

EXAMINATION NOTES

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UNIT-1

*FINANCIAL DERIVATIVES

Financial derivatives are **financial contracts** whose value is **derived from an underlying asset**.

The underlying asset can be:

- Shares (stocks)
- Bonds
- Commodities (gold, oil)
- Currencies
- Interest rates or market indices

Common types of financial derivatives:

- **Forwards**
- **Futures**
- **Options**
- **Swaps**

Example:

A futures contract on gold gets its value from the **price of gold**.

Need for Financial Derivatives

Financial markets face **price uncertainty and risk**. Derivatives are needed to:

1. **Manage risk (hedging)**
Protect against price fluctuations in stocks, commodities, or currencies.
2. **Price discovery**
Help determine the future expected price of an asset.
3. **Liquidity**
Increase trading activity and make markets more efficient.
4. **Speculation**
Allow investors to profit from price movements with lower initial investment.

Importance of Financial Derivatives

1. Risk Management

- Used by companies and investors to **reduce losses**
- Example: Airlines hedge fuel prices using derivatives

2. Efficient Capital Use

- Require **less capital** compared to buying assets directly
- Enable leverage

3. Market Stability

- Help distribute risk across different market participants

4. Portfolio Diversification

- Improve returns while controlling risk

5. Support to Financial System

- Widely used by banks, mutual funds, insurance companies, and corporations

Advantages (Quick Points)

- Protect against uncertainty
- Improve market efficiency
- Flexible investment strategies
- *Global risk management tool*

*EVALUATION OF FINANCIAL DERIVATIVES

Evaluation (or valuation) of financial derivatives refers to the process of **determining the fair price or value of a derivative contract** based on its underlying asset and market conditions.

Since derivatives derive their value from another asset, their evaluation depends on **future price expectations and risk factors**.

Factors Affecting Evaluation of Financial Derivatives

The value of a derivative is influenced by:

1. **Price of the underlying asset**
2. **Time to maturity**
3. **Market volatility**
4. **Interest rates**
5. **Expected dividends or cash flows**
6. **Type of derivative contract**

Methods of Evaluation of Financial Derivatives

1. Valuation of Forward Contracts

- Based on the **spot price, cost of carry, and time to maturity**
- Formula (conceptual):
Forward Price = Spot Price + Cost of Carry

2. Valuation of Futures Contracts

- Similar to forwards
- Marked-to-market **daily**
- Prices determined through **exchange trading**

3. Valuation of Options

Options are evaluated using **option pricing models**:

a) Black–Scholes Model

- Used for European options
- Considers:
 - Current stock price
 - Strike price
 - Time to maturity
 - Volatility
 - Risk-free interest rate

b) Binomial Model

- Uses price movement over discrete time intervals
- Flexible and easy to understand

4. Valuation of Swaps

- Based on the **present value of future cash flows**
- Interest rate swaps compare **fixed vs floating rate payments**

Importance of Evaluation of Financial Derivatives

- Helps determine **fair value**
- Prevents **mispricing and arbitrage**
- Aids in **risk management**
- Supports **investment and hedging decisions**
- Ensures **market efficiency**

Advantages of Proper Evaluation

- Accurate pricing
- Reduced financial risk

- Better financial planning
- Transparent and stable markets

Types of Financial Derivatives

Financial derivatives are mainly classified into **four major types**:

1. Forward Contracts

- **Customized contracts** between two parties
- Agreement to buy or sell an asset at a **future date** at a **fixed price**
- Traded **over-the-counter (OTC)**

Example:

A farmer agrees today to sell wheat at a fixed price after 3 months.

2. Futures Contracts

- **Standardized contracts**
- Traded on **organized exchanges**
- Settlement happens through **daily mark-to-market**

Example:

Gold futures traded on a commodity exchange.

3. Options

- Gives the buyer the **right, but not the obligation**, to buy or sell an asset
- Buyer pays a **premium**

Types of Options:

- **Call Option** → Right to buy
- **Put Option** → Right to sell

Example:

Buying a call option on a company's shares.

4. Swaps

- Agreement to **exchange cash flows** between two parties
- Common types:
 - **Interest Rate Swaps**
 - **Currency Swaps**

Example:

Exchanging fixed interest payments for floating interest payments.

Other Classifications (Optional for Exams)**a) Based on Underlying Asset**

- Equity derivatives
- Commodity derivatives
- Currency derivatives
- Interest rate derivatives

b) Based on Trading Place

- Exchange-traded derivatives
- Over-the-counter (OTC) derivatives

Derivative Market

The **derivative market** is a financial market where **derivative instruments** are bought and sold. These instruments derive their value from an **underlying asset** such as shares, commodities, currencies, interest rates, or market indices.

***DERIVATIVE MARKET**

A derivative market facilitates trading in contracts like **forwards, futures, options, and swaps**, rather than the actual assets themselves.

Example:

Trading index futures instead of buying all shares in the index.

Features of Derivative Market

- Based on **underlying assets**
- Can be **exchange-traded** or **OTC**
- Used for **hedging, speculation, and arbitrage**
- Involves **high leverage**
- Requires margin payments

Types of Derivative Markets**1. Exchange-Traded Derivative Market**

- Regulated and transparent
- Standardized contracts

- Examples: Stock and commodity exchanges

2. Over-the-Counter (OTC) Market

- Customized contracts
- Less regulation
- Common for forwards and swaps

Functions of Derivative Market

- **Risk management** through hedging
- **Price discovery**
- **Liquidity enhancement**
- **Market efficiency**

Importance of Derivative Market

- Protects investors from price volatility
- Supports economic stability
- Helps businesses plan future costs and revenues
- Encourages efficient allocation of capital

Advantages

- Low transaction cost
- Wide range of risk management tools
- Global participation

Disadvantages

- High risk due to leverage
- Complex instruments
- Potential for speculation

Difference Between Cash Market and Derivative Market

Basis	Cash Market	Derivative Market
Meaning	Market where actual assets are bought and sold	Market where derivative contracts are traded
Asset Traded	Shares, bonds, commodities	Futures, options, swaps

Basis	Cash Market	Derivative Market
Ownership	Immediate transfer of ownership	No immediate ownership of asset
Settlement	Immediate or T+2 settlement	Settlement on future date
Price	Current spot price	Price derived from underlying asset
Risk	Lower risk	Higher risk due to leverage
Purpose	Investment	Hedging, speculation, arbitrage
Capital Required	Full value paid	Margin-based (low initial investment)
Regulation	Highly regulated	Exchange-traded regulated; OTC less regulated
Example	Buying shares in stock market	Buying index futures or options

Importance of Both Markets

- **Cash Market** helps in **capital formation and investment**
- **Derivative Market** helps in **risk management and price discovery**
- Together, they ensure **financial market stability**

* PARTICIPANT IN DERIVATIVE MARKET

The **derivative market** involves different participants, each with a **specific objective**. Participation mainly includes the following:

1. Hedgers

- Participate to **reduce or eliminate risk**
- Use derivatives to protect against **price fluctuations**

Example:

A farmer uses futures to lock in crop prices.

2. Speculators

- Participate to **earn profit**

- Take calculated risks by predicting market movements

Example:

A trader buys index futures expecting prices to rise.

3. Arbitrageurs

- Participate to **earn risk-free profit**
- Exploit price differences between markets

Example:

Buying in one market and selling in another at a higher price.

4. Margin Traders

- Trade using **small margin amounts**
- Gain exposure to large contract values

5. Market Makers (Optional / Advanced)

- Provide **liquidity**
- Quote buy and sell prices continuously

Importance of Participation

- Improves **liquidity**
- Enhances **price discovery**
- Distributes risk efficiently
- Stabilizes financial markets

The derivative market in India deals in **contracts whose value is derived from underlying assets** such as:

- Shares
- Stock indices
- Commodities
- Currencies
- Interest rates

Evolution of Derivative Market in India

- Introduced to manage **price volatility**
- Equity derivatives were launched in the **early 2000s**
- Rapid growth with the establishment of **electronic trading platforms**

Major Derivative Exchanges in India

1. National Stock Exchange (NSE)

- Largest derivative exchange in India
- Trades **index futures, index options, stock futures, stock options**
- NIFTY derivatives are highly popular

2. Bombay Stock Exchange (BSE)

- Trades Sensex derivatives and stock derivatives

3. Commodity Exchanges

- **MCX (Multi Commodity Exchange)** – metals, energy, agri products
- **NCDEX** – agricultural commodities

Types of Derivatives Traded in India

- **Equity Derivatives**
- **Commodity Derivatives**
- **Currency Derivatives**
- **Interest Rate Derivatives**

Participants in Indian Derivative Market

- Hedgers
- Speculators
- Arbitrageurs
- Institutional investors
- Retail investors

Regulation of Derivative Market in India

- Regulated by **SEBI (Securities and Exchange Board of India)**
- Ensures transparency, investor protection, and risk control
- Clearing corporations manage settlement and margins

Importance of Derivative Market in India

- Helps in **risk management**
- Improves **price discovery**
- Increases **liquidity**
- Supports economic growth
- Assists corporates and investors in financial planning

A derivative disaster occurs when derivative instruments—meant mainly for **risk hedging**—are used recklessly, resulting in **unexpected and uncontrollable losses**.

Causes of Derivative Disasters

1. **Excessive leverage**
Small market movements cause massive losses.
2. **Speculation instead of hedging**
Derivatives used for gambling rather than risk protection.
3. **Lack of understanding**
Complex products traded without proper knowledge.
4. **Weak risk management systems**
No limits, poor monitoring, or internal controls.
5. **Regulatory failure**
Inadequate supervision of OTC derivatives.

Famous Examples of Derivative Disasters

1. Barings Bank (1995)

- Collapse due to unauthorized futures trading by a single trader.
- One of the oldest banks in the UK failed.

2. LTCM (1998)

- Hedge fund collapse due to excessive leverage in derivatives.
- Required international bailout to avoid market collapse.

3. AIG (2008)

- Massive losses from credit default swaps.
- Played a major role in the global financial crisis.

Impact of Derivative Disasters

- Bankruptcy of financial institutions
- Loss of investor confidence
- Financial market instability
- Global economic slowdown
- Increased regulation

Lessons from Derivative Disasters

- Derivatives must be used **primarily for hedging**

- Strong **risk management systems** are essential
- Transparency and regulation are critical
- Proper knowledge and internal controls are necessary

UNIT-2

*FORWARD CONTRACTS

Forward contract is an agreement between two parties to **buy or sell an underlying asset at a fixed price on a future date.**

Features

- Customized contract
- Traded **over-the-counter (OTC)**
- No initial margin
- Settlement only at maturity
- Higher **counterparty risk**

Example

An exporter agrees today to sell dollars after 3 months at a fixed exchange rate.

*FUTURES CONTRACTS

Meaning

A **futures contract** is a standardized agreement to **buy or sell an asset at a predetermined price on a future date**, traded on a recognized exchange.

Features

- Standardized contracts
- Traded on **organized exchanges**
- Requires margin
- Daily **mark-to-market**
- Low counterparty risk (clearing house guarantee)

Example Buying NIFTY futures on the NSE.

Difference Between Forward and Futures Contracts

Basis	Forward Contract	Futures Contract
Trading	OTC market	Organized exchange
Nature	Customized	Standardized

Basis	Forward Contract	Futures Contract
Margin	Not required	Required
Risk	High default risk	Low risk
Liquidity	Low	High
Settlement	At maturity	Daily settlement

Importance in Financial Derivatives

- Help in **hedging price risk**
- Used for **speculation**
- Aid in **price discovery**
- Improve market efficiency

***FORWARDS CONTRACTS**

1. Negotiation and Agreement

Customization: Forward contracts are customized agreements between two parties, allowing them to negotiate the terms of the contract, including the price, quantity, settlement date, and delivery method. This flexibility is beneficial for addressing specific needs but requires detailed negotiation.

- **Over-the-Counter (OTC) Trading:** Forwards are traded directly between parties in the over-the-counter market. This private negotiation is usually facilitated by financial institutions or brokers who connect buyers and sellers.

2. Counterparty Risk

Lack of Central Clearing: There is no central clearinghouse involved in forward contracts. Consequently, the primary risk is counterparty risk, which is the risk that one party might default on their obligations. This risk is mitigated through credit assessments and collateral agreements but is still present.

3. Settlement

- **Settlement Method:** At the contract's maturity, settlement can occur through physical delivery of the underlying asset or cash settlement, where the difference between the agreed price and the market price is exchanged.

- **Flexibility in Settlement Date:** The settlement date is agreed upon by the parties and can be tailored to their specific needs. This flexibility can be advantageous but requires precise planning.

4. Transparency and Regulation

- **Limited Transparency:** Prices and terms of forward contracts are not publicly available due to their OTC nature. This lack of transparency can lead to informational asymmetry between parties.
- **Regulation:** Forward contracts are less regulated compared to futures. The terms of the contract are enforced based on the agreement between the parties and the legal framework governing their transaction.

*FUTURES CONTRACTS

1. Standardization and Exchange Trading

- **Standardization:** Futures contracts are standardized with fixed terms, including contract size, expiration date, and settlement procedures. This standardization simplifies trading and ensures uniformity across contracts.
- **Exchange Trading:** Futures contracts are traded on regulated exchanges, such as the Chicago Mercantile Exchange (CME) or the Intercontinental Exchange (ICE). Exchanges provide a platform for buyers and sellers to trade futures contracts, ensuring transparency and liquidity.

2. Clearinghouse and Counterparty Risk

- **Central Clearinghouse:** Futures contracts are cleared through a central clearinghouse, which acts as an intermediary between buyers and sellers. This setup reduces counterparty risk by guaranteeing the performance of the contract and managing the settlement process.
- **Margin Requirements:** Participants must maintain margin accounts, which serve as collateral to cover potential losses. Initial margins are required to open a position, and maintenance margins are required to keep it open. The margin system helps mitigate counterparty risk and ensures contract performance.

3. Daily Settlement (Mark-to-Market)

- **Mark-to-Market:** Futures contracts are marked to market daily. This means that the gains and losses of the contract are calculated based on the current market price, and adjustments are made to the margin accounts accordingly. Daily settlement reduces the risk of large losses accumulating over time.

4. Settlement and Expiration

- **Settlement Method:** Futures contracts can be settled either through physical delivery of the underlying asset or cash settlement, where the contract's value is settled in cash based on the final market price. The specific settlement method is determined by the contract specifications.
- **Standard Expiration Dates:** Futures contracts have standardized expiration dates set by the exchange (e.g., monthly, quarterly). This standardization provides predictability and convenience for traders and investors.

5. Transparency and Regulation

- **High Transparency:** Futures prices and trading volumes are publicly available, providing transparency and allowing market participants to make informed decisions.
- **Regulation:** Futures markets are heavily regulated by financial authorities and exchanges to ensure fair trading practices, protect investors, and maintain market integrity.

The trading mechanisms of forwards and futures contracts reflect their distinct characteristics and market functions. Forwards offer customization and flexibility but come with higher counterparty risk due to their OTC nature. In contrast, futures contracts benefit from standardization, transparency, and reduced counterparty risk through exchange trading and central clearinghouses. Understanding these mechanisms helps market participants effectively utilize these derivatives for their specific financial needs and objectives

FUTURES PAYOFF EXPLAINED

1. Long Futures (Buy Futures)

- **Payoff Formula:** $\text{Profit/Loss} = S_T - F_0$
 - S_T : Spot price at expiry
 - F_0 : Futures price at entry
- **Outcome:**
 - If the underlying price **rises above entry price**, profit is unlimited.
 - If the underlying price **falls below entry price**, losses are unlimited.

Example:

- Buy Nifty Futures at ₹17,703.
- If expiry price = ₹18,000, profit = ₹297 × lot size.
- If expiry price = ₹17,000, loss = ₹703 × lot size.

2. Short Futures (Sell Futures)

- **Payoff Formula:** $\text{Profit/Loss} = F_0 - S_T$
- **Outcome:**

- If the underlying price **falls below entry price**, profit is unlimited.
- If the underlying price **rises above entry price**, losses are unlimited.

Example:

- Sell crude oil futures at **\$80/barrel**.
- If expiry price = **\$70**, profit = $\$10 \times \text{contract size}$.
- If expiry price = **\$90**, loss = $\$10 \times \text{contract size}$.

Key Characteristics

- **Linear Payoff:** Unlike options, futures have a straight-line payoff (no asymmetry).
- **Unlimited Risk:** Both long and short positions can incur unlimited losses.
- **Leverage Effect:** Small price changes in the underlying can lead to large gains/losses due to margin requirements.

* FUTURES PRICING

The **futures price** is determined by the relationship between the spot price of the underlying asset and the cost of carry (financing, storage, dividends, etc.).

General Formula (Continuous Compounding):

$$F_t = S_0 \cdot e^{\{(r+c-y)T\}}$$

- F_t : Futures price at time t
- S_0 : Spot price of the underlying asset
- r : Risk-free interest rate
- c : Storage/financing costs (if applicable)
- y : Income/benefits from holding the asset (e.g., dividends, convenience yield)
- T : Time to maturity

Key Points:

- If **costs > benefits**, futures trade at a premium to spot.
- If **benefits > costs**, futures may trade at a discount (known as *backwardation*).
- For financial assets (like stocks without dividends), the formula simplifies to:

$$F_t = S_0 \cdot (1+r)^T$$

Futures Valuation

- **At Initiation:** Value = **0** (no money changes hands).

- **During Contract Life:** Value depends on the difference between the current futures price and the original contract price.
 - **Long Position Value:**

$$V_t = (F_t - F_0) \cdot Q$$
 - **Short Position Value:**

$$V_t = (F_0 - F_t) \cdot Q$$
 - Where Q = contract size.
- **Daily Settlement (Mark-to-Market):**
 - Gains/losses are credited or debited daily to margin accounts.
 - This ensures no accumulation of large unpaid losses.

Example

Suppose:

- Spot price of gold = ₹60,000 per 10g
- Risk-free rate = 5% annually
- Time to maturity = 6 months
- No storage cost, no yield

Futures Price:

$$F_t = 60,000 \cdot (1 + 0.05)^{0.5} \approx ₹61,482$$

If you entered at ₹61,482 and the futures price rises to ₹63,000:

- Long position profit = ₹1,518 × contract size
- Short position loss = ₹1,518 × contract size

*CORPORATE ACTIONS

***Corporate actions such as dividends, bonuses, rights issues, mergers, demergers, and stock splits directly affect futures contracts by adjusting their base price, lot size, and sometimes expiry, so that the economic value of positions remains unchanged for traders. These adjustments are made just before the ex-date of the corporate action.**

Key Effects of Corporate Actions on Futures

1. Dividends

- **Ordinary dividends:** Usually *do not* lead to adjustments in futures contracts.

- **Extraordinary dividends:** Futures prices are reduced by the dividend amount to keep the contract fair.

2. Bonus Issues / Stock Splits

- **Impact:** Futures contract lot size and base price are adjusted proportionally.
- **Example:** If a company announces a 1:1 bonus, the lot size doubles and the futures price halves, ensuring the overall contract value remains the same.

3. Rights Issues

- Futures contracts are adjusted to reflect the dilution effect of rights.
- Lot size and base price are recalibrated so that the position value remains unchanged.

4. Mergers / Demergers

- Contracts may be restructured or closed before expiry.
- New contracts are created for the merged/demerged entity, ensuring continuity of positions.

5. Amalgamation / Consolidation

- Futures contracts are adjusted to reflect the new shareholding pattern.
- Sometimes expiry dates are modified, and adjusted contracts are traded instead.

How Adjustments Work

- **Base Price Adjustment:** Futures base price is recalculated to reflect the corporate action.
- **Lot Size Adjustment:** Market lot is changed so that the total contract value remains constant.
- **Timing:** Adjustments are made at market close on the day before the ex-date.

Example

Suppose a company trading at ₹1,000 announces a **2-for-1 stock split**:

- Spot price adjusts to ₹500.
- Futures contract base price also adjusts to ₹500.
- Lot size doubles, so the overall contract value remains

*INDEX FUTURES

***Index futures at NSE (like Nifty and Sensex futures) are standardized contracts that allow traders to speculate on the movement of stock indices. The NSE uses a fully automated, order-driven trading system where futures are matched on a price-time priority basis,**

ensuring transparency and efficiency. Speculators use these contracts to profit from expected index movements without owning the underlying stocks.

Index Futures at NSE

- **Definition:** An index future is a futures contract based on a stock market index (e.g., Nifty 50, Bank Nifty).
- **Underlying Asset:** The index itself, not individual shares.
- **Contract Size:** Determined by multiplying the index value with a fixed lot size (e.g., Nifty futures lot = 50 units).
- **Settlement:** Cash-settled, since indices cannot be physically delivered.
- **Expiry:** Monthly contracts (near, next, and far month).

Trading System of Futures at NSE

- **Platform:** NSE's Futures & Options (F&O) segment.
- **Order Matching:**
 - Orders are time-stamped and matched on **price-time priority**.
 - Best buy order matches with the best sell order.
- **Transparency:** Screen-based, nationwide, floor-less trading system.
- **Surveillance:** Real-time monitoring to ensure fair practices.
- **Margin System:** Traders must deposit initial margin + mark-to-market margin daily.

*ARBITRAGE WITH FUTURES

Arbitrage is about exploiting price differences between the **spot market** and the **futures market** to earn risk-free profits.

How it works:

- If **Futures Price > Fair Value (Cost of Carry model)** → Arbitrageurs sell futures and buy the underlying in the spot market.
- If **Futures Price < Fair Value** → Arbitrageurs buy futures and short the underlying in the spot market.

Example:

- Spot price of Nifty = ₹22,000
- Fair futures price (based on cost of carry) = ₹22,100
- Actual futures price = ₹22,300
- Arbitrageur sells futures at ₹22,300 and buys Nifty stocks at ₹22,000.
- At expiry, both converge, locking in ₹200 profit per unit (risk-free).

*HEDGING WITH FUTURES

Hedging is about **reducing risk** by taking an opposite position in futures compared to your exposure in the spot market.

How it works:

- **Long Hedge:** If you plan to buy an asset later and fear prices will rise, you buy futures now.
- **Short Hedge:** If you own an asset and fear prices will fall, you sell futures.

Example:

- A mutual fund holds ₹100 crore worth of Nifty stocks.
- Fund manager fears market may fall.
- He sells Nifty futures equivalent to his portfolio value.
- If Nifty falls, losses in stocks are offset by gains in futures.

UNIT-3

*OPTIONS

Options are financial contracts that give the buyer the *right, but not the obligation*, to buy or sell an underlying asset at a predetermined price within a specified time. The two main types are *call options* (right to buy) and *put options* (right to sell). Key terminology includes strike price, premium, expiration date, and moneyness.

Meaning of Options

- **Definition:** An option is a derivative contract linked to an underlying asset (stocks, indices, commodities, currencies).
- **Buyer's Right:** The buyer has the right, not the obligation, to exercise the option.
- **Seller's Obligation:** The seller (writer) must fulfill the contract if the buyer exercises it.
- **Premium:** The price paid by the buyer to the seller for this right.

Types of Options

1. Call Option

- Right to **buy** the underlying asset at the strike price.
- Profitable when the asset's market price rises above the strike price.

2. Put Option

- Right to **sell** the underlying asset at the strike price.
- Profitable when the asset's market price falls below the strike price

Example

- Stock price = ₹100
- Call option strike = ₹95, premium = ₹5
- If stock rises to ₹110:
 - Intrinsic value = ₹15 (110 – 95)
 - Profit = ₹15 – ₹5 = ₹10 per share.
- If stock falls to ₹90:
 - Option expires worthless, loss = premium = ₹5.

*WORKING OF AN OPTION

1. Contract Creation

- An option is created on an underlying asset (stock, index, commodity, currency).
- It specifies: strike price, expiry date, and premium.

2. Buyer's Role

- Pays the premium upfront.

- Gains the *right but not obligation* to buy (call) or sell (put) the asset at the strike price.
- 3. **Seller's Role (Writer)**
 - Receives the premium.
 - Has the *obligation* to fulfill the contract if the buyer exercises it.
- 4. **Exercise & Expiry**
 - On or before expiry (depending on style: American or European), the buyer decides whether to exercise.
 - If profitable (in-the-money), the option is exercised.
 - If not profitable (out-of-the-money), the option expires worthless.
- 5. **Settlement**
 - In India (NSE), options are **cash-settled**.
 - Profit/loss is credited or debited to the trader's margin account.

Example of Working

- Stock price = ₹100
- Call option strike = ₹95, premium = ₹5
- **Case 1: Stock rises to ₹110**
 - Buyer exercises → Buys at ₹95, sells at ₹110.
 - Profit = ₹15 – ₹5 premium = ₹10.
 - Seller loses ₹10.
- **Case 2: Stock falls to ₹90**
 - Buyer does not exercise.
 - Loss = premium = ₹5.
 - Seller keeps ₹5.

*PAYOFF FROM A CALL OPTION

- **Buyer of Call (Long Call):**
 - Gains if the underlying price rises above the strike price.
 - Loss limited to the premium paid.
 - **Formula:**

$$\text{Payoff} = \max(S_T - K, 0) - \text{Premium}$$

- S_T : Price of underlying at expiry
- K : Strike price
- **Seller of Call (Short Call):**
 - Gains limited to the premium received.
 - Loss is unlimited if the underlying rises sharply.

- **Formula:**

$$\text{Payoff} = \text{Premium} - \max(S_T - K, 0)$$

Payoff from a Put Option

- **Buyer of Put (Long Put):**
 - Gains if the underlying price falls below the strike price.
 - Loss limited to the premium paid.
 - **Formula:**

$$\text{Payoff} = \max(K - S_T, 0) - \text{Premium}$$

- **Seller of Put (Short Put):**
 - Gains limited to the premium received.
 - Loss is large if the underlying falls sharply (but limited to strike price \times lot size).
 - **Formula:**

$$\text{Payoff} = \text{Premium} - \max(K - S_T, 0)$$

Example

- Stock price = ₹100
- Strike price = ₹95
- Premium = ₹5

Call Buyer:

- If stock rises to ₹110 \rightarrow Payoff = $(110 - 95) - 5 = ₹10$ profit.
- If stock falls to ₹90 \rightarrow Payoff = $0 - 5 = ₹5$ loss.

Put Buyer:

- If stock falls to ₹85 \rightarrow Payoff = $(95 - 85) - 5 = ₹5$ profit.
- If stock rises to ₹105 \rightarrow Payoff = $0 - 5 = ₹5$ loss

company shares, it's linked to the performance of the entire index.

* INDEX OPTIONS

- **Definition:** A derivative contract giving the buyer the right, but not the obligation, to buy (call option) or sell (put option) an index at a specified strike price on or before expiry.
- **Settlement:** Always **cash-settled** (since you can't physically deliver an index).
- **Style:** In India (NSE), index options are **European-style** (can only be exercised on expiry).

Types of Index Options

1. **Call Option on Index**
 - Right to buy the index at the strike price.
 - Profitable if the index rises above the strike.
2. **Put Option on Index**
 - Right to sell the index at the strike price.
 - Profitable if the index falls below the strike.

Key Terminology in Index Options

- **Underlying:** The index (e.g., Nifty 50).
- **Strike Price:** Level of the index at which the option can be exercised.
- **Premium:** Price paid by the buyer to the seller for the option.
- **Expiry Date:** Last date when the option can be exercised.
- **Lot Size:** Fixed number of units (e.g., Nifty options lot = 50 units).
- **Moneyness:**
 - *In the Money (ITM):* Exercising is profitable.
 - *At the Money (ATM):* Strike = current index level.
 - *Out of the Money (OTM):* Exercising is not profitable.

Example

- Nifty index = 22,000
- Call option strike = 21,800, premium = ₹200
- If Nifty rises to 22,300 at expiry:
 - Intrinsic value = 500 (22,300 – 21,800)
 - Profit = 500 – 200 = ₹300 × lot size (50) = ₹15,000
- If Nifty falls to 21,500:
 - Option expires worthless.
 - Loss = premium = ₹200 × 50 = ₹10,000

*OPTIONS STRATEGIES

Options strategies are designed to manage risk by combining calls and puts in different ways—some limit losses, others generate steady income, and some hedge against market volatility. The most common risk-management strategies include protective puts, covered calls, spreads, and straddles/strangles.

Core Risk-Management Option Strategies

1. Protective Put (Insurance Strategy)

- **How it works:** Buy a put option while holding the underlying asset.
- **Purpose:** Protects against downside risk while keeping upside potential.
- **Example:** Own Nifty at 22,000 and buy a 21,800 put. If Nifty falls, the put offsets losses.

2. Covered Call

- **How it works:** Hold the underlying asset and sell a call option.
- **Purpose:** Generates income (premium) but caps upside gains.
- **Example:** Own Reliance shares at ₹2,500 and sell a 2,600 call. If Reliance rises above 2,600, gains are limited, but you keep the premium.

3. Spreads (Bull/Bear)

- **Bull Call Spread:** Buy a lower strike call and sell a higher strike call.
 - Limits both profit and loss, useful in moderately bullish markets.
- **Bear Put Spread:** Buy a higher strike put and sell a lower strike put.
- Limits risk in moderately bearish markets.

4. Straddle

- **How it works:** Buy a call and a put at the same strike price.
- **Purpose:** Profits from large moves in either direction (high volatility).
- **Risk:** Loss limited to premiums if market stays flat.

5. Strangle

- **How it works:** Buy a call and a put at different strike prices (both OTM).
- **Purpose:** Cheaper than straddle, still benefits from volatility.
- **Risk:** Loss limited to premiums if market doesn't move much.

6. Iron Condor

- **How it works:** Combine bull put spread and bear call spread.
- **Purpose:** Earns premium when market stays range-bound.
- **Risk:** Limited, as spreads cap losses.

7. Collar

- **How it works:** Buy a protective put and sell a covered call simultaneously.
- **Purpose:** Locks in a range of outcomes—limits both upside and downside.
- **Example:** Own Infosys stock, buy a put below current price, sell a call above current price

*OPTION GREEKS

Option Greeks are risk measures that show how the price of an option changes with respect to different market factors like the underlying asset price, time, volatility, and interest rates. Traders use them to manage risk, hedge positions, and design strategies.

The Major Option Greeks

1. Delta (Δ)

- **Meaning:** Sensitivity of option price to changes in the underlying asset price.
- **Range:** 0 to 1 for calls, -1 to 0 for puts.
- **Application:**
 - Measures directional exposure.
 - Used for **delta hedging** (neutralizing price risk by balancing positions).
- **Example:** A call option with delta = 0.6 means if the stock rises ₹10, the option price rises ₹6.

2. Gamma (Γ)

- **Meaning:** Rate of change of delta with respect to the underlying price.
- **Application:**
 - Shows how stable delta is.
 - High gamma = option is very sensitive near strike price.
- **Example:** Traders monitor gamma to avoid sudden swings in delta when the underlying moves sharply.

3. Theta (Θ)

- **Meaning:** Sensitivity of option price to the passage of time (time decay).
- **Application:**
 - Important for option sellers who benefit from time decay.
 - Buyers lose value as expiry approaches if the option is not in-the-money.
- **Example:** A theta of -5 means the option loses ₹5 in value per day, all else equal.

4. Vega (v)

- **Meaning:** Sensitivity of option price to changes in volatility.
- **Application:**
 - Crucial for trading around events (earnings, announcements).
 - High vega = option price rises significantly if volatility increases.
- **Example:** If vega = 0.2, a 1% rise in implied volatility increases option price by ₹0.2.

5. Rho (ρ)

- **Meaning:** Sensitivity of option price to changes in interest rates.
- **Application:**
 - More relevant for long-dated options.

- Call options gain value when interest rates rise; puts lose value.
- **Example:** A rho of 0.1 means a 1% rise in interest rates increases option price by ₹0.1.

Applications of Greeks in Trading

Practical Example (NSE Context)

- A trader buys **Nifty call options** before Union Budget announcements.
- **High Vega:** Option premiums rise due to expected volatility.
- **Theta:** If Nifty doesn't move much, time decay erodes premium daily.
- **Delta & Gamma:** If Nifty jumps, delta increases rapidly, magnifying gains.

*BINOMIAL OPTION PRICING MODEL

- **Concept:** Uses a discrete-time framework. Assumes the underlying asset price can move **up or down** in each step until expiry.
- **Process:**
 1. Build a **binomial tree** of possible asset prices.
 2. At each node, calculate the option payoff.
 3. Work backwards using **risk-neutral probabilities** to find today's option price.
- **Formula (one-step model):**

$$C = \frac{p \cdot C_u + (1-p) \cdot C_d}{1+r}$$

- C: Current option value
- C_u, C_d: Option values if price goes up/down
- p: Risk-neutral probability
- r: Risk-free rate
- **Advantages:**
 - Flexible (can handle American options, dividends, complex payoffs).
 - Intuitive step-by-step approach.
- **Limitations:**
 - Computationally heavy for many steps.

2. Black-Scholes Model

- **Concept:** Continuous-time model. Assumes asset prices follow a **geometric Brownian motion** with constant volatility and interest rates.
- **Formula (European Call Option):**

$$C = S_0 N(d_1) - Ke^{-rT} N(d_2)$$

- S₀: Current stock price
- K: Strike price
- T: Time to maturity

- r : Risk-free interest rate
- $N(\cdot)$: Cumulative normal distribution
- $d_1 = \frac{\ln(S_0/K) + (r + \sigma^2/2)T}{\sigma \sqrt{T}}$
- $d_2 = d_1 - \sigma \sqrt{T}$
- **Advantages:**
 - Provides closed-form solution (quick calculation).
 - Widely used in financial markets.
- **Limitations:**
 - Assumes constant volatility and interest rates.
 - Only works for European options (not American).

UNIT-4

*MEANING OF SWAP

- **Definition:** A swap is an agreement between two counterparties to exchange cash flows based on different financial instruments.
- **Underlying Basis:** Can be interest rates, currencies, commodities, or credit risk.
- **Purpose:** Risk management (hedging), cost reduction, or speculation.
- **Settlement:** Usually over-the-counter (OTC), not exchange-traded.

Features of Swaps

1. **Bilateral Contract**
 - Agreement between two parties, often customized to their needs.
2. **Cash Flow Exchange**
 - One party pays fixed cash flows, the other pays variable cash flows (depending on swap type).
3. **No Initial Payment**
 - Typically, swaps involve no upfront payment (except for transaction costs).
4. **Customization**
 - Terms (tenor, notional amount, payment dates) are tailored to the counterparties.
5. **Risk Management Tool**
 - Used to hedge exposure to interest rate changes, currency fluctuations, or commodity prices.
6. **Types of Swaps**
 - **Interest Rate Swap:** Exchange fixed interest payments for floating ones.
 - **Currency Swap:** Exchange principal and interest in one currency for another.
 - **Commodity Swap:** Exchange cash flows linked to commodity prices.
 - **Credit Default Swap (CDS):** Provides insurance against credit risk.
7. **OTC Nature**
 - Traded outside exchanges, often with banks or financial institutions as intermediaries.

Example

- **Interest Rate Swap:**
 - Company A has a loan with floating interest (LIBOR + 2%).
 - Company B has a loan with fixed interest (6%).
 - They swap payments: A pays fixed 6% to B, B pays floating LIBOR + 2% to A.
 - Both reduce risk according to their preferences.

*SWAP MARKET

The **swap market** is a major segment of the global derivatives market where participants exchange cash flows or financial obligations to manage risk, reduce costs, or speculate. It is

primarily an **over-the-counter (OTC)** market, meaning contracts are customized and negotiated directly between parties rather than traded on exchanges.

Characteristics of the Swap Market

1. Over-the-Counter (OTC) Nature

- Swaps are not exchange-traded; they are privately negotiated contracts.
- Terms (tenor, notional amount, payment frequency) are customized to suit counterparties.

2. Global and Large-Scale

- The swap market is one of the largest financial markets worldwide.
- Interest rate swaps and currency swaps dominate in terms of volume.

3. Counterparty Risk

- Since swaps are OTC, there is risk that one party may default.
- Clearinghouses and central counterparties (CCPs) are increasingly used to reduce this risk.

4. Flexibility

- Swaps can be structured to meet specific needs (hedging, speculation, arbitrage).
- Common types: interest rate swaps, currency swaps, commodity swaps, credit default swaps.

5. No Initial Cash Flow

- Typically, swaps involve no upfront payment (except transaction costs).
- Cash flows are exchanged periodically during the life of the contract.

6. Risk Management Tool

- Corporates, banks, and institutions use swaps to hedge against interest rate changes, currency fluctuations, or commodity price volatility.

7. Regulation and Transparency

- Post-2008 financial crisis, swap markets are more regulated.
- Many swaps are now reported to trade repositories and cleared through CCPs to enhance transparency.

8. Participants

- Major players include banks, financial institutions, corporations, hedge funds, and governments.
- Corporates use swaps to stabilize cash flows, while speculators use them to profit from market movements.

*CURRENCY SWAP

A **currency swap** is a derivative contract where two parties exchange principal and interest payments in different currencies. It's widely used by corporations and governments to manage foreign exchange risk, reduce borrowing costs, or access capital in another currency.

Structure of a Currency Swap

1. **Initial Exchange of Principal**
 - At the start, each party exchanges an agreed notional principal in their respective currencies.
 - Example: Party A gives USD 100 million, Party B gives EUR equivalent at the agreed exchange rate.
2. **Periodic Interest Payments**
 - Each party pays interest on the principal they received, in the currency they received.
 - Interest can be fixed-for-fixed, fixed-for-floating, or floating-for-floating.
3. **Final Exchange of Principal**
 - At maturity, the principals are re-exchanged at the original agreed rate (not the prevailing market rate).
 - This eliminates exchange rate risk on the principal.

Features

- **Customization:** Terms (tenor, notional, interest type) are tailored to counterparties.
- **Hedging Tool:** Protects against currency and interest rate fluctuations.
- **OTC Contract:** Negotiated privately, not exchange-traded.
- **Flexibility:** Can combine interest rate swaps with currency swaps.

Pricing of Currency Swaps

Pricing is based on the **present value of expected cash flows** in each currency, discounted at appropriate interest rates.

Steps:

1. **Determine Cash Flows**
 - Calculate interest payments in both currencies over the life of the swap.
2. **Discount Cash Flows**
 - Use the relevant risk-free yield curve for each currency to discount cash flows.

3. Exchange Rate Consideration

- Convert one currency's discounted cash flows into the other using the spot exchange rate.

4. Fair Value Condition

- At initiation, the present value of cash flows exchanged should be equal (so the swap has zero value).

Example

- Party A: Needs EUR funding, has USD.
- Party B: Needs USD funding, has EUR.
- They agree:
 - Exchange USD 100 million for EUR 90 million (spot rate 1.11).
 - Party A pays EUR interest (say 3%), Party B pays USD interest (say LIBOR + 1%).
 - At maturity, principals are swapped back at 1.11, regardless of market rate.

*INTEREST RATE SWAP (IRS).

Interest rate swap (IRS) is a contract where two parties exchange cash flows based on different interest rate structures—typically one pays a fixed rate while the other pays a floating rate (like LIBOR or SOFR). The **valuation and pricing** of an IRS is based on the present value of expected cash flows from both legs of the swap.

Structure of an Interest Rate Swap

- **Fixed Leg:** Pays a fixed interest rate on the notional principal.
- **Floating Leg:** Pays a floating interest rate (reset periodically, e.g., every 3 or 6 months).
- **Notional Principal:** Used only for calculating interest payments; not exchanged.
- **Settlement:** Net cash flows exchanged at each payment date.

*VALUATION OF INTEREST RATE SWAPS

The value of a swap = **Present Value (PV) of Floating Leg – PV of Fixed Leg**

1. Fixed Leg Valuation

$$PV_{\{\mathrm{fixed}\}} = N \cdot R_{\{\mathrm{fixed}\}} \cdot \sum_{i=1}^n d(t_i)$$

- N: Notional principal
- $R_{\{\mathrm{fixed}\}}$: Fixed rate
- $d(t_i)$: Discount factor for payment date t_i

2. Floating Leg Valuation

$$PV_{\{\mathrm{floating}\}} = N \cdot (1 - d(T))$$

- $d(T)$: Discount factor at maturity
- This formula arises because the floating leg resets to par at each payment date.

3. Swap Value

$$V_{\{\mathrm{swap}\}} = PV_{\{\mathrm{floating}\}} - PV_{\{\mathrm{fixed}\}}$$

- If positive \rightarrow benefit to floating-rate payer.
- If negative \rightarrow benefit to fixed-rate payer.

Pricing of Interest Rate Swaps

- At **initiation**, swaps are priced so that **PV of fixed leg = PV of floating leg**, meaning the swap has **zero value**.
- The **swap rate** (fixed rate agreed upon) is chosen to satisfy this equality.

Swap Rate Formula:

$$R_{\{\mathrm{swap}\}} = \frac{1 - d(T)}{\sum_{i=1}^n d(t_i)}$$

Example

- Notional = \$100 million
- Tenor = 3 years, annual payments
- Discount factors: $d(1)=0.95, d(2)=0.90, d(3)=0.85$

Fixed Leg PV:

$$PV_{\{\mathrm{fixed}\}} = 100m \cdot R_{\{\mathrm{fixed}\}} \cdot (0.95 + 0.90 + 0.85) = 100m \cdot R_{\{\mathrm{fixed}\}} \cdot 2.70$$

Floating Leg PV:

$$PV_{\{\mathrm{floating}\}} = 100m \cdot (1 - 0.85) = 15m$$

Swap Rate:

So the fixed rate should be **5.56%** to make the swap fair at initiation

*EQUITY SWAP

- **Definition:** An equity swap is a derivative contract where two parties agree to exchange cash flows—one leg is based on the return of an equity (stock or equity index), and the other leg is usually based on a fixed or floating interest rate.

- **Structure:**
 - **Party A:** Pays equity returns (dividends + capital gains/losses).
 - **Party B:** Pays fixed or floating interest (e.g., LIBOR + spread).
- **Purpose:**
 - Allows investors to gain equity exposure without owning the stock.
 - Used for hedging, speculation, or accessing markets where direct investment is difficult.
- **Example:**
 - Bank pays investor the return on Nifty 50 index.
 - Investor pays bank LIBOR + 1% on notional principal.

* REVERSE EQUITY SWAP

Definition: A reverse equity swap is essentially the opposite arrangement—where the party that originally received equity returns now pays them, and the other party receives them.

- **Structure:**
 - **Party A:** Pays fixed/floating interest.
 - **Party B:** Pays equity returns.
- **Purpose:**
 - Used when an investor wants to **offload equity exposure** but still retain interest income.
 - Often applied by institutions that already hold equities but want to hedge against downside risk.
- **Example:**
 - Investor holds Reliance shares but enters a reverse swap to pay equity returns to a counterparty.
 - In return, the investor receives a fixed interest stream, reducing exposure to equity volatility.

*INDIAN CORPORATIONS USE DERIVATIVES

Indian corporations use derivatives primarily for *hedging risks* related to currency fluctuations, interest rate changes, and commodity price volatility. They also employ derivatives for *speculation* and *arbitrage*, though risk management remains the dominant motive, especially for firms with global exposure.

Why Corporations in India Use Derivatives

- **Risk Management (Hedging):**
 - Protect against foreign exchange risk (important for exporters/importers).
 - Manage interest rate risk on loans and bonds.
 - Hedge commodity price risk (steel, oil, agricultural inputs).
- **Cost Reduction:**

- Access cheaper funding through swaps.
- Lock in favorable prices for raw materials.
- **Speculation:**
 - Some corporates take directional bets on indices, currencies, or commodities.
- **Arbitrage:**
- Exploit mispricing between spot and futures/options markets.

Common Derivatives Used by Indian Corporations

1. Currency Derivatives

- Forwards, futures, and options to hedge against INR/USD, INR/EUR, INR/JPY volatility.
- Example: Infosys and TCS hedge dollar receivables using currency forwards/options.

2. Interest Rate Derivatives

- Swaps to convert floating-rate debt into fixed-rate obligations.
- Example: Indian banks and infrastructure firms use interest rate swaps to stabilize borrowing costs.

3. Commodity Derivatives

- Futures and options on crude oil, metals, and agricultural commodities.
- Example: Airlines hedge jet fuel prices; steel companies hedge iron ore and coal.

4. Equity Derivatives

- Index futures and options for portfolio hedging.
- Example: Mutual funds and corporates hedge equity exposure using Nifty options.

Examples of Corporate Use in India

- **Air India & IndiGo:** Hedge aviation turbine fuel (ATF) prices using commodity futures.
- **Infosys, Wipro, TCS:** Hedge foreign exchange risk due to large USD inflows.
- **Reliance Industries:** Use commodity and currency derivatives to manage oil and petrochemical exposure.
- **Banks (SBI, ICICI):** Use interest rate swaps to manage lending/borrowing mismatches.

Benefits and Risks

- **Benefits:**
 - Stabilizes cash flows.
 - Protects profit margins.
 - Enhances competitiveness in global markets.
- **Risks:**
 - Misuse for speculation can lead to large losses.
 - Counterparty risk in OTC contracts.
 - Regulatory compliance (RBI and SEBI oversight).

