Subject: DERIVATIVES AND RISK MANAGEMENT

Subject Code: MBPC3006

Branch: Management (MBA)

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LECTURE NOTES PREPARED BY:

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COURSE OBJECTIVES:

1. To gain knowledge on derivative instruments used like forwards, futures, swaps, and options, including the platform on which they are traded.

2. To explore the risk in financial derivative contracts, focusing on price discovery mechanisms and risk mitigation strategies.

3. To understand different derivative contracts, including their pricing principles, value calculations, and payoff structures.

4. To gain an understanding of the derivatives market and trading mechanisms including pricing models (e.g., Binomial, Black-Scholes-Merton), and explore trading strategies using options spreads and combinations.

SYLLABUS

Module - I:

Introduction to Derivatives: Meaning of Derivatives, Types of Derivatives Instruments
Why Derivatives? Insurance Vs. Derivatives
Derivatives Markets: Exchange-Traded Vs. OTC Market
Types of Derivatives Contracts: Forwards, Futures, Options, Swaps
Price Discovery and Risk Management
Trading and Settlement Mechanism: Traders in a Derivatives Market, Market Order and Limit Order
Order Matching
Margins: Initial Margin, Maintenance Margin
Mark to Market and Settlement Mechanism
Introduction to Trading of Derivatives in Indian Stock Market
Forward and Future Contracts: Meaning, Concept of Carry Model, Pricing of Forwards and Future Contract, Value of Forward and Future Contract
Hedging with Forward and Futures
Why Hedge? Hedging Concepts: Basis Risk, Hedging Strategies – Long Hedge, Short Hedge and Cross Hedge.

Module-II:

Option Contracts: Meaning of Option Contract, Development of Option Market, Types of Option Contracts – Call Option and Put Option
Exchange Traded Vs. Over the Counter Options Market
Mechanics of Option Trading: Option Quotations
Option Trading Strategies: Option Spreads and Combinations
Valuation of Options: Intrinsic Value, Time Value, Payoff of Call and Put Option

Principle of Option Pricing: The Binomial Model – Risk Neutral Arbitrage, One-Period Binomial Model, Two-Period Binomial Model
The Black-Scholes Merton Model: Assumption of BSM Model, Factors in the BSM Model, Option Pricing Model – The Black-Scholes Model
Valuation of Call and Put Option

Module-III:

Swaps: Introduction, Features, Market for Swap Contracts, Evolution
Types of Swaps: Basic Concept of Interest Rate Swap, Currency Swap
Basic Concept of Interest Rate Swap, Currency Swap

COURSE OUTCOMES:

CO1: Describe about basics of financial derivative products and nature of Risk Management.

CO2: Analyse different concept and technicalities of forward and future contracts and evaluating the value of the forward and future contract.

CO3: Apply different concept and technicalities of Options contracts and determining the pricing of options using Binomial and Black-Scholes Model.

CO4: Describe different concept and technicalities of Swap contracts.

BOOKS RECOMMENDED:

1. Options, Futures and other Derivatives, Hull J.C., Pearson

2. Financial Derivatives – Theory, concepts and problems, Gupta, PHI

3. Derivatives and Risk Management, Verma J.R., TMH

4. Derivatives and Risk Management, Srivastava, Oxford

5. Fundamentals of Financial Derivatives, NR Parasuraman, Wiley India

Module 1: Introduction to Derivatives

Concept and Meaning of Derivatives: -

The term "derivative" comes from the word derive, meaning something that is obtained from another source.
In finance, a derivative is a contract whose value depends on (or is derived from) the performance of an underlying asset, index, or rate.
The underlying asset can be anything that has a market price or value:
Financial Assets - shares, bonds, treasury bills, stock indices, interest rates, currencies.
Commodities - gold, silver, crude oil, wheat, cotton, coffee, etc.
Example - Suppose you buy a derivative contract linked to the price of gold. The value of this derivative will change when the price of gold changes. If gold rises, the value of your contract may rise; if gold falls, your contract may lose value.
Thus, derivatives are not independent instruments; they always "follow" something else.

Evolution of Derivatives: -

Ancient practices: Even in Mesopotamia (1750 BC), farmers and merchants used contracts similar to forwards to fix future trade prices.
Japan (17th century): Rice merchants traded "rice coupons," functioning like futures contracts.
Modern Era:
1848 – Chicago Board of Trade (CBOT) established organized trading in commodity futures.
1970s – Financial derivatives (currency, interest rate futures) developed.
1980s–90s – Options and swaps gained worldwide popularity.
India - Derivatives trading was introduced in 2000 (SEBI approved NSE & BSE for futures/options).

Features of Derivatives: -

- Value derived from underlying - They have no value on their own.
- Contractual agreements - Always involve two parties (buyer and seller).
- Future orientation - Terms are decided today, but settlement is in future.
- Zero or small initial investment - Only margin or premium is required.
- Leverage - A small investment can control a large value of assets.
- Two types of trading: -
        - OTC (Over the Counter) - Informal, customized, between two parties.
        - Exchange Traded - Standardized, regulated by exchanges.
Example - If you want exposure to ₹1 crore worth of NIFTY shares, you don't need to invest the entire ₹1 crore. By using derivatives (say futures contracts), you may only need to put a margin of 5–10% (₹5–10 lakhs). This leverage can multiply profits but also magnifies losses.

What is a Derivatives Market?

A **derivatives market** is a financial marketplace where **derivative contracts** are **traded**. These contracts derive their value from the **price of an underlying asset**, such as:

- Stocks
- Bonds
- Commodities (e.g., gold, oil)
- Currencies (e.g., USD, INR)
- Interest rates
- Market indices (e.g., Nifty, S&P 500)

1. Derivatives Market

A **derivatives market** is a platform where **buyers and sellers** trade contracts based on the **future value** of an underlying asset, to **hedge risk, speculate, or arbitrage**.

Example:

A wheat farmer fears prices will drop in 3 months.
→ He **sells a wheat futures contract** today at a fixed price.
→ Even if market prices fall, he receives the pre-agreed price.

In short, the **derivatives market** is a key part of the global financial system, allowing participants to **manage risk**, **speculate**, and **ensure efficient pricing** of financial assets.

Size of the Derivatives Market
Global Perspective:
- The **derivatives market is one of the largest financial markets in the world**, far exceeding the size of the spot (cash) markets.
- It includes a wide range of instruments across **interest rates, equities, currencies, commodities, credit, and more**.

Key Figures *(approximate values as of recent years)***:**

- **Notional Value**: Over **$600 trillion** globally (BIS data).
  - o Note: *Notional* is the total value of underlying assets — **not actual exposure** or capital at risk.
- **Breakdown**:
  - o **OTC Derivatives**: ~85% of total market
  - o **Exchange-Traded Derivatives (ETD)**: ~15% of total market

India's Derivatives Market:
- Dominated by **equity derivatives** (especially index options like Nifty).
- **NSE** (National Stock Exchange) is among the **largest globally** in terms of derivative contracts traded (by volume).
- Growing interest in **currency and commodity derivatives**.

Why So Large?
- Derivatives allow for **leverage**, meaning large exposures can be taken with small capital.
- Used by a wide range of participants: **hedgers, speculators, arbitrageurs, institutions, governments**.

2. Exchange-Traded Derivatives (ETD) Market

Definition:

Exchange-Traded Derivatives are **standardized contracts** (like futures and options) **listed and traded** on organized exchanges such as **NSE, BSE, CME, ICE, etc.**

Key Characteristics:

Feature	Description
Standardization	Contract terms (lot size, expiry, margin) are **predefined** by the exchange
Regulation	Regulated by **financial authorities** (e.g., SEBI in India, CFTC in U.S.)
Transparency	**Prices and volumes** are publicly available
Clearing House	Acts as counterparty to all trades, reducing **default risk**
Daily Settlement	Uses **mark-to-market** for margining and daily profit/loss adjustment

Examples:
- **Nifty 50 Futures** on NSE (index futures)

- **Gold Futures** on MCX (commodity futures)
- **USD/INR Futures** on NSE (currency futures)
- **Bank Nifty Options**, **Reliance Options**, etc.

Advantages:
- Low counterparty risk (clearinghouse involvement)
- High liquidity and market depth
- Transparent pricing
- Easy entry and exit (standardized contracts)

Limitations:
- Less flexibility (due to standardization)
- Limited to traded underlying assets
- Initial margin + MTM margin required daily

3. Over-the-Counter (OTC) Derivatives Market

Definition:
OTC derivatives are **privately negotiated contracts** between two parties, without using an exchange or clearinghouse.

Key Characteristics:

Feature	Description
Customization	Fully customizable (terms, size, maturity, underlying asset, etc.)
No Central Counterparty	Higher **counterparty risk** — depends on the creditworthiness of the parties
Less Regulated	Subject to **bilateral regulation and documentation** (e.g., ISDA agreements)
Illiquid	Difficult to trade/exit before maturity
Limited Transparency	Prices not public; **privately quoted**

Common OTC Derivatives:
- **Forward contracts** (e.g., foreign exchange forward)
- **Interest rate swaps**
- **Currency swaps**
- **Credit default swaps (CDS)**
- Customized **exotic options**

Advantages:
- Tailored to specific needs (size, timing, terms)
- Useful for complex risk management
- Often cheaper for large, sophisticated participants

Risks:
- **Counterparty default risk** (especially during financial stress)
- **Lack of price transparency**
- **Regulatory compliance and legal risks**

Real-World Example:
During the **2008 financial crisis**, OTC derivatives like **CDS (Credit Default Swaps)** played a major role. Institutions had large uncollateralized exposures, and the **failure of AIG** revealed the systemic risk of OTC markets.

Trading & Settlement Mechanism in Derivatives Market

A. Trading Mechanism

Order Execution:

- In exchange-traded markets, derivatives are traded via **electronic order-matching systems**.

- Orders can be:

    o **Market orders**: Execute at best available price

    o **Limit orders**: Execute only at a specified price

- Platforms like **NSE NOW**, **BSE BOLT**, or via brokers

Participants in Trading:

- **Retail investors**

- **Institutional investors** (mutual funds, FIIs)

- **Hedgers** (corporates, exporters/importers)

- **Speculators & Arbitrageurs**

- **Market Makers** (provide liquidity)

B. Clearing and Settlement

Clearing House Functions:

- Every trade is novated — the **clearinghouse becomes the counterparty** to both buyer and seller.

- Ensures **guaranteed settlement** even if one party defaults.

Margining System:

Type of Margin	Purpose
Initial Margin	Required upfront to open a position
Mark-to-Market (MTM)	Daily gain/loss is credited/debited based on closing price
Maintenance Margin	Minimum balance to be maintained in margin account
Margin Call	Triggered if account falls below maintenance level

Settlement Types:

Settlement Type	Description
Cash Settlement	Difference in prices is settled in cash (no physical delivery)
Physical Settlement	Actual delivery of underlying asset (used in some commodity and currency contracts)

Example of Trading & Settlement:

Suppose you buy **Nifty Futures** at 20,000 on NSE:

- **Initial Margin**: 10% → You deposit ₹2,00,000 (on notional value of ₹20 lakhs)

- **MTM**: If Nifty rises to 20,200 next day:
  - You gain ₹200 per lot x lot size (say 50) = ₹10,000 credited to margin account
- **On Expiry**: If you don't square off early, the contract is settled at closing price.

OTC Trading & Settlement:

- Done via **bilateral agreements** (e.g., ISDA).
- No central clearing → **risk mitigation via collateral**, credit checks, etc.
- Settlement typically at maturity, **based on contract terms**.
- Increasingly, **central clearing** is being mandated (especially post-2008 crisis).

Summary Table

Aspect	Exchange-Traded	OTC
Trading Platform	Organized Exchange (NSE, BSE)	Private Negotiation
Standardization	High	Low (fully customized)
Counterparty Risk	Low (clearinghouse involved)	High (no intermediary)
Liquidity	High	Low
Transparency	High (public prices)	Low (private quotes)
Regulation	Tightly regulated (e.g., SEBI)	Light, but increasing post-2008
Users	Retail, institutions, traders	Corporates, banks, large institutions

The **derivatives market** is a powerful financial ecosystem that serves diverse functions — from **risk management to speculation**, from **price discovery to liquidity enhancement**. Understanding the **structure (exchange vs. OTC)** and **mechanics (trading, clearing, settlement)** is crucial for any market participant or student of finance.

Types of Derivatives Instruments

Derivatives are financial contracts whose value is derived from an underlying asset such as commodities, stocks, bonds, currencies, or interest rates. The four major types of derivative instruments are:

1) Forward Contracts

Definition:

A forward contract is a customized agreement between two parties to buy or sell an asset at a predetermined price on a specific future date.

Key Features:

- OTC (Over-the-Counter): Not traded on exchanges; privately negotiated.
- Customization: Terms such as quantity, quality, price, and date are tailored.
- No Intermediary: No clearinghouse; higher counterparty (default) risk.
- Settlement: Usually settled at maturity, not daily.
- No upfront cost (except if priced off-market).

Example:

A farmer agrees to sell 100 quintals of wheat to a trader at ₹2,000/quintal, deliverable after 3 months. Regardless of the actual market price after 3 months, the trader pays ₹2,000/quintal.

- If market price is ₹2,200 → Trader gains.
- If market price is ₹1,800 → Farmer gains.

Use Cases:

- Corporates managing foreign exchange or commodity exposure.
- Farmers locking in crop prices.
- Importers/exporters hedging against currency fluctuation.

Risks:

- Credit/default risk (no clearinghouse).
- Illiquidity (hard to exit early).
- Price may move unfavorably.

2) Futures Contracts

Definition:

A futures contract is a standardized forward contract traded on a formal exchange to buy or sell an asset at a future date and price.

Key Features:

- Standardized: Fixed contract sizes, maturities, etc.
- Traded on regulated exchanges (e.g., NSE, BSE, CME).
- Clearinghouse acts as a counterparty → virtually eliminates default risk.
- Mark-to-market: Gains/losses are settled daily in the trader's margin account.
- Can be offset before maturity (high liquidity).

Example:

A trader buys Reliance Futures on NSE at ₹2,500/share for October expiry.

- If Reliance rises to ₹2,600 → Trader earns ₹100 per share.
- If it falls to ₹2,400 → Trader loses ₹100 per share.
- Profits/losses adjusted daily.

Use Cases:

- Hedging by portfolio managers or businesses.
- Speculation on index, commodity, or stock prices.
- Arbitrage between spot and futures markets.

Risks:

- Market risk (price moves against position).
- Margin calls if losses mount.

3) Options Contracts

Definition:

An option is a contract that gives the buyer the right (but not the obligation) to buy or sell an asset at a fixed price (strike price) on or before a specific date.

Types of Options:

Type	Buyer's Right	Seller's Obligation
Call Option	To buy the asset	Must sell if exercised
Put Option	To sell the asset	Must buy if exercised

Key Features:

- Asymmetrical payoff: Buyer's loss limited to premium paid; profit potential unlimited (for calls).
- Traded on exchanges (standardized) or OTC (custom).
- Buyer pays a premium upfront.
- Can be European style (exercise only at maturity) or American style (any time before maturity).

Example:

A trader buys a Call Option on Infosys with:

- Strike Price = ₹1,500
- Premium = ₹50
- Expiry = 1 month

If Infosys trades at ₹1,600 on expiry:

- Trader exercises the option, buys at ₹1,500, and gains ₹100 – ₹50 = ₹50 net profit per share.

If Infosys is below ₹1,500, the option is not exercised, and loss is limited to ₹50 (premium).

Use Cases:

- Hedging (e.g., buying puts to protect stock portfolio).
- Speculation with limited downside.
- Income generation through writing options.

Risks:

- Complex to price (requires models like Black-Scholes).
- Time decay reduces option value as expiry approaches.
- Option writers (sellers) face unlimited loss potential (in case of naked calls).

4) Swaps

Definition:

A swap is an OTC agreement between two parties to exchange a series of cash flows over a period, based on predefined terms.

Key Types of Swaps:

a) Interest Rate Swap (IRS)

- Exchange of fixed interest payments for floating rate payments (or vice versa).
- Usually based on a notional principal which is not exchanged.

Example:

- Company A has a loan at floating rate (LIBOR + 1%).
- Company B has a loan at fixed rate (6%).
- They swap interest payments:
  - A pays 6% fixed to B.
  - B pays LIBOR + 1% to A.

Purpose: Each company gets the preferred type of interest exposure.

b) Currency Swap

- Exchange of principal and interest in one currency for those in another currency.
- Used to hedge foreign exchange and interest rate exposure.

Example:

- Company A (India) borrows ₹100 crore.
- Company B (US) borrows $10 million.
- They swap loans to access cheaper financing in foreign markets:
  - A pays USD interest to B.
  - B pays INR interest to A.
  - On maturity, they return original principal in respective currencies.

Use Cases of Swaps:

- Hedging interest rate or currency risk.
- Managing asset-liability mismatches in banking.
- Arbitrage between borrowing markets.

Risks in Swaps:
- Counterparty risk (especially in long-term contracts).
- Valuation complexity (depends on future rates).
- Limited secondary market (illiquidity).

Summary Table

Derivative Type	Traded On	Customization	Default Risk	Use Case
Forwards	OTC	High	High	Hedging commodity/currency risks
Futures	Exchange	Low (standardized)	Low	Speculation, hedging, arbitrage
Options	Exchange or OTC	Medium	Buyer: Low	Directional bets, portfolio protection
Swaps	OTC	High	High	Managing interest/currency exposure

Functions of Derivatives

1. Risk Management (Hedging)

What it means:

Derivatives are widely used by businesses and investors to **reduce or eliminate the risk** associated with price movements of assets such as commodities, currencies, interest rates, or stocks.

How it works:

Hedging involves taking a position in a derivative that **offsets potential losses** in another asset. The goal isn't to make a profit, but to protect against unfavourable price changes.

Example: Airline Fuel Hedge

An airline company is heavily exposed to jet fuel prices. If fuel costs rise, it increases operational costs and reduces profit margins. To hedge this:
- The airline **buys crude oil futures** contracts (since jet fuel prices track crude oil prices).
- If oil prices rise, the **gain on futures** offsets the increased fuel cost.
- If prices fall, the airline **pays more on futures**, but benefits from **cheaper fuel**, so overall risk is neutralized.

Other real-world hedging uses:
- Farmers hedge crop prices using commodity futures.
- Exporters hedge foreign exchange risk with currency forwards.
- Banks hedge interest rate risk using interest rate swaps.

2. Price Discovery

What it means:

Derivatives markets contribute to discovering the **future expected price** of an asset based on supply-demand dynamics, investor expectations, and market sentiment.

How it works:

Prices of futures and options reflect what market participants believe an asset **will be worth in the future**. These prices serve as **signals** to the broader economy.

Example:
- A wheat futures contract priced higher than the current spot price may signal that market participants **expect wheat shortages** or **higher demand** in the coming months.
- This information is useful not just for traders, but also for **policymakers, producers, and consumers** to make informed decisions.

Why it matters:

Price discovery helps in:
- **Efficient resource allocation**
- **Better financial planning**
- **Market transparency**

3. Arbitrage Opportunities

What it means:

Arbitrage is the practice of **buying low and selling high simultaneously** in different markets to earn a **risk-free profit**. Derivatives enable such opportunities when prices between the spot and derivatives markets **diverge temporarily**.

How it works:

Arbitrageurs track **price discrepancies** between:

- The spot market (where assets are traded for immediate delivery)
- The futures market (where delivery is set for a future date)

If the futures price is too high compared to the spot price + cost of carry (storage, interest, etc.), arbitrageurs:

- Buy in the spot market
- Sell in the futures market
- Lock in a **riskless profit** when prices converge

Example:

- Suppose gold trades at $1,800/oz in the spot market and $1,850/oz in the futures market.
- If storage and interest costs are $20, the arbitrageur:
  - Buys gold at $1,800
  - Stores it and sells a futures contract at $1,850
  - After delivery, earns $30 profit per ounce

Why it's important:

- Arbitrage **enforces pricing discipline** between markets.
- It **enhances market efficiency** and corrects mispricing.

4. Market Liquidity

What it means:

Derivatives increase **market participation**, which in turn boosts **liquidity** — the ease with which assets can be bought or sold without affecting their price.

How it works:

Because derivatives:

- Require **less capital** than buying assets outright (thanks to leverage/margin)
- Allow exposure to a wide range of assets
  They attract:
- Hedgers
- Speculators
- Arbitrageurs
- Institutional investors

This wide participation leads to:

- **Tighter bid-ask spreads**
- **Faster trade execution**
- **Lower transaction costs**

Example:

In the equity market:

- A stock might trade thinly.
- But its futures or options might have heavy volumes.
- This added liquidity **spills over** to the underlying market, improving its efficiency.

5. Speculation
What it means:
Speculators use derivatives to **bet on price movements** to make profits, without intending to actually own the underlying asset.
How it works:
Speculators take directional positions:
- Long (buy) if they expect prices to rise
- Short (sell) if they expect prices to fall

Because derivatives allow **high leverage**, speculators can:
- Control large positions with small capital
- Amplify gains (and losses)

Example:
A trader believes that the S&P 500 will rise:
- Buys futures contracts on the S&P 500
- If the index rises, they profit from the **change in contract value**

Alternatively, if they expect a stock to fall:
- They might buy **put options**
- Profit if the stock price declines

Risk:
Speculation can be **highly profitable**, but also **highly risky**, especially due to leverage. It adds **volatility**, but also **liquidity** to the market.

Summary Table

Function	Purpose	Users	Impact on Market
Risk Management	Hedge against adverse price movements	Corporates, investors	Reduces uncertainty, stabilizes earnings
Price Discovery	Reveal market expectations about future prices	Traders, analysts, producers	Improves transparency and planning
Arbitrage Opportunities	Exploit price inefficiencies for risk-free profit	Arbitrageurs	Enforces pricing efficiency
Market Liquidity	Attract more participants, enhance trading volume	All types of market players	Lowers transaction costs, improves access
Speculation	Profit from directional bets on price movements	Traders, hedge funds	Adds risk and reward, boosts activity

Participants in Derivatives Market
Understanding the key market players is essential to grasp how derivatives function effectively in the financial ecosystem. Each participant has distinct motives and risk preferences.
Hedgers
Objective: Reduce or eliminate risk from adverse price movements.
Hedgers use derivatives to **protect their business or portfolio** against future uncertainty. They are usually exposed to **underlying assets** and want to avoid losses due to price volatility.

Examples:
- **Farmers** hedge against falling crop prices by selling commodity futures.

- **Exporters/Importers** hedge foreign exchange risk using currency forwards.
- **Portfolio Managers** use options to protect against stock market downturns.

Example:
A wheat farmer expects harvest in 3 months. Wheat is currently priced at ₹2,000 per quintal. To hedge against price drops, the farmer **sells a futures contract** at ₹2,000. If the price falls to ₹1,800 at harvest, the farmer loses ₹200 in the spot market but **gains ₹200 from the futures** — maintaining income stability.

Speculators
Objective: Earn profit by predicting price movements.
Speculators have **no intention to own or use the underlying asset**. They willingly take on risk in hopes of **profiting from market volatility**. While they add liquidity to the market, they can also introduce instability.
Features:
- Use leverage to amplify returns.
- Make directional bets: Long (buy) if bullish, Short (sell) if bearish.
- Use tools like futures, options, swaps.
Example:
A trader believes crude oil prices will rise. Buys oil futures at $85/barrel. If the price rises to $95, the trader profits from the difference. If it falls, they incur losses.

Arbitrageurs
Objective: Exploit price discrepancies in different markets for risk-free profit.
Arbitrage involves **simultaneous buying and selling** of the same or equivalent asset in two markets. Their actions **align prices**, promoting market efficiency.
Example of Arbitrage:
- **Spot price of gold** = ₹60,000 per 10g
- **Futures price of gold** = ₹61,000 per 10g
- **Arbitrage strategy**:
  - Buy 10g gold in the **spot market** at ₹60,000
  - Sell a **futures contract** at ₹61,000
  - On delivery, gain ₹1,000 **risk-free**, assuming costs like storage and interest are negligible.
Impact:
- Arbitrage reduces mispricing
- Promotes **price uniformity** across markets

Risks in Derivatives
Despite their usefulness, derivatives carry **multiple types of risk**, especially due to their leverage and complexity.

1. Market Risk
Definition: The risk that prices move unfavorably, causing losses.
- A core risk for **speculators and hedgers** alike.
- Driven by changes in asset prices, interest rates, currencies, etc.
Example:
You buy a futures contract assuming the market will rise. Instead, prices fall — causing a **loss on your position**.

2. Credit/Counterparty Risk

Definition: The other party defaults on the contract.

- Especially significant in **OTC (Over-the-Counter)** derivatives, which are not exchange-traded.
- Central clearing in exchange-traded derivatives **reduces** this risk.

Example:

In an OTC interest rate swap, if one bank fails to make payments, the counterparty suffers a loss.

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3. Liquidity Risk

Definition: Difficulty in entering or exiting a derivative position before maturity without significant cost.

- Common in **illiquid contracts** with low trading volume.
- May result in poor pricing or inability to close positions.

Example:

A corporate holds a customized currency forward with a bank. If it wants to exit early, **no market exists** — must negotiate, often at a **loss**.

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4. Operational Risk

Definition: Losses from internal failures — such as systems breakdown, human error, or fraud.

- May arise from poor processes, inadequate controls, or technology issues.

Example:

Incorrect trade entry in a derivatives system leads to an unintended exposure worth millions.

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5. Regulatory / Legal Risk

Definition: Losses due to sudden regulatory changes or legal ambiguities.

- Especially high in global markets with different laws.
- Includes **bans**, **tax changes**, **contract enforceability issues**.

Example:

A country bans short-selling derivatives during a market crash — leaving speculators and hedgers unable to manage positions.

Advantages of Derivatives

Advantage	Explanation
Risk Transfer	Derivatives allow businesses to **shift risk** to parties willing to take it, like speculators.
Price Discovery	Futures and options prices reflect **market expectations**, helping in forecasting and planning.
Market Efficiency & Liquidity	Increased trading activity improves **price efficiency**, narrows spreads, and attracts investors.
Leverage	Small capital can control large positions, enabling **higher returns** (but also higher risk).

Disadvantages of Derivatives

Disadvantage	Explanation
High Speculative Risk	Leverage can cause **massive losses** if market moves against the position.
Complexity in Pricing	Some derivatives, like options, require advanced models (e.g., Black-Scholes), and assumptions may not hold.
Potential for Misuse	Can be used for **pure gambling** or hiding losses (e.g., rogue trading cases).
Systemic Risk	Large institutional defaults (like Lehman Brothers) can trigger **financial contagion**.

Example of Systemic Risk:

During the 2008 financial crisis, massive exposure to **credit default swaps (CDS)** on mortgage-backed securities caused cascading failures. Institutions like **AIG** nearly collapsed, threatening the entire financial system — and required government bailouts.

Summary

Derivatives are contracts derived from underlying assets like stocks, commodities, currencies, etc.

Four main types: Forwards, Futures, Options, Swaps.

They serve purposes like hedging, speculation, arbitrage, and price discovery.

Participants include hedgers, speculators, and arbitrageurs.

While they offer benefits like risk management and liquidity, they also carry risks like market and credit risk.

Module II: Option Contracts – Comprehensive Notes

Meaning of Option Contract

An **option contract** is a type of **financial derivative** that gives the holder the **right**, but **not the obligation**, to **buy or sell** an underlying asset at a **specific price (strike price)** on or before a certain date (expiry date).

- **Buyer of Option**: Pays a premium to gain the right.

- **Seller (Writer) of Option**: Has an obligation if the buyer chooses to exercise the option.

Types of Options:

1. **Call Option** – Right to **buy** an asset.

2. **Put Option** – Right to **sell** an asset.

Development of Option Market

- **1973**: Options trading began formally with the creation of the **Chicago Board Options Exchange (CBOE)**.

- **India**: Options trading introduced by **NSE in 2001**, starting with **index options (Nifty 50)**.

- Over time, options expanded to **stocks, currencies, and commodities**.

Types of Option Contracts – Call and Put Options

Introduction

In the world of derivatives, **options** are one of the most widely used financial instruments for **hedging**, **speculation**, and **risk management**. The two fundamental types of option contracts are:

1. **Call Options**   2.   **Put Options**

These contracts give the holder (buyer) the right, but not the obligation, to **buy or sell** an underlying asset at a pre-agreed price, called the **strike price**, on or before a specific date known as the **expiry date**.

1. Call Option – Definition and Features

A **call option** is a financial contract that gives the **buyer (holder)** the **right, but not the obligation**, to **buy** the underlying asset at the **strike price** on or before the **expiration date**.

Key Characteristics:

Feature	Description
Buyer	Pays a **premium** to gain the right to buy
Seller (Writer)	Receives the premium and takes on the **obligation** to sell if the option is exercised
Exercise	Profitable when **market price > strike price**
Underlying	Can be stocks, indices, currencies, commodities, etc.

Example:

- You buy a **Call Option** on **Infosys** with:

  o **Strike Price** = ₹1,500

  o **Premium Paid** = ₹50

  o **Expiry** = 1 Month

If the market price rises to ₹1,600 before expiry, you can **buy Infosys shares at ₹1,500**, even though the market is ₹1,600. Your **gain** is ₹100 (₹1,600 - ₹1,500), and **net profit** = ₹100 – ₹50 = ₹50 per share.

But if Infosys stays below ₹1,500, the option expires **worthless**, and your loss is **limited to the ₹50 premium**.

Summary of Payoff:

Market Price	Outcome	Profit/Loss
Below ₹1,500	Option not exercised	Loss = Premium
Above ₹1,500	Option exercised	Profit = (Market – Strike) – Premium

2. Put Option – Definition and Features

A **put option** gives the **buyer** the **right, but not the obligation**, to **sell** the underlying asset at a pre-determined **strike price** on or before the expiration date.

Key Characteristics:

Feature	Description
Buyer	Pays a **premium** to gain the right to sell
Seller (Writer)	Obligated to **buy** if the option is exercised
Exercise	Profitable when **market price < strike price**

Example:

You buy a **Put Option** on **TCS** with:
- **Strike Price** = ₹3,000
- **Premium Paid** = ₹60
- **Expiry** = 1 Month

If TCS falls to ₹2,800, you can **sell it at ₹3,000**, gaining ₹200. Your **net profit** = ₹200 – ₹60 = ₹140 per share. But if the market stays above ₹3,000, the option is **not exercised**, and your loss is limited to the **₹60 premium**.

Summary of Payoff:

Market Price	Outcome	Profit/Loss
Above ₹3,000	Option not exercised	Loss = Premium
Below ₹3,000	Option exercised	Profit = (Strike – Market) – Premium

Call vs. Put Option

Feature	Call Option	Put Option
Right	Buy asset	Sell asset
Buyer	Bullish on asset	Bearish on asset
Seller	Must sell if exercised	Must buy if exercised
Profit if	Market price ↑	Market price ↓
Max Loss	Limited to premium	Limited to premium
Max Profit	Unlimited	Limited (till price becomes zero)

Why Do Traders Use Call and Put Options?

Hedging:

- **Call Options**: Protects against rising prices.

- **Put Options**: Protects against falling prices.

Example: An investor holding a stock can buy a **put option** to protect against losses if the stock price falls (insurance-like protection).

Speculation:

- Options allow traders to **profit from market movements** without owning the underlying asset.

- Lower initial investment due to premium.

Example: Buying a **call option** on a stock expected to rise sharply.

Arbitrage and Strategies:

- Traders combine call and put options to create **strategies** like straddles, spreads, and butterflies to capitalize on different market views.

Real-World Use Cases

a) Call Option Use Case – Airline Fuel Hedging:

- Airlines often use **call options** on oil to protect against rising fuel costs.

- If prices rise, they buy fuel at a lower strike price.

- If prices fall, they let the option expire and buy at the market price.

b) Put Option Use Case – Equity Investor Hedge:

- A mutual fund manager holding large-cap stocks may buy **put options** on Nifty to hedge portfolio losses during volatile times.

Key Terms in Option Contracts

Term	Explanation
Strike Price	Price at which the option can be exercised
Premium	Cost paid to buy the option
Expiry Date	Last date to exercise the option
Lot Size	Standard unit of the option (e.g., 75 shares)
In-the-Money (ITM)	Option has intrinsic value (profitable)
At-the-Money (ATM)	Strike price = current market price
Out-of-the-Money (OTM)	Option has no intrinsic value (not profitable)

Important Notes

- **European Options**: Can be exercised **only on expiry**.
- **American Options**: Can be exercised **anytime up to expiry**.
- In India, stock options are typically **European-style**.
- Options are **zero-sum games** — gain for one party = loss for another.

Concept of ITM, ATM, and OTM

These terms describe the **moneyness** of options — their intrinsic value:

Term	Meaning	Call Option	Put Option
ITM	In-the-money	Market price > Strike price	Market price < Strike price
ATM	At-the-money	Market price = Strike price	Market price = Strike price
OTM	Out-of-the-money	Market price < Strike price	Market price > Strike price

Exchange-Traded vs. Over-the-Counter (OTC) Options

Feature	Exchange-Traded Options	OTC Options
Traded On	Formal exchanges (e.g. NSE, BSE)	Privately between parties
Standardized	Yes	No (customized)
Regulation	Strict	Flexible
Liquidity	High	Low
Counterparty Risk	Low (clearinghouse involved)	High

Exchange-Traded vs. Over-the-Counter (OTC) Options

Introduction

Options are powerful derivatives used for risk management, speculation, and arbitrage. Depending on how and where they are traded, options fall into two broad categories: **Exchange-Traded Options (ETOs)** and **Over-the-Counter (OTC) Options**. Understanding the differences between these two types is crucial for both academic and practical finance.

1. Exchange-Traded Options (ETOs)

Exchange-Traded Options are listed and traded on formal exchanges such as:
- **NSE** (National Stock Exchange)
- **BSE** (Bombay Stock Exchange)
- **CME** (Chicago Mercantile Exchange)
- **NYSE**, etc.

These options are standardized in terms of:
- **Contract size (lot size)**
- **Strike prices**
- **Expiration dates**
- **Underlying assets**

All trading happens through a regulated, electronic system, and a **clearinghouse** guarantees the performance of the contract, eliminating **counterparty risk**.

Key Features:

- **Standardized**: Terms such as expiry, strike, and lot size are predefined.
- **Regulated**: Under the purview of financial market regulators like SEBI (India), CFTC (USA).
- **High Liquidity**: Active participation from retail and institutional investors.
- **Transparency**: Price quotes, volumes, and open interest are publicly available.

Example:

A call option on **Reliance Industries** with:
- Strike price = ₹2,500
- Expiry = Last Thursday of the month
- Lot size = 505 shares

2. Over-the-Counter (OTC) Options

OTC options are **privately negotiated** contracts between two parties, usually **banks**, **corporates**, or **financial institutions**. These contracts are customized to suit the specific needs of the parties involved.

Key Features:

- **Customized**: Strike price, expiration, and asset type can be tailored.
- **No Exchange Listing**: Deals are made directly or through intermediaries.
- **Higher Risk**: No clearinghouse; exposed to **counterparty default**.
- **Low Liquidity**: Can't be easily transferred or sold in a secondary market.

Example:

A large exporting company and a bank may agree on a **customized currency option** to hedge USD/INR exposure over 9 months, with non-standard expiry and notional amounts.

Key Differences Table:

Feature	Exchange-Traded Options	OTC Options
Trading Platform	Organized Exchange	Private Agreement
Standardization	Yes	No
Regulation	High	Low
Counterparty Risk	Very Low	High
Customization	No	Yes
Liquidity	High	Low
Transparency	Full	Limited

Point 6: Mechanics of Option Trading

Introduction

Trading options involves a series of well-defined steps and participants, governed by regulations and market infrastructure. Understanding the mechanics of option trading is essential to make informed investment or hedging decisions.

1. Choosing the Option Contract

Before entering a trade, the investor selects key parameters:

- **Underlying Asset**: e.g., Nifty 50, Reliance stock
- **Option Type**: Call or Put
- **Strike Price**
- **Expiration Date**
- **Lot Size**
- **Premium**

All these elements influence the option's **cost and profitability**.

2. Order Placement

An order is placed through a **registered broker** using an online trading platform or by phone. The order includes:

- Type (Buy/Sell)
- Option Type (Call/Put)
- Quantity
- Limit or Market Order

Once placed, the exchange matches buyers with sellers.

3. Premium Payment

When an investor buys an option, they pay a **premium** upfront. This is the **maximum loss** they can incur. The **seller receives** this premium and takes on the **obligation** of fulfilling the contract if exercised.

4. Daily Mark-to-Market (MTM)

For **futures-style option contracts**, MTM adjustments are made daily:

- Profits/losses from changes in premium are **settled every day**.
- Reduces cumulative risk for brokers and traders.

5. Exercise and Expiry

- **European options**: Can only be exercised **on expiry**.
- **American options**: Can be exercised **any time** before expiry.

If the option is **in-the-money**, the buyer can exercise it to make a profit. If it's **out-of-the-money**, it expires worthless.

Example:

You buy a **Call Option** on Infosys:

- Strike: ₹1,500
- Premium: ₹50
- Market Price on Expiry: ₹1,600

Payoff = ₹100 – ₹50 = ₹50 profit per share

6. Option Settlement

- **Physical Settlement**: Actual delivery of shares.
- **Cash Settlement**: Net profit/loss paid in cash.

In India, stock options now follow **physical settlement** rules as per SEBI.

Principles of Call and Put Option Pricing

Options are financial derivatives that give the buyer the right, but not the obligation, to buy (call option) or sell (put option) an underlying asset at a predetermined price (called the **strike price**) on or before a specific date (called the **expiration date**). The pricing of these options depends on several key factors, which are analyzed using models such as the **Black-Scholes model** or the **Binomial model**. Understanding the pricing dynamics helps traders, investors, and risk managers make informed decisions.

1. Underlying Asset Price (Spot Price)

The current market price of the asset directly affects option pricing.

- **Call Option**: The value increases when the spot price rises above the strike price.
- **Put Option**: The value increases when the spot price falls below the strike price.

2. Strike Price

The strike price is the price at which the option holder can buy (call) or sell (put) the asset.

- For **calls**, the lower the strike price relative to the spot price, the more valuable the option.
- For **puts**, the higher the strike price relative to the spot price, the more valuable it becomes.

3. Time to Expiration

More time means more uncertainty, which increases the likelihood of favorable price movements.

- Longer time to expiration increases the **time value** of both call and put options.

- As expiration nears, options lose value due to **time decay** (theta).

4. Volatility

Volatility measures how much the price of the underlying asset fluctuates.

- Higher volatility increases the chance that the asset will move significantly, making both call and put options more valuable.

5. Interest Rates

Interest rates affect the present value of the strike price.

- As interest rates rise, the value of **call options** tends to increase, while the value of **put options** tends to decrease slightly.

Payoff of Option Contracts

The **payoff** of an option refers to the profit or loss realized by the buyer or seller at the time of expiration.

- ◆ **Call Option Payoff**

  - **Buyer of a Call**:
    Profit = Max(0, Spot Price − Strike Price) − Premium Paid
    If the spot price at expiration is greater than the strike price, the call option is **in-the-money**, and the buyer earns a profit after deducting the premium.

  - **Seller (Writer) of a Call**:
    Profit = Premium Received − Max(0, Spot Price − Strike Price)
    The seller earns the premium but takes on the risk of unlimited loss if the asset's price rises significantly.

- ◆ **Put Option Payoff**

  - **Buyer of a Put**:
    Profit = Max(0, Strike Price − Spot Price) − Premium Paid
    The buyer profits when the asset's price falls below the strike price. This acts as a form of insurance against falling prices.

  - **Seller (Writer) of a Put**:
    Profit = Premium Received − Max(0, Strike Price − Spot Price)
    The seller earns the premium but risks losses if the price drops significantly.

Trading Strategies Using Options

Options can be combined in multiple ways to form strategic positions:

a) Spreads:

Combining two or more options of the **same type (Call/Put)**.

- **Bull Call Spread**: Buy low strike call, sell high strike call.
- **Bear Put Spread**: Buy high strike put, sell low strike put.

b) Combinations:

Combining **call and put** options.

- **Straddle**: Buy call and put at same strike.
- **Strangle**: Buy call and put at different strikes.
- **Butterfly Spread**: Involves 3 options — aims for limited risk/profit.

Option Price Quotations

Exchange provides real-time data including:

- Option Type (Call or Put)
- Strike Price
- Premium
- Expiry Date
- Open Interest
- Volume

Example Quote:

Symbol	Strike	Type	LTP	Volume	OI
NIFTY	19,000	CE	₹120	2,00,000	10,00,000

Basic Notations and Terminologies

Term	Meaning
S	Spot Price of Underlying
K	Strike Price
T	Time to Expiry
r	Risk-Free Rate
σ (sigma)	Volatility of the Underlying
C	Call Option Price
P	Put Option Price

Put-Call Parity

A fundamental principle in options pricing.

Formula:

C + PV(K) = P + S

Where:

- C = Call option price

- P = Put option price

- S = Spot price

- PV(K) = Present value of strike price

This shows a relationship between European call and put options with the same strike and expiry.

Trading Strategies Using Options

Options can be combined in multiple ways to form strategic positions:

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Combining two or more options of the **same type (Call/Put)**.

- **Bull Call Spread**: Buy low strike call, sell high strike call.

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Combining **call and put** options.

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Option Pricing Models

Used to determine the fair value of an option based on inputs like volatility, time, interest rate, etc.

- **The Binomial Model**

Concept:

- Assumes price can go **up or down** in steps over discrete periods.

- Useful for American options (exercise before expiry allowed).

Key Elements:

- **Tree Structure** to model price movement

- Backward induction to calculate value at each node

- Accounts for early exercise

- Concept of Risk-Neutral Arbitrage

Used in theoretical pricing:

- Assumes investors are **indifferent to risk**

- Expected return = **risk-free rate**

- No arbitrage → Ensures consistency in option pricing

- One-Period Binomial Model

Assumptions:

- Price can move to two possible values (Up or Down)

- Calculate **option payoff** at both outcomes

- Discount expected value back to present

Formula:

C = [p × Cu + (1 − p) × Cd] / (1 + r)
Where Cu and Cd = option values at up and down nodes

- Two-Period Binomial Model

Extension of one-period model:

- Price can move up/down over two time intervals

- More complex tree with 3 outcomes:

    o Up-Up
    o Up-Down (or Down-Up)
    o Down-Down

Helps model more realistic movements.

- The Black-Scholes-Merton (BSM) Model

Introduced by:

- **Fischer Black, Myron Scholes (1973)**

- Later extended by **Robert Merton**

Used for pricing **European options** on non-dividend-paying stocks.

Assumptions of BSM Model

- Underlying follows **lognormal distribution**

- No dividends

- No transaction costs

- Constant interest rates

- Continuous trading

- No arbitrage opportunities

20. Factors Affecting BSM Model

Factor	Effect on Call Price
Underlying Price ↑	Call ↑
Strike Price ↑	Call ↓
Volatility ↑	Call ↑
Time to Expiry ↑	Call ↑
Risk-free rate ↑	Call ↑

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21. Valuation of Call and Put Option using BSM Formula

Call Option Formula:

C = S × N(d1) − K × e^−rt × N(d2)

Put Option Formula:

P = K × e^−rt × N(−d2) − S × N(−d1)

Where:

- C = Price of the **call** option
- P = Price of the **put** option
- S = Current price of the **underlying stock**
- K = **Strike price** of the option
- r = **Risk-free interest rate** (annualized, continuous compounding)
- t = **Time to maturity** (in years)
- N(x) = Cumulative distribution function of the **standard normal distribution**
- e = Euler's number (≈ 2.71828)

Module III: Swaps

1. Introduction to Swaps

1.1 Meaning and Concept

In finance, a **swap** is a contractual agreement between two parties to **exchange sequences of cash flows** for a specified period of time. These cash flows are calculated on a **notional principal amount**, which serves only as a reference for computation and is usually **not exchanged**.

Swaps belong to the family of **over-the-counter (OTC) derivatives**, meaning they are privately negotiated rather than standardized exchange-traded contracts. Each swap can therefore be **customized** to suit the precise needs of the contracting parties with respect to tenor, payment frequency, reference rate, and currency denomination.

The fundamental purpose of a swap is **risk management**. By swapping one set of payment obligations for another, parties can reduce exposure to:

- **Interest-rate volatility**

- **Exchange-rate fluctuations**

- **Commodity-price uncertainty**

- **Equity-market variability**

1.2 Historical Background and Evolution

The origin of swaps can be traced to the late 1970s and early 1980s, an era characterized by high interest-rate volatility and increasing international capital mobility.

- **Early currency arrangements**: Before formal swaps existed, multinational firms engaged in *back-to-back* or *parallel loans*, where two companies in different countries lent to each other's subsidiaries in local currencies.

- **Formalization**: The first recognized *currency swap* occurred in **1981** between **IBM** and the **World Bank**, allowing each to hedge currency exposure cost-effectively.

- **Expansion to interest-rate swaps**: Shortly afterward, the concept of exchanging interest obligations in a single currency developed, giving birth to the modern **interest-rate swap** market.

- **Rapid growth**: By the 1990s, swaps had become the most widely used derivative instrument globally, forming the backbone of the OTC derivatives market.

Today, the swap market encompasses not only interest-rate and currency swaps but also **commodity**, **credit**, and **equity** swaps, making it one of the most versatile financial innovations of the modern era.

2. Nature and Essential Characteristics of Swaps

2.1 Bilateral Contractual Nature

Every swap is a **bilateral agreement** between two counterparties who agree to exchange cash flows according to predetermined terms. Unlike exchange-traded futures, there is **no clearinghouse guarantee**; therefore, each party bears **counterparty credit risk**.

2.2 Notional Principal

The notional principal is a **hypothetical amount** used solely to compute payment obligations. It provides the base upon which interest or other rates are applied, but the principal itself is usually not transferred (except in currency swaps).

2.3 Periodicity and Tenure

Swaps have **finite maturities**, commonly ranging from one to ten years. Payment exchanges occur periodically—quarterly, semi-annually, or annually—depending on the agreement.

2.4 Cash-Flow Exchange

The parties agree on the **basis of exchange**—for instance, one may pay a fixed rate while the other pays a floating rate. Settlement is often on a **net basis**, meaning only the difference in payment amounts is exchanged.

2.5 Customization and Flexibility

Because swaps are OTC products, their structure—maturity, notional value, frequency, and rate index—can be fully customized. This adaptability makes them extremely useful for corporate financial management.

2.6 Risk Profile

Swaps inherently expose participants to:

1. **Market risk** – adverse movements in interest or exchange rates.

2. **Credit (counterparty) risk** – default by the other party.

3. **Liquidity risk** – difficulty in unwinding the position before maturity.

4. **Operational and legal risks** – errors or contract enforceability issues.

3. Features of Swaps

1. **Over-the-Counter Instrument** – privately negotiated, not exchange-traded.

2. **Tailor-Made Contracts** – can accommodate unique cash-flow patterns.

3. **No Initial Cash Flow** – generally initiated with no premium or upfront payment.

4. **Net Settlement Mechanism** – only differential cash flows exchanged.

5. **Credit Risk Exposure** – absence of clearinghouse means reliance on counterparty creditworthiness.

6. **Documentation** – governed by frameworks such as the **ISDA Master Agreement** internationally.

7. **Use as Hedging and Speculative Tool** – primary use is hedging, though speculative and arbitrage motives exist.

4. Classification of Swaps

Swaps may be categorized in several ways:

Basis of Classification	Types
Nature of Underlying	Interest-Rate, Currency, Commodity, Equity, Credit Swaps
Type of Cash Flow	Fixed-for-Floating, Floating-for-Floating, Fixed-for-Fixed

Basis of Classification	Types
Settlement Mechanism	Gross Settlement, Net Settlement
Purpose	Hedging, Speculation, Arbitrage

Among these, **Interest-Rate Swaps (IRS)** and **Currency Swaps (CS)** constitute the majority of swap transactions worldwide.

5. General Mechanics of a Swap

Understanding how a swap operates requires following its chronological steps:

1. **Negotiation Stage** – Parties agree on notional principal, term, frequency, and payment basis.

2. **Execution Stage** – Contract documentation is completed, often referencing benchmark rates like **LIBOR**, **SOFR**, or domestic equivalents.

3. **Periodic Exchange** – At each settlement date, interest or other payments are calculated separately by each party and netted.

4. **Maturity and Termination** – Upon contract expiration, all obligations cease. Some swaps may include early-termination clauses or options to unwind.

Example (simplified):

Party A pays fixed interest of 6 % p.a. on a notional ₹100 crore.
Party B pays floating interest at **MIBOR + 1 %**.
Every six months, interest is computed, and the difference is exchanged—saving each party from direct market exposure.

6. Interest-Rate Swaps (IRS)

6.1 Definition

An **Interest-Rate Swap** is a contractual agreement between two parties to **exchange interest payments**—one fixed and one floating—based on a common notional principal amount and for a defined period. No principal is exchanged; only the interest-rate cash flows differ.

6.2 Economic Rationale

Interest-rate swaps emerged because different firms possess **comparative advantages** in borrowing markets:

- Some can borrow **more cheaply at fixed rates** (e.g., due to strong credit ratings).

- Others have advantages in **floating-rate markets**.

By entering a swap, each firm can effectively **obtain the preferred type of exposure** at a lower net cost than by direct borrowing.

6.3 Basic Structure

Party A	Party B
Pays **fixed** rate	Pays **floating** rate (e.g., LIBOR + spread)
Receives floating rate	Receives fixed rate
Notional principal	₹ N (basis for computation)

Payments are netted at each settlement date.

6.4 Types of Interest-Rate Swaps

1. **Plain Vanilla Fixed-for-Floating Swap**

   o The most common form.

   o One leg pays a fixed rate, the other a floating rate indexed to LIBOR, MIBOR, SOFR, etc.

2. **Basis Swap (Floating-for-Floating)**

   o Both legs pay floating rates but referenced to different benchmarks, e.g., **3-month LIBOR** vs **6-month LIBOR**.

   o Used to realign exposures to different term structures.

3. **Fixed-for-Fixed (Cross-Currency IRS)**

   o Occurs when both legs are fixed but denominated in different currencies—technically overlapping with currency swaps.

6.5 Illustration

Suppose:

- Company X can borrow at **10 % fixed** or **MIBOR + 1 % floating**.

- Company Y can borrow at **11.2 % fixed** or **MIBOR + 1.8 % floating**.

Company X has an advantage in both markets but a **greater comparative advantage** in the fixed-rate market (1.2 % vs 0.8 %).
If Y prefers fixed and X prefers floating, a swap can be structured so both benefit from the differential—each obtaining its desired exposure at a lower effective cost.

6.6 Theoretical Explanation: Comparative-Advantage Approach

The comparative-advantage model explains why swaps generate mutual benefit.

- **Step 1:** Each party identifies its cost advantage (fixed vs floating).

- **Step 2:** The difference in advantages is shared between the two through the swap rate.

- **Step 3:** Both parties realize savings relative to their standalone borrowing alternatives.

This theory underpins much of the early academic literature on swap motivation.

6.7 Mechanics of Cash-Flow Exchange

At each interest-reset date:

1. The floating rate (e.g., current MIBOR) is observed.

2. Each party computes its interest obligation on the notional amount.

3. The net difference is paid by the party owing more.

Mathematically,

$$\text{Net Payment} = |(rf - rx) * N * t/360|$$

where
(r_f) = floating-rate payment,
(r_x) = fixed-rate payment,
(N) = notional principal,
(t) = interest period in days.

6.8 Valuation of Interest-Rate Swaps (Conceptual)

The value of an IRS at any point equals the **present value (PV)** of the difference between the fixed-leg and floating-leg cash flows.

$$\text{Vswap} = \text{PV floating leg} – \text{PV fixed leg}$$

- **Fixed leg:** future cash flows are known; discount using the appropriate zero-coupon yield curve.

- **Floating leg:** future cash flows depend on future short-term rates; immediately after a reset date its value equals the notional principal (since next payment reflects current rate).

When $(\text{Vswap} > 0)$, the holder of the floating-rate leg is in a favorable position, and vice versa.

6.9 Detailed Valuation of Interest Rate Swaps

Valuation plays a central role in understanding and managing swaps. The value of a swap at any point in its life is derived from the **difference in the present value (PV)** of the cash flows exchanged between two parties.

6.9.1 Fundamental Principle

A swap can be viewed as the **combination of two bonds**:

- A **fixed-rate payer** is essentially *short* a fixed-rate bond and *long* a floating-rate bond.

- A **floating-rate payer** is *long* a fixed-rate bond and *short* a floating-rate bond.

Therefore,

$$\text{Vswap} = \text{Vfloating bond} - \text{Vfixed bond}$$

If the value is positive, the swap is favorable to the holder of the floating-rate leg; if negative, it is favorable to the fixed-rate payer.

6.9.2 Step-by-Step Valuation Method

1. **Identify cash flows** for both legs (fixed and floating).

2. **Determine discount rates** appropriate for each payment period (derived from the current yield curve).

3. **Compute PV of each leg** by discounting future cash flows.

4. **Find net value** of the swap as the difference between the two present values.

Mathematically,

$$V_{swap} = \sum_{i=1}^{n} \frac{(R_f - R_v)}{(1 + y_i)^t} \times N$$

where
(Rf) = fixed rate,
(Rv) = variable rate,
(yi) = discount rate for period (i),
(N) = notional principal,
(t) = time in years.

6.9.3 Valuation Example (Conceptual)

Suppose two parties agree to a 3-year swap on ₹100 crore notional, where:

- Fixed rate = 6 % p.a.

- Floating rate = MIBOR (currently 5.8 %)

- Payments semi-annually.

After one year, market interest rates rise to 7 %. The floating-rate payer benefits because future floating payments will be higher, making the fixed-rate payer's position less valuable.
Revaluation using new discount factors will show the fixed-rate leg declining in value relative to the floating-rate leg.

6.9.4 Economic Interpretation

If interest rates **increase**, fixed-rate payers lose, and floating-rate payers gain.
If rates **fall**, the opposite occurs.
This inverse relationship between market rates and swap value mirrors the behavior of bonds.

7. Currency Swaps

7.1 Meaning and Definition

A **Currency Swap (CS)** is an agreement between two parties to **exchange principal and interest payments** in one currency for those in another currency. Unlike interest-rate swaps, currency swaps typically involve **exchange of principal amounts** both at the start and at maturity.

It helps firms hedge against **foreign exchange risk** and obtain **cheaper foreign currency financing**.

7.2 Basic Structure

Currency swaps usually have **three stages**:

1. **Exchange of principal** – Each party lends the other an equivalent principal in their respective currencies using the spot exchange rate.

2. **Exchange of interest payments** – Throughout the contract, the parties pay interest on the principal amounts they have received, in their respective currencies.

3. **Re-exchange of principal at maturity** – At the end of the term, the principal amounts are exchanged back at the same pre-agreed rate (eliminating exchange-rate risk).

7.3 Example (Conceptual)

Suppose:

- Indian Company A needs US Dollars for a project in the USA.

- US Company B needs Indian Rupees for investment in India.

Instead of borrowing in foreign markets at unfavorable rates, they can enter a **currency swap**:

- A borrows ₹500 crore in India at 8 %.

- B borrows USD equivalent at 5 % in the US.

- They exchange the principals and agree to pay each other's interest obligations in their home currencies.
  At maturity, they re-exchange the principals at the same exchange rate used initially.

Each company benefits from borrowing in its domestic market where it has a comparative advantage and avoids exchange-rate exposure.

7.4 Types of Currency Swaps

1. **Fixed-for-Fixed Currency Swap**

   o Both legs pay fixed interest rates but in different currencies.

   o Common among multinational corporations seeking long-term financing stability.

2. **Fixed-for-Floating Currency Swap**

   o One leg pays fixed rate in one currency; the other pays floating rate in another.

   o Combines features of both interest-rate and currency swaps.

3. **Floating-for-Floating Currency Swap (Basis Currency Swap)**

   o Both legs pay floating rates linked to different benchmarks (e.g., SOFR vs MIBOR).

   o Used to balance foreign-currency exposures when interest benchmarks differ.

7.5 Valuation of Currency Swaps

Currency swaps involve **discounting cash flows in two different currencies**. The value of the swap is determined by converting the foreign-currency leg into the domestic currency at the prevailing **spot exchange rate**.

$$V_{CS} = (PV_{foreign\,leg} \times S) - PV_{domestic\,leg}$$

where
(S) = current spot exchange rate (domestic per unit of foreign).

Each leg's PV is computed using respective yield curves in each currency.

7.6 Comparative Advantage and Motivation

Just as in interest-rate swaps, the motivation lies in **comparative advantage**:

- A firm may have lower borrowing costs in one currency relative to another.

- By entering into a swap, both parties share the cost advantage and reduce their overall financing expense.

Example:
If an Indian company can borrow in INR at 8 % and in USD at 5 %, while a US company can borrow in USD at 4 % and in INR at 10 %, both can swap their obligations to achieve effective rates lower than direct market alternatives.

7.7 Risks in Currency Swaps

1. **Exchange-Rate Risk** – Although the principal is re-exchanged at a fixed rate, interim interest payments may be affected by fluctuations.

2. **Credit Risk** – Default by counterparty may result in loss of future payments.

3. **Interest-Rate Risk** – If one leg is floating, rate changes affect payment streams.

4. **Sovereign and Legal Risks** – Arising from cross-border jurisdictional differences.

7.8 Comparison between Interest-Rate Swaps and Currency Swaps

Basis	Interest-Rate Swap (IRS)	Currency Swap (CS)
Currencies Involved	Single currency	Two different currencies
Principal Exchange	Not exchanged	Exchanged at start and maturity
Purpose	Hedge interest-rate exposure	Hedge exchange-rate exposure
Interest Payments	Fixed ↔ Floating (same currency)	Fixed/Floating ↔ Fixed/Floating (different currencies)
Market Risk	Sensitive to rate changes	Sensitive to both rate and exchange-rate changes
Typical Tenure	1–10 years	2–15 years

8. Other Types of Swaps

Although interest-rate and currency swaps dominate, several other variants exist to cater to different forms of risk exposure.

8.1 Commodity Swaps

These involve exchanging cash flows related to the **price of a specific commodity**, such as oil, natural gas, or gold.

- One party pays a **fixed price**, while the other pays a **floating market price**.
- Used by producers and consumers to hedge against adverse price movements.

Example:
An airline company may enter a jet-fuel swap to fix its fuel cost, protecting against rising oil prices.

8.2 Equity Swaps

An **equity swap** involves the exchange of returns on an equity index or stock (including dividends and capital appreciation) for fixed or floating interest payments.
These allow investors to **gain equity exposure without owning the stock** and to manage equity-market risk.

Example:
Party A pays the total return on the NIFTY 50 index; Party B pays a fixed 7 % interest. If the NIFTY appreciates, A owes B more, and vice versa.

8.3 Credit Default Swaps (CDS)

A **CDS** transfers credit risk from one party to another.

- The *protection buyer* pays a regular premium to the *protection seller*.
- If a specified credit event (default, bankruptcy, restructuring) occurs, the seller compensates the buyer.
  This instrument functions similarly to insurance against borrower default.

8.4 Total Return Swaps (TRS)

In a **total return swap**, one party pays the total return (interest + capital gains/losses) of an asset, while the other pays a fixed or floating rate.
This helps separate the ownership of an asset from its economic exposure.

8.5 Inflation Swaps

Here, one party pays a fixed rate while the other pays a rate linked to an inflation index (like CPI).
These are used by pension funds and insurers to hedge inflation exposure in long-term obligations.

8.6 Interest Rate Caps, Floors, and Collars (Related Instruments)

While not pure swaps, these instruments—often structured using swap principles—allow customization of rate exposure:

- **Cap:** Limits maximum rate payable.
- **Floor:** Guarantees a minimum rate receivable.
- **Collar:** Combination of cap and floor for balanced risk control.

8.7 Comparative Overview of Swap Types

Type	Underlying Risk Managed	Cash Flow Basis	Principal Exchange
Interest-Rate Swap	Interest-rate fluctuations	Fixed ↔ Floating	No
Currency Swap	Exchange-rate changes	Fixed/Floating ↔ Fixed/Floating	Yes
Commodity Swap	Commodity price changes	Fixed ↔ Market price	No
Equity Swap	Equity-market movements	Equity return ↔ Interest	No
Credit Default Swap	Default/credit risk	Premium ↔ Protection	No

9. Applications of Swaps in Risk Management

Swaps are among the most flexible financial instruments used to **manage exposure to changes in interest rates, exchange rates, and prices**. They allow institutions to restructure their liabilities and assets without altering their actual borrowing or investment positions.

9.1 Hedging Interest Rate Risk

A company with **floating-rate debt** faces uncertainty when interest rates rise.
By entering an **interest rate swap**, it can exchange its floating-rate payments for fixed-rate ones, effectively locking in its borrowing cost.

Example:
A firm with a loan linked to MIBOR + 1 % may swap to a fixed rate of 7 %, thus protecting itself from future rate increases.

9.2 Managing Exchange Rate Risk

Currency swaps enable companies to **hedge against currency fluctuations**.
If a firm borrows in a foreign currency, it can swap that exposure into its home currency.
This stabilizes its cash outflows and protects against unfavorable exchange rate movements.

Example:
An Indian company borrowing USD can enter into a USD-INR currency swap, paying INR-based interest while receiving USD payments to meet its loan obligations.

9.3 Reducing Borrowing Costs

Swaps allow two entities with **different credit ratings** to exploit their **comparative advantage** in different markets.
By swapping interest or currency obligations, both can achieve **lower effective financing costs** than if they borrowed directly in those markets.

9.4 Altering the Nature of Assets or Liabilities

Swaps help modify the characteristics of a portfolio:

- Convert fixed-rate assets to floating (to benefit from falling rates)
- Convert floating-rate liabilities to fixed (to achieve cost stability)
- Change the currency composition of assets/liabilities to match operational needs

9.5 Managing Mismatch between Assets and Liabilities

Financial institutions, such as banks, often face a mismatch between the **interest rate sensitivities** of their assets (loans) and liabilities (deposits).
Swaps are used to **balance this mismatch** and stabilize net interest income.

9.6 Speculation and Arbitrage Opportunities

Apart from hedging, sophisticated investors use swaps for **speculative purposes**—betting on the direction of interest or exchange rates.
Arbitrageurs exploit **pricing inefficiencies** between the swap market and related bond markets to earn risk-free profits.

However, speculative use involves high risk and is generally avoided by conservative institutions.

10. Valuation Recap and Accounting Treatment

10.1 Valuation Recap

The **value of a swap** at initiation is typically **zero**, as both legs are priced to be of equal present value.
During its life, the value fluctuates due to:

- Changes in interest/exchange rates

- Credit risk of counterparties

- Time remaining to maturity

For interest-rate swaps:

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

For currency swaps:

$$V_{CS} = (PV_{foreign\ leg} \times Spot\ rate) - PV_{domestic\ leg}$$

10.2 Accounting Treatment

Under modern accounting standards (IFRS 9 / Ind AS 109):

- Swaps are recognized as **derivative instruments**.

- They are recorded at **fair value** on the balance sheet.

- Changes in value are recognized in **profit and loss (P&L)** or **other comprehensive income**, depending on whether the swap qualifies for hedge accounting.

Hedging relationships must be documented, specifying:

1. The risk being hedged

2. The type of hedge (fair value, cash flow, or net investment hedge)

3. The method of effectiveness testing

11. Advantages of Swaps

Swaps provide multiple strategic and financial benefits for corporations, banks, and investors.

Advantage	Explanation
1. Flexibility	Swaps can be customized in terms of tenor, notional amount, and rate structure.
2. Cost Reduction	Companies can access cheaper funds by using comparative advantage.
3. Risk Management	Effective hedging tool for both interest rate and exchange rate exposures.
4. Market Access	Enables entry into markets otherwise inaccessible due to regulatory or credit barriers.
5. Liquidity and Portfolio Management	Allows modification of exposure without buying/selling actual assets.
6. Balance Sheet Optimization	Firms can alter liability or asset characteristics without changing the actual instruments.
7. Tax Efficiency	Sometimes swaps help optimize tax liabilities across jurisdictions.

12. Disadvantages and Risks of Swaps

Risk/Disadvantage	Explanation
1. Counterparty (Credit) Risk	The other party may default on payments, leading to losses.
2. Market Risk	Fluctuations in interest or exchange rates affect the swap's value.
3. Liquidity Risk	Customized swaps may not have an active secondary market for early exit.
4. Operational and Legal Risk	Errors in documentation, valuation, or settlement may occur.
5. Complexity	Valuation and accounting require advanced financial knowledge.
6. Regulatory Constraints	Some jurisdictions impose limits on derivative use.
7. Potential for Speculative Misuse	Improper use may result in significant financial losses.

13. Swap Market in India

13.1 Development Overview

The **Indian swap market** has grown steadily since the early 2000s, primarily driven by the **Reserve Bank of India (RBI)** initiatives to promote derivatives for risk management.

Initially, the market focused on **interest rate swaps (IRS)** linked to **MIBOR (Mumbai Interbank Offered Rate)**.

Today, swaps are actively used by:

- Commercial banks

- Financial institutions

- Corporates

- Multinational companies

13.2 Major Instruments Traded in India

1. **MIBOR-based Interest Rate Swaps** – The most common form used to manage rate exposure.

2. **INR-USD Currency Swaps** – Facilitates hedging of foreign currency loans and ECBs (External Commercial Borrowings).

3. **Cross-Currency Interest Rate Swaps (CCIRS)** – Combines both interest and exchange rate features.

4. **Overnight Indexed Swaps (OIS)** – Linked to overnight rates (such as MIBOR or call money rate). Used widely for short-term interest rate hedging.

13.3 Regulatory Framework

- The **RBI** governs swap transactions under the **Foreign Exchange Management Act (FEMA), 1999**.

- Swaps are mainly executed in **OTC (Over-the-Counter)** markets, though clearing mechanisms are improving.

- RBI mandates periodic reporting of swap positions through **Clearing Corporation of India Ltd (CCIL)** for transparency.

13.4 Key Participants

Category	Examples	Purpose
Banks	SBI, HDFC, ICICI	Asset-liability management
Corporates	Infosys, Reliance, TCS	Foreign exchange hedging
Financial Institutions	LIC, GIC, mutual funds	Interest rate management
Foreign Investors	FIIs, FPIs	Portfolio risk adjustment

13.5 Challenges in Indian Swap Market

- Limited secondary market liquidity.

- Counterparty credit risk remains a concern.

- Dependence on MIBOR leads to benchmark risk.

- Lack of standardized documentation in smaller corporate transactions.

- Gradual transition towards electronic trading and clearing.

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14. Practical Significance and Future Outlook

Swaps have become an **essential financial management tool** in India's liberalized and globalized environment.
With the gradual development of financial markets and better risk awareness among corporates, **swap usage is expanding** beyond large corporations to mid-sized firms.

The future of swaps in India will be influenced by:

- **RBI's regulatory liberalization** for derivatives

- **Adoption of global benchmarks** like SOFR (replacing LIBOR)

- **Growth of electronic trading platforms**

- **Integration of fintech solutions** for real-time risk analytics

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15. Summary and Key Takeaways

1. **Swap Definition:** A financial contract involving the exchange of cash flows between two parties.

2. **Types:** Interest rate swaps, currency swaps, commodity swaps, equity swaps, credit default swaps, etc.

3. **Interest Rate Swaps:** Exchange fixed and floating interest payments in the same currency.

4. **Currency Swaps:** Exchange principal and interest in different currencies to hedge exchange risk.

5. **Valuation:** Based on present value of expected future cash flows discounted at appropriate rates.

6. **Uses:** Hedging, reducing cost of capital, managing asset-liability mismatch.

7. **Risks:** Market, credit, legal, and operational risks.

8. **Indian Scenario:** MIBOR-based swaps dominate; RBI regulates through FEMA; CCIL ensures clearing and transparency.

9. **Emerging Trends:** SOFR adoption, electronic clearing, and fintech-driven risk analytics.