

# Complex Instruments Valuation

**February 19, 2025**  
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# Fair Value Measurement

## Complex Financial Instruments

**Para 29 of Ind-AS 32** gives the definition of complex financial instruments.

- The issuer of a non-derivative financial instrument shall evaluate the terms of the financial instrument to determine whether it contains both a liability and an equity component. Such components shall be classified separately as financial liabilities, financial assets or equity instruments in accordance with paragraph 15.
- An entity recognizes separately the components of a financial instrument that (a) creates a financial liability of the entity and (b) grants an option to the holder of the instrument to convert it into an equity instrument of the entity.
- For example, a bond or similar instrument convertible by the holder into a fixed number of ordinary shares of the entity **is a compound financial instrument**.
- From the perspective of the entity, such an instrument comprises two components: **a financial liability** (a contractual arrangement to deliver cash or another financial asset) and **an equity instrument** (a call option granting the holder the right, for a specified period of time, to convert it into a fixed number of ordinary shares of the entity).
- The entity needs to present the liability and equity components separately in its balance sheet.

# Fair Value Measurement

## Complex Financial Instruments

The procedure to value the equity and liability component is defined in **Para 31 of Ind-AS 32**. Separation of the instrument into its liability and equity components is performed at the time of issue of CFI. The method prescribed is as follows:

- Identify the various components of Compound Financial Instrument
- Determine the value of Compound Financial Instrument as a whole
- Determine the value of liability component and embedded derivatives
- Determine the value of equity component

# Fair Value Measurement

## Key Terms Impacting the Valuation of the CFI

### Conversion Terms

- Fixed Conversion Ratio (Debt Component and Equity Component)
- Variable Conversion Ratio (Based on the Equity Value at the time of Conversion)

# Option Pricing

## Introduction to Options : Basics

### What is an Option?

- An option is a **derivative contract** which
- provides the holder with the **right to buy or sell**
- a specified quantity
- of an **underlying asset**
- **at a fixed price** (called a strike price or an exercise price)
- at or **before the expiration date** of the option.

Since ***it is a right and not an obligation***, the holder can choose not to exercise the right and allow the option to expire. The price of the right is known as **option premium**.

### Exercise styles:

- ❑ **European:** Gives owner the right to exercise the option *only on the expiration date*.
- ❑ **American:** Gives owner the right to exercise the option *on or before the expiration date*.

In India, we generally have **only European Options**.



# Option Pricing

## Option Types

### How it Works?

Options are derivative instruments, meaning that their prices are derived from the price of their **underlying security**, which could be almost anything: **stocks, bonds**, currencies, indexes, commodities, etc.

Many options are created in a standardized form and traded on an options exchange like the Chicago Board Options Exchange (CBOE), **although** it is possible for the **two parties** to an options contract to **agree to create options with completely customized terms**.

There are two types of options:

1. **Call Options** - A buyer of a call option has **the right to buy** the underlying asset for a certain price.
2. **Put Options** - The buyer of a put option has **the right to sell** the underlying asset for a certain price.

# Option Pricing

## Terms Used in Call & Put Options

Type	Description
Expiration Date	Expiration date is the day on which the <b>option matures</b> .
Strike Price	The strike price is the <b>price</b> at which an <b>option can be exercised</b> .
Option Price	A call option gives the holder the right but not the obligation to buy an asset by a certain date for a <b>certain price</b> .
In the Money Option	An In the Money Option is an option that would lead to a <b>positive cash flow to the holder</b> if it is exercised immediately.
At the Money Option	At the Money Option is an option that would lead to <b>zero cash flow</b> , if it is exercised immediately.
Out of Money Option	Out of Money Option is an option that would lead to a <b>negative cash flow</b> if it is exercised immediately.

# Option Pricing

## Call Options

### What is a Call Option?

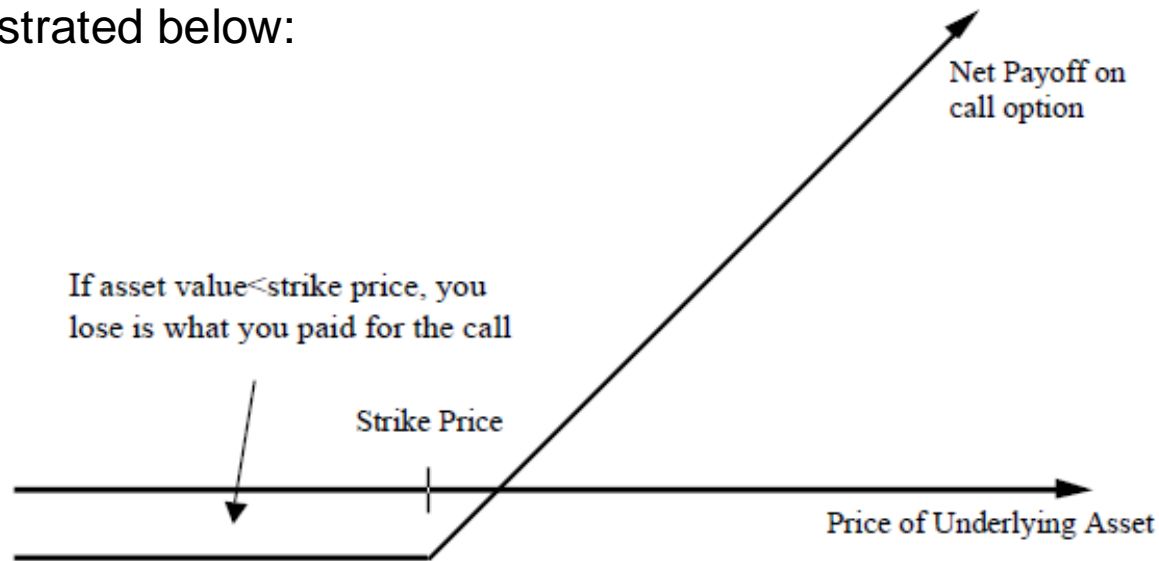
- A call option gives the buyer of the option *the right to buy the underlying asset at a fixed price*, called the strike or the exercise price, *at any time prior to the expiration date of the option*.
- The buyer pays a price for this right.
- If at expiration, the value of the asset **is less than** the strike price, *the option is not exercised* and *expires worthless*.
- If, on the other hand, the value of the asset **is greater than** the strike price, *the option is exercised* - the buyer of the option buys the asset [stock] at the exercise price.
- And the difference between the asset value and the exercise price comprises the gross profit on the option investment. *The net profit on the investment is the difference between the gross profit and the price paid for the call initially.*



# Option Pricing

## Payoff on Call Options

- For a call, **the net payoff is negative** (and equal to the price paid for the call) *if the value of the underlying asset is less than the strike price.*
- If the price of the **underlying asset exceeds the strike price**, the gross payoff is *the difference between the value of the underlying asset and the strike price* and *the net payoff is the difference between the gross payoff and the price of the call.*
- This is illustrated below:



# Option Pricing

## Illustration

### Question:

An investor buys a call option on the stock of RTL Ltd at an exercise price of Rs 200 for a premium of Rs 15. The option can be exercised on the expiration date after 3 months. The current market price of the stock is Rs 195. Find out the profit/loss to the call option holder if stock price on expiration date is (i) 175 (ii) 185 (iii) 195 (iv) 200 (v) 205 (vi) 215 (vii) 225 (viii) 235.

**What will be his maximum loss and maximum gain?**

# Option Pricing

## Illustration

The net profit/loss to the call option holder is calculated as under:

Stock price at expiry	175	185	195	200	205	215	225	235
Whether option is exercised	No	No	No	No	Yes	Yes	Yes	Yes
Cash outflow	0	0	0	0	-200	-200	-200	-200
Cash inflow	0	0	0	0	205	215	225	235
Premium paid	-15	-15	-15	-15	-15	-15	-15	-15
Profit/Loss	-15	-15	-15	-15	-10	0	10	20

# Option Pricing

## Illustration

The net profit/loss to the call option seller is calculated as under:

Stock price at expiry	175	185	195	200	205	215	225	235
Whether option is exercised	No	No	No	No	Yes	Yes	Yes	Yes
Cash outflow	0	0	0	0	200	200	200	200
Cash inflow	0	0	0	0	-205	-215	-225	-235
Premium paid	15	15	15	15	15	15	15	15
Profit/Loss	15	15	15	15	10	0	-10	-20

# Option Pricing

## Put Options

### What is a Put Option?

- A put option is a **derivative contract** which
- gives the buyer of the option
- the **right to sell**
- the underlying asset
- at a **fixed price** (called the strike or exercise price)
- at **any time prior to the expiration date** of the option.

The buyer pays a price for this right. If the price of the underlying asset is greater than the strike price, the option will **not be exercised** and **will expire worthless**.

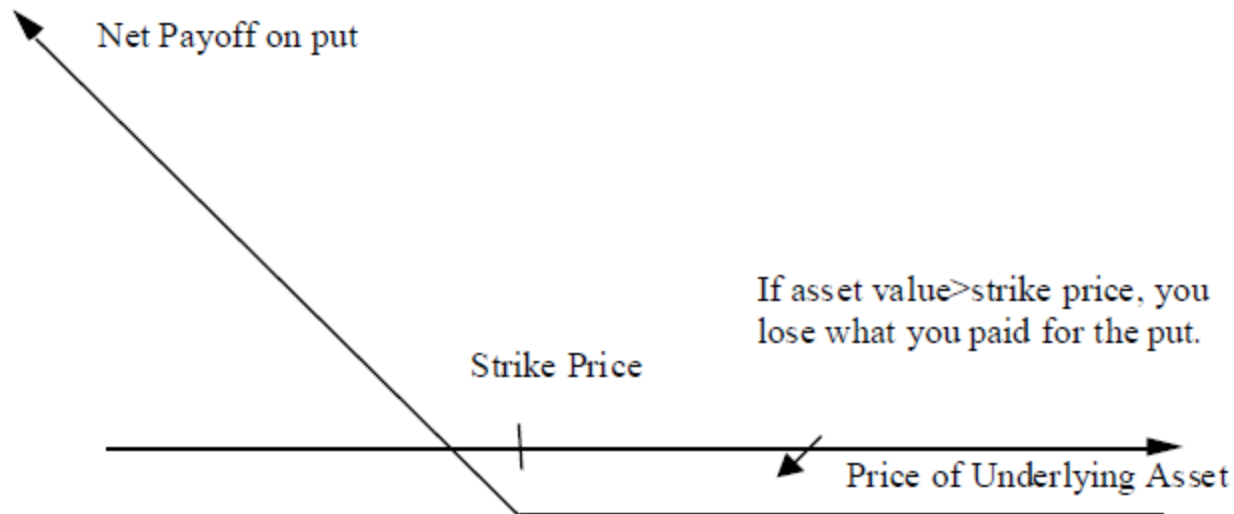
If on the other hand, the price of the underlying asset is **less** than the strike price, the owner of the put option **will exercise the option** and **sell the stock** at the **strike price**, claiming the difference between the strike price and the market value of the asset as the **gross profit, netting out the initial cost paid** for the put yields the net profit from the transaction.



# Option Pricing

## Payoff on Put Options

- A put has a *negative net payoff* if the value of the underlying asset exceeds the strike price and,
- A gross payoff equal to the difference between the strike price and the value of the underlying asset *if the asset value is less than the strike price*.
- This is illustrated below:



# Option Pricing

## Illustration

### Question:

An investor buys a put option on the stock of RTL Ltd at an exercise price of Rs 170 for a premium of Rs 10. The option can be exercised on the expiration date after 3 months. The current market price of the stock is Rs 165. Find out the profit/loss to the call option holder if stock price on expiration date is (i) 140 (ii) 150 (iii) 160 (iv) 170 (v) 180 (vi) 190 (vii) 200 (viii) 210.

**What will be his maximum loss and maximum gain?**

# Option Pricing

## Illustration

The net profit/loss to the call option holder is calculated as under:

Stock price at expiry	140	150	160	170	180	190	200	210
Whether option is exercised	Yes	Yes	Yes	No	No	No	No	No
Cash outflow	-140	-150	-160	0	0	0	0	0
Cash inflow	170	170	170	0	0	0	0	0
Premium paid	-10	-10	-10	-10	-10	-10	-10	-10
Profit/Loss	20	10	0	-10	-10	-10	-10	-10

# Option Pricing

## Illustration

The net profit/loss to the call option seller is calculated as under:

Stock price at expiry	140	150	160	170	180	190	200	210
Whether option is exercised	Yes	Yes	Yes	No	No	No	No	No
Cash outflow	140	150	160	0	0	0	0	0
Cash inflow	-170	-170	-170	0	0	0	0	0
Premium paid	10	10	10	10	10	10	10	10
Profit/Loss	-20	-10	0	10	10	10	10	10

# Option Pricing

## Value of an Option

Total Value of an Option = Intrinsic Value of an Option + Time Premium of an Option



Intrinsic Value (call) = Underlying Price – Strike Price

Intrinsic Value (put) = Strike Price – Underlying Price

- The intrinsic value of an option is the *value*, or *benefit*, obtained by the holder by *exercising* the option immediately.
- The time premium of the option is its *value*, or *benefit*, of being able to *wait and see*.
- At expiration, the *ability to wait* is *not there* and so the time value of the option *becomes zero*.

For example, when a stock is selling for \$60 a share, its call option with exercise price \$55 is selling for \$8.

Then the *intrinsic value* of the call is \$5 and the *time value* \$3.

For another option priced at \$3 with stock price \$79 and exercise price \$80, the intrinsic value is zero, and hence the time premium is \$3.



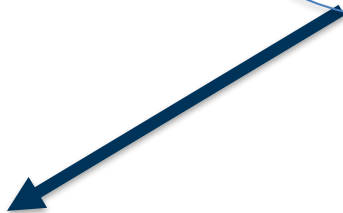
# Option Pricing

## Option Pricing Models

The price of any asset in the world is Present Value (PV) of future cash flows.

If we talk about call option, future cash flows are payoff:

Payoff from Call =  $S$  (Underlying Price) –  $E$  (Strike Price)



This  $S$  is uncertain and we need to model how this evolves over time. We are discussing following processes for modelling  $S$ :

1. Binomial Model (Discrete)
2. Black Scholes Merton Model (BSM) (Continuous)
3. Use of Monte Carlo Simulation in BSM

# Option Pricing

## Black Scholes Model

### Overview :

- The formula, developed by three economists – Fischer Black, Myron Scholes and Robert Merton – is perhaps the **world's most well-known options pricing model**.
- It was introduced in their 1973 paper, "The Pricing of Options and Corporate Liabilities," published in the Journal of Political Economy.
- The Black Scholes model is a model of **price variation over time** of *financial instruments* such as stocks that can, *among other things, be used to determine the price of a European call option*.
- It's used to **calculate the theoretical value of European-Style Options** using current stock prices, expected dividends, the option's strike price, expected interest rates, time to expiration and expected volatility.

# Option Pricing

## Inputs in the Black Scholes Model

Input	Description	Source of Data
<b>Striking Price (E)</b>	The <b>lower the striking price</b> for a given stock, <b>the more the option should be worth</b> , because a call option lets you buy at a predetermined striking price.	In case of listed shares, market quotes; in unlisted cases based on a valuation of the shares as on date.
<b>Time Until Expiration (T)</b>	The longer the time until expiration, <b>the more the option is worth</b> . The <b>Option premium increases for more distant expirations for puts and calls</b> .	The price at which the option is exercisable as per the contract / scheme.
<b>Stock Price (<math>S_0</math>)</b>	The <b>higher the stock price, the more a given call option is worth</b> . A call option holder <b>benefits from a rise in the stock price</b> .	As per the scheme or contract.
<b>Volatility (<math>\sigma</math>)</b>	The greater the price volatility, <b>the more the option is worth</b> . The volatility estimate Sigma <b>cannot be directly observed and must be estimated</b> . Volatility plays a major role in determining time value.	Market prices of similar stock.
<b>Dividends</b>	A <b>Company that pays a large dividend will have a small option premium</b> than a Company with a lower dividend, everything else being equal.	Based on historic trend or estimate for the future.
<b>Risk- Free Interest Rate (r)</b>	The <b>higher the risk free interest rate, the higher the option premium</b> , everything else being equal.	Market data on G.Sec yields.

# Option Pricing

## Illustration: Black Scholes Model (BSM)

### Illustration:

Consider the following information:

Underlying Price (S) – 500

Strike/Exercise Price (E) – 520

Standard Deviation (S.D.) ( $\sigma$ ) – 20%

Time to maturity (t) – 3 Months or 0.25 years

Risk Free Rate (r) (Continuous Compounding) – 6%

Compute the Call option premium using BSM Model.

# Option Pricing

## Illustration: Black Scholes Model (BSM)

### Solution:

Inputs:	
Stock Price now (P)	500
Exercise Price of Option (EX)	520
Number of periods to Exercise in years (t)	0.25
Compounded Risk-Free Interest Rate (rf)	6.00%
Standard Deviation (annualized s)	20%

Outputs:	
Present Value of Exercise Price (PV(EX))	512.3
$s \cdot t^{.5}$	0.10
d1	(0.2)
d2	(0.3)
Delta N(d1) Normal Cumulative Density Function	0.42
Bank Loan $N(d2) \cdot PV(EX)$	197.25

Value of Call	14.643
Value of Put	26.901



# Valuation of Convertible Instrument

## With Fixed Conversion Ratio

Convertible instrument with fixed convertible ratio has 2 components -Debt Component and Equity Component.

### Valuation of Debt Component

#### ABC Limited

##### *Key Assumptions for OCD*

Valuation Date	31-Jan-25
Face Value of One OCD (INR)	10
Coupon Rate	0.01%
Redemption Price	Issue Price
Tenure	10 years
YTM (See Below)	10.14%

#### ABC Limited

##### *Calculation of Yield to Maturity*

Particulars	Bond Yield
7.0 -Year Corporate Bond Yield*	8.16%
8.0 -Year Corporate Bond Yield*	8.05%
7.2 -Year Corporate Bond Yield (Interpolated)	8.14%
Adjustment Factor for Size, Lack of Liquidity	2.00%
<b>Yield to Maturity</b>	<b>10.14%</b>

\* Source: [www.fimmda.org](http://www.fimmda.org)

#### ABC Limited

##### *Determination of Fair Value of Debt Component via the Discounted Cash Flow Method*

*(Figures in INR)*

Issue Price Per OCD	10.0
Valuation Date	08-Feb-25
YTM	10.14%
Coupon Rate	0.01%
End Date of Tenure	28-Mar-32
Time Period (In Years)	7.1
Principal Repayment Per OCD	10.00
Coupon Payments Per OCD (1)	0.01
Total Repayment	10
Present Value Factor	0.5016
<b>Present Value of Debt Component of OCD</b>	<b>5.0</b>
<b>Concluded Fair Value of Debt Component of OCD</b>	<b>5.0</b>

(1) We have compounded the coupon payments as we have assumed that all the coupon payments due will be paid at the end of the tenure of OCDs.

# Valuation of Convertible Instrument

## With Fixed Conversion Ratio

### Valuation of Equity Component

#### ABC Limited

##### Calculation of Risk Free Rate

Particulars	Bond Yield
7.0 -Year Bond Yield rate*	6.66%
8.0 -Year Bond Yield rate*	6.76%
7.2 -Year Bond Yield (Interpolated)	6.68%
<b>Risk Free Rate of Return (Continuous Compounding)</b>	<b>6.46%</b>

\* Source: [www.investing.com](http://www.investing.com)

#### ABC Limited

##### Historical Price Volatility

Comparable Companies	7.2 Years
ACC Limited	31.8%
Birla Corporation Limited	39.5%
J.K. Cement Limited	30.7%
Shree Cement Limited	28.5%
Ultratech Cement Limited	27.5%
Dalmia Bharat Cement Limited	37.7%
Ramco Cement	29.8%
JK Lakshmi Cement	36.2%
Ambuja Cement	34.2%
<b>Average Volatility</b>	<b>32.9%</b>
<b>Selected Volatility (Rounded)</b>	<b>35.0%</b>

#### ABC Limited

##### Black-Scholes Option Pricing Model

Input Data	
Stock Price (S0)	30.0
Exercise Price of Option (EX)	27.0
Number of periods to Exercise in years (t)	7.2
Compounded Risk-Free Interest Rate (rf)	6.5%
Standard Deviation (annualized s)	35.0%
Dividend Yield	0.0%

Output Data	
Present Value of Exercise Price (PV(EX))	17.0
$s \cdot t^{0.5}$	0.9
d1	1.1
d2	0.1
Delta N(d1) Normal Cumulative Density Function	0.9
Bank Loan $N(d2) \cdot PV(EX)$	9.4
<b>Value of Call Option for One Equity Share</b>	<b>16.3</b>

**Conversion Ratio** **2.7**

<b>Value of Call Option for One OCD</b>	<b>6.0</b>
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(1) The conversion ratio is 27:10, i.e., 27 OCDs are convertible into 10 equity share.

# Valuation of Convertible Instrument

## With Fixed Conversion Ratio

### Valuation of Optionally Convertible Debenture

ABC Limited

*Fair Value of one OCD as on January 31, 2025*

	<i>(Figures in INR)</i>
Fair Value of Call Option of OCD(A)	6.0
Fair Value of Debt Component of OCD (B)	5.0
<b>Fair Value of Optionally Convertible Debenture (A+B)</b>	<b>11.1</b>

# Valuation of Convertible Instrument

## With Variable Conversion Ratio

A convertible instrument with variable conversion ratio is treated as a debt instrument since the conversion is dependent on the price of the security at the time of conversion. There is not upside apart from the interest accrued over the tenure of the instrument.

Fair Value of a convertible instrument with variable conversion ratio is equal to the present value of the cash flows (interest + principal) receivable over the tenure of the instrument

# Option Pricing

## BSM Application: Employee Stock Option Plan

- Employee Stock Option Plans/Equity Incentive Plans (commonly referred to as ESOPs) are one of the **most important tools** to attract, encourage and retain employee.
- It is the *mechanism* by which **employees are compensated** with *increasing equity interest over time*.
- Company grants an option to its employee to acquire equity shares of the company at a **future date** and at **predetermined price**.
- ESOP's are commonly **valued using Black Scholes Model**.
- There is *no limit on quantum of ESOPs* to be issued to employees.





# Option Pricing

## Employee Stock Option Plan : Terms Used in ESOP

Type	Description
Vesting	The process by which the employee is given <b>the right to apply for shares</b> of the company <b>against the option granted to him</b> in pursuance of ESOP.
Vesting Period	It is the <b>period between the grant date</b> and the <b>date on which all the specified vesting conditions</b> of the ESOP are to be satisfied.
Excercise Period	It is the <b>time period after vesting</b> within which the employees has the right to apply for shares against the option vested in him/her, as per ESOP.
Exercise Price/Strike Price	It is the <b>price payable</b> by the employee <b>for exercising the option</b> granted to him/her in pursuance of the ESOP.
Market Price/Stock Price	<p>Means the <b>latest available closing price</b>, prior to the date of grant, on the stock exchange on which the shares of the company are listed.</p> <p>If the shares are <b>listed on more than one stock exchange</b>, then the stock exchange where there is highest trading volume on the said date shall be considered.</p> <p>In case of <b>unlisted enterprise</b>, independent valuer's valuation report for the value of share is to be considered as the stock price</p>

# Option Pricing

## BSM Application: Allocation of Equity Value

It is very prevalent now to have several financial instruments issued by a Company with different liquidation preferences.

**Liquidation preference** means the company's investors or the preferred stockholders *receive their investment back first in case the company liquidates.*

Liquidation preference determines *who gets first* and *how much* when the company is liquidated, sold, or declares bankruptcy.

Type	Description
Participating	Preferred stock will get their liquidation preference first and then have the opportunity to participate pro rata with the common stock.
Non Participating	Gives the preferred stock a liquidation preference over the common stock <b>equal to the per share price the investor paid (or some multiple of that per share price)</b>

# Option Pricing

## Liquidation Preference

### Illustration:-

Founders of a startup held 30,000 common equity shares that they paid for at incorporation at Rs. 10 per share (or a total of 30,000). Investor A invests Rs. 20 Lakhs to buy 20,000 shares of preferred stock (i.e. Rs. 100 per share). The percentage of ownership is shown below. Investor A has a non-participating liquidation preference at 1x of the investment amount.

Shareholder	Number of Share	Amount Invested	% Interest
Founders	30,000	3,00,000	60%
Investor A	20,000	2,00,000	40%

Now, if startup was acquired for Rs 60 Lakhs, the preferred stockholders would convert their preferred stock to common stock to participate in the gain. If the preferred stockholders did not convert they would only be entitled to their liquidation preference, or Rs 20 lakhs.

By converting to common stock (assuming a 1 preferred stock to 1 common stock conversion ratio), the investors would receive their pro rata share of the Rs. 60 lakhs along with all the other common stock. Therefore, Investor A will now hold 40% of the common stock and entitle them to receive 40% of the Rs. 60 lakhs, or 24 lakhs. **Clearly, it is an easy decision for Investor A to convert and get a bigger bounty.**

# Option Pricing

## Liquidation Preference

However, many venture capital investors **negotiate for a participating liquidation preference**.

Preferred stock with a participating liquidation preference will get their liquidation preference first and then have the opportunity to participate pro rata with the common stock. Assuming the Rs. 60 lakhs acquisition of startup, Investor A would get a Rs 20 lakhs liquidation preference PLUS be allowed to participate in getting their pro rata share of the remaining Rs. 40 lakhs. The residual Rs. 40 lakhs (after the preferred stock gets paid its Rs. 20 lakhs preference) will be divided pro rata between the common stock and the preferred stock as if the preferred stock had converted to common stock. Therefore, with a participating liquidation preference, Investor now gets a distribution of Rs 20 lakhs (i.e. the preference) PLUS Rs. 16 lakhs in participation proceeds (i.e. 40% of the remaining Rs. 40 lakhs) for a grand total of Rs. 36 lakhs.

Tranche	Liquidation Preference	Investor A	Founders
Tranche 1	Upto Rs. 20 Lakhs	20,00,000	0
Tranche 2	> 20 Lakhs	16,00,000	24,00,000

# Option Pricing

## BSM Application: Backsolve Option Pricing Method

### Equity Allocation Method : Backsolve Option Pricing Method

- The Backsolve method uses the **Black-Scholes Option-Pricing Method (OPM)** that treats the common stock and preferred stock are treated *as call options* on the subject company's enterprise value with exercise prices *based on the liquidation preference of the preferred stock*.
- It is useful in **allocation of total equity value** to the various classes of equity holders as per the capitalization table.
- In the model, **the exercise price is based on a comparison** with the enterprise value rather than, as in the case of a “regular” call option, a comparison with a per-share stock price.
- **Common stock is considered *to be a call option*** with a claim on the enterprise at an exercise price equal to the remaining value immediately after the preferred stock is liquidated.
- The option pricing method has commonly **used the Black-Scholes model** *to price the call option*.
- *It calculates the equity value based on recent transactions in the subject company's shares. The option pricing method may be complex to implement.*



# Option Pricing

## Binomial Model

### Overview:

- A binomial model is **based on the idea** that, **over the next period**, the value of an asset *will change to one of two possible values*.
- To construct a binomial model we need know:
  - The beginning asset value
  - The size of the two possible changes
  - The probability of the changes occurring
- The binomial model **can be used** to *value a European as well as an American option*.
- The **number of nodes** in the binomial model **is determined** *by the time to expiry of the option*.
- The **life of the option** *is divided into a large number of small time intervals*, i.e. the binomial model values options in discrete time.

# Option Pricing

## Binomial Model

### Assumptions :

- The option is European and *can only be exercised at expiration*.
- *No dividends are paid* out during the life of the option.
- Markets are *efficient* (i.e., market movements cannot be predicted).
- There are *no transaction costs* in buying the option.
- The risk-free rate and volatility of the underlying *are known* and *constant*.
- The returns on the underlying *are normally distributed*.

# Option Pricing

## Illustration: Binomial Model

Binomial Model says, there are only 2 possible values that stock price can take after 1 year is upside possibility and another downside possibility.

### Illustration:

Consider the following information:

Underlying Price (S) – 500

Strike/Exercise Price (E) – 520

Standard Deviation (S.D.) ( $\sigma$ ) – 10%

Time to maturity (t) – 2 Year

Risk Free Rate (r) (Continuous Compounding) – 6%

Compute the Call option premium using Binomial Model.

# Option Pricing

## Illustration: Binomial Model

### Solution:

$$\text{Up move factor (U)} = e^{\sigma\sqrt{t}} = \text{Exp}((0.06)*(\text{SQRT}(1))) = 1.1052$$

$$\text{Down move factor (D)} = 1/U = 0.9048$$

$$\text{Su} = S*U = 500*1.1052 = 552.585$$

$$\text{Sd} = S*D = 500*0.9048 = 452.419$$

$$\text{Su}^2 = S*U*U = 500*1.1052*1.1052 = 610.701$$

$$\text{Sud} = S*U*D = 500*1.1052*0.9048 = 500$$

$$\text{Sd}^2 = S*D*D = 500*0.9048*0.9048 = 409.365$$

(These are presented in binomial tree on following slides)

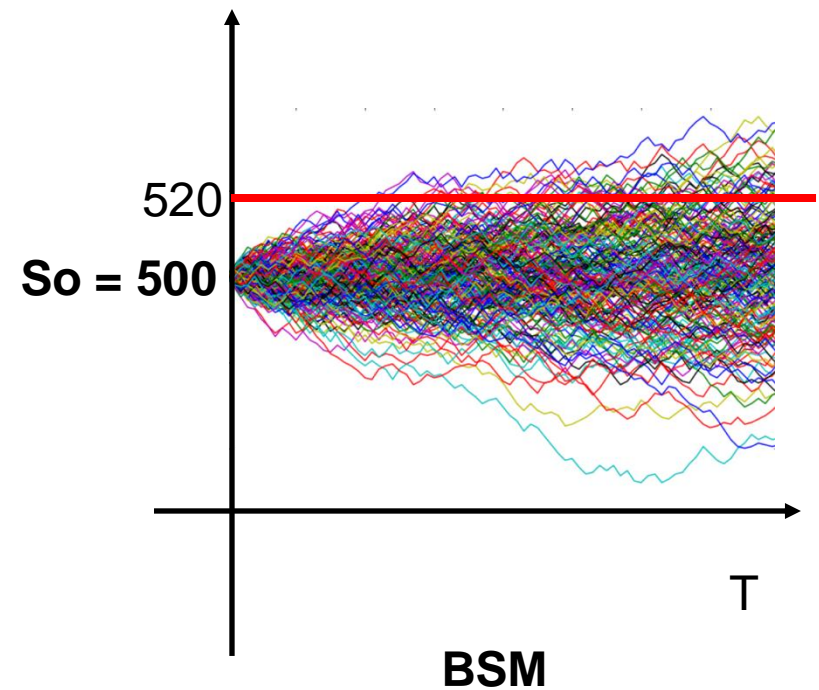
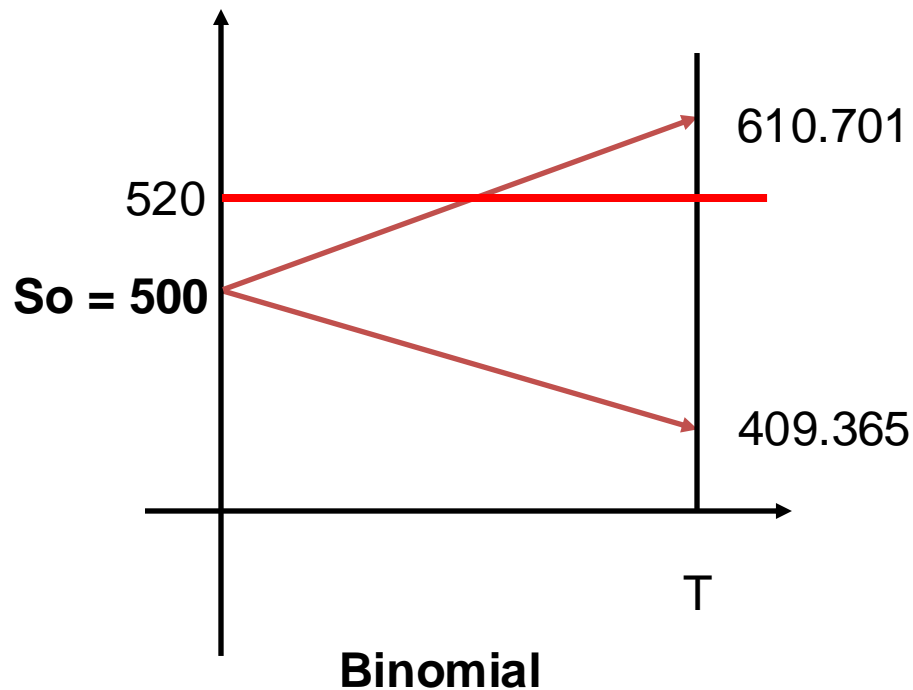
This process is not realistic, in fact we can have binomial process at each movement such that underlying price can take infinite possibilities on a continuous scale.

This is achieved using Black Scholes Model (BSM).

# Option Pricing

## Illustration: Binomial Model

So Binomial is a discrete process and BSM assumes continuous time case.

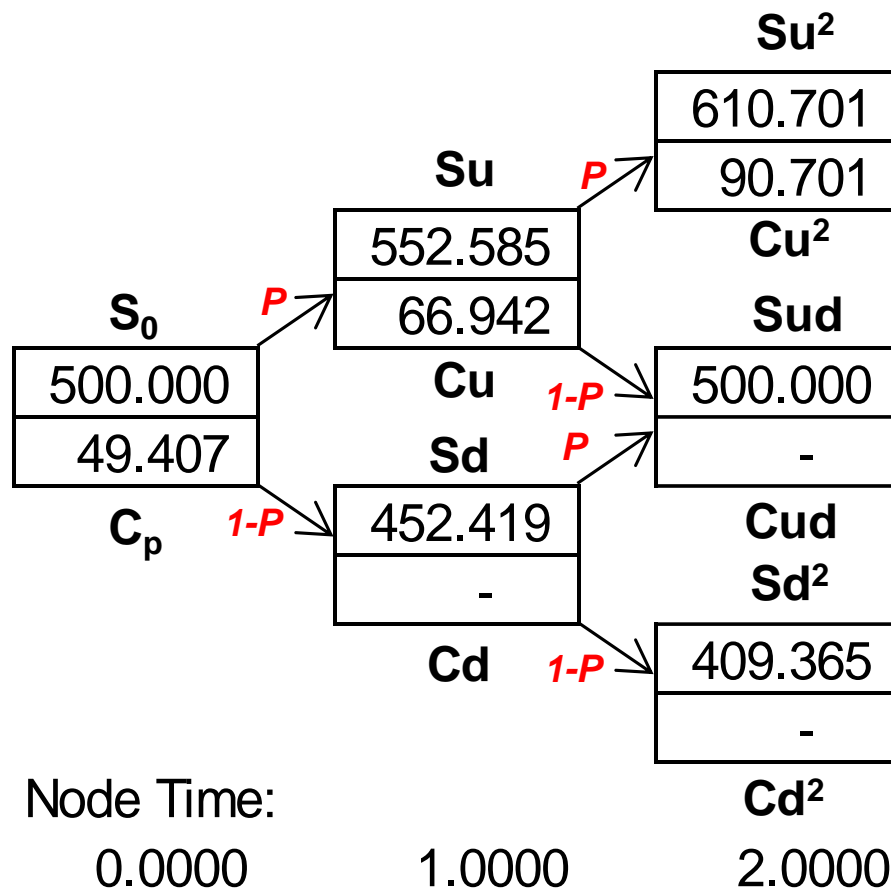




# Option Pricing

## Illustration: Binomial Model

### Valuation of Call Option Premium



*P = Probability of going up which comes out to be 0.7837*  
*(1-P) = Probability of going down comes out to be 0.2163*

Under this approach, price of an option is the PV of expected payoff discounted at Rf

$$C_p = \frac{P \times C_u + (1 - P) \times C_d}{e^{rt}}$$

*C<sub>p</sub> comes out to be 49.407*

#### How to find P?

P should be found in such a way that expected value of stock yields risk free rate of return.

$$P \times S \times U + (1 - P) \times S \times D = S \times e^{rt}$$

As a result, P comes out to be:

$$P = \frac{e^{rt} - D}{U - D}$$

# Option Pricing

## Monte Carlo Simulation

### Overview :

- Monte Carlo Simulations involves assigning a probability distribution to each variable factor
- Based on the probability distributions assigned, ***it generates*** using random numbers, ***a range of values for each variable factor***
- Types of probability distributions include:
  - Normal distribution
  - Log normal distribution
  - Triangular distribution
- The model then ***calculates the results over and over***, each time ***using a different set of random values from the probability functions***

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- In modern M&A transactions, call and put instruments have become essential structuring tools. Below is a case study illustrating their application:
- An acquirer (“Buyer”) purchased a 60% stake in XYZ Private Limited at INR 200 million from its Founders (“Sellers”). The transaction is structured to provide:
  - **Call Option:** The buyer has the right to purchase the remaining 40% stake at a future date.
  - **Put Option:** The sellers have the right to sell their remaining stake at a future date, subject to mutual consent.
- Key Transaction Terms:
  - Transaction Date: January 25, 2024
  - Debt outstanding as of January 25, 2024: INR 226.61 million
  - Founder’s Exit Valuation:
    - Non-IPO-Scenario: 10.25x of last FY EBITDA
    - IPO scenario: 10.50x of last FY EBITDA

# Thank You

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