C = Epx | PV of Node C

Node A = Σ (p × PV of Node B) + (p × PV of Node C) | PV of Node A

Binomial for American Options

Value = PV of Exp Pay off - Same as above

Value of American Option = Max (Computed Value, Intrinsic Value)

(One extra step)

Trick

$\log_e \boxed{1.04} = 0.0392$ (Given)

$e^{rt} = 1.04$ (from workings)

$\log_e(e^{rt}) = \log_e(1.04)$ [Taking $\log_e$ on both sides]

$rt = 0.0392$ given

[use to find r]

<u>Upside & Downside price not given -</u>

<u>Annual volatility given :-</u>

$$\text{US factor} = e^{\sigma\sqrt{t}}$$

$$\text{DS factor} = \frac{1}{\text{USF}}$$

[Var is proportional to time but not SD]

$$SD = \underset{\text{p.a.}}{\sigma}\sqrt{t}$$

Delta Route

Delta of an option = $\dfrac{\text{Change in Pay off}}{\text{Change in underlying Price}}$

Δ of Call = positive
Δ of Put = negative

#

	Δ
ITM	± 1
ATM	± 0.5
OTM	0

Uses of Δ

1. Value of Call option

$$C_0 = \Delta_C \times \left[\text{Current Stock Price} - \text{PV of } \frac{\text{lower Exp Price}}{e^{Rt}}\right]$$

lower Exp Price : Binomial

tree's Lower price

S_0 — Up / Low

Value of Put Option

= Use PCP Eqn with above value of call.

2. Hedging using Delta

Futures = Use Beta

Options = use delta

Used when = Hedging stock using Options

$$\boxed{\text{Eq No. of options} = \frac{\text{No. of Shares}}{\Delta}}$$

$$\boxed{\text{No. of shares} = \text{Eq no. of Options} \times \Delta}$$

Used when - hedging Options Writing using stocks

Net Position of Trader - to hedge Call writing

Call writing : $\Delta \times$ No. of Shares $\times$ Share Price $-$ Borrowings

Ct is already hedged - so not used in examples

Option Greeks

Option Price = f(Delta, Theta, Rho, Vega, Gamma)

1. Delta = $\dfrac{\Delta \text{ Op Price}}{\Delta \text{ Stock Price}}$

2. Theta : $\dfrac{\Delta \text{ Op Price}}{\Delta \text{ Time till maturity}}$

3. Rho = $\dfrac{\Delta \text{ Op Price}}{\Delta \text{ Rf Rate}}$

Rf int rises ↑, Call price rise ↑

Put price falls ↓

4. **Vega** = $\frac{\Delta \text{ Op Price}}{\Delta \text{ volatility}}$

Higher volatility in upside = higher call option Price

" " " downside = higher Put Option Price

5. **Gamma** = $\frac{\Delta \text{ Op Price}}{\Delta \text{ delta}}$

⇒ to determine stability of Δ

Black Scholes Merton Model

1. for European option only
2. Assumptions
   1. Perfect mkt, no transn cost
   2. Fractional shares can be traded
   3. European Options
   4. Non div paying Stock (S0 − PV of Div)

5. R_f = Continuously compounded & constant

6. Annualised volatility

7. Stock Price are log normally distbⁿ

3. Thought Process

$\boxed{\text{Call Writing} = \Delta \times S - \text{Borrowing}}$ ← Observe

$\boxed{\text{Value of call option} = N(d_1) \times S_0 - PV \text{ of } E \times N(d_2)}$

4. $N(d_1)$ & $N(d_2)$

$N(d_1)$ = Area to the left of d_1

$N(d_2)$ = " " " " " d_2

[using normal distbⁿ] assume $z = d_1$ or d_2

5. d_1 & d_2

$$d_1 = \frac{\ln\left(\frac{S_0}{E}\right) + \left(R_f + \frac{\sigma^2}{2}\right) \times t}{\sigma\sqrt{t}}$$

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

ln = log normal

σ = Annualised volatility

6. Log normal

$\ln 5 \Rightarrow$ **Step 1** 5 $\sqrt{}$ 12 times

Step 2 -1

Step 3 $\times 4096$

7 Value of Put Option

Option 1

1. Value of Call Option (C_0) – using BSM
2. Value of Put – using PCP Eqn

Option 2

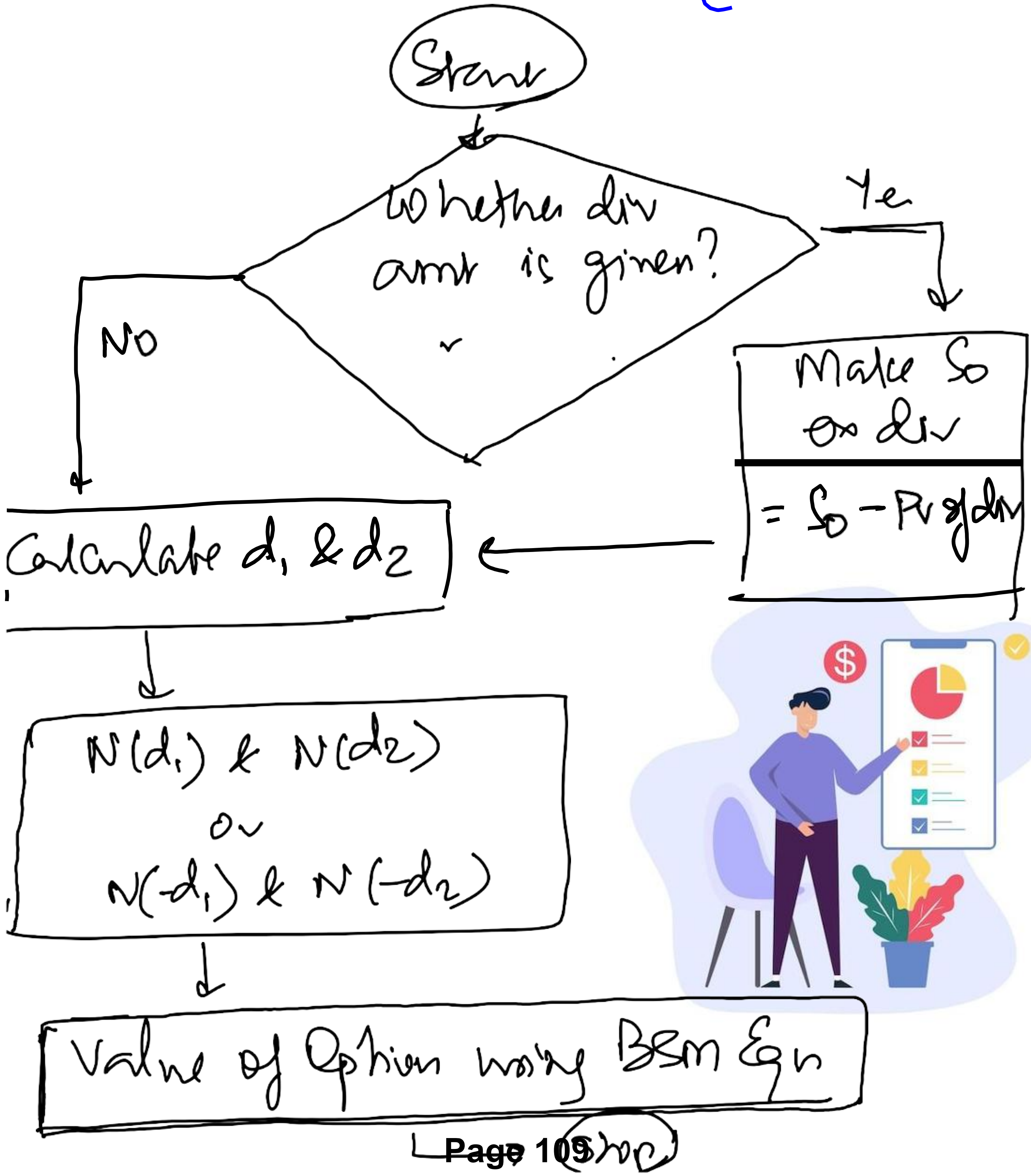
$$\boxed{\begin{array}{l} \underline{P_0\ (BSM)} \\ = PV\ of\ E \times N(-d_2) - S_0 \times N(-d_1) \end{array}}$$

8. Div Paying Stock

$$S_0 \text{ revised} = S_0 - \text{PV of Dividend}$$

or

$$S_0 - \frac{Div}{e^{rt}}$$



Liked our efforts?

The fees that you may pay to us is your REFERENCE.

Please refer your friends or family to take all classes of CA/CMA only from SJC Institute.

Thank You.