

LECTURE NOTES

ON

FINANCIAL DERIVATIVES

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SYLLABUS

UNIT- I: INTRODUCTION TO DERIVATIVES

Development and growth of derivative markets, types of derivatives uses of derivatives, fundamental linkages between spot & derivative markets, the role of derivatives market, uses and misuses of derivatives.

UNIT-II: FUTURE AND FORWARD MARKET

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UNIT-III: BASIC OPTION STRATEGIES

Options, distinguish between options and futures, structure of options market, principles of option pricing.

Option pricing models: the binomial model, the Black-Scholes Merton model. Basic option strategies, advanced option strategies, trading with options, hedging with options, currency options.

UNIT-IV: COMMODITY MARKET DERIVATIVES

Introduction, types, commodity futures and options, swaps commodity exchanges multi *commodity exchange*, national commodity derivative exchange role, functions and trading.

UNIT-V: SWAPS

Concept and nature, evolution of swap market, features of swaps, major types of swaps, interest rate swaps, currency swaps, commodity swaps, equity index swaps, credit risk in swaps, credit swaps, using swaps to manage risk, pricing and valuing swaps.

Unit-I

INTRODUCTION TO DERIVATIVES

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DERIVATIVE MARKET

One of the key features of financial markets are extreme volatility. Prices of foreign currencies, petroleum and other commodities, equity shares and instruments fluctuate all the time, and poses a significant risk to those whose businesses are linked to such fluctuating prices . To reduce this risk, modern finance provides a method called hedging. Derivatives are widely used for hedging. Of course, some people use it to speculate as well – although in India such speculation is prohibited.

Derivatives are products whose value is derived from one or more basic variables called underlying assets or base . In simpler form, derivatives are financial security such as an option or future whose value is derived in part from the value and characteristics of another an underlying asset. The primary objectives of any investor are to bring an element of certainty to returns and minimize risks. Derivatives are contracts that originated from the need to limit risk.

Derivative contracts can be standardized and traded on the stock exchange. Such derivatives are called exchange-traded derivatives. Or they can be customized as per the needs of the user by negotiating with the other party involved. Such derivatives are called over-the-counter (OTC) derivatives.

A Derivative includes:

- (a) a security derived from a debt instrument, share, loan, whether secured or unsecured, risk instrument or contract for differences or any other form of security ;

- (b) a contract which derives its value from the prices, or index of prices, of underlying securities.

Advantages of Derivatives:

1. They help in transferring risks from risk adverse people to risk oriented people.
2. They help in the discovery of future as well as current prices.
3. They catalyze entrepreneurial activity.
4. They increase the volume traded in markets because of participation of risk adverse people in greater numbers.
5. They increase savings and investment in the long run.

TYPES OF DERIVATIVE INSTRUMENTS:

Derivative contracts are of several types. The most common types are forwards, futures, options and swap.

Forward Contracts

A forward contract is an agreement between two parties – a buyer and a seller to purchase or sell something at a later date at a price agreed upon today. Forward contracts, sometimes called forward commitments, are very common in everyone life. Any type of contractual agreement that calls for the future purchase of a good or service at a price agreed upon today and without the right of cancellation is a forward contract.

Future Contracts

A futures contract is an agreement between two parties – a buyer and a seller – to buy or sell something at a future date. The contract trades on a futures exchange and is subject to a daily settlement procedure. Future contracts evolved out of forward contracts and possess many of the same characteristics. Unlike forward contracts, futures contracts trade on organized exchanges, called future markets. Future contracts also differ from forward contracts in that they are subject to a daily settlement procedure. In the daily settlement, investors who incur losses pay them every day to investors who make profits.

Options Contracts

Options are of two types – calls and puts. Calls give the buyer the right but not the obligation to buy a given quantity of the underlying asset, at a given price on or before a given future date. Puts give the buyer the right, but not the obligation to sell a given quantity of the underlying asset at a given price on or before a given date.

Swaps

Swaps are private agreements between two parties to exchange cash flows in the future according to a prearranged formula. They can be regarded as portfolios of forward contracts. The two commonly used swaps are interest rate swaps and currency swaps.

1. **Interest rate swaps:** These involve swapping only the interest related cash flows between the parties in the same currency.

2. **Currency swaps:** These entail swapping both principal and interest between the parties, with the cash flows in one direction being in a different currency than those in the opposite direction.

SEBI Guidelines:

SEBI has laid the eligibility conditions for Derivative Exchange/Segment and its Clearing Corporation/House to ensure that Derivative Exchange/Segment and Clearing Corporation/House provide a transparent trading environment, safety and integrity and provide facilities for redressal of investor grievances. Some of the important eligibility conditions are :

1. Derivative trading to take place through an on-line screen based Trading System.
2. The Derivatives Exchange/Segment shall have on-line surveillance capability to monitor positions, prices, and volumes on a real time basis so as to deter market manipulation.
3. The Derivatives Exchange/ Segment should have arrangements for dissemination of information about trades, quantities and quotes on a real time basis through at least two information vending networks, which are easily accessible to investors across the country.
4. The Derivatives Exchange/Segment should have arbitration and investor grievances redressal mechanism operative from all the four areas/regions of the country.
5. The Derivatives Exchange/Segment should have satisfactory system of monitoring investor complaints and preventing irregularities in trading.
6. The Derivative Segment of the Exchange would have a separate Investor Protection Fund.
7. The Clearing Corporation/House shall perform full novation, i.e., the Clearing Corporation/House shall interpose itself between both legs of every trade, becoming the legal counterparty to both or alternatively should provide an unconditional guarantee for settlement of all trades.
8. The Clearing Corporation/House shall have the capacity to monitor the overall position of Members across both derivatives market and the underlying securities market for those Members who are participating in both.
9. The level of initial margin on Index Futures Contracts shall be related to the risk of loss on the position. The concept of value-at-risk shall be used in calculating required level of initial margins. The initial margins should be large enough to

cover the one-day loss that can be encountered on the position on 99 per cent of the days.

10. The Clearing Corporation/House shall establish facilities for electronic funds transfer (EFT) for swift movement of margin payments.
11. In the event of a Member defaulting in meeting its liabilities, the Clearing Corporation/House shall transfer client positions and assets to another solvent Member or close-out all open positions.
12. The Clearing Corporation/House should have capabilities to segregate initial margins deposited by Clearing Members for trades on their own account and on account of his client. The Clearing Corporation/House shall hold the clients' margin money in trust for the client purposes only and should not allow its diversion for any other purpose.
13. The Clearing Corporation/House shall have a separate Trade Guarantee Fund for the trades executed on Derivative Exchange/Segment.

SEBI has specified measures to enhance protection of the rights of investors in the Derivative Market. These measures are as follows:

1. Investor's money has to be kept separate at all levels and is permitted to be used only against the liability of the Investor and is not available to the trading member or clearing member or even any other investor.
2. The Trading Member is required to provide every investor with a risk disclosure document which will disclose the risks associated with the derivatives trading so that investors can take a conscious decision to trade in derivatives.
3. Investor would get the contract note duly time stamped for receipt of the order and execution of the order. The order will be executed with the identity of the client and without client ID order will not be accepted by the system. The investor could also demand the trade confirmation slip with his ID in support of the contract note. This will protect him from the risk of price favor if any, extended by the Member.
4. In the derivative markets all money paid by the Investor towards margins on all open positions is kept in trust with the Clearing House /Clearing Corporation and in the event of default of the Trading or Clearing Member the amounts paid by the client towards margins are segregated and not utilised towards the default of the member. However, in the event of a default of a member, losses suffered by the Investor, if any, on settled/closed out position are compensated from the

Investor Protection Fund, as per the rules, bye-laws and regulations of the derivative segment of the exchanges.

TYPES OF DERIVATIVES

Derivative contracts can be differentiated into several types. All the derivative contracts are created and traded in two distinct financial markets, and hence are categorized as following based on the markets:

- **EXCHANGE TRADED CONTRACT:** Exchange traded contracts trade on a derivatives facility that is organized and referred to as an exchange. These contracts have standard features and terms, with no customization allowed and are backed by a clearinghouse.
- **OVER THE COUNTER CONTRACT:** Over the counter (OTC) contracts are those transactions that are created by both buyers and sellers anywhere else. Such contracts are unregulated and may carry the default risk for the contract owner.



DERIVATIVE CATEGORIES

Generally, the derivatives are classified into two broad categories:

- Forward Commitments
- Contingent Claims

FORWARD COMMITMENTS

Forward commitments are contracts in which the parties promise to execute the transaction at a specific later date at a price agreed upon in the beginning. These contracts are further classified as follows:

OVER THE COUNTER CONTRACTS

Over the counter contracts are of two types:

FORWARD

In this type of contract, one party commits to buy and the other commits to sell an underlying asset at a certain price on a certain future date. The underlying can either be a physical asset or a stock. The loss or gain of a particular party is determined by the price movement of the asset. If the price increases, the buyer incurs a gain as he still gets to buy the asset at the older and lower price. On the other hand, the seller incurs a loss in the same scenario.

SWAP

Swap can be defined as a series of forward derivatives. It is essentially a contract between two parties where they exchange a series of cash flows in the future. One party will consent to pay the floating interest rate on a principal amount while the other party will pay a fixed interest rate on the same amount in return. Currency and equity returns swaps are the most commonly used swaps in the markets.

EXCHANGE TRADED CONTRACTS

Exchange traded forward commitments are called futures. A future contract is another version of a forward contract, which is exchange-traded and standardized. Unlike forward contracts, future contracts are actively traded in the secondary market, have the backing of the clearinghouse, follow regulations and involve a daily settlement cycle of gains and losses.

CONTINGENT CLAIMS

Contingent claims are contracts in which the payoff depends on the occurrence of a certain event. Unlike forward commitments where the contract is bound to be settled on or before the termination date, contingent claims are legally obliged to settle the contract only when a specific event occurs. Contingent claims are also categorized into OTC and exchange-traded contracts, depending on the type of contract. The contingent claims are further sub-divided into the following types of derivatives:

OPTIONS

Options are the type of contingent claims that are dependent on the price of the stock at a future date. Unlike the forward commitments derivatives where payoffs are calculated keeping the movement of the price in mind, the options have payoffs only if the price of the stock crosses a certain threshold. Options are of two types: Call and Put. A call option gives the option to buy the underlying asset at a specific price. A put option is the option to sell the underlying at a certain price.

INTEREST RATE OPTIONS

Options where the underlying is not a physical asset or a stock, but the interest rates.

WARRANTS

Warrants are the options which have a maturity period of more than one year and hence, are called long-dated options. These are mostly OTC derivatives.

CONVERTIBLE BONDS

Convertible bonds are the type of contingent claims that gives the bondholder an option to participate in the capital gains caused by the upward movement in the stock price of the company, without any obligation to share the losses.

CALLABLE BONDS

Callable bonds provide an option to the issuer to completely pay off the bonds before their maturity.

ASSET-BACKED SECURITIES

Asset-backed securities are also a type of contingent claim as they contain an option feature, which is the prepayment option available to the asset owners.

OPTIONS ON FUTURES

A type of options that are based on the futures contracts.

EXOTIC OPTIONS

These are the advanced versions of the standard options, having more complex features.

In addition to the categorization of derivatives on the basis of payoffs, they are also subdivided on the basis of their underlying asset. Since a derivative will always have an

underlying asset, it is common to categorize derivatives on the basis of the asset. Equity derivatives, weather derivatives, interest rate derivatives, commodity derivatives, exchange derivatives, etc are the most popular ones that derive their name from the asset they are based on. There are also credit derivatives where the underlying is the credit risk of the investor or the government.

Derivatives take their inspiration from the history of mankind. Agreements and contracts have been used from ages to execute commercial transactions and so is the case with derivatives. Likewise, financial derivatives have also become more important and complex to execute smooth financial transactions. This makes it important to understand the basic characteristics and the type of derivatives available to the players in the financial market.

USES OF DERIVATIVES

Today's sophisticated international markets have helped foster the rapid growth in derivative instruments. In the hands of knowledgeable investors, derivatives can derive profit from:

- Changes in interest rates and equity markets around the world
- Currency exchange rate shifts
- Changes in global supply and demand for commodities such as agricultural products, precious and industrial metals, and energy products such as oil and natural gas

Adding some of the wide variety of derivative instruments available to a traditional portfolio of investments can provide global diversification in financial instruments and currencies, help hedge against inflation and deflation, and generate returns that are not correlated with more traditional investments. The two most widely recognized benefits attributed to derivative instruments are **price discovery** and **risk management**.

1. Price Discovery

Futures market prices depend on a continuous flow of information from around the world and require a high degree of transparency. A broad range of factors (climatic conditions, political situations, debt default, refugee displacement, land reclamation and environmental health, for example) impact supply and demand of assets (commodities in particular) - and thus the current and future prices of the underlying asset on which the derivative contract is based. This kind of information and the way people absorb it constantly changes the price of a commodity. This process is known as price discovery.

- With some futures markets, the underlying assets can be geographically dispersed, having many spot (or current) prices in existence. The price of the contract with the shortest time to expiration often serves as a proxy for the underlying asset.
- Second, the price of all future contracts serve as prices that can be accepted by those who trade the contracts in lieu of facing the risk of uncertain future prices.
- Options also aid in price discovery, not in absolute price terms, but in the way the market participants view the volatility of the markets. This is because options are a different form of hedging in that they protect investors against losses while allowing them to participate in the asset's gains.

As we will see later, if investors think that the markets will be volatile, the prices of options contracts will increase. This concept will be explained later.

2. Risk Management

This could be the most important purpose of the derivatives market. Risk management is the process of identifying the desired level of risk, identifying the actual level of risk and altering the latter to equal the former. This process can fall into the categories of hedging and speculation.

Hedging has traditionally been defined as a strategy for reducing the risk in holding a market position while speculation referred to taking a position in the way the markets will move. Today, hedging and speculation strategies, along with derivatives, are useful tools or techniques that enable companies to more effectively manage risk.

3. They Improve Market Efficiency for the Underlying Asset

For example, investors who want exposure to the S&P 500 can buy an S&P 500 stock index fund or replicate the fund by buying S&P 500 futures and investing in risk-free bonds. Either of these methods will give them exposure to the index without the expense of purchasing all the underlying assets in the S&P 500.

If the cost of implementing these two strategies is the same, investors will be neutral as to which they choose. If there is a discrepancy between the prices, investors will sell the richer asset and buy the cheaper one until prices reach equilibrium. In this context, derivatives create market efficiency.

4. Derivatives Also Help Reduce Market Transaction Costs

Because derivatives are a form of insurance or risk management, the cost of trading in them has to be low or investors will not find it economically sound to purchase such "insurance" for their positions

DIFFERENCE BETWEEN FUTURES AND FORWARDS

The fundamental difference between futures and forwards is that futures are traded on exchanges and forwards trade OTC. The difference in trading venues gives rise to notable differences in the two instruments:

- Futures are standardized instruments transacted through brokerage firms that hold a "seat" on the exchange that trades that particular contract. The terms of a futures contract - including delivery places and dates, volume, technical specifications, and trading and credit procedures - are standardized for each type of contract. Like an ordinary stock trade, two parties will work through their respective brokers, to transact a futures trade. An investor can only trade in the futures contracts that are supported by each exchange. In contrast, forwards are entirely customized and all the terms of the contract are privately negotiated between parties. They can be keyed to almost any conceivable underlying asset or measure. The settlement date, notional amount of the contract and settlement form (cash or physical) are entirely up to the parties to the contract.
- Forwards entail both market risk and credit risk. Those who engage in futures transactions assume exposure to default by the exchange's clearing house. For OTC derivatives, the exposure is to default by the counterparty who may fail to perform on a forward. The profit or loss on a forward contract is only realized at the time of settlement, so the credit exposure can keep increasing.
- With futures, credit risk mitigation measures, such as regular mark-to-market and margining, are automatically required. The exchanges employ a system whereby counterparties exchange daily payments of profits or losses on the days they occur. Through these margin payments, a futures contract's market value is effectively reset to zero at the end of each trading day. This all but eliminates credit risk.
- The daily cash flows associated with margining can skew futures prices, causing them to diverge from corresponding forward prices.

- Futures are settled at the settlement price fixed on the last trading date of the contract (i.e. at the end). Forwards are settled at the forward price agreed on at the trade date (i.e. at the start).
- Futures are generally subject to a single regulatory regime in one jurisdiction, while forwards - although usually transacted by regulated firms - are transacted across jurisdictional boundaries and are primarily governed by the contractual relations between the parties.
- In case of physical delivery, the forward contract specifies to whom the delivery should be made. The counterparty on a futures contract is chosen randomly by the exchange.
- In a forward there are no cash flows until delivery, whereas in futures there are margin requirements and periodic margin calls.

ROLE OF DERIVATIVE MARKETS

Following are few key roles of the derivative markets.

Role of derivative markets

1. Risk Management
2. Price discovery
3. Operational advantages
4. Market efficiency

Risk Management

As derivative prices are related to the underlying spot market goods (assets), they can be used to reduce or increase the risk of owning the spot items. For example, buying the spot item and selling a futures contract or call option reduces the investor's risk. If the goods price falls, the price of the futures or options contract will also fall. The investor can then repurchase the contract at the lower price, affecting a gain that can at least partially offset the loss on the spot item. All investors however want/need to keep their investments at an acceptable risk level. Derivative markets enable those wishing to reduce their risk to transfer it to those wishing to increase it, whom we call speculators.

Because these markets are so effective at re-allocating risk among investors, no one need to assume an uncomfortable level of risk. Consequently investors are willing to supply more

funds to the financial markets. This benefits the economy, because it enables more firms to raise capital and keeps the cost of that capital as low as possible.

Many investors prefer to speculate with derivatives rather than with the underlying securities. The ease with which speculation can be done using derivatives in turn makes it easier and less costly for hedgers. (hedge- a transaction in which an investor seeks to protect a position or anticipated position in the spot market by using an opposite position in derivatives.)

Price discovery

Forward and futures markets are an important source of information about prices. Futures markets in particular are considered a primary means for determining the spot price of an asset. Futures and forwards prices also contain information about what people expect future spot prices to be. In most cases the futures price is more active hence, information taken from it is considered more reliable than spot market information.

Therefore futures and forward market are said to provide price discovery. Option markets do not directly provide forecasts of future spot prices. They do, however provide valuable information about the volatility and hence the risk of the underlying spot asset.

Operational advantages

Derivative markets offer several operational advantages, such as:

1. They entail lower transaction costs. This means that commission and other trading costs lower for traders in these markets.
2. Derivative markets, particularly the futures and exchanges have greater liquidity than the spot markets.
3. The derivative markets allow investors to sell short more easily. Securities markets impose several restrictions designed to limit or discourage short if not applied to derivative transactions. Consequently many investors sell short in these markets in lieu of selling short the underlying securities.

Market efficiently

Spot markets for securities probably would be efficient even if there were no derivative markets. There are important linkages among spot and derivative prices. The ease and low

cost of transacting in these markets facilitate the arbitrage trading and rapid price adjustments that quickly eradicate these opportunities. Society benefits because the prices of the underlying goods more accurately reflect the goods true economic value.

Therefore the derivative markets provide a means of managing risk, discovering prices, reducing costs, improving liquidity, selling short and making the market more efficient.

USES AND MISUSES OF DERIVATIVES

Derivatives are the most important innovation which has happened in the past few years when it comes to financial markets. It has changed the whole way of operations of stock, commodities and currency market. Given below are some of the advantages and disadvantages of derivatives –

ADVANTAGES

1. Since all transactions related to derivatives take place in future it provides individuals with better opportunities because an individual who want to short some stock for long time can do it only in futures or options hence the biggest benefit of this is that it gives numerous options to an investor or trader to execute all sorts of strategies.
2. In derivatives market people can transact huge transactions with small amounts and therefore it gives the benefit of leverage and hence even people who have less amount of money can enter into this market.
3. Intraday traders get the benefit of liquidity as these contracts are very liquid and also the costs such as basis expense, brokerage are less as compared to cash market.
4. It is a great risk management tool and if applied judiciously it can produce good results and benefit its user

DISADVANTAGES

1. Leverage is a double edged sword and therefore if you do not get it right chances are you would end up losing huge amount of money because these contracts have specific maturities and on that date they get expired unlike cash market where you can hold on to stocks for long period of time.
2. Since its inception many critics have been blaming derivatives for huge fall which keeps happening frequently after the introduction of derivatives and many people

say that it increases unnecessary speculation in the market which is not good for the small retail investors who are the backbone of stock market.

3. It is quite complex and various strategies of derivatives can be implemented only by an expert and therefore for a layman it is difficult to use this and therefore it limits its usefulness.

MISUSE OF DERIVATIVES

Derivatives have four large risks. The most dangerous is that it's nearly impossible to know any derivative's real value. That's because it's based on the value of one or more underlying asset. Their complexity makes them difficult to price. That's the reason mortgage-backed securities were so deadly to the economy. No one, not even the computer programmers who created them, knew what their price was when housing prices dropped. Banks become unwilling to trade them because they couldn't value them.

Another risk is also one of the things that makes them so attractive: leverage. For example, futures traders are only required to put 2-10 percent of the contract into a margin account to maintain ownership. If the value of the underlying asset drops, they must add money to the margin account to maintain that percentage until the contract expires or is offset. If the commodity price keeps dropping, covering the margin account can lead to enormous losses. The CFTC Education Center provides a lot of information about derivatives.

The third risk is their time restriction. It's one thing to bet that gas prices will go up. It's another thing entirely to try to predict exactly when that will happen. No one who bought MBS thought housing prices would drop. That's because the last time they did was the Great Depression. They also thought they were protected by CDS. The leverage involved meant that when losses occurred, they were magnified throughout the entire economy.

Furthermore, they were unregulated and not sold on exchanges. That's a risk unique to OTC derivatives.

UNIT- II

FUTURE AND FORWARD MARKET

In stock market shares are traded in spot market as well as in forward market. In the spot market, there is delivery of shares against payment. But in forward market an agreement is for future payment and delivery. This may or may not materialize. But, the purpose of entering into forward market is to prevent any fall in the price of shares which is an insurance against the risk of fluctuating prices. This is called Hedge.

In financial market, risks arise due to the fluctuation in the price of securities or due to a change in the interest rate on debt instruments. So, to protect these, the financial companies undertake derivative contract in the forward or futures markets by which they protect themselves from falling prices or interest rates.

What is a Forward market?

A forward market is a contract entered into between a buyer and seller for future delivery of stock or currency or commodity. The buyer in a forward contract gains if the price at which he buys is less than the spot price and he will lose if the price is higher than the spot price.

What is the purpose of forward contract in a forward market?

The purpose of the forward contract is to protect the seller or buyer against any fluctuations in the price. If the seller or the buyer incurs loss in a forward contract, they can compensate the same by reversing the contract and selling or buying at lower or higher prices, according to their positions. Thus, a forward market is a hedge against fluctuating prices. This applies to stock, currency as well as goods.

Forward Market classification:

Forward market can be classified as

- commodity forward, and
- Financial forward.

In financial forward, we have currency contracts. There is also forward market on interest rate and the agreement reached in the forward market for interest rate is called forward rate agreement. Such agreements are entered into when traders expect an increase in demand for funds in the next 3 or 4 months.

Though futures market is similar to forward market, it comes under regulated organizations in which members alone are permitted to transact. The futures market will have its own rules and regulations and will also fix the minimum value for each transaction. Here again, the purpose is to smooth out the price fluctuation so that neither the buyer nor the seller incurs heavy loss due to price fluctuations.

Futures market can be classified as

- commodity future, and
- Financial future.

BENEFITS OF FORWARD AND FUTURES MARKETS**Forward and futures markets protect against price fluctuations:**

Any expectation in the price increase or any decline in the same can be protected by entering into forward contracts to buy or sell at a particular price.

Forward and futures markets provide the option of buying and selling:

The buyer or seller can exercise their option and if they are not keen to execute the contract they can opt out by paying a nominal amount.

They enable the buyer or seller to make proper arrangements for finance:

Since the transactions are for future buying or selling, suitable financial arrangements could be done by proper planning.

Investors can plan their future investments:

Based on the forward or future market, investors can plan their investments either by shifting it from the existing investment or by borrowing and going in for new investments.

Cash crunch does not arise owing to these markets:

As the transactions do not involve payments in bulk and with buying and selling of securities or currencies, only marginal amount is involved.

Forward and futures markets help in large transactions:

With more people entering the market, volume of transactions increases along with frequent turnover of transactions.

Flexibility in forward and futures markets:

They are very flexible contracts enabling the buyer or seller to opt out by paying a small margin amount. The market provides flexibility, as simultaneously a person can buy and sell in different markets due to the development of Information Technology.

Forward and Futures markets reduce risks for financial companies:

The forward and futures market has improved financial services and financial companies are able to reduce their risks. With various credit instruments available and resources made

available from various sources, the financial companies are in a position to earn good profits even with a very low margin in their price. This is due to the higher volume of trade. The market is also attracting funds from foreign countries. So, the financial companies with various financial products are able to have better returns for their investment.

Portfolio investment:

Mutual fund companies are able to have better portfolio investment due to forward contracts and hedging against price fluctuations

A **forward contract** is a customized contractual agreement where two private parties agree to trade a particular asset with each other at an agreed specific price and time in the future. Forward contracts are traded privately over-the-counter, not on an exchange.

A **futures contract** — often referred to as **futures** — is a standardized version of a forward contract that is publicly traded on a futures exchange. Like a forward contract, a futures contract includes an agreed upon price and time in the future to buy or sell an asset — usually stocks, bonds, or commodities, like gold.

The main differentiating feature between futures and forward contracts — that futures are publicly traded on an exchange while forwards are privately traded — results in several operational differences between them. This comparison examines differences like counterparty risk, daily centralized clearing and mark-to-market, price transparency, and efficiency.

Comparison chart

Forward Contract versus Futures Contract comparison chart

	Forward Contract	Futures Contract
Definition	A forward contract is an agreement between two parties to buy or sell an asset (which can be of any kind) at a pre-agreed future point in time at a specified price.	A futures contract is a standardized contract, traded on a futures exchange, to buy or sell a certain underlying instrument at a certain date in the future, at a specified price.
Structure & Purpose	Customized to customer needs. Usually no initial payment required. Usually used for hedging.	Standardized. Initial margin payment required. Usually used for speculation.

Forward Contract versus Futures Contract comparison chart

	Forward Contract	Futures Contract
Transaction method	Negotiated directly by the buyer and seller	Quoted and traded on the Exchange
Market regulation	Not regulated	Government regulated market (the Commodity Futures Trading Commission or CFTC is the governing body)
Institutional guarantee	The contracting parties	Clearing House
Risk	High counterparty risk	Low counterparty risk
Guarantees	No guarantee of settlement until the date of maturity only the forward price, based on the spot price of the underlying asset is paid	Both parties must deposit an initial guarantee (margin). The value of the operation is marked to market rates with daily settlement of profits and losses.
Contract Maturity	Forward contracts generally mature by delivering the commodity.	Future contracts may not necessarily mature by delivery of commodity.
Expiry date	Depending on the transaction	Standardized
Method of pre-termination	Opposite contract with same or different counterparty. Counterparty risk remains while terminating with different counterparty.	Opposite contract on the exchange.
Contract size	Depending on the transaction and the requirements of the contracting parties.	Standardized
Market	Primary & Secondary	Primary

FUTURES AND FORWARDS SHARE SOME COMMON CHARACTERISTICS:

- Both futures and forwards are firm and binding agreements to act at a later date. In most cases this means exchanging an asset at a specific price sometime in the future.
- Both types of derivatives obligate the parties to make a contract to complete the transaction or offset the transaction by engaging in another transaction that settles

each party's obligation to the other. Physical settlement occurs when the actual underlying asset is delivered in exchange for the agreed-upon price. In cases where the contracts are entered into for purely financial reasons (i.e. the engaged parties have no interest in taking possession of the underlying asset), the derivative may be cash settled with a single payment equal to the market value of the derivative at its maturity or expiration.

- Both types of derivatives are considered leveraged instruments because for little or no cash outlay, an investor can profit from price movements in the underlying asset without having to immediately pay for, hold or warehouse that asset.
- They offer a convenient means of hedging or speculating. For example, a rancher can conveniently hedge his grain costs by purchasing corn several months forward. The hedge eliminates price exposure, and it doesn't require an initial outlay of funds to purchase the grain. The rancher is hedged without having to take delivery of or store the grain until it is needed. The rancher doesn't even have to enter into the forward with the ultimate supplier of the grain and there is little or no initial cash outlay.
- Both physical settlement and cash settlement options can be keyed to a wide variety of underlying assets including commodities, short-term debt, Eurodollar deposits, gold, foreign exchange, the S&P 500 stock index, etc.

STRUCTURE OF FUTURE AND FORWARD MARKETS

A derivative is simply any financial instrument that "derives" (hence the name) its value from the price movement of another instrument. In other words, the price of the derivative is not a function of any inherent value, but rather of changes in the value of whatever instrument the derivative tracks. For example, the value of a derivative linked to the S&P 500 is a function of price movements in the S&P 500. One type of derivative is a futures contract.

A futures contract is an agreement between two parties to buy or sell an asset at a specified future date and price. Each futures contract is specific to the underlying commodity or financial instrument and expiration date. Prices for each contract fluctuate throughout the trading session in response to economic events and market activity.

Some futures contracts call for physical delivery of the asset, while others are settled in cash. In general, most investors trade futures contracts to hedge risk and speculate, not to exchange physical commodities – that's the primary activity of the cash/spot market. Nearly

all futures contracts are cash settled and end without the actual physical delivery of any commodity.

All futures contracts have specific expiration dates. If you don't exit your position before that date – and it's a physically settled contract, like corn – you have to deliver the physical commodity (if you're in a short position) or take delivery (if you're long). The following image shows an example of the various monthly corn contracts available on the CME. Note that the nearer the contract expiration, the greater the trading volume – and the further out the contract, the higher the price.

MECHANICS OF FUTURE MARKETS HEDGING STRATEGIES

Producers and consumers of commodities use the futures markets to protect against adverse price moves. A producer of a commodity is at risk of prices moving lower. Conversely, a consumer of a commodity is at risk of prices moving higher. Therefore, *hedging* is the process of protecting against financial loss.

Futures

Futures exchanges offer contracts on commodities. These contracts offer producers and consumers alike a mechanism, a futures contract, with which to hedge future production or consumption.

Futures contracts trade for different time periods -- therefore, producers and consumers can choose hedges that closely reflect their individual risks. Additionally, futures contracts are liquid instruments. Aside from producers and consumers -- speculators, traders, investors and other market participants utilize these markets. The exchanges also offer clearing; this means that the clearinghouse becomes the transaction partner of a trade. This removes credit risk. The exchange requires those who hold long and short positions to post margin, which is a performance bond. Producers and consumers often receive special treatment on commodity exchanges, as hedgers their margin rates are often lower than other market participants. When a producer or consumer uses a futures exchange to hedge a future physical sale or purchase of a commodity they exchange price risk for basis risk.

Reducing Risk

Producers or consumers of commodities, who do not wish to assume the risk of price fluctuations, can reduce their total risk by hedging their cash positions in the futures markets.

To hedge, it is necessary to take a futures position of approximately the same size, but opposite in price direction, from the cash or physical position. Therefore, a producer who is naturally long a commodity hedge by selling futures contracts. The sale of futures contracts amounts to a substitute sale for the producer.

A consumer who is naturally short commodity hedges by buying futures contracts. The purchase of futures contracts amounts to a substitute purchase for the consumer. A producer is a *short hedger* while a consumer is a *long hedger*.

While supply and demand for commodities fluctuate, so does price. A producer or consumer who does not hedge assumes price risk. Producers and consumers who use futures markets to hedge transfer price risk. If a one holds a commodity, they assume the price risk as well as the costs associated with holding that commodity. *Carrying charges* is an important concept for hedgers. The holding costs are the carrying charges that include interest, insurance and storage costs. The price of a commodity for a future delivery reflects carrying costs. In a *normal market*, the price of deferred futures is higher than nearby futures prices. Normal markets are the same as *premium* or contango markets. An *inverted market* is the same as a *discount market* or a market in *backwardation*.

Hedging in the futures market is far from perfect. Futures markets depend upon standardization. Commodity futures contracts represent certain qualities or grades for set delivery dates and delivery locations.

Sometimes, hedgers produce or consume commodities that do not conform to the specifications of future contracts. In these cases, hedgers will assume additional risks by using standardized futures. However, hedgers have different options.

Alternatives to Futures Markets

Futures markets are not the only choice for hedgers. They can also use forward markets, fixed price pre-export finance transactions and swaps to hedge. These markets entail principle-to-principle transactions with each party assuming the credit and performance risk

of the other. However, these tailor-made transactions often meet the specific needs of consumers and/or producers with respect to the commodities at risk.

Hedging is an important tool when it comes to running a business from many perspectives. A hedge will guaranty a consumer a supply of a required commodity at a set price.

A hedge will guaranty a producer a known price for commodity output. Hedging is a mechanism that aids raw material suppliers and buyers so that they can plan ahead and cover the costs of running their business.

Determination of Futures Prices

A futures contract is nothing more than a standard forward contract. Therefore, the determinants of the value of either type of contract are the same, so the following discussion will focus on futures. When a contract is 1st entered into, the price of a futures contract is determined by the spot price of the underlying asset, adjusted for time plus benefits and carrying costs accrued during the time until settlement. Even if the contract is closed out before the delivery date, these costs and benefits are taken into account in determining the price of the contract, since there may be a delivery. Benefits that accrue with ownership include dividends and interest that is paid by the underlying asset. Costs associated with ownership include storage costs, such as with oil, and the interest rate used to determine the present value of a transaction, which represents the opportunity cost of delaying the transaction. To simplify the following discussion, benefits and costs will be restricted to present value and income yield.

When a futures contract is initially agreed to, the net present value of the transaction must be equal for both parties; otherwise, there would be no agreement. The delivery price is the price agreed to in the contract. However, with time, the position of the parties will change as a spot price of the underlier changes, with the gains by one party equal to loss of the other party. As the settlement date approaches, the prices of the futures contract and its underlying asset must necessarily converge, so that on the delivery or settlement date, the futures price will equal the spot price of the underlying asset. Because futures contracts can be used to hedge positions in the underlying asset, a perfectly hedged position must necessarily yield the risk-free rate of return — otherwise, arbitrage opportunities would arise that would conform the rate of return to the risk-free rate of return.

For instance, suppose that you invest \$2,600 in an ETF that tracks the NASDAQ 100 and you enter into a short position for a hypothetical futures contract for the Nasdaq 100 for a price of \$2,700.

NASDAQ 100 Futures Contract Price 2700

Stock Portfolio Value	2600	2650	2700	2750	2800
Short Futures Position Payoff	100	50	0	-50	-100
Dividend Income	50	50	50	50	50
Total	2750	2750	2750	2750	2750

While dividend payments are not entirely certain, the probability of their change is small compared to the probability of a change in stock prices.

Generally, the price of a futures contract is related to its underlying asset by the **spot-futures parity theorem**, which states that the futures price must be related to the spot price by the following formula:

$$\text{Futures Price} = \text{Spot Price} \times (1 + \text{Risk-Free Interest Rate} - \text{Income Yield})$$

Otherwise, the deviation from parity would present a risk-free arbitrage opportunity.

Entering a futures position does not require a payment of cash, so the risk-free rate that can be earned from the cash is added. (Although margin must be posted, it is much less than the value of the contract, and margin can be in the form of Treasuries, which earn interest.) The income yield is subtracted because no income is earned without owning the underlying asset. Applying this formula to a stock:

$$\text{Futures Price} = \text{Stock Price} \times (1 + \text{Risk-Free Interest Rate} - \text{Dividend Yield})$$

Example — Futures Market Arbitrage Opportunity If Spot-Futures Parity Violated

Suppose that you pay \$2,600 for 1 share of a stock index exchange-traded fund (ETF) that tracks the Nasdaq 100 at the beginning of the year and that it pays \$52 in dividends during the year. At the same time, you sell a futures contract short for the Nasdaq 100 that is cash-settled, requiring you to pay \$2,700 at the end of the year. (Note this futures contract is hypothetical since there is no contract for just 1 share of an ETF or stock, but it simplifies the math while still illustrating the principle.) Suppose further that:

- Risk-free rate = 5%

- Dividend yield = 2%

Therefore, the futures settlement price should be:

= ETF Price \times (1 + .05 - .02) = \$2,600 \times 1.03 = \$2,678, but if it is \$2,700 instead, here is what you can do:

Cash Flow if Futures Contract is Mispriced according to Spot-Futures Parity

	Initial Cash Flow	Cash Flow in 1 Year	
Borrow at 5% Interest	\$2,600	-\$2,730	= 2600 * 1.05
Buy Stock Index ETF	-\$2,600	$S_t + \$52$	Dividend Payment
Sell Stock Index Futures Short 0		$-S_t + \$2,700$	Mispriced
Total	\$0	\$22	Risk-Free Profit

Cash Flow if Futures Contract is Priced according to Parity

Borrow at 5% Interest	\$2,600	-\$2,730	= 2600 * 1.05
Buy Stock Index ETF	-\$2,600	$S_t + \$52$	Dividend Payment
Sell Stock Index Futures Short 0		$-S_t + \$2,678$	Correctly Priced
Total	\$0	\$0	No Profit

At the end of the year, the trader with a long position pays you the settlement price of the futures contract in exchange for your ETF, so if the futures contract was overpriced, then you can earn a riskless profit by the amount of the overpricing.

Although the net initial investment is 0, the future cash flow in 1 year is a riskless positive number which is exactly equal to the mispricing of the futures contract compared to what it would be at parity. Because of this riskless arbitrage, traders would bid up the price of the stock or ETF and bid down the price of the futures contract until parity was satisfied. If the futures contract was less than the corresponding stock price, then a reversal of the arbitrage could be done to earn riskless profits, thereby bidding up the futures price and bidding down the stock price. To summarize:

$$F_0 = S_0(1 + r_f - d)$$

- F_0 = Initial Futures Price
- S_0 = Initial Stock Price
- r_f = Risk-Free Interest Rate
- d = Dividend Yield

The parity relationship is also known as the **cost-of-carry relationship** because it asserts that the futures price is determined by the relative costs of buying a stock with deferred delivery in the futures market versus buying it in the spot market with immediate delivery and carrying it as inventory. When buying the stock, the interest that could be earned with the money used to buy the stock is forfeited for the duration of the stock ownership. However, dividend payments may be received. Thus, the net carrying cost advantage of deferring delivery of the stock is the risk-free interest rate minus the dividend per period, which is why the futures price differs from the spot price by the amount of the future-parity equation.

The parity relation must also hold for longer contract periods. Because money has time value, there must be a larger difference between the price of a longer term futures contract and the current spot price compared to a short-term contract, so for a contract maturity of t periods, the spot-futures parity equation is modified:

$$F_0 = S_0(1 + r_f - d)^t$$

This is equivalent to the formula for calculating the future value of an investment, where the spot price is the initial value, the term $(1 + r_f - d)$ is the interest rate, and t represents the number of compounding periods.

The spot-futures parity equation can also be applied to other futures contracts with different underlying assets by making the appropriate modifications. For instance, for bonds, the coupon payment would be equal to the dividend payment. If the underlying asset pays no dividends, such as a commodity like silver, then the dividend is simply set equal to 0, so the price of the futures contract would be equal to asset price multiplied by the risk-free interest rate. By taking the long position in the futures contract, the trader can earn the risk-free rate of interest with the money that would otherwise be used to buy the asset; ergo, the long position must agree to a higher price to compensate the short position for holding an asset that pays no interest or dividends.

INTEREST RATE FUTURES CURRENCY FUTURES AND FORWARDS

Ever since the global financial crisis hit the economies world over, more and more regulators and markets across the world are seen drifting away from the over-the-counter forward market to embrace exchange-traded market.

The OTC market refers to transactions made outside the realm of formal and regulated exchanges. The main reason for this change, experts opine is that the centrally counter-party guaranteed exchange-traded market is perhaps the one institution to have come out unscathed in this economic meltdown.

In India, the trading in the newly launched derivatives or more popularly the interest rate futures began on August 31, 2009 clocking trading volumes of Rs 276 crore in their first day of trade. A dream debut, indeed! But what is this interest rate futures all about? Who is eligible and where can you trade them? Read on to find out the answers for these and much more about interest rate futures touted to be the next big thing in Indian derivatives.

What is interest rate futures trading?

In a nutshell, an interest rate future is a financial derivative. For the uninitiated, a derivative is a financial contract the value of which is 'derived' from a long-standing security such as a stock or a bond, or even an asset, or a market index.

So an interest rate future is a financial derivative based on an underlying security, actually a debt obligation that moves in value as interest rates change. That is, buying an interest rate futures contract will allow the buyer to lock in a future investment rate.

When the interest rates scale up, the buyer will pay the seller of the futures contract an amount equal to the profit expected when investing at a higher rate against the rate mentioned in the futures contract. On the flip side when the interest rates go down, the seller will pay off the buyer for the poorer interest rate when the futures contract expires.

According to experts, the interest rate futures market had priced the futures so that there is sparse room for arbitrage.

Interest rate futures trade in India

In India, the underlying for interest rate futures trading is the Government of India's securitized 10-year notional coupon bond. The qualification of GoI securities to be used as

underlying assets is that it should have a maturity status between seven-and-a-half years and 15 years from the first day of the delivery month.

This apart the outstanding should be for a minimum value of Rs 10,000 crore (Rs 100 billion). There will be a regular publishing of the list of deliverable-grade securities at the Exchanges.

Who can trade and where?

You are eligible to trade in interest rate futures market if you are a company, or a bank, or a foreign institutional investor, or a non-resident Indian or a retail investor.

You can trade live in interest rate futures on the currency derivatives segment of the National Stock Exchange while you could also soon trade the contracts on the Bombay Stock Exchange once it is launched. The foreign exchange derivatives bourse of the newly launched Multi-Commodity Exchange MCX-SX is awaiting the regulatory approval to commence trading in the segment.

The contract size and quotation

Globally, the interest rate futures are almost 25-30 per cent of all derivatives. In India the trading on the NSE will see a minimum contract size of Rs 200,000. As far as the quotation is concerned, it would be the same as the quoted price of GoI securities and with a count convention of 30/360-day.

The maximum tenor of contracts

While the maximum tenor of the futures contract is 1 year or 12 months, usually it will have to be rolled over in three months making the contract cycle span over four fixed quarterly contracts.

Daily settlement calculation and procedure for final settlement

Under normal circumstances, the weighted average price of the futures contract for the final 30 minutes would be taken as the daily settlement price.

However, at times when this trading is not carried out the exchange would fix the theoretical price as the daily settlement rate. Usually, the daily settlement is done on a daily marked-to-market procedural basis while the final settlement would be through physical delivery of securities.

Risk Management Strategies

Primary purpose of derivatives trading in commodities is aimed to reduce price risk from the seasonal fluctuations. The strategies of risk management include hedging, speculation and arbitrage.

Hedging is an economic function that helps to reduce the price risks in commodities significantly, if not eliminate altogether. Hedging is the practice of off-setting the price risk inherent in any cash market position by taking an equal but opposite position in the futures market.

Futures markets believed to be originally developed to meet the requirements of producers who wanted to hedge against the price risk arising from seasonal fluctuations. However, the scope of commodity futures has expanded latter with widespread participation of producers, traders and users of commodities. Hedger is the person who has a position in physical market and wants to avoid the risk.

Hedging will be effective only when the following requirements are met

- Driven by the demand and supply over a period the prices of cash and futures markets tend to move together
- As the maturity date approaches, cash and futures prices tend to converge or reach an acceptable difference.

Process: Hedging in the futures market in general is a two-step process, depending upon the hedger's cash market situation

First step: If the hedger is going to buy a commodity in the cash market at a later time, his first step is to buy futures contracts. Or if he is going to sell in cash commodity at a later time, his first step in the hedging process is to sell futures contracts.

Second step: when the cash market transaction takes place, the futures position is no longer needed for price protection and should therefore be closed. Depending on the initial position taken long or short, hedger would offset his position by selling or buying back the futures contract.

For example, in June if a farmer expects an output of 100 tonnes of soyabean in October. Soyabean prices in October are expected to be relatively lower as it is harvesting season for soya bean. In order to hedge against the price fall, the farmer sells 100 contracts of one ton each at Rs.1347 in June. On a fall of price to Rs.1216 per ton in October he makes a profit of Rs.131 per ton.

Speculation: Contrary to the hedging, speculation involves risk with no cash market position. Speculators take risk that hedgers want to avoid with a motive to make profits and provide the necessary liquidity through bid-offers that result into a continuous flow of transactions. Commodities are becoming increasingly attractive to investor as an alternative asset class that may allow reduction in overall risk of financial portfolio and enhance returns. Unlike in spot markets, he has to invest only a margin amount instead of the total amount and can gain profits to the total extent.

Arbitrage: A third category of market participants is the arbitrageurs. Arbitrage is a risk-less profit realized by simultaneous trading in two or more markets. However, arbitrage opportunities are very desirable but not easy to uncover, as they do not last longer since the prices get adjusted soon with buying and selling

Arbitrage is possible when one of three conditions is met:

- The same asset must trade at the different prices on all markets.
- Two assets with identical cash flows must trade at different prices.
- An asset with a known price in the future, must trade today at a different price than its future price discounted at the risk-free interest rate.

For example, spot price of gold in Mumbai is Rs 7000 per 10 gm and at the same time the futures contract on MCX is traded at Rs 7200 per gm then the trader buys a kg of gold in cash market and simultaneously takes a short position in the futures market. On the expiry of the contract he opts to deliver the physical gold and gains at the rate of Rs 200 per gm.

Basis and Basis risk

Understanding basis risk is fundamental for hedging in futures trading

$$\text{Basis}_t^T = \text{Spot price}_t - \text{Futures price}^T_t$$

Where T is maturity period and t is a specific date

It is normally quoted as premium or discount in relation to the cash price.

If $S_p > F_p$ then basis is said to be **OVER** future and called **premium**

If $S_p < F_p$ then basis is said to be **UNDER** future and called **discount**

Example: on a particular day (October 1) if a trader purchased soyabean in Indore market at a price of Rs 1180 per quintal and on the same day, October futures contract closed at Rs 1208 per quintal then the basis could be calculated by subtracting the futures price from spot price (Rs 28)

The basis is partly determined by the interest on difference between margin deposit and the total value of the contract and partly by storage costs. Thus, futures prices for physical commodities are typically higher than spot prices, a situation known as **Contango**.

Differences in quality and grade as well as expectations about future supply also can affect the basis. If expected future supplies greatly exceed current supplies, futures prices may be lower than spot prices, a situation known as **backwardation**.

Basis risk exists when futures and spot prices do not change in the same magnitude and may not converge at maturity on account of the physical attributes of the commodities including grade, location and chemical composition etc.,

It is now common that the market participants analyse their risk in a mark-to-market perspective at date 't'. As a result, the basis risk is often defined as the variance of the basis.

$$s^2 (S_t - F^T(t)) = s^2 (S_t) + s^2 (F^T(t)) - 2rs (S_t)s (F^T(t))$$

Where, r is the correlation coefficient between the futures and spot price series

The equation shows basis risk is zero when variances between the Futures and spot prices are identical and r equals one.

Practically, the correlation between spot and futures prices is the stringent factor and on which the magnitude of basis risk depends.

Price Discovery

Futures contracts are often relied upon for price discovery as well as for hedging. In many commodities, cash market participants typically base spot and forward prices on the futures prices that are “discovered” in the competitive, open auction market of a futures exchange. This is considered to be an important economic purpose of futures markets. In financial futures contracts such as stocks, interest rates, and foreign currency, the price discovery role of futures occurs in tandem with the cash markets, which also contribute significantly to price discovery.

Players in futures market

Hedgers: Futures markets believed to be originally developed to meet the requirements of hedgers or producers who wanted to safeguard against the price risk. However, the scope of commodity futures has expanded latter with widespread participation of producers and users of commodities. Hedger is the person who basically wants to avoid the risk and enters into a contract with speculator.

Speculators: speculation is the opposite of hedging Speculators on the other hand, wish to take risk that hedgers want to avoid with a motive to make profits and provide the necessary liquidity through bids and offers that result into a continuous flow of transactions. Commodities are becoming increasingly attractive to investor and hedge fund managers as an alternative asset class that may allow reduction in overall risk of financial portfolio and enhance returns.

Arbitrager: A third category of market participants is the arbitragers. Arbitrage is a risk-less profit realized by simultaneous trading in two or more markets. However, arbitrage opportunities are very desirable but not easy to uncover, as they do not last longer since the prices get adjusted soon with buying and selling

UNIT-III

BASIC OPTION STRATEGIES

FUTURES AND OPTIONS

Futures and options represent two of the most common form of "Derivatives". Derivatives are financial instruments that derive their value from an 'underlying'. The underlying can be a stock issued by a company, a currency, Gold etc., The derivative instrument can be traded independently of the underlying asset.

The value of the derivative instrument changes according to the changes in the value of the underlying.

Derivatives are of two types -- exchange traded and over the counter.

Exchange traded derivatives, as the name signifies are traded through organized exchanges around the world. These instruments can be bought and sold through these exchanges, just like the stock market. Some of the common exchange traded derivative instruments are futures and options.

Over the counter (popularly known as OTC) derivatives are not traded through the exchanges. They are not standardized and have varied features. Some of the popular OTC instruments are forwards, swaps, swaptions etc.

Futures

A 'Future' is a contract to buy or sell the underlying asset for a specific price at a pre-determined time. If you buy a futures contract, it means that you promise to pay the price of the asset at a specified time. If you sell a future, you effectively make a promise to transfer the asset to the buyer of the future at a specified price at a particular time. Every futures contract has the following features:

- Buyer
- Seller
- Price
- Expiry

Some of the most popular assets on which futures contracts are available are equity stocks, indices, commodities and currency.

The difference between the price of the underlying asset in the spot market and the futures market is called 'Basis'. (As 'spot market' is a market for immediate delivery) The basis is usually negative, which means that the price of the asset in the futures market is more than the price in the spot market. This is because of the interest cost, storage cost, insurance premium etc., That is, if you buy the asset in the spot market, you will be incurring all these expenses, which are not needed if you buy a futures contract. This condition of basis being negative is called as 'Contango'.

Sometimes it is more profitable to hold the asset in physical form than in the form of futures. For eg: if you hold equity shares in your account you will receive dividends,

whereas if you hold equity futures you will not be eligible for any dividend.

When these benefits overshadow the expenses associated with the holding of the asset, the basis becomes positive (i.e., the price of the asset in the spot market is more than in the futures market). This condition is called 'Backwardation'. Backwardation generally happens if the price of the asset is expected to fall.

It is common that, as the futures contract approaches maturity, the futures price and the spot price tend to close in the gap between them i.e., the basis slowly becomes zero.

Options

Options contracts are instruments that give the holder of the instrument the right to buy or sell the underlying asset at a predetermined price. An option can be a 'call' option or a 'put' option.

A call option gives the buyer, the right to buy the asset at a given price. This 'given price' is called 'strike price'. It should be noted that while the holder of the call option has a right to demand sale of asset from the seller, the seller has only the obligation and not the right. For eg: if the buyer wants to buy the asset, the seller has to sell it. He does not have a right.

Similarly a 'put' option gives the buyer a right to sell the asset at the 'strike price' to the buyer. Here the buyer has the right to sell and the seller has the obligation to buy.

So in any options contract, the right to exercise the option is vested with the buyer of the contract. The seller of the contract has only the obligation and no right. As the seller of the contract bears the obligation, he is paid a price called as 'premium'. Therefore the price that is paid for buying an option contract is called as premium.

The buyer of a call option will not exercise his option (to buy) if, on expiry, the price of the asset in the spot market is less than the strike price of the call. For eg: A bought a call at a strike price of Rs 500. On expiry the price of the asset is Rs 450. A will not exercise his call. Because he can buy the same asset from the market at Rs 450, rather than paying Rs 500 to the seller of the option.

The buyer of a put option will not exercise his option (to sell) if, on expiry, the price of the asset in the spot market is more than the strike price of the call. For eg: B bought a put at a strike price of Rs 600. On expiry the price of the asset is Rs 619. A will not exercise his put option. Because he can sell the same asset in the market at Rs 619, rather than giving it to the seller of the put option for Rs 600.

A futures contract is an agreement between two parties to buy or sell an asset at a certain time in the future at a certain price.

Such an agreement works for those who do not have the money to buy the contract now but can bring it in at a certain date. These contracts are mostly used for arbitrage by traders. It means traders buy a stock at a low price in the cash market and sell it at a higher price in the

futures market or vice versa. The idea is to play on the price difference between two markets for the same stock.

In case of futures contracts, the obligation is on both the buyer and the seller to execute the contract at a certain date. Futures contracts are special types of forward contracts. They are standardized exchange-traded contracts like futures of the Nifty index.



OPTIONS

An Option gives the buyer the right but not the obligation. As a buyer, you may choose to let the option to buy call or put option lapse. The seller has an obligation to comply with the contract. In the case of a futures contract, there is an obligation on the part of both the buyer and the seller.

Options are of two types - Calls and Puts options:

'Calls' give the buyer the right, but not the obligation to buy a given quantity of the underlying asset, at a given price on or before a given future date.

'Puts' give the buyer the right, but not the obligation to sell a given quantity of underlying asset at a given price on or before a given future date.

If the buyer of options chooses to exercise the option to buy, the counter-party (seller) must comply. A futures contract, on the other hand, is binding on both counter-parties as both parties have to settle on or before the expiry date.

Please note that all option contract available on NSE can be exercised on expiry date only

DISTINGUISH BETWEEN OPTIONS AND FUTURES

Key Differences between Futures and Options

The significant differences between future and options are mentioned below:

1. A binding agreement, for buying and selling of a financial instrument at a predetermined price at a future specified date, is known as Futures Contract. The

contract in which the investor gets the right to buy or sell the financial instrument at a set price, on or before a certain date, however, the investor is not obligated to do so, is known as Options Contract.

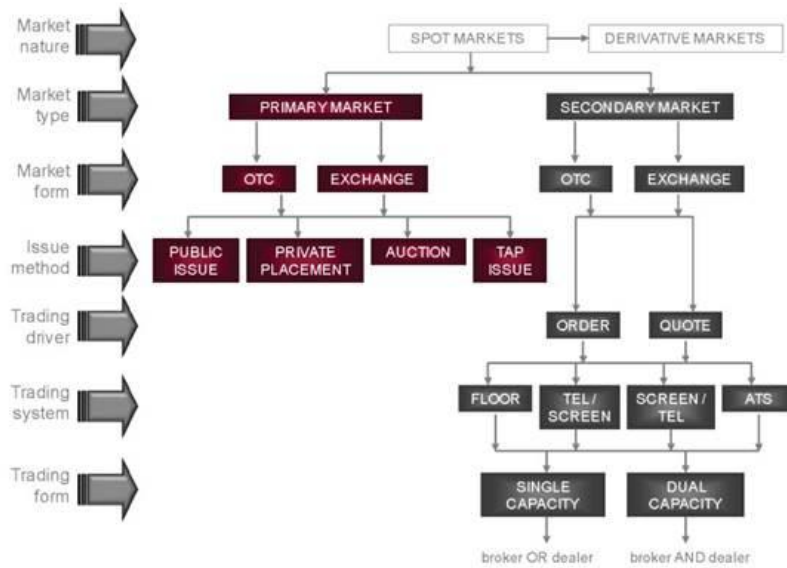
2. Futures contract puts an obligation on the buyer to honour the contract on the stated date, so he is locked into the contract. Conversely, in the options contract, there is an option, not the obligation of buying or selling the security.
3. In futures, the performance of the contract is done only at the future specified date, but in the case of options, the performance of the contract can be done at any time before the expiry of the agreed date.
4. Futures are riskier than the options.
5. Apart from the commission paid, futures do not require advance payment, but options require the payment of premium.
6. In futures, a person can earn/incur an unlimited amount of profit or loss, whereas in options the profits are unlimited, but the losses are up to a certain level.

BASIS FOR COMPARISON

Basis for Comparison	Futures	Options
Meaning	Futures contract is a binding agreement, for buying and selling of a financial instrument at a predetermined price at a future specified date.	Options are the contract in which the investor gets the right to buy or sell the financial instrument at a set price, on or before a certain date, however the investor is not obligated to do so.
Obligation of buyer	Yes, to execute the contract.	No, there is no obligation.
Execution of contract	On the agreed date.	Anytime before the expiry of the agreed date.
Risk	High	Limited
Advance payment	No advance payment	Paid in the form of premiums.
Degree of profit/loss	Unlimited	Unlimited profit and limited loss.

Organisational structure of forward markets

is one way of depicting the organisational structure of the spot financial markets.



organizational structure of spot financial markets

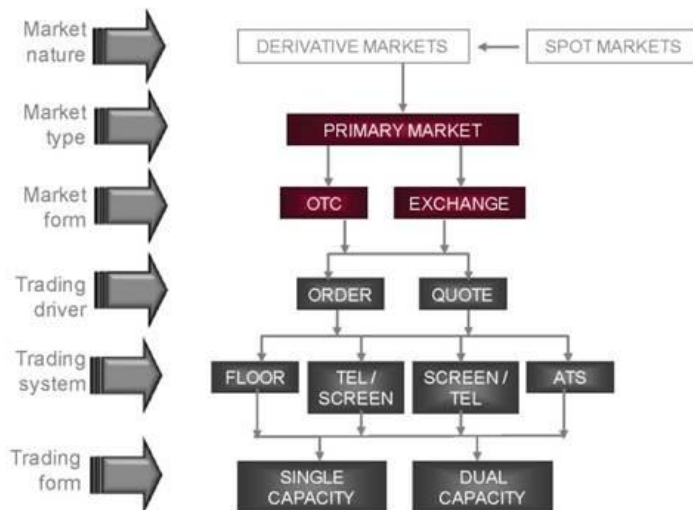


Figure 15: organizational structure of derivative financial markets

However, this applies to the "normal" financial markets, i.e. the money, bond and share markets. It is not well suited to the foreign exchange and derivative markets. Figure 15 is an attempt to visualize the derivative markets.

PRINCIPLES OF OPTION PRICING.

A contract that gives the holder the right - not the obligation - to buy (call), or to sell (put) a specified amount of the underlying asset, at a set exchange rate and expiration date. The investor buying the option is called the buyer or holder.

OPTION PRICING MODELS

The Black-Scholes model and the Cox, Ross and Rubinstein binomial model are the primary pricing models used by the software available from this site (Finance Add-in for Excel, the Options Strategy Evaluation Tool, and the on-line pricing calculators.)

Both models are based on the same theoretical foundations and assumptions (such as the geometric Brownian motion theory of stock price behaviour and risk-neutral valuation). However, there are also some important differences between the two models and these are highlighted below.

The Black-Scholes model is used to calculate a theoretical call price (ignoring dividends paid during the life of the option) using the five key determinants of an option's price: stock price, strike price, volatility, time to expiration, and short-term (risk free) interest rate.

The original formula for calculating the theoretical option price (OP) is as follows:

$$OP = SN(d_1) - Xe^{-rt}N(d_2)$$

Where:

$$d_1 = \frac{\ln\left(\frac{S}{X}\right) + \left(r + \frac{v^2}{2}\right)t}{v\sqrt{t}}$$

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

The variables are:

S = stock price

X = strike price

t = time remaining until expiration, expressed as a percent of a year

r = current continuously compounded risk-free interest rate

v = annual volatility of stock price (the standard deviation of the short-term returns over one year). See below for how to estimate volatility.

ln = natural logarithm

N(x) = standard normal cumulative distribution function

e = the exponential function

The model is based on a normal distribution of underlying asset returns which is the same thing as saying that the underlying asset prices themselves are lognormally distributed. A lognormal distribution has a longer right tail compared with a normal, or bell-shaped, distribution. The lognormal distribution allows for a stock price distribution of between zero and infinity (ie no negative prices) and has an upward bias (representing the fact that a stock price can only drop 100% but can rise by more than 100%).

In practice underlying asset price distributions often depart significantly from the lognormal. For example historical distributions of underlying asset returns often have fatter left and right tails than a normal distribution indicating that dramatic market moves occur

with greater frequency than would be predicted by a normal distribution of returns-- ie more very high returns and more very low returns.

A corollary of this is the volatility smile -- the way in which at-the-money options often have a lower volatility than deeply out-of-the-money options or deeply in-the-money options.

The Finance Add-in for Excel which can be downloaded from this site contains three sets of tools for dealing with non-log normally distributed asset prices and the volatility smile:

- ♦ Modified Black-Scholes and binomial pricing (using implied binomial trees) for European and American option pricing with non-lognormal distributions. These models can be used to see the impact on option prices of non-lognormal price distributions (as measured by coefficients of skewness (symmetry) and kurtosis (fatness of distribution tails and height of peaks)), and to calculate and plot the volatility smile implied by these distributions.
- ♦ Measuring the degree to which historical asset price distributions diverge from the lognormal (as measured by coefficients of skewness and kurtosis).
- ♦ Plotting non-lognormal distribution curves for specified coefficients of skewness and Kurtosis (as well as volatility etc) to see how they differ from the lognormal.

In addition to using the add-in you can use the on-line stock price distribution calculator to examine the sensitivity of the shape of the lognormal stock price distribution curve to changes in time, volatility, and expected growth rates. And you can also use the on-line stock price probability calculator to look at the probabilities of stock prices exceeding upper and lower boundary prices -- both at the end of a specified number of days and at any time during the period.

Advantage: The main advantage of the Black-Scholes model is speed -- it lets you calculate a very large number of option prices in a very short time.

Limitation: The Black-Scholes model has one major limitation: it cannot be used to accurately price options with an American-style exercise as it only calculates the option price at one point in time -- at expiration. It does not consider the steps along the way where there could be the possibility of early exercise of an American option.

As all exchange traded equity options have American-style exercise (ie they can be exercised at any time as opposed to European options which can only be exercised at expiration) this is a significant limitation.

The exception to this is an American call on a non-dividend paying asset. In this case the call is always worth the same as its European equivalent as there is never any advantage in exercising early.

Various adjustments are sometimes made to the Black-Scholes price to enable it to approximate American option prices (eg the Fischer Black Pseudo-American method) but these only work well within certain limits and they don't really work well for puts.

BINOMIAL MODEL

The binomial model breaks down the time to expiration into potentially a very large number of time intervals, or steps. A tree of stock prices is initially produced working forward from the present to expiration. At each step it is assumed that the stock price will move up or down by an amount calculated using volatility and time to expiration. This produces a binomial distribution, or recombining tree, of underlying stock prices. The tree represents all the possible paths that the stock price could take during the life of the option.

At the end of the tree -- ie at expiration of the option -- all the terminal option prices for each of the final possible stock prices are known as they simply equal their intrinsic values.

Next the option prices at each step of the tree are calculated working back from expiration to the present. The option prices at each step are used to derive the option prices at the next step of the tree using risk neutral valuation based on the probabilities of the stock prices moving up or down, the risk free rate and the time interval of each step. Any adjustments to stock prices (at an ex-dividend date) or option prices (as a result of early exercise of American options) are worked into the calculations at the required point in time. At the top of the tree you are left with one option price.

To get a feel for how the binomial model works you can use the on-line binomial tree calculators: either using the original Cox, Ross, & Rubinstein tree or the equal probabilities tree, which produces equally accurate results while overcoming some of the limitations of the C-R-R model. The calculators let you calculate European or American option prices and display graphically the tree structure used in the calculation. Dividends can be specified as being discrete or as an annual yield, and points at which early exercise is assumed for American options are highlighted.

Advantage: The big advantage the binomial model has over the Black-Scholes model is that it can be used to accurately price American options. This is because with the binomial model it's possible to check at every point in an option's life (ie at every step of the binomial tree) for the possibility of early exercise (eg where, due to eg a dividend, or a put being deeply in the money the option price at that point is less than its intrinsic value).

Where an early exercise point is found it is assumed that the option holder would elect to exercise, and the option price can be adjusted to equal the intrinsic value at that point. This then flows into the calculations higher up the tree and so on.

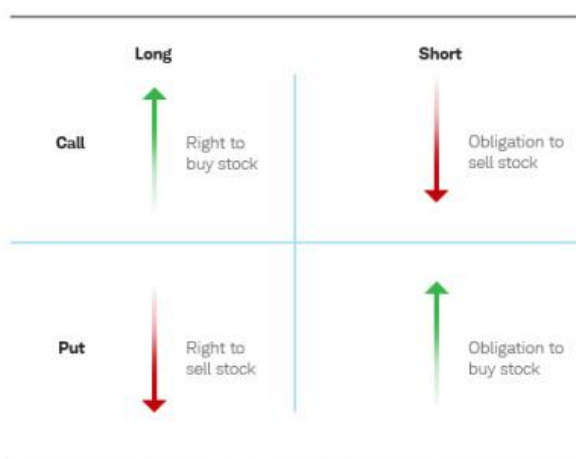
The on-line binomial tree graphical option calculator highlights those points in the tree structure where early exercise would have caused an American price to differ from a European price.

The binomial model basically solves the same equation, using a computational procedure that the Black-Scholes model solves using an analytic approach and in doing so provides opportunities along the way to check for early exercise for American options.

Limitation: The main limitation of the binomial model is its relatively slow speed. It's great for half a dozen calculations at a time but even with today's fastest PCs it's not a practical solution for the calculation of thousands of prices in a few seconds.

OPTIONS TRADING STRATEGIES

Bullish vs. bearish options trading strategies



Source: Schwab Center for Financial Research.

Long calls

Perhaps, the simplest option strategy to understand (though not necessarily the simplest with which to make a profit) may be the long call trade. A long call trade is often the first option strategy used by investors once they decide to venture into trading options. Unfortunately, long calls can often be difficult to trade profitably. However, it's good to discuss the strategy because it helps to lay the foundation for more complex option strategies.

A long call option is a bullish strategy, but unlike a long stock trade, you generally have to be right about more than just the direction of the underlying stock to be profitable. As we discussed in part one of this series, the price of an option is based on many components. Three of these components are: (1) type of option (call vs. put), (2) the strike price of the option and (3) the amount of time until the option expires. To profit on a long call trade, you will need to be right about the direction of the underlying stock price movement and the number of points it moves in that direction, as well as how long it takes to make the move. Occasionally, you can be profitable if you are right on two of these three items, but direction alone is almost never enough.

Before you decide to enter into any option strategy, it is important to do some simple calculations to find the maximum gain, maximum loss and breakeven points (price of the

underlying stock/index where there is neither a gain nor a loss) for the trade. The formula for these calculations on a long call trade (assuming the position is held until expiration) and a visual depiction of a profit-and-loss graph are illustrated below:

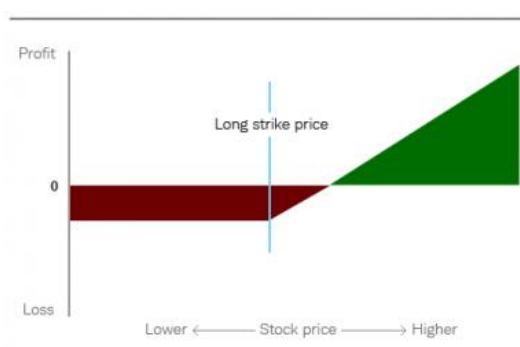
Long 1 XYZ Jan 50 Call @ \$3

Maximum gain = unlimited

Maximum loss = \$300 (3.00 option premium paid x 100 shares per contract)

Breakeven point = 53 (50 strike price + 3.00 option premium)

Long call



Source: Schwab Center for Financial Research.

Note: Chart depicts strategy at expiration.

As you can see, while the maximum potential loss on a long call trade is the price paid for the option, the upside profit potential is theoretically unlimited. However, keep in mind that because the option has a limited lifespan, the underlying stock will need to move up enough to cover the cost of the option and offset the erosion in time value and possibly even offset changes in volatility. These factors work against the owner of a long option, resulting in a much more difficult profit-and-loss scenario than you might think.

Short calls

Although I don't recommend the use of short (naked) calls, and they would be particularly inappropriate for inexperienced option traders or traders without substantial risk capital, I think it's helpful to illustrate how selling a call creates a profit-and-loss scenario that is exactly the opposite of long call. Here's an example:

Short 1 XYZ Jan 50 Call @ \$3

Maximum gain = \$300 (3.00 option premium received x 100 shares per contract)

Maximum loss = unlimited

Breakeven point = 53 (50 strike price + 3.00 option premium)

Uncovered (“Naked”) call



Source: Schwab Center for Financial Research.

Note: Chart depicts strategy at expiration.

Note: Chart depicts strategy at expiration. An uncovered (naked) call trade is an extremely risky position, because while the profit (if the stock drops in price) is limited to the premium received at the time the option is sold, the upside risk is unlimited. To enter an uncovered call trade, you'll need the highest option approval level available at Schwab (level 3), and must have substantial funds to meet the higher margin requirements of this strategy.

Long puts

Similar to a long call trade, a long put trade is fairly straightforward. Although long put trades can be difficult to trade profitably, it's also worthwhile to discuss the strategy as a foundation for more complex option strategies.

A long put option is a bearish strategy, but unlike a short stock trade, you generally have to be right about more than just the direction of the underlying stock in order to be profitable. As with long calls, to be profitable, you will need to be right about the stock price movement direction and the magnitude and the time frame. You can occasionally be profitable if you are right on two of these three items, but direction alone is almost never enough.

As with long calls, before you decide to enter a long put trade, be sure to find the maximum gain, maximum loss and breakeven points. The formula for these calculations on a long put trade and a visual depiction of a profit-and-loss graph are illustrated below:

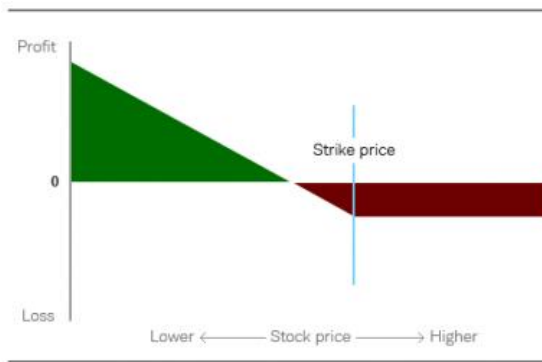
Long 1 XYZ Jan 50 Put @ \$3

Maximum gain = \$4,700 (50 strike price – 3.00 option premium x 100 shares per contract)

Maximum loss = \$300 (3.00 option premium paid x 100 shares per contract)

Breakeven point = 47 (50 strike price – 3.00 option premium)

Long put



Source: Schwab Center for Financial Research.

Note: Chart depicts strategy at expiration.

As you can see, while the maximum potential loss on a long put trade is the price paid for the option, the profit potential, as the stock drops in price, is significant. However, keep in mind that because the option has a limited lifespan, the underlying stock will need to move down enough to cover the cost of the option and offset the erosion in time value and possibly even changes in volatility. These factors work against the owner of a long option, resulting in a much more difficult profit-and-loss scenario than you might think.

Short puts

Although short (naked) puts are not quite as risky as short (naked) calls, they are still not a strategy for inexperienced option traders or traders without substantial risk capital. Selling a put creates a profit-and-loss scenario that is exactly the opposite of long put. Here's an example:

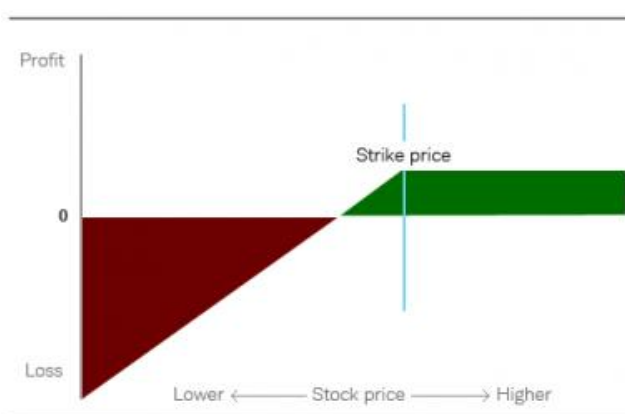
Short 1 XYZ Jan 50 Put @ \$3

Maximum gain = \$300 (3.00 option premium received x 100 shares per contract)

Maximum loss = \$4,700 (50 strike price – 3.00 option premium x 100 shares per contract)

Breakeven = 47 (50 strike price – 3.00 option premium)

Naked put



Source: Schwab Center for Financial Research.

Note: Chart depicts strategy at expiration.

An uncovered (naked) put trade is an extremely risky position, because while the profit (if the stock rises in price) is limited to the premium received at the time the option is sold, the downside risk can increase until the stock reaches zero. To enter an uncovered put trade, you'll need not only the highest option approval level available at Schwab (level 3), but also must have substantial funds to meet the high margin requirements of this strategy.

Selecting your strike price

When first introduced to options, many traders have little trouble understanding the risk/reward characteristics of options but often have difficulty deciding which strike prices to use. Whether those strike prices are in, at, or out of the money will affect the magnitude of the underlying move needed to reach profitability and also determine whether the trade can be profitable if the underlying stock remains unchanged. The tables below illustrate how to properly structure a long or short option trade to match your level of bullishness or bearishness.

For example, if you are extremely bullish, you may want to consider out-of-the-money (OOTM) long calls or in-the-money (ITM) short puts. Keep in mind, both will generally require a bullish move in the underlying stock of extreme magnitude in order to reach profitability. By contrast, if you are only slightly bullish, you may want to consider ITM long calls or OOTM short puts, the latter of which can sometimes be profitable with no movement in the underlying stock.

OPTIONS TRADING

An 'Option' is a type of security that can be bought or sold at a specified price within a specified period of time, in exchange for a non-refundable upfront deposit. An options contract offers the buyer the right to buy, not the obligation to buy at the specified price or date. Options are a type of derivative product.

The right to sell a security is called a 'Put Option', while the right to buy is called the 'Call Option'.

They can be used as:

- **Leverage:** Options help you profit from changes in share prices without putting down the full price of the share. You get control over the shares without buying them outright.
- **Hedging :** They can also be used to protect yourself from fluctuations in the price of a share and letting you buy or sell the shares at a pre-determined price for a specified period of time.

Though they have their advantages, trading in options is more complex than trading in regular shares. It calls for a good understanding of trading and investment practices as well as constant monitoring of market fluctuations to protect against losses.

Just as futures contracts minimize risks for buyers by setting a pre-determined future price for an underlying asset, options contracts do the same however, without the obligation to buy that exists in a futures contract.

The seller of an options contract is called the 'options writer'. Unlike the buyer in an options contract, the seller has no rights and must sell the assets at the agreed price if the buyer chooses to execute the options contract on or before the agreed date, in exchange for an upfront payment from the buyer.

There is no physical exchange of documents at the time of entering into an options contract. The transactions are merely recorded in the stock exchange through which they are routed.

When you are trading in the derivatives segment, you will come across many terms that may seem alien. Here are some Options-related jargons you should know about.



- **Premium:** The upfront payment made by the buyer to the seller to enjoy the privileges of an option contract.
- **Strike Price / Exercise Price:** The pre-decided price at which the asset can be bought or sold.
- **Strike Price Intervals:** These are the different strike prices at which an options contract can be traded. These are determined by the exchange on which the assets are traded.

There are typically at least 11 strike prices declared for every type of option in a given month - 5 prices above the spot price, 5 prices below the spot price and one price equivalent to the spot price.

Following strike parameter is currently applicable for options contracts on all individual securities in NSE Derivative segment:

The strike price interval would be:

Underlying Closing Price	Strike Price Interval	No. of Strikes Provided In the money- At the money- Out of the money	No. of additional strikes which may be enabled intraday in either direction
Less than or equal to Rs.50	2.5	5-1-5	5
> Rs.50 to = Rs.100	5	5-1-5	5
> Rs.100 to = Rs.250	10	5-1-5	5
> Rs.250 to = Rs.500	20	5-1-5	5
> Rs.500 to = Rs.1000	20	10-1-10	10
> Rs.1000	50	10-1-10	10

Strike Price Intervals for Nifty Index

The number of contracts provided in options on index is based on the range in previous day's closing value of the underlying index and applicable as per the following table:

Index Level	Strike Interval	Scheme of Strike to be introduced
upto 2000	50	4-1-4
>2001 upto 4000	100	6-1-6
>4001 upto 6000	100	6-1-6
>6000	100	7-1-7

- **Expiration Date:**

A future date on or before which the options contract can be executed. Options contracts have three different durations you can pick from:

- Near month (1 month)
- Middle Month (2 months)
- Far Month (3 months)

*Please note that long terms options are available for Nifty index. Futures & Options contracts typically expire on the last Thursday of the respective months, post which they are considered void.

- **American and European Options:**

The terms 'American' and 'European' refer to the type of underlying asset in an options contract and when it can be executed. American options' are Options that can be executed at any time on or before their expiration date. 'European options' are Options that can only be executed on the expiration date.

- **LOT SIZE:**

Lot size refers to a fixed number of units of the underlying asset that form part of a single F&O contract. The standard lot size is different for each stock and is decided by the exchange on which the stock is traded.

E.g. options contracts for Reliance Industries have a lot size of 250 shares per contract.

- **Open Interest:**

Open Interest refers to the total number of outstanding positions on a particular options contract across all participants in the market at any given point of time. Open Interest becomes nil past the expiration date for a particular contract.

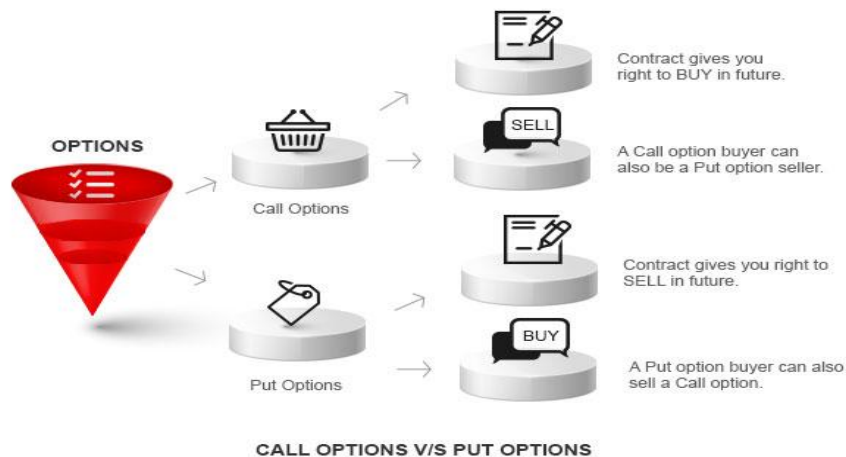
Let us understand with an example:

If trader A buys 100 Nifty options from trader B where, both traders A and B are entering the market for the first time, the open interest would be 100 futures or two contract.

The next day, Trader A sells her contract to Trader C. This does not change the open interest, as a reduction in A's open position is offset by an increase in C's open position for this particular asset.

Now, if trader A buys 100 more Nifty Futures from another trader D, the open interest in the Nifty Futures contract would become 200 futures or 4contracts.

As described earlier, options are of two types, the 'Call Option' and the 'Put Option'.



- **Call Option**

The ‘Call Option’ gives the holder of the option the right to buy a particular asset at the strike price on or before the expiration date in return for a premium paid upfront to the seller. Call options usually become more valuable as the value of the underlying asset increases. Call options are abbreviated as ‘C’ in online quotes.

- **Put Option:**

The Put Option gives the holder the right to sell a particular asset at the strike price anytime on or before the expiration date in return for a premium paid up front. Since you can sell a stock at any given point of time, if the spot price of a stock falls during the contract period, the holder is protected from this fall in price by the strike price that is pre-set. This explains why put options become more valuable when the price of the underlying stock falls.

Similarly, if the price of the stock rises during the contract period, the seller only loses the premium amount and does not suffer a loss of the entire price of the asset. Put options are abbreviated as ‘P’ in online quotes.

The price of an Option Premium is controlled by two factors – intrinsic value and time value of the option.



HOW PREMIUM OPTIONS PRICING IS ARRIVED AT

- **Intrinsic Value**

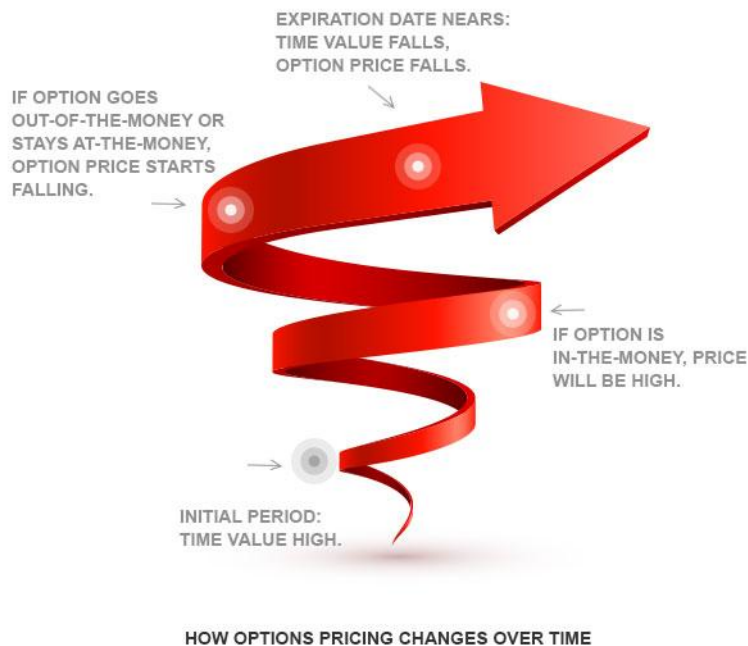
Intrinsic Value is the difference between the cash market spot price and the strike price of an option. It can either be positive (if you are in-the-money) or zero (if you are either at-the-money or out-of-the-money). An asset cannot have negative Intrinsic Value.

- **Time Value** basically puts a premium on the time left to exercise an options contract. This means if the time left between the current date and the expiration date of Contract A is longer than that of Contract B, Contract A has higher Time Value.

This is because contracts with longer expiration periods give the holder more flexibility on when to exercise their option. This longer time window lowers the risk for the contract holder and prevents them from landing in a tight spot.

At the beginning of a contract period, the time value of the contract is high. If the option remains in-the-money, the option price for it will be high. If the option goes out-of-the-money or stays at-the-money this affects its intrinsic value, which becomes zero. In such a case, only the time value of the contract is considered and the option price goes down.

As the expiration date of the contract approaches, the time value of the contract falls, negatively affecting the option price.



HEDGING WITH OPTIONS

Hedging is a technique that is frequently used by many investors, not just options traders. The basic principle of the technique is that it is used to reduce or eliminate the risk of holding one particular investment position by taking another position. The versatility of options contracts make them particularly useful when it comes to hedging, and they are commonly used for this purpose.

Stock traders will often use options to hedge against a fall in price of a specific stock, or portfolio of stocks, that they own. Options traders can hedge existing positions, by taking up an opposing position. On this page we look in more detail at how hedging can be used in options trading and just how valuable the technique is.

What is Hedging?

One of the simplest ways to explain this technique is to compare it to insurance; in fact insurance is technically a form of hedging. If you take insurance out on something that you own: such as a car, house, or household contents, then you are basically protecting yourself against the risk of loss or damage to your possessions. You incur the cost of the insurance premium so that you will receive some form of compensation if your possessions are lost, stolen, or damaged, thus limiting your exposure to risk.

Hedging in investment terms is essentially very similar, although it's somewhat more complicated than simply paying an insurance premium. The concept is in order to offset any potential losses you might experience on one investment, you would make another investment specifically to protect you.

For it to work, the two related investments must have negative correlations; that's to say that when one investment falls in value the other should increase in value. For example, gold is widely considered a good investment to hedge against stocks and currencies. When the stock market as a whole isn't performing well, or currencies are falling in value, investors often turn to gold, because it's usually expected to increase in price under such circumstances.

Because of this, gold is commonly used as a way for investors to hedge against stock portfolios or currency holdings. There are many other examples of how investors use hedging, but this should highlight the main principle: offsetting risk.

Why Do Investors Use Hedging?

This isn't really an investment technique that's used to make money, but it's used to reduce or eliminate potential losses. There are a number of reasons why investors choose to hedge, but it's primarily for the purposes of managing risk.

For example, an investor may own a particularly large amount of stock in a specific company that they believe is likely to go up in value or pay good dividends, but they may be a little uncomfortable about their exposure to risk. In order to still benefit from any potential dividend or stock price increase, they could hold on to the stock and use hedging to protect themselves in case the stock does fall in value.

Investors can also use the technique to protect against unforeseen circumstances that could potentially have a significant impact on their holdings or to reduce the risk in a volatile investment.

Of course, by making an investment specifically to protect against the potential loss of another investment you would incur some extra costs, therefore reducing the potential profits of the original investment. Investors will typically only use hedging when the cost of doing so is justified by the reduced risk. Many investors, particularly those focused on the long term, actually ignore hedging completely because of the costs involved.

However, for traders that seek to make money out of short and medium term price fluctuations and have many open positions at any one time, hedging is an excellent risk

management tool. For example, you might choose to enter a particularly speculative position that has the potential for high returns, but also the potential for high losses. If you didn't want to be exposed to such a high risk, you could sacrifice some of the potential losses by hedging the position with another trade or investment.

The idea is that if the original position ended up being very profitable, then you could easily cover the cost of the hedge and still have made a profit. If the original position ended up making a loss, then you would recover some or all of those losses.

How to Hedge Using Options

Using options for hedging is, relatively speaking, fairly straightforward; although it can also be part of some complex trading strategies. Many investors that don't usually trade options will use them to hedge against existing investment portfolios of other financial instruments such as stock. There a number of options trading strategies that can specifically be used for this purpose, such as covered calls and protective puts.

The principle of using options to hedge against an existing portfolio is really quite simple, because it basically just involves buying or writing options to protect a position. For example, if you own stock in Company X, then buying puts based on Company X stock would be an effective hedge.

Most options trading strategies involve the use of spreads, either to reduce the initial cost of taking a position, or to reduce the risk of taking a position. In practice most of these options spreads are a form of hedging in one way or another, even this wasn't its specific purpose.

For active options traders, hedging isn't so much a strategy in itself, but rather a technique that can be used as part of an overall strategy or in specific strategies. You will find that most successful options traders use it to some degree, but your use of it should ultimately depend on your attitude towards risk.

CURRENCY OPTIONS

A Currency Options (CO) Contract is an agreement that gives investors the right, but not the obligation, to buy or sell a Currency Futures Contract on a future date at a fixed price. COs give investors the right to buy the underlying Currency Future. Put Options give them the right to sell it. Investors are required to pay a premium for choice of exercising the Option or not. The premium is calculated based on the volatility of the underlying exchange rate.

Investors, importers, exporters and travellers can use COs to hedge themselves against movements in the exchange rate. Speculators use COs to make a profit on short-term movements in prices. Arbitrageurs use them to profit from the price differentials of similar products in different markets. Some investors also use COs to enhance the overall performance of a portfolio over the long term.

Features

- Limit losses to the premium paid as investors are not obliged to buy or sell the CO underlying the Option on expiry.

- Provide protection against exchange rate fluctuations in investment portfolios.
- Allow the holder to fix prices for import and export purposes.
- Allow investors to take advantage of price movements in the exchange rate because they can take a view as to whether the exchange rate will strengthen or weaken.
- Standardized contracts traded on a regulated exchange eliminate counterparty risk.
- Highly liquid market.
- Investors may lose the premium paid if they choose not to exercise the Option.
- Traded based on margins that change based on the underlying currency's volatility. This means that investors may be required to make additional payments on a daily basis should their initial margin payment become insufficient because of movements in the underlying currency.

UNIT-IV

COMMODITY MARKET DERIVATIVES

Commodity market in India:

India is one among the top-5 producers of most of the commodities and to being a major consumer of bullion and energy products. Agriculture contributes about for about 22% to the GDP of the Indian economy. It employees for about 57% of the labor force on a total of 163 million hectares of land. Agriculture sector is a significant factor in achieving a GDP growth of 8-10%. All this point out that India can be promoted as a main center for trading of commodity derivatives.

It is regrettable that the policies of FMC during the most of 1950s to 1980s suppressed the markets. But in fact it was supposed to encourage and nurture to grow with times. It was a mistake and other emerging economies of the world would want to avoid such instance. However, it is not in India alone those derivatives were suspected of creating too much speculation that would be damaging the healthy growth of the markets and the farmers. Such suspicions may generally arise due to a misunderstanding of the characteristics and role of derivative product. It is significant to understand why commodity derivatives are necessary and the role they can play in risk management. It is general knowledge that prices of commodities, metals, shares and currencies fluctuate over time. The opportunity of adverse price changes in future creates risk for businesses. Derivatives are used to diminish or eliminate price risk arising from unforeseen price changes. A derivative is a financial contract whose price depends on, or is resultant from, the price of another asset.

Two important types of Commodity Derivatives

Commodity Futures Contracts

A futures contract is a contract for buying or selling a commodity for a predetermined delivery price at a specific future time. Futures are standardized agreements that are traded on organized futures exchanges that ensure performance of the contracts and therefore eliminate the default risk. The commodity futures had existed ever since the Chicago Board of Trade (CBOT) was established in 1848, in view to bring farmers and merchants together. The main function of futures markets is to transfer price risk from hedgers to speculators. For instance, suppose a farmer is expecting his crop of wheat to be ready in two months time, but is worried that the price of wheat may turn down in this period. In order to minimize his risk, he can penetrate into a futures contract to sell his crop in two months' time at a price determined now. In this way he is able to hedge his risk arising from a probable adverse change in the price of his commodity.

Commodity Options contracts

options are also financial instruments like hedges, which are used for hedging and speculation. The commodity option holder has the right, except he don't have the obligation, to buy (or sell) a specific quantity of a commodity at a specified price on or before a specified date. Option agreements involve two parties, namely the seller of the option writes the option in favor of the buyer (holder) who pays a certain premium to the seller as a price for the option. There are two kinds of commodity options. First one is a

‘call’ option gives the holder a right to buy a commodity at an agreed price and the other one is ‘put’ option gives the holder a right to sell a commodity at an agreed price on or before a specified date (called expiry date).

The option holder will exercise the option only if it is advantageous to him; or else he will let the option lapse. For instance, presume a farmer buys a put option to sell 100 Quintals of wheat at a price of Rs 1250 per quintal and pays a ‘premium’ of Rs. 25 per quintal (or a total of Rs. 2500). If the price of wheat reduces to say Rs. 1000 before expiry, the farmer will exercise his option and sell his wheat at the agreed price of rs. 1250 per quintal. Nevertheless, if the market price of wheat amplifies to say rs. 1500 per quintal, it would be beneficial for the farmer to sell it directly in the open market at the spot price, instead of exercise his option to sell at rs. 1250 per quintal. Futures and options trading for that reason helps in hedging the price risk and also provide investment opportunity to speculators who are keen to assume risk for a possible return. In addition to this, futures trading and the ensuing discovery of price can help farmers in deciding which crops to cultivate. They can also help in building a competitive edge and enable businesses to smoothen their earnings since non- hedging of the risk would boost the volatility of their quarterly earnings. Thus futures and options markets perform essential functions that can not be ignored in modern business environment. At the same time, it is factual that too much speculative activity in vital commodities would destabilize the markets and hence, these markets are normally regulated as per the laws of the country.

Commodity Trading: Different Types of Derivatives

Trading in the commodity market involves buying or selling commodities on exchanges such as the MCX and derivative trading is a part of this market. Here, derivatives are products, which get their value from an underlying asset or other variables. Trading in derivatives can be of two types - exchange trading or over the counter. The latter is applicable to most complex types of derivatives and transactions are conducted directly between large financial institutions.

The commodity derivatives market covers various segments such as agriculture, metals, coal, crude oil, and gas to name a few. Benefits of derivatives are that they boost entrepreneurial activity, increase long-term returns and savings, and help transfer risk from conservative traders to risk takers. The different types of derivative instruments in commodity trading are:

- Forwards

These are contracts between a buyer and a seller to purchase or sell something on a later date at a price agreed upon the current date. Also known as forward commitments, they do not come with a cancellation clause

- Futures

A futures contract is defined as a financial agreement between two parties (buyer and seller) to buy or sell an asset at a future date. Futures contracts are subject to daily settlements. They have quite a few things in common with forwards contracts from which they have evolved.

- Options

Options can be categorized into two categories - call and put. In a call, the buyer has the right to buy a certain quantity of the underlying asset at a determined price on or before a particular date. Similarly, put gives the buyer the right to sell a certain quantity of the underlying asset at a determined price on or before a particular date. There is no obligation involved in either.

- Swaps

This refers to an exchange of financial instruments between two parties as per an agreed upon formula. They help to hedge risks of different kinds. Currency and interest rate swaps are commonly traded in the market

The Securities and Exchanges Board of India (SEBI), has quite a few measures in place to safeguard the rights of investors in the derivatives market as well as online commodity trading.

SWAPS COMMODITY EXCHANGES

A commodity swap helps producers manage their exposure to fluctuations in their products' prices, and although they can be risky, these swaps are important for energy, chemical and agricultural companies. The speculators who buy and sell these commodities through various types of swaps are a crucial part of the market and play a key role in pricing these commodities.

Commodities are physical assets such as precious and base metals, energy stores (natural gas or crude oil) and food (including wheat, pork bellies and cattle). These can be swapped for cash flows under what's called a commodity swap, through markets that involve two kinds of agents: end-users (hedgers) and investors (speculators).

Commodity Swap Users

Commodity producers need to manage their exposure to fluctuations in the prices for their products. They're primarily concerned with fixing prices on contracts to sell their commodities. A gold producer will want to hedge losses related to a fall in the price of gold for his current inventory, while a cattle farmer will seek to hedge his exposure to changes in the price of livestock.

End-users need to hedge the prices at which they can purchase these commodities. A university might want to lock in the price at which it purchases electricity to supply its air conditioning units for the upcoming summer months; an airline will need to lock in the price of the jet fuel it needs to purchase in order to satisfy the peak in seasonal demand for travel.

Speculators are funds or individual investors who can either buy or sell commodities by participating in the global commodities market. While many may argue that their involvement is fundamentally destabilizing, it's the liquidity they provide in normal markets that facilitates the business of the producer and of the end-user.

Why Would Speculators Look at the Commodities Markets?

Traditionally, speculators looked at the commodities market as a way to hedge against inflation and offset increased prices stemming from higher input costs.

Or, speculators can also find tremendous opportunity in commodity markets. Some analysts argue that commodity markets are more technically-driven or more likely to show a persistent trend compared to other markets like bonds or foreign exchange.

The futures markets have been the traditional vehicles for participating in the commodities markets. In fact, derivatives markets started in the commodities field.

Types of Commodity Swaps

There are two types of commodity swaps: fixed-floating and commodity-for-interest.

Fixed-floating swaps are just like the fixed-floating swaps in the interest rate swap market, but they involve commodity-based indices.

General market indices in the commodities market like the Goldman Sachs Commodities Index (GSCI) and the Commodities Research Board Index (CRB) place different weights on the various commodities, so they'll be used according to the swap agent's requirements.

Commodity-for-interest swaps are similar to the equity swap in that a total return on the commodity in question is exchanged for some money market rate (plus or minus a spread).

Valuing a Commodity Swap

In pricing a commodity swap, it's helpful to think of the swap as a strip of forward contracts, each priced at inception with zero market value (in a present value sense). Thinking of a swap as a strip of at-the-money forwards is also a useful and intuitive way of interpreting interest rate swaps or equity swaps.

A commodity swap is characterized by some idiosyncratic peculiarities that we should take into account. These include:

1. The cost of hedging
2. The institutional structure of the particular commodity market in question
3. The liquidity of the underlying commodity market

4. Seasonality and its effects on the underlying commodity market
5. The variability of the futures bid/offer spread
6. Brokerage fees
7. Credit risk, capital costs and administrative costs

Some of these factors must be extended to the pricing and hedging of interest rate swaps, currency swaps and equity swaps as well. The idiosyncratic nature of the commodity markets refers more to the often-limited number of participants in these markets (naturally begging questions of liquidity and market information), the unique factors driving these markets, the inter-relations with cognate markets and the individual participants in these markets.

MULTI COMMODITY EXCHANGE

Multi Commodity Exchange (Full Form of MCX) as the name suggests is an exchange like BSE and NSE where commodities are traded. It is a platform for commodity traders that facilitate online trading, settlement and clearing of commodity futures transactions, thereby providing a platform for risk management (hedging). It was established in November 2003 under the regulatory framework of FMC. In 2016, the FMC was merged with SEBI and MCX as an exchange falls under the regulatory purview of SEBI.

Which commodities are traded on MCX?

Following types of commodities are traded on MCX

- Bullion
 - Gold
 - Gold Mini
 - Gold Guinea
 - Gold Petal
 - Gold Petal (New Delhi)
 - Gold Global
 - Silver
 - Silver Mini
 - Silver Micro
 - Silver 1000
- Base Metals
 - Aluminium
 - Aluminium Mini
 - Copper
 - Copper Mini
 - Lead
 - Lead Mini
 - Nickel
 - Nickel Mini
 - Zinc
 - Zinc Mini
- Energy

- Crude Oil
- Crude Oil Mini
- Brent Crude Oil
- Natural Gas
- Agro Commodities
 - Cardamom
 - Cotton
 - Crude Palm Oil
 - Kapas
 - Mentha Oil

As one can see the products chosen are essentially meant to be hedging instruments for the dealers in those commodities.

Market Operations:

Trading and Surveillance: A member of MCX performs trading operation using Trading Work Station, a platform for placing and executing orders

Clearing and Settlement: Activities pertaining to delivery, fund settlements, margins is monitored by an in-house clearing house.

Delivery: Delivery & Settlement of commodities traded are monitored and performed by Delivery Department. The department is a facilitator for delivery related documentation.

Warehousing and Logistics: This division caters to exchange members and their constituents with respect to their needs to store goods and give delivery through exchange platform

Determination of Spot Prices on MCX

Prices are captured at identified basis centres by getting price quotes from various participants in the market and the overall value chain representing various levels viz. farmer, grader, miller, auctioneer, importers, traders etc, and then the prices are circulated after eliminating the outliers. This spot price is used for the settlement of derivative contracts on the MCX at the expiry of the contract.

NATIONAL COMMODITY DERIVATIVE EXCHANGE ROLE

the NMCE merged with the Indian Commodity Exchange, (ICEX) in 2017.^[1]

The combined exchange is India's third-largest commodities market offering contracts on oils and oil seeds, coffee, rubber and spices, ranked behind the Multi-Commodity Exchange (MCX) and the National Commodity & Derivatives Exchange (NCDEX).

The National Multi Commodity Exchange of India Ltd. (NMCE) was launched on November 26, 2002 as India's first online, demutualized commodity exchange by a group of Indian commodity-based corporations and public agencies, and listed its first contracts on 24 commodities in November 2002.^{[2][3]}

As of July 2016, the NMCE listed futures contracts on a total of 13 different commodities, ranging from oils and oil seeds, to rubber, sacking, raw jute, coffee, Isabgul seed, chana, pepper and cardamom.

India's commodities market space received a fourth exchange competitor named the Indian Commodity Exchange (ICEX) in 2009 but it closed in 2014.^[4]

NMCE and ICEX agreed to merge in July 2017 and were to close the deal by December 2017. The merger was forged in part by an Indian regulatory requirement that the exchange meet a Rs 100-core minimum net worth for commodity exchanges. At the time of the merger, the NMCE's net worth was Rs 76 core, while ICEX's net worth was Rs 100 core. ICEX was given regulatory approval in July 2017 to restart its operations

Objectives of NMCE

National Multi-Commodity Exchange of India Limited is providing world class services of on-line screen based Futures Trading of permitted commodities and efficient Clearing and guaranteed settlement, while complying with Statutory / Regulatory requirements. It shall strive to ensure continual improvement of customer services and remain quality leader amongst all commodity exchanges.

- Improving efficiency of marketing through on-line trading in Dematerialization form.
- Minimization of settlement risks.
- Improving efficiency of operations by providing best infrastructure and latest technology.
- Rationalizing the transaction fees to optimum level.
- Implementing best quality standards of warehousing, grading and testing in tune with trade practices.
- Improving facilities for structured finance.
- Improving quality of services rendered by suppliers.
- Promoting awareness about on-line features trading services of NMCE across the length and breadth of the country.

Promoters of NMCE

1. PNB
2. CWC
3. NAFED
4. NIAM
5. GAIICL
6. GSAMB

Unit-V

SWAPS

A **swap** is a derivative contract where two parties exchange financial instruments.^[1] Most swaps are derivatives in which two counter parties exchange cash flows of one party's financial instrument for those of the other party's financial instrument. The benefits in question depend on the type of financial instruments involved. For example, in the case of a swap involving two bonds, the benefits in question can be the periodic interest (coupon) payments associated with such bonds. Specifically, two counterparties agree to exchange one stream of cash flows against another stream. These streams are called the *legs* of the swap. The swap agreement defines the dates when the cash flows are to be paid and the way they are accrued and calculated. Usually at the time when the contract is initiated, at least one of these series of cash flows is determined by an uncertain variable such as a floating interest rate, foreign exchange rate, equity price, or commodity price.^[2]

The cash flows are calculated over a notional principal amount. Contrary to a future, a forward or an option, the notional amount is usually not exchanged between counterparties. Consequently, swaps can be in cash or collateral.

Swaps can be used to hedge certain risks such as interest rate risk, or to speculate on changes in the expected direction of underlying prices.

Swaps were first introduced to the public in 1981 when IBM and the World Bank entered into a swap agreement.^[4] Today, swaps are among the most heavily traded financial contracts in the world: the total amount of interest rates and currency swaps outstanding is more than \$348 trillion in 2010, according to Bank for International Settlements (BIS).^[citation needed]

Most swaps are traded over-the-counter (OTC), "tailor-made" for the counterparties. Some types of swaps are also exchanged on futures markets such as the Chicago Mercantile Exchange, the largest U.S. futures market, the Chicago Board Options Exchange, Intercontinental Exchange and Frankfurt-based Eurex AG.

Meaning of Swap:

A swap in simple terms can be explained as a transaction to exchange one thing for another or 'barter'. In financial markets the two parties to a swap transaction contract to exchange cash flows. A swap is a custom tailored bilateral agreement in which cash flows are determined by applying a prearranged formula on a notional principal.

Types of Swap:

Swaps are generally of the following types:

1. Interest Rate Swap:

Where cash flows at a fixed rate of interest are exchanged for those referenced to a floating rate. An interest rate swap is a contractual agreement to exchange a series of cash flows. One leg of cash flow is based on a fixed interest rate and the other leg is based on a floating interest rate over a period of time.

There is no exchange of principal. The size of the swap is referred to as the notional amount and is the basis for calculating the cash flows.

Example of such swaps in the Indian market are:

Overnight Index Swaps (OIS) – Fixed v/s NSE Overnight MIBOR Index

Mumbai Inter-bank Forward Offer Rate (MIFOR) Swap – Fixed V/s Implied INR yield derived from the USD/INR premium and the relevant USD Libor for that tenor, usually 6 months.

INBMK Swap – Fixed v/s 1 year INBMK rate

The 1 year INBMK rate is derived from the rate on the benchmark Indian Government of India securities.

Pricing an Interest Rate Swap:

An interest rate swap is simply an exchange of a fixed rate payment for a floating rate payment or vice versa. Hence the first step in pricing an IRS consists in finding the present values of the cash flows of these two payment. The net present value of the cash flows of these two payment should be equal to start with.

It is easy to compute the present value of the fixed rate leg as risk free zero rates for various maturities are easily available from, say, government securities yield curve. It is not so easy to compute the present value of floating leg payments as one does not know what the rates are likely to be in future.

Hence using the zero rates, an implied forward yield curve is developed and these rates are used to discount the floating leg payments. The present values of fixed and floating legs thus obtained are equated and the rate that makes them equal is computed. This rate will be base rate for pricing the swap on which mark up may be made to offer it to the market.

(The Yield to Maturity or YTM has a drawback in that it assumes that future cash flows will be invested at the same rate “y” – the YTM itself, which is a wrong assumption for no one knows what the interest rates are likely to be in future).

If we are able to eliminate the intermediary cash flows by some means, then there will be no reinvestment risk and hence the assumption of same rate for future periods can also be done away with.

Types of Interest Rate Swaps:

1. A Plain Vanilla Swap:

This is the simplest form of Interest rate swaps where a fixed rate is exchanged for a floating rate or vice versa on a given notional principal at pre-agreed intervals during the life of the contract.

2. A Basis Swap:

In a floating to floating swap, it is possible to exchange the floating rates based on different benchmark rates. For example, we may agree to exchange 3m Mibor for 91 days T Bills rate. Such a swap is called a Basis Swap.

3. An Amortising swap:

As the name suggests, swaps that provide for reduction in notional principal amount corresponding to the amortisation of a loan, are called amortising swaps.

4. Step-up Swap:

This is the opposite of an amortising swap. In this variety the notional principal increases as per a pre- agreed schedule.

5. Extendable Swap:

When one of the counter parties has the right to extend the maturity of the swap beyond its original life, the swap is said to be an extendable swap.

6. Delayed Start Swaps/Deferred Swaps/ Forward Swaps:

When it is agreed between the counter parties that the swap will come into effect on a future date, it is termed as a delayed start swap or deferred swap or a forward swap.

7. Differential Swaps:

Interest rate swaps which are structured in such a way that one leg of the swap provides for payment of interest at a rate pertaining to a currency other than the currency of the underlying principal amount. The other leg provides for payment of interest at the rate and currency of the underlying principal.

For example, a corporate can choose to enter into a differential swap by which it could bind itself to pay 3m USD Libor on a principal of Rs. 100 crores and receive 12% fixed in the Indian currency. The interest on both the legs will be computed on the notional principal of Rs. 100 crores. The swap is thus a combination of currency and plain interest rate swaps. There is no currency risk in this arrangement.

Salient Features of RBI Guidelines on IRS:

1. Scheduled commercial banks (excluding Regional Rural Banks), Primary Dealers and all India Financial Institutions are free to undertake IRS as a product for their own balance sheet management for market making.
2. They may also offer these products to corporate for hedging their own balance sheet exposures.

3. Participants should ensure adequate infrastructure and risk management systems before venturing into market making activities.
4. The Bench Mark rate should necessarily evolve on its own in the market and require market acceptance.
5. The parties are free to use any domestic money or debt market rate as benchmark rate provided the methodology of computing the rate is objective, transparent and mutually acceptable.
6. There is no restriction on the minimum or maximum size of notional principal amounts. Size norms are to emerge in the market with the development of the market.
7. There is no restriction on the tenor as well.
8. Banks, Financial Institutions and Primary Dealers are required to maintain capital for FRAs and IRS.
9. Transactions for hedging and market making purposes should be recorded separately. Positions on account of market making activities should be marked to market at least at fortnightly intervals. Transactions entered into for hedging purposes should be accounted for on accrual basis.
10. Participants could consider using ISDA standard documentation with suitable modifications for transactions in FRAs and IRS.
11. Participants are required to report their operations in FRAs and IRS on a fortnightly basis to Monetary Policy Department of RBI.
12. Capital adequacy for banks and financial institutions for undertaking FRAs and IRS transactions shall be calculated.

The notional principal will be multiplied by a conversion factor as per the table below:

For original maturities less than a year 0.5%

For original maturities one year and less than two years 1.00%

For each additional year 1.00%

The product thus obtained shall be assigned risk weightage at 20% for banks and financial institutions and at 100% for others (except governments).

On the resultant sum, the required capital adequacy of 9% will have to be maintained.

Salient Points:

1. An interest rate swap is a series of FRAs.

2. The notional principal is not normally exchanged between the counterparties in an FRA and IRS.

3. An Interest Rate Swap is a contract between two parties whereby they agree to exchange a stream of interest payments on a notional principal for a given period at pre-agreed intervals of time.

4. Buying an IRS means choosing to pay Fixed and receive Floating.

5. Prices of IRS are quoted in terms of the fixed leg.

6. Pricing of IRS is based on the present value of fixed rate cash flows and floating rate cash flows.

2. *Currency Swap:*

Where cash flows in one currency are exchanged for cash flows in another currency. A currency swap is contractually similar to an interest rate swap.

The main differences are:

- i. Each interest rate is in a different currency,
- ii. The notional amount is now replaced by two principal amounts – one in each currency, and
- iii. These principal amounts are typically exchanged at the start of the swap and then re-exchanged at maturity.

The major difference between a generic interest rate swap (IRS) and a generic currency swap is that the latter includes not only the exchange of interest rate payments but also the exchange of principal amounts both initially and on termination. Since the payments made by both parties are in different currencies, the payments need not be netted.

The different kinds of currency swaps are as follows:

- i. Principal + Interest Swap – Covers both Principal and Coupon flows,
- ii. Principal Only Swap (POS) – Covers only Principal amount, and
- iii. Coupon (Interest) Only Swap – Covers only Coupon flows.

3. *Basis Swaps:*

Where cash flows on both the legs of the swap are referenced to different floating rates A Basis swap could be an Interest Rate Swap or a currency swap where both legs are based on a floating rate.

A basis swap involves a regular exchange of cash flows, both of which are based on floating interest rates. Most swaps are based on payment of a fixed rate against a floating rate, say, LIBOR. In the basis swap both legs are calculated on floating rates.

For example:

1. 6 months USD LIBOR against 3 months USD LIBOR.
2. 6 month JPY LIBOR against 6 month USD LIBOR.
3. 6 month MIFOR against 6 Month USD LIBOR.

A Basis Swap is most commonly used when:

1. Liabilities are tied to one floating rate index and,
2. Financial assets are tied to another floating index, and
3. This mismatch can be hedged via a basis swap.

Uses of Swap:

1. To create either synthetic fixed or floating rate liabilities or assets,
2. To hedge against adverse movements,
3. As an asset liability management tool,
4. To reduce the funding cost by exploiting the comparative advantage that each counterparty has in the fixed/floating rate markets, and
5. For trading.

In the Indian market Banks are allowed to run a book on swaps which have an Indian Rupee leg. Banks can offer swaps, which do not have an Indian Rupee leg, to their customers but have to cover these with an overseas bank on a back-to-back basis.

Currency Swap Definition

A currency swap is an agreement between two parties to exchange the cash flows of one party's loan for the other of a different currency denomination. They allow companies to exploit the global capital markets more efficiently because they are an integral arbitrage link between the interest rates of different developed countries.

The Exchange of Principal at Inception and at Maturity

An interest rate swap involves the exchange of cash flows related to the interest payments on the designated notional amount. There is no exchange of notional at the inception of the contract, so the notional amount is the same for both sides of the currency and it's delineated in the same currency. Principal exchange is redundant.

In the case of a currency swap, however, principal exchange is not redundant due to the differences in currency. The exchange of principal on the notional amounts is done at market rates, often using the same rate for the transfer at inception as is employed at maturity.

Take the example of a U.S.-based company we'll call Acme Tool & Die. Acme has raised money by issuing a Swiss Franc-denominated Eurobond with fixed semi-annual coupon payments of 6% on 100 million Swiss Francs. Up front, the company receives 100 million Swiss Francs from the proceeds of the Eurobond issue (ignoring any transaction or other fees) and is able to use the Swiss Francs to fund its U.S. operations.

Because this issue is funding U.S.-based operations, two things are going to have to happen: Acme is going to have to convert the 100 million Swiss Francs into U.S. dollars, and it would prefer to pay its liability for the coupon payments in U.S. dollars every six months.

The company can convert this Swiss Franc-denominated debt into a U.S. dollar-like debt by entering into a currency swap with the First London Bank.

It agrees to exchange the 100 million Swiss Francs at inception into U.S. dollars, as well as receiving the Swiss Franc coupon payments on the same dates as the coupon payments are due to Acme's Eurobond investors and pay U.S. dollar coupon payments tied to a pre-set index and re-exchange the U.S. dollar notional into Swiss Francs at maturity.

Acme's U.S. operations generate U.S. dollar cash flows that pay the U.S.-dollar index payments. In that way, the currency swap is used to hedge or lock-in the value-added of issuing Eurobonds, which is why these kinds of swaps are often negotiated as part of the whole issuance package with the main issuing financial institution.

Flexibility

Unlike interest rate swaps, which allow companies to focus on their comparative advantage in borrowing in a single currency in the short end of the maturity spectrum, currency swaps give companies extra flexibility to exploit their comparative advantage in their respective borrowing markets.

They also provide a chance to exploit advantages across a network of currencies and maturities.

The success of the currency swap market and the success of the Eurobond market are explicitly linked.

Exposure

Currency swaps generate a larger credit exposure than interest rate swaps because of the exchange and re-exchange of notional principal amounts.

Companies have to come up with the funds to deliver the notional at the end of the contract, and are obliged to exchange one currency's notional against the other at a fixed rate.

The more actual market rates have deviated from this contracted rate, the greater the potential loss or gain.

This potential exposure is magnified as volatility increases with time. The longer the contract, the more room for the currency to move to one side or the other of the agreed upon contracted rate of principal exchange.

This explains why currency swaps tie up greater credit lines than regular interest rate swaps.

Pricing

Currency swaps are priced or valued in the same way as interest rate swaps – using a discounted cash flow analysis having obtained the zero coupon version of the swap curves.

Generally, a currency swap transacts at inception with no net value. Over the life of the instrument, the currency swap can go “in-the-money,” “out-of-the-money” or it can stay “at-the-money.”

COMMODITY SWAP

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2. The institutional structure of the particular commodity market in question
3. The liquidity of the underlying commodity market
4. Seasonality and its effects on the underlying commodity market
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6. Brokerage fees
7. Credit risk, capital costs and administrative costs

Some of these factors must be extended to the pricing and hedging of interest rate swaps, currency swaps and equity swaps as well. The idiosyncratic nature of the commodity markets refers more to the often-limited number of participants in these markets (naturally begging questions of liquidity and market information), the unique factors driving these markets, the inter-relations with cognate markets and the individual participants in these markets.

CURRENCY SWAPS

Currency swaps are an essential financial instrument utilized by banks, multinational corporations and institutional investors. Although these type of swaps function in a similar fashion to interest rate swaps and equity swaps, there are some major fundamental qualities that make currency swaps unique and thus slightly more complicated. (Learn how these derivatives work and how companies can benefit from them

A currency swap involves two parties that exchange a notional principal with one another in order to gain exposure to a desired currency. Following the initial notional exchange, periodic cash flows are exchanged in the appropriate currency.

Purpose of Currency Swaps

An American multinational company (Company A) may wish to expand its operations into Brazil. Simultaneously, a Brazilian company (Company B) is seeking entrance into the U.S. market. Financial problems that Company A will typically face stem from Brazilian banks' unwillingness to extend loans to international corporations. Therefore, in order to take out a loan in Brazil, Company A might be subject to a high interest rate of 10%. Likewise, Company B will not be able to attain a loan with a favorable interest rate in the U.S. market. The Brazilian Company may only be able to obtain credit at 9%.

While the cost of borrowing in the international market is unreasonably high, both of these companies have a competitive advantage for taking out loans from their domestic banks. Company A could hypothetically take out a loan from an American bank at 4% and

Company B can borrow from its local institutions at 5%. The reason for this discrepancy in lending rates is due to the partnerships and ongoing relations that domestic companies usually have with their local lending authorities. (This emerging market is making strides in regulation and disclosure. See *Investing In China*.)

Setting Up the Currency Swap

Based on the companies' competitive advantages of borrowing in their domestic markets, Company A will borrow the funds that Company B needs from an American bank while Company B borrows the funds that Company A will need through a Brazilian Bank. Both companies have effectively taken out a loan for the other company. The loans are then swapped. Assuming that the exchange rate between Brazil (BRL) and the U.S (USD) is 1.60BRL/1.00 USD and that both Companies require the same equivalent amount of funding, the Brazilian company receives \$100 million from its American counterpart in exchange for 160 million real; these notional amounts are swapped.

Company A now holds the funds it required in real while Company B is in possession of USD. However, both companies have to pay interest on the loans to their respective domestic banks in the original borrowed currency. Basically, although Company B swapped BRL for USD, it still must satisfy its obligation to the Brazilian bank in real. Company A faces a similar situation with its domestic bank. As a result, both companies will incur interest payments equivalent to the other party's cost of borrowing. This last point forms the basis of the advantages that a currency swap provides. (Learn which tools you need to manage the risk that comes with changing rates, check out *Managing Interest Rate Risk*.)

Advantages of the Currency Swap

Rather than borrowing real at 10% Company A will have to satisfy the 5% interest rate payments incurred by Company B under its agreement with the Brazilian banks. Company A has effectively managed to replace a 10% loan with a 5% loan. Similarly, Company B no longer has to borrow funds from American institutions at 9%, but realizes the 4% borrowing cost incurred by its swap counterparty. Under this scenario, Company B actually managed to reduce its cost of debt by more than half. Instead of borrowing from international banks, both companies borrow domestically and lend to one another at the lower rate. The diagram below depicts the general characteristics of the currency swap.

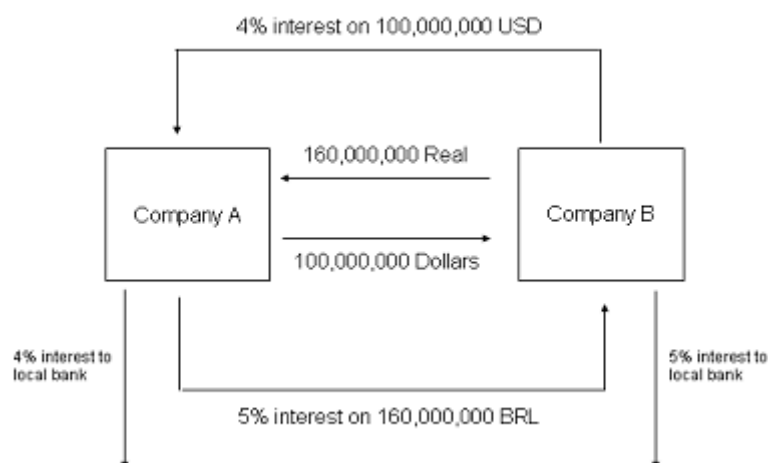


Figure 1: Characteristics of a Currency Swap

For simplicity, the aforementioned example excludes the role of a swap dealer, which serves as the intermediary for the currency swap transaction. With the presence of the dealer, the realized interest rate might be increased slightly as a form of commission to the intermediary. Typically, the spreads on currency swaps are fairly low and, depending on the notional principals and type of clients, may be in the vicinity of 10 basis points. Therefore, the actual borrowing rate for Companies A and B is 5.1% and 4.1%, which is still superior to the offered international rates.

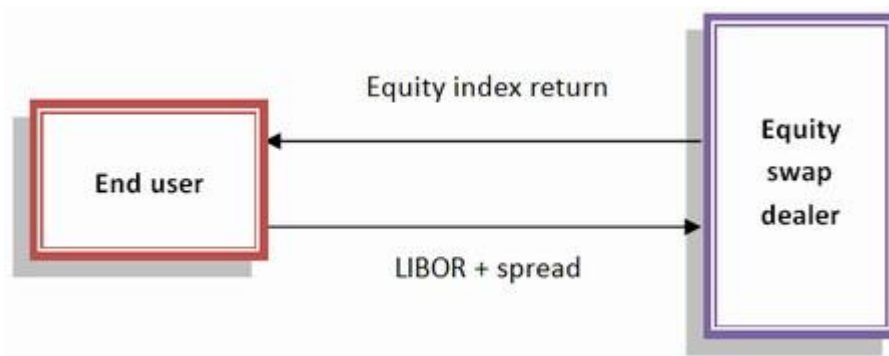
Currency Swap Basics

There are a few basic considerations that differentiate plain vanilla currency swaps from other types of swaps. In contrast to plain vanilla interest rate swaps and return based swaps, currency based instruments include an immediate and terminal exchange of notional principal. In the above example, the US\$100 million and 160 million reals are exchanged at initiation of the contract. At termination, the notional principals are returned to the appropriate party. Company A would have to return the notional principal in reals back to Company B, and vice versa. The terminal exchange, however, exposes both companies to foreign exchange risk as the exchange rate will likely not remain stable at original 1.60BRL/1.00USD level.

Additionally, most swaps involve a net payment. In a total return swap, for example, the return on an index can be swapped for the return on a particular stock. Every settlement date, the return of one party is netted against the return of the other and only one payment is made. Contrastingly, because the periodic payments associated with currency swaps are not denominated in the same currency, payments are not netted. Every settlement period, both parties are obligated to make payments to the counterparty.

EQUITY INDEX SWAPS

An equity swap where one party periodically pays a fixed amount and receives an amount based on the performance of a basket of shares or a stock index. In other words, this swap involves the payment of periodic cash flows based on the change (positive or negative) in the value of an equity index in return for a fixed or a floating rate of interest applied to the notional principal.



MANAGING INTEREST RATE WITH SWAP

This swap can be structured in a way that the notional amount remains constant over the life of the swap or varies according to the changing level of the underlying index.

Interest rate swaps and other hedging strategies have long provided a way for parties to help manage the potential impact on their loan portfolios of changes occurring in the interest rate environment. A standard interest rate swap is a contract between two parties to exchange a stream of cash flows according to pre-set terms. In essence, the transaction involves trading costs associated with two different types of loans—typically swapping the terms of a floating rate loan for those of a fixed rate loan or vice versa.

Borrowers may have specific objectives when choosing to participate in an interest rate swap or related hedging strategy. For example, the goal may be to reduce interest expense on a particular loan by swapping a higher fixed rate for a lower floating rate. Alternatively, a borrower may wish to hedge existing interest rate risk related to the potential that rates will move higher in the future. This is accomplished by swapping the terms of an existing variable rate loan for those of a fixed rate loan that will lock in the interest rate on a loan for the loan duration.

An important distinction of an interest rate swap compared to other types of financial transactions is that principal is never exchanged. The swap represents an agreement to exchange interest cash flows over time. Interest rate swaps are completely customizable with flexible terms. The contract is legally separate from the hedged item, and no upfront premium is required to execute a swap.

This paper provides an overview of the workings of interest rate swaps and related strategies that individuals or entities may want to consider to help manage interest rate risk. This includes a discussion of how the interest rate environment may affect any decisions made about swaps or related hedging strategies.

Fundamental interest rate considerations

Interest rate swaps typically involve trading of a variable rate loan structure for one with a fixed rate or vice versa. Before considering the viability of pursuing an interest rate swap, it is important to understand some underlying fundamentals about loans and how they may influence a swap strategy.

Loans can typically be structured either with a floating rate or a fixed interest rate. Each comes with its own advantages and disadvantages.

Type of Loan	Potential Advantages	Potential Disadvantages
Floating Rate Loan	<ul style="list-style-type: none"> • Applicable interest rate tends to be the lowest available at the time the loan is initiated. • If interest rates trend lower, interest expense can be reduced. 	<ul style="list-style-type: none"> • When interest rates trend higher, loans become more expensive. • Borrower carries the interest rate risk.
Fixed Rate Loan	<ul style="list-style-type: none"> • Risk of changes in interest rate market are removed. • Takes advantage of a favorable rate environment to lock-in long-term interest stability on a loan. 	<ul style="list-style-type: none"> • More expensive form of a loan at the time it is initiated compared to a floating-rate loan. • Pre-payment penalty may be required if loan is paid off early.

These are factors that need to be considered not only when first obtaining a loan, but also when considering whether to swap a loan for one with different terms.

Another consideration is the current state of the interest rate market. While the future direction of interest rates is not predictable, historical trends can provide some guidance on potential future trends. This may impact a hedging strategy.

Why consider an interest rate swap?

There are a variety of reasons that an interest rate swap might be considered:

- To lock in a fixed interest rate, taking advantage of a favorable environment and removing interest rate risk as a consideration.
- To reduce current interest expense by swapping for a floating rate that is lower than the fixed rate currently being paid without having to refinance a loan and pay the associated costs.
- To more effectively match interest rate sensitive assets and liabilities.
- To better diversify financial risks in a loan portfolio by converting a loan portfolio from all fixed or all variable to a mix of the two.
- To change the interest rate composition of a current loan without facing the expense associated with refunding or issuing new debt.

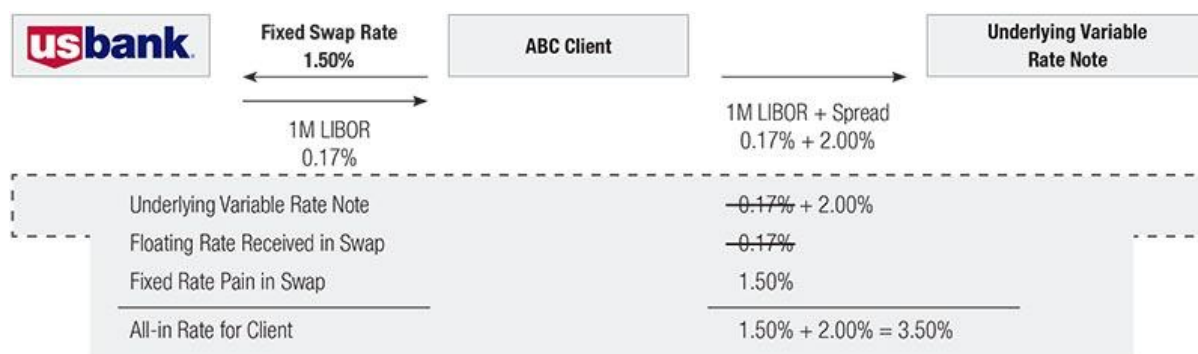
Mechanics of an interest rate swap

An interest rate swap represents a derivative product. When two parties agree to an interest rate swap, they are trading interest rate arrangements. In a typical case, a borrower that currently carries a loan with a variable interest rate arranges with a counterparty (such as U.S. Bank) to swap loan terms, exchanging the variable rate for a fixed rate. The borrower will pay a fixed rate plus any spread that is applied to the proxy used to determine the variable rate. In return, the counterparty provides payment of the lending rate (not including any spread), so that portion of interest is, in essence, canceled out for the borrower.

The exchange includes only interest cash flows over time, with no principal involved. Each party is simply swapping its existing obligation for the desired obligation. The fixed rate is based on an average of expected future floating rates.

Here is a simple example of how an interest rate swap arrangement works

A family business borrowed \$5 million dollars using a variable rate loan and is now interested in locking in a fixed rate. Its variable rate loan is priced at 2.17 percent (the current LIBOR¹ rate of 0.17 percent + a 2 percent spread). It comes to an agreement to pay an additional 1.5 percent to lock in a fixed rate. In effect, the business agrees to pay interest on its loan at a rate of 3.5 percent (the 2 percent spread plus 1.5 percent premium for to fix the interest rate). The variable rate loan minus the spread (currently at 0.17 percent but subject to change) becomes the responsibility of the counterparty, generally a financial institution. The borrower is no longer at risk for changes in the variable rate loan. There is no exchange of principal amounts.



Other terms that drive the mechanics of the transaction include:

- The notional amount of the principal (not the principal itself)
- The effective date, termination date and payment dates of the loan

Additional hedging strategies for borrowers

A straightforward swap of one interest rate for another is only one strategy that can be pursued. Depending on circumstances, other approaches may be more appropriate. Here are examples of different strategies that can be considered:

Partial Hedge (Blended Rate strategy)

This allows a borrower to use a combination of fixed rate and variable rate loans in order to manage interest rate risk. For example, consider an individual or entity that needs to borrow

\$10 million dollars. The borrower can lock in a fixed rate and limit the interest rate risk, or use a variable rate as a way to save interest expense provided that rates don't rise significantly.

Another option is to use a mixed approach, hedging variable rates by locking in a fixed rate for a portion of the loan. For example, an interest rate swap could be executed for \$6 million of the loan using an interest rate swap while the remaining \$4 million is placed in a variable rate loan. This allows the borrower to experience a blended rate that is lower than the fixed rate, reducing interest expense for the period of the loan. If at some point the borrower chooses to swap the variable portion of the loan, this can be done with less cost than would be the case if the entire loan were based on a variable rate. Depending on the interest rate environment, the borrower may realize significant savings by using this blended strategy.

Blend and extend strategy

An offshoot of the blended rate strategy is to consider refinancing a fixed rate loan before the term of that loan matures. Terms of commercial loans are often for a limited number of years. At the time the loan matures, the borrower has to either refinance or pay off the loan balance. If the interest rate environment is favorable before the loan matures but the risk of higher rates by the time the term ends is high, it may be beneficial to refinance the loan prior to maturity of the term. Even if a swap prepayment penalty is due by refinancing early, the penalty could be blended into the new rate. This could generate important savings by eliminating the risk of paying higher interest expenses in the future and the need to pay an upfront fee.

Interest rate cap strategy

Borrowers who are interested in taking advantage of low rates sometimes hesitate to seek a loan due to the risk that rates will rise down the road. Interest expense may be the difference in determining whether an investment that must be financed will ultimately be profitable for the borrower. To help eliminate interest rate uncertainty, using a variable rate structure, terms can be arranged (for an additional premium) that allow for the borrower to set a maximum interest rate (ceiling). The applicable interest rate, which will fluctuate, is capped. Even if rates exceed the ceiling, the borrower would not pay interest charges higher than the ceiling. This can eliminate the potential of higher interest expense in the future while still retaining the possibility for lower interest expense when interest rates remain low.

Forward Rate Lock

Using this strategy, a borrower can arrange a series of loans over a number of years and lock in a pre-determined interest rate. The rate will be higher than the current market rate, but it may be an appropriate way to hedge against a significant increase in rates occurring down the road.

Assessing the interest rate environment

Any swap or hedging strategy needs to take into account the outlook for interest rates. At the same time, it is important to note that interest rate trends are inherently unpredictable. Historic trends show that rates can rise or fall quickly in certain environments. When such dramatic changes occur, borrowers can be caught by surprise. Hedging positions to prepare for potential changes in interest rates can be an effective strategy. Borrowers need to consider the current state of the interest rate environment as they determine a suitable strategy for their loan portfolio.

In recent years, interest rates have hovered near historically low levels. This has created favorable conditions for borrowers regardless of whether they chose fixed rate or variable rate loans. The extended period of low rates made variable rate borrowing particularly attractive. This environment will likely not continue indefinitely. One lesson from the past is that a dramatic rise in interest rates can occur over a short period of time. There are numerous examples. Between December 1976 and December 1978, the Fed Funds² effective rate rose from 4.17 percent to 10.84 percent. The Fed Funds rate stood below 8 percent in June 1980 and by the end of that year had risen to 20.89 percent. From June to December, 1985, the Fed Funds rate jumped from 7.95 percent to 13.46 percent. More recently, from June 2004 to September 2006, the rate increased from 0.94 percent to 5.27 percent. All provide examples that interest rate spikes can happen in short order, and often without much notice.

Change in Fed funds rate

In this current low interest rate environment, borrowers who have been increasingly dependent on variable rate loans may want to consider swapping for a fixed rate loan to help manage interest rate risk. This is one way to secure still low interest rates.

In circumstances when interest rates are at higher levels, borrowers may want to consider swapping their fixed rate loans at higher rates for variable rate loans, seeking to take advantage of the potential for an improving interest rate environment. Keep in mind, however, that future interest rate trends are difficult to predict.

Suitability for interest rate swaps and hedging strategies

Changes in suitability requirements have been implemented for interest rate swaps as part of the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010, for example, net worth requirements must be met in order to participate in the type of transactions discussed in this paper. A financial professional can provide more details about suitability requirements to participate in interest rate swaps or related strategies.

Risks associated with derivatives transactions

It is important to be aware of risks that are inherent in any transactions related to interest rate swaps and related hedging strategies. These include:

- **Opportunity Costs** – locking in a fixed rate may result in higher interest expense than the average of the floating rate over the same period.
- **Potential Mark-to-Market (Make-Whole)** – if the swap is unwound prior to maturity and interest rates have declined, the borrower may be subject to a termination cost.
- **Liquidity & Credit Pricing Risk** – the derivative contract is separate and distinct from the underlying loan. It does not create any commitment to lend or act as a source of funding. It represents a hedge of changes in a variable rate index only, not a hedge of the actual credit pricing on the underlying loan. Especially in instances where the derivative contract maturity extends beyond the loan maturity date, liquidity risk can result from a failure of the underlying financing to be extended along with the potential for changes in credit price at any renewal/amendment date.
- **Basis Risk** – it is possible that changes in the variable rate index used in the derivative contract do not perfectly mirror changes in the variable rates used to set the pricing on the underlying loan.
- **Settlement** – a risk exists that the counterparty will fail to make required payments.
- **Tax & Accounting Issues** – any person or entity entering into a derivative transaction is strongly encouraged to consult with tax, legal and accounting advisors to determine appropriate tax and accounting treatment.

CREDIT SWAPS

Definition of Credit Default Swap – CDS are a financial instrument for swapping the risk of debt default. Credit default swaps may be used for emerging market bonds, mortgage-backed securities, corporate bonds and local government bond

- The buyer of a credit default swap pays a premium for effectively insuring against a debt default. He receives a lump sum payment if the debt instrument defaults.
- The seller of a credit default swap receives monthly payments from the buyer. If the debt instrument defaults they have to pay the agreed amount to the buyer of the credit default swap.

Example of Credit Default Swap

- An investment trust owns £1 million corporate bond issued by a private housing firm.
- If there is a risk the private housing firm may default on repayments, the investment trust may buy a CDS from a hedge fund. The CDS is worth £1 million.
- The investment trust will pay interest on this credit default swap of say 3%. This could involve payments of £30,000 a year for the duration of the contract.
- If the private housing firm doesn't default. The hedge fund gains the interest from the investment bank and pays nothing out. It is simple profit.
- If the private housing firm does default, then the hedge fund has to pay compensation to the investment bank of £1 million – the value of the credit default swap.
- Therefore the hedge fund takes on a larger risk and could end up paying £1million

The higher the perceived risk of the bond, the higher the interest rate the hedge fund will require.

Why Would People Buy Credit Default Swaps?

1. Hedge against risk. Suppose an investment fund owned mortgage bonds from riskymortgage.co.uk. It might be worried about losing all its investment. Therefore, to hedge against the risk of default, they could purchase a credit default swap from Lloyds TSB. If riskymortgage.co.uk defaulted, they will lose their investment, but receive a pay-off from Lloyds to compensate. If they don't default, they have paid a premium to Lloyds but have had security.

2. Speculation e.g. risk is underpriced.

Suppose a hedge fund felt risky mortgage was very likely to default because of a rise in home repossessions. They would buy a credit default swap. If the debt defaulted, then they would make a profit from Lloyds TSB. Note you don't have to actually own debt to take a credit default swap.

The riskier a bond is the higher premium will be required from a buyer of a credit default swap. It is argued that credit default swaps provide an important role in indicating the riskiness/creditworthiness of a firm.

3. Arbitrage

If a company's financial position improves, the credit rating should also improve and therefore, the CDS spread should fall to reflect improved rating. This makes CDS more attractive to sell CDS protection. If the company position deteriorated, CDS protection would be more attractive to buy. Arbitrage could occur when dealers exploit any slowness of the market to respond to signals.

SWAP PRICING

To price a swap, we need to determine the present value of cash flows of each leg of the transaction. In an interest rate swap, the fixed leg is fairly straightforward since the cash flows are specified by the coupon rate set at the time of the agreement. Pricing the floating leg is more complex since, by definition, the cash flows change with future changes in the interest rates. The pricing both legs of the swap is examined in detail below.

Fixed Leg of a Swap

$$P_{\text{fix}} = \sum_{i=1}^n N \cdot R \cdot \alpha_{i-1,i} \cdot D_{i,T}$$

where

- P_{fix} = present value of cash flows for the fixed leg,
- N = notional principal amount,
- R = fixed coupon rate,

n = number of coupons payable between value date and maturity date,
 $\alpha_{i-1,i}$ = accrual factor between dates $i - 1$ and i based on the specified accrual method,
 and
 D_i = discount factor on cash flow date i .

Floating Leg of a swap

$$P_{flt} = \sum_{i=1}^n N \cdot F_{i-1,i} \cdot \alpha_{i-1,i} \cdot D_i,$$

and

$$F_{i-1,i} = \frac{1}{\alpha_{i-1,i}} \left(\frac{D_{i-1}}{D_i} - 1 \right),$$

where

P_{flt} = present values of cash flows for floating leg,
 N = notional principal amount,
 $F_{i-1,i}$ = (implied) forward rate from date $i - 1$ to date i ,
 $\alpha_{i-1,i}$ = accrual factor from date $i - 1$ to date i based on the specified accrual method, and
 n = number of cash flows from settlement date to the maturity date, and
 D_i = discount factor on cash flow date i .

Interest Rate Swap

A swap is a contractual agreement to exchange net cash flows for a specified pay leg and receive leg, each of which may be either fixed or floating. The present value of cash flows of the swap is the difference between the values of the two streams of cash flows. In other words,

Pay floating, receive fixed

$$P_{\text{swap}} = P_{\text{fix}} - P_{\text{flt}},$$

Pay fixed, receive floating

$$P_{\text{swap}} = P_{\text{flt}} - P_{\text{fix}}.$$

Swap Risk Statistics

Several risk statistics are calculated for interest rate swaps including modified duration, convexity, and basis point value. These swap risk statistics are based on the risk statistics for the individual legs of the swap, as described below.

For the individual fixed and floating legs of the swap, the modified duration, convexity and basis point value are calculated numerically by bumping the accruing and discounting curves. The rates in the accruing and discounting curves are bumped up by a small amount

Δ , and down by Δ . These bumped curves are then used to obtain the bumped up and bumped down fair value P_{Δ} and $P_{-\Delta}$, respectively.

Example: Vanilla Fixed for Floating Interest Rate Swap

From a counterparty's perspective, a swap can be viewed as two series of cash flows: outflows are known as the "pay leg" and inflows are known as the "receive leg". Suppose the following situation exists:

Company A	Company B
'AA' credit rating	'A' credit rating
can issue fixed debt at 7%	can issue fixed debt at 7.65%
can borrow floating at LIBOR + 10 bps	can borrow floating at LIBOR + 30 bps
believes rates will be stable or falling, wants floating	wants secure funding - fixed debt

The current swap rate is 7.2% vs. LIBOR flat. Both companies will find it advantageous to enter into the swap, as illustrated by the following diagram:



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