NSE Academy's Certification in Financial Markets (NCFM)

Equity Derivatives: A Beginner's Module

NCFM Module Examination Details

Sr. NO	Module Name	Test Duration (in minutes)	No. Of Questions	Maximum Marks	Negative Marking	Pass marks	Allowable access to Candidate at Test Centre			
							Open Office Spread Sheet	Normal Distribution Table	Regular / Scientific Calculator	Financial Calculator
FOUNDATION										
1	Financial Markets: A Beginners' Module	120	60	100	NO	50	NO	NO	YES	NO
2	Mutual Funds : A Beginners' Module	120	60	100	NO	50	NO	NO	YES	NO
3	Currency Derivatives: A Beginner's Module	120	60	100	NO	50	NO	NO	YES	NO
4	Equity Derivatives: A Beginner's Module	120	60	100	NO	50	NO	NO	YES	NO
5	Interest Rate Derivatives: A Beginner's Module	120	60	100	NO	50	NO	NO	YES	NO
6	Commercial Banking in India: A Beginner's Module	120	60	100	NO	50	NO	NO	YES	NO
7	FIMMDA-NSE Debt Market (Basic) Module	120	60	100	YES	60	YES	NO	YES	NO
8	Securities Market (Basic) Module	120	60	100	YES	60	NO	NO	YES	NO
9	Clearing Settlement and Risk Management Module	60	75	100	NO	60	YES	NO	YES	NO
10	Banking Fundamental - International	90	48	48	YES	29	YES	NO	YES	NO
11	Capital Markets Fundamental - International	90	40	50	YES	30	YES	NO	YES	NO
INTERMEDIATE										
1	Capital Market (Dealers) Module	105	60	100	YES	50	NO	NO	YES	NO
2	Derivatives Market (Dealers) Module	120	60	100	YES	60	NO	NO	YES	NO
3	Investment Analysis and Portfolio Management	120	60	100	YES	60	NO	NO	YES	NO
4	Fundamental Analysis Module	120	60	100	YES	60	NO	NO	YES	NO
5	Operation Risk Management Module	120	75	100	YES	60	NO	NO	YES	NO
6	Options Trading Strategies Module	120	60	100	YES	60	NO	NO	YES	NO
7	Banking Sector Module	120	60	100	YES	60	NO	NO	YES	NO
8	Treasury Management Module	120	60	100	YES	60	YES	NO	YES	NO
9	Insurance Module	120	60	100	YES	60	NO	NO	YES	NO
10	Macroeconomics for Financial Markets Module	120	60	100	YES	60	NO	NO	YES	NO
11	NSDL–Depository Operations Module #	75	60	100	YES	60	NO	NO	YES	NO
12	Commodities Market Module	120	60	100	YES	50	NO	NO	YES	NO
13	Surveillance in Stock Exchanges Module	120	50	100	YES	60	NO	NO	YES	NO
14	Technical Analysis Module	120	60	100	YES	60	NO	NO	YES	NO
15	Mergers and Acquisitions Module	120	60	100	YES	60	NO	NO	YES	NO
16	Back Office Operations Module	120	60	100	YES	60	NO	NO	YES	NO
17	Wealth Management Module	120	60	100	YES	60	NO	NO	YES	NO
18	Project Finance Module	120	60	100	YES	60	NO	NO	YES	NO
19	Venture Capital and Private Equity Module	120	70	100	YES	60	NO	NO	YES	NO
20	Financial Services Foundation Module ###	120	45	100	YES	50	NO	NO	YES	NO
21	NSE Certified Quality Analyst $	120	60	100	YES	50	NO	NO	YES	NO
22	NSE Certified Capital Market Professional (NCCMP)	120	60	100	NO	50	NO	NO	YES	NO
23	US Securities Operation Module	90	41	50	YES	30	YES	NO	YES	NO
ADVANCED										
1	Algorithmic Trading Module	120	100	100	YES	60	YES	NO	YES	NO
2	Financial Markets (Advanced) Module	120	60	100	YES	60	YES	NO	YES	NO
3	Securities Markets (Advanced) Module	120	60	100	YES	60	YES	NO	YES	NO
4	Derivatives (Advanced) Module	120	55	100	YES	60	YES	YES	YES	NO
5	Mutual Funds (Advanced) Module	120	60	100	YES	60	YES	NO	YES	NO
6	Options Trading (Advanced) Module	120	35	100	YES	60	YES	YES	YES	YES
7	Retirement Analysis and Investment Planning	120	77	150	NO	50	YES	NO	YES	YES
8	Retirement Planning and Employee Benefits **	120	77	150	NO	50	YES	NO	YES	YES
9	Tax Planning and Estate Planning **	120	77	150	NO	50	YES	NO	YES	YES
10	Investment Planning **	120	77	150	NO	50	YES	NO	YES	YES
11	Examination 5/Advanced Financial Planning **	240	30	100	NO	50	YES	NO	YES	YES
12	Equity Research Module ##	120	49	60	YES	60	YES	NO	YES	NO
13	Financial Valuation and Modeling	120	100	100	YES	60	YES	NO	YES	YES
14	Mutual Fund and Fixed Income Securities Module	120	100	60	YES	60	YES	NO	YES	YES
15	Issue Management Module ##	120	55	70	YES	60	YES	NO	YES	NO
16	Market Risk Module ##	120	40	65	YES	60	YES	NO	YES	NO
17	Financial Modeling Module ###	120	30	100	YES	50	YES	NO	YES	NO
18	Business Analytics Module ###	120	66	100	NO	50	YES	NO	YES	NO

\# Candidates securing 80% or more marks in NSDL-Depository Operations Module ONLY will be certified as 'Trainers'.
Module of IMS Proschool
Modules of Finitiatives Learning India Pvt. Ltd. (FLIP)
** Financial Planning Standards Board India (Certified Financial Planner Certification) FPSB India Exam
$ SSA Business School

The curriculum for each of the modules (except Modules of Financial Planning Standards Board India, Finitiatives Learning India Pvt. Ltd. and IMS Proschool) is available on our website: www.nseindia.com

Preface

About NSE Academy

NSE Academy is a subsidiary of National Stock Exchange of India. NSE Academy straddles the entire spectrum of financial courses for students of standard VIII and right up to MBA professionals. NSE Academy has tied up with premium educational institutes in order to develop pool of human resources having right skills and expertise which are apt for the financial market. Guided by our mission of spreading financial literacy for all, NSE Academy has constantly innovated its education template, this has resulted in improving the financial well-being of people at large in society. Our education courses have so far facilitated more than 41.8 lakh individuals become financially smarter through various initiatives.

NSE Academy's Certification in Financial Markets (NCFM)

NCFM is an online certification program aimed at upgrading skills and building competency. The program has a widespread reach with testing centers present at more than 154+ locations across the country.

The NCFM offers certifications ranging from the Basic to Advanced.

One can register for the NCFM through:

- Online mode by creating an online login id through the link 'Education'>'Certifications' > 'Online Register / Enroll' available on the website www.nseindia.com
- Offline mode by filling up registration form available on the website www.nseindia.com > 'Education' >'Certifications' >'Register for Certification'

Once registered, a candidate is allotted a unique NCFM registration number along with an online login id and can avail of facilities like SMS alerts, online payment, checking of test schedules, online enrolment, profile update etc. through their login id.

CONTENTS

Distribution of weights in the Equity Derivatives: A

Beginner's Module Curriculum

Chapter No.	Title	Weights (%)
1	Introduction	15
2	Definitions of Basic Derivatives	15
3	Applications of Derivatives	10
4	Trading Futures	20
5	Trading Options	20
6	Derivatives Trading on Exchange	20

Note: Candidates are advised to refer to NSE's website: www.nseindia.com, click on 'NCFM' link and then go to "Announcements' link, regarding revisions/updations in NCFM modules or launch of new modules, if any.

CHAPTER 1: Introduction

1.1 Definition of Derivatives

One of the most significant events in the securities markets has been the development and expansion of financial derivatives. The term "derivatives" is used to refer to financial instruments which derive their value from some underlying assets. The underlying assets could be equities (shares), debt (bonds, T-bills, and notes), currencies, and even indices of these various assets, such as the Nifty 50 Index. Derivatives derive their names from their respective underlying asset. Thus if a derivative's underlying asset is equity, it is called equity derivative and so on. Derivatives can be traded either on a regulated exchange, such as the NSE or off the exchanges, i.e., directly between the different parties, which is called "over-the-counter" (OTC) trading. (In India only exchange traded equity derivatives are permitted under the law.) The basic purpose of derivatives is to transfer the price risk (inherent in fluctuations of the asset prices) from one party to another; they facilitate the allocation of risk to those who are willing to take it. In so doing, derivatives help mitigate the risk arising from the future uncertainty of prices. For example, on November 1, 2009 a rice farmer may wish to sell his harvest at a future date (say January 1, 2010) for a pre-determined fixed price to eliminate the risk of change in prices by that date. Such a transaction is an example of a derivatives contract. The price of this derivative is driven by the spot price of rice which is the "underlying".

1.2 Origin of derivatives

While trading in derivatives products has grown tremendously in recent times, the earliest evidence of these types of instruments can be traced back to ancient Greece. Even though derivatives have been in existence in some form or the other since ancient times, the advent of modern day derivatives contracts is attributed to farmers' need to protect themselves against a decline in crop prices due to various economic and environmental factors. Thus, derivatives contracts initially developed in commodities. The first "futures" contracts can be traced to the Yodoya rice market in Osaka, Japan around 1650. The farmers were afraid of rice prices falling in the future at the time of harvesting. To lock in a price (that is, to sell the rice at a predetermined fixed price in the future), the farmers entered into contracts with the buyers. These were evidently standardized contracts, much like today's futures contracts.

In 1848, the Chicago Board of Trade (CBOT) was established to facilitate trading of forward contracts on various commodities. From then on, futures contracts on commodities have remained more or less in the same form, as we know them today.

While the basics of derivatives are the same for all assets such as equities, bonds, currencies, and commodities, we will focus on derivatives in the equity markets and all examples that we discuss will use stocks and index (basket of stocks).

1.3 Derivatives in India

In India, derivatives markets have been functioning since the nineteenth century, with organized trading in cotton through the establishment of the Cotton Trade Association in 1875. Derivatives, as exchange traded financial instruments were introduced in India in June 2000. The National Stock Exchange (NSE) is the largest exchange in India in derivatives, trading in various derivatives contracts. The first contract to be launched on NSE was the Nifty 50 index futures contract. In a span of one and a half years after the introduction of index futures, index options, stock options and stock futures were also introduced in the derivatives segment for trading. NSE's equity derivatives segment is called the Futures & Options Segment or F&O Segment. NSE also trades in Currency and Interest Rate Futures contracts under a separate segment.

A series of reforms in the financial markets paved way for the development of exchange-traded equity derivatives markets in India. In 1993, the NSE was established as an electronic, national exchange and it started operations in 1994. It improved the efficiency and transparency of the stock markets by offering a fully automated screen-based trading system with real-time price dissemination. A report on exchange traded derivatives, by the LC. Gupta Committee, set up by the Securities and Exchange Board of India (SEBI), recommended a phased introduction of derivatives instruments with bi-level regulation (i.e., self-regulation by exchanges, with SEBI providing the overall regulatory and supervisory role). Another report, by the J.R. Varma Committee in 1998, worked out the various operational details such as margining and risk management systems for these instruments. In 1999, the Securities Contracts (Regulation) Act of 1956, or SC(R)A, was amended so that derivatives could be declared as "securities". This allowed the regulatory framework for trading securities, to be extended to derivatives. The Act considers derivatives on equities to be legal and valid, but only if they are traded on exchanges.

The Securities Contracts (Regulation) Act, 1956 defines "derivatives" to include:

1. 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.
2. A contract which derives its value from the prices, or index of prices, of underlying securities.

At present, the equity derivatives market is the most active derivatives market in India. Trading volumes in equity derivatives are, on an average, more than three and a half times the trading volumes in the cash equity markets.

Table 1.1 Milestones in the development of Indian derivative market

November 18, 1996	L.C. Gupta Committee set up to draft a policy framework for introducing derivatives
May 11, 1998	L.C. Gupta committee submits its report on the policy framework
May 25, 2000	SEBI allows exchanges to trade in index futures
June 12, 2000	Trading on Nifty futures commences on the NSE
June 4, 2001	Trading for Nifty options commences on the NSE
July 2, 2001	Trading on Stock options commences on the NSE
November 9, 2001	Trading on Stock futures commences on the NSE
August 29, 2008	Currency derivatives trading commences on the NSE
August 31, 2009	Interest rate derivatives trading commences on the NSE
February 2010	Launch of Currency Futures on additional currency pairs
October 28, 2010	Introduction of European style Stock Options
October 29, 2010	Introduction of Currency Options

1.4 Two important terms

Before discussing derivatives, it would be useful to be familiar with two terminologies relating to the underlying markets. These are as follows:

1.4.1 Spot Market

In the context of securities, the **spot market** or **cash market** is a securities market in which securities are sold for cash and delivered immediately. The delivery happens after the settlement period. Let us describe this in the context of India. The NSE's cash market segment is known as the Capital Market (CM) Segment. In this market, shares of SBI, Reliance, Infosys, ICICI Bank, and other public listed companies are traded. The settlement period in this market is on a T+2 basis i.e., the buyer of the shares receives the shares two working days after trade date and the seller of the shares receives the money two working days after the trade date.

1.4.2 Index

Stock prices fluctuate continuously during any given period. Prices of some stocks might move up while that of others may move down. In such a situation, what can we say about the stock market as a whole? Has the market moved up or has it moved down during a given period? Similarly, have stocks of a particular sector moved up or down? To identify the general trend in the market (or any given sector of the market such as banking), it is important to have a reference barometer which can be monitored. Market participants use various indices for this purpose. An index is a basket of identified stocks, and its value is computed by taking the weighted average of the prices of the constituent stocks of the index. A market index for example consists of a group of top stocks traded in the market and its value changes as the prices of its constituent stocks change. In India, Nifty Index is the most popular stock index and it is based on the top 50 stocks traded in the market. Just as derivatives on stocks are called stock derivatives, derivatives on indices such as Nifty are called index derivatives.

CHAPTER 2: Definitions of Basic Derivatives

There are various types of derivatives traded on exchanges across the world. They range from the very simple to the most complex products. The following are the three basic forms of derivatives, which are the building blocks for many complex derivatives instruments (the latter are beyond the scope of this book):

- Forwards
- Futures
- Options

Knowledge of these instruments is necessary in order to understand the basics of derivatives. We shall now discuss each of them in detail.

2.1 Forwards

A forward contract or simply a **forward** is a contract between two parties to buy or sell an asset at a certain future date for a certain price that is pre-decided on the date of the contract. The future date is referred to as expiry date and the pre-decided price is referred to as Forward Price. It may be noted that Forwards are private contracts and their terms are determined by the parties involved.

A forward is thus an agreement between two parties in which one party, the buyer, enters into an agreement with the other party, the seller that he would buy from the seller an underlying asset on the expiry date at the forward price. Therefore, it is a commitment by both the parties to engage in a transaction at a later date with the price set in advance. This is different from a spot market contract, which involves immediate payment and immediate transfer of asset.

The party that agrees to buy the asset on a future date is referred to as a long investor and is said to have a long position. Similarly the party that agrees to sell the asset in a future date is referred to as a short investor and is said to have a short position. The price agreed upon is called the delivery price or the Forward Price.

Forward contracts are traded only in Over the Counter (OTC) market and not in stock exchanges. OTC market is a private market where individuals/institutions can trade through negotiations on a one to one basis.

2.1.1 Settlement of forward contracts

When a forward contract expires, there are two alternate arrangements possible to settle the obligation of the parties: physical settlement and cash settlement. Both types of settlements happen on the expiry date and are given below.

Physical Settlement

A forward contract can be settled by the physical delivery of the underlying asset by a short investor (i.e. the seller) to the long investor (i.e. the buyer) and the payment of the agreed forward price by the buyer to the seller on the agreed settlement date. The following example will help us understand the physical settlement process.

Illustration

Consider two parties (A and B) enter into a forward contract on 1 August, 2009 where, A agrees to deliver 1000 stocks of Unitech to B, at a price of Rs. 100 per share, on 29th August, 2009 (the expiry date). In this contract, A, who has committed to sell 1000 stocks of Unitech at Rs. 100 per share on 29th August, 2009 has a short position and B, who has committed to buy 1000 stocks at Rs. 100 per share is said to have a long position.

In case of physical settlement, on 29th August, 2009 (expiry date), A has to actually deliver 1000 Unitech shares to B and B has to pay the price (1000 * Rs. 100 = Rs. 10,000) to A. In case A does not have 1000 shares to deliver on 29th August, 2009, he has to purchase it from the spot market and then deliver the stocks to B.

On the expiry date the profit/loss for each party depends on the settlement price, that is, the closing price in the spot market on 29th August, 2009. The closing price on any given day is the weighted average price of the underlying during the last half an hour of trading in that day. Depending on the closing price, three different scenarios of profit/loss are possible for each party. They are as follows:

Scenario I. Closing spot price on 29 August, 2009 (S_T) is greater than the Forward price (F_T) Assume that the closing price of Unitech on the settlement date 29 August, 2009 is Rs. 105. Since the short investor has sold Unitech at Rs. 100 in the Forward market on 1 August, 2009, he can buy 1000 Unitech shares at Rs. 105 from the market and deliver them to the long investor. Therefore the person who has a short position makes a loss of (100 - 105) X 1000 = Rs. 5000. If the long investor sells the shares in the spot market immediately after receiving them, he would make an equivalent profit of (105 - 100) X 1000 = Rs. 5000.

Scenario II. Closing Spot price on 29 August (S_T), 2009 is the same as the Forward price (F_T)

The short seller will buy the stock from the market at Rs. 100 and give it to the long investor. As the settlement price is same as the Forward price, neither party will gain or lose anything.

Scenario III. Closing Spot price (S_T) on 29 August is less than the futures price (F_T)

Assume that the closing price of Unitech on 29 August, 2009 is Rs. 95. The short investor, who has sold Unitech at Rs. 100 in the Forward market on 1 August, 2009, will buy the stock from the market at Rs. 95 and deliver it to the long investor. Therefore the person who has a short position would make a profit of (100 - 95) X 1000 = Rs. 5000 and the person who has long position in the contract will lose an equivalent amount (Rs. 5000), if he sells the shares in the spot market immediately after receiving them.

The main disadvantage of physical settlement is that it results in huge transaction costs in terms of actual purchase of securities by the party holding a short position (in this case A) and transfer of the security to the party in the long position (in this case B). Further, if the party in the long position is actually not interested in holding the security, then she will have to incur further transaction cost in disposing off the security. An alternative way of settlement, which helps in minimizing this cost, is through cash settlement.

Cash Settlement

Cash settlement does not involve actual delivery or receipt of the security. Each party either pays (receives) cash equal to the net loss (profit) arising out of their respective position in the contract. So, in case of Scenario I mentioned above, where the spot price at the expiry date (S_T) was greater than the forward price (F_T), the party with the short position will have to pay an amount equivalent to the net loss to the party at the long position. In our example, A will simply pay Rs. 5000 to B on the expiry date. The opposite is the case in Scenario (III), when $S_T < F_T$. The long party will be at a loss and have to pay an amount equivalent to the net loss to the short party. In our example, B will have to pay Rs. 5000 to A on the expiry date. In case of Scenario (II) where $S_T = F_T$, there is no need for any party to pay anything to the other party.

Please note that the profit and loss position in case of physical settlement and cash settlement is the same except for the transaction costs which is involved in the physical settlement.

2.1.2 Default risk in forward contracts

A drawback of forward contracts is that they are subject to default risk. Regardless of whether the contract is for physical or cash settlement, there exists a potential for one party to default, i.e. not honor the contract. It could be either the buyer or the seller. This results in the other party suffering a loss. This risk of making losses due to any of the two parties defaulting is known as counter party risk. The main reason behind such risk is the absence of any mediator

between the parties, who could have undertaken the task of ensuring that both the parties fulfill their obligations arising out of the contract. Default risk is also referred to as counter party risk or credit risk.

2.2 Futures

Like a forward contract, a futures contract is an agreement between two parties in which the buyer agrees to buy an underlying asset from the seller, at a future date at a price that is agreed upon today. However, unlike a forward contract, a futures contract is not a private transaction but gets traded on a recognized stock exchange. In addition, a futures contract is standardized by the exchange. All the terms, other than the price, are set by the stock exchange (rather than by individual parties as in the case of a forward contract). Also, both buyer and seller of the futures contracts are protected against the counter party risk by an entity called the Clearing Corporation. The Clearing Corporation provides this guarantee to ensure that the buyer or the seller of a futures contract does not suffer as a result of the counter party defaulting on its obligation. In case one of the parties defaults, the Clearing Corporation steps in to fulfill the obligation of this party, so that the other party does not suffer due to non-fulfillment of the contract. To be able to guarantee the fulfillment of the obligations under the contract, the Clearing Corporation holds an amount as a security from both the parties. This amount is called the Margin money and can be in the form of cash or other financial assets. Also, since the futures contracts are traded on the stock exchanges, the parties have the flexibility of closing out the contract prior to the maturity by squaring off the transactions in the market.

The basic flow of a transaction between three parties, namely Buyer, Seller and Clearing Corporation is depicted in the diagram below:

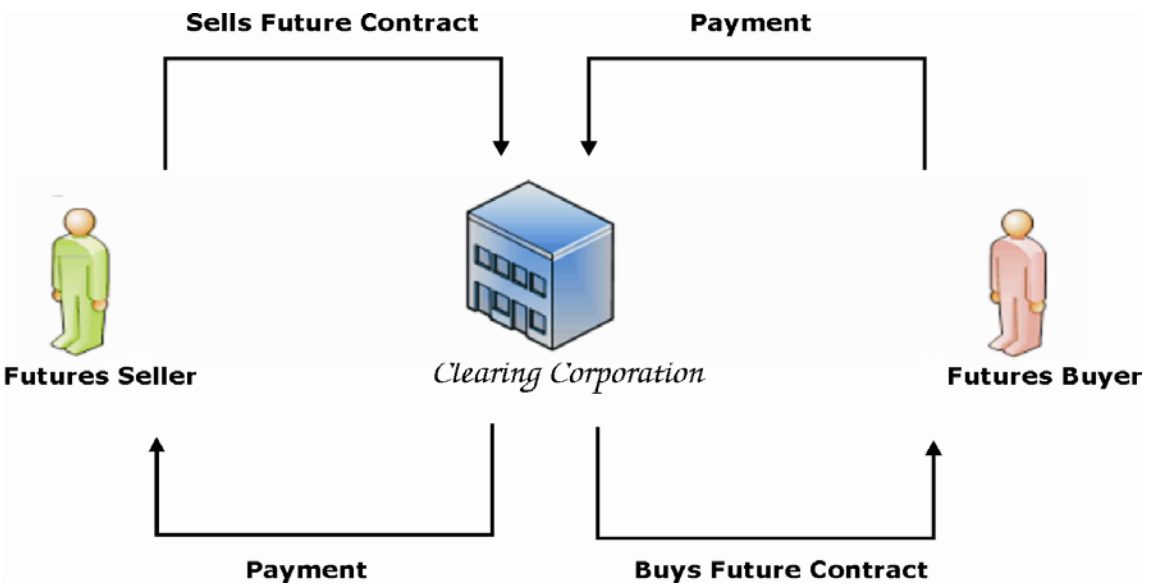


Table 2.1: Difference between forwards and futures

Forwards	**Futures**
Privately negotiated contracts	Traded on an exchange
Not standardized	Standardized contracts
Settlement dates can be set by the parties	Fixed settlement dates as declared by the exchange
High counter party risk	Almost no counter party risk

2.3 Options

Like forwards and futures, options are derivative instruments that provide the opportunity to buy or sell an underlying asset on a future date.

An **option** is a derivative contract between a buyer and a seller, where one party (say First Party) gives to the other (say Second Party) the right, but not the obligation, to buy from (or sell to) the First Party the underlying asset on or before a specific day at an agreed-upon price. In return for granting the option, the party granting the option collects a payment from the other party. This payment collected is called the "premium" or price of the option.

The right to buy or sell is held by the "option buyer" (also called the option holder); the party granting the right is the "option seller" or "option writer". Unlike forwards and futures contracts, options require a cash payment (called the premium) upfront from the option buyer to the option seller. This payment is called option premium or option price. Options can be traded either on the stock exchange or in over the counter (OTC) markets. Options traded on the exchanges are backed by the Clearing Corporation thereby minimizing the risk arising due to default by the counter parties involved. Options traded in the OTC market however are not backed by the Clearing Corporation.

There are two types of options—call options and put options—which are explained below.

2.3.1 Call option

A call option is an option granting the *right* to the buyer of the option to buy the underlying asset on a specific day at an agreed upon price, *but not the obligation* to do so. It is the seller who grants this right to the buyer of the option. It may be noted that the person who has the

right to buy the underlying asset is known as the "buyer of the call option". The price at which the buyer has the right to **buy** the asset is agreed upon at the time of entering the contract. This price is known as the strike price of the contract (call option strike price in this case). Since the buyer of the call option has the right (but no obligation) to buy the underlying asset, he will **exercise his right to buy the underlying asset if and only if the price of the underlying asset in the market is more than the strike price on or before the expiry date of the contract.** The buyer of the call option does not have an obligation to buy if he does not want to.

2.3.2 Put option

A put option is a contract granting the *right* to the buyer of the option to sell the underlying asset on or before a specific day at an agreed upon price, *but not the obligation* to do so. It is the seller who grants this right to the buyer of the option. The person who has the **right to sell** the underlying asset is known as the "buyer of the put option". The price at which the buyer has the right to **sell** the asset is agreed upon at the time of entering the contract. This price is known as the strike price of the contract (put option strike price in this case). Since the buyer of the put option has the right (but not the obligation) to sell the underlying asset, he will **exercise his right to sell the underlying asset if and only if the price of the underlying asset in the market is less than the strike price on or before the expiry date of the contract.** The buyer of the put option does not have the obligation to sell if he does not want to.

Illustration

Suppose A has "bought a call option" of 2000 shares of Hindustan Unilever Limited (HLL) at a strike price of Rs 260 per share at a premium of Rs 10. This option gives A, the buyer of the option, the right to buy 2000 shares of HLL from the seller of the option, on or before August 27, 2009 (expiry date of the option). The seller of the option has the obligation to sell 2000 shares of HLL at Rs 260 per share on or before August 27, 2009 (i.e. whenever asked by the buyer of the option).

Suppose instead of buying a call, A has "sold a put option" on 100 Reliance Industries (RIL) shares at a strike price of Rs 2000 at a premium of Rs 8. This option is an obligation to A to buy 100 shares of Reliance Industries (RIL) at a price of Rs 2000 per share on or before August 27 (expiry date of the option) i.e., as and when asked by the buyer of the put option. It depends on the option buyer as to when he exercises the option. As stated earlier, the buyer does not have the obligation to exercise the option.

Table 2.2: Differences between futures and options

Futures	Options
Both the buyer and the seller are under an obligation to fulfill the contract.	The buyer of the option has the right and not an obligation whereas the seller is under obligation to fulfill the contract if and when the buyer exercises his right.
The buyer and the seller are subject to unlimited risk of loss.	The seller is subjected to unlimited risk of losing whereas the buyer has limited potential to lose (which is the option premium).
The buyer and the seller have potential to make unlimited gain or loss.	The buyer has potential to make unlimited gain while the seller has a potential to make unlimited gain. On the other hand the buyer has a limited loss potential and the seller has an unlimited loss potential.

2.4 Terminology of Derivatives

In this section we explain the general terms and concepts related to derivatives.

2.4.1 Spot price (ST)

Spot price of an underlying asset is the price that is quoted for immediate delivery of the asset. For example, at the NSE, the spot price of Reliance Ltd. at any given time is the price at which Reliance Ltd. shares are being traded at that time in the Cash Market Segment of the NSE. Spot price is also referred to as cash price sometimes.

2.4.2 Forward price or futures price (F)

Forward price or futures price is the price that is agreed upon at the date of the contract for the delivery of an asset at a specific future date. These prices are dependent on the spot price, the prevailing interest rate and the expiry date of the contract.

2.4.3 Strike price (K)

The price at which the buyer of an option can buy the stock (in the case of a call option) or sell the stock (in the case of a put option) on or before the expiry date of option contracts is called strike price. It is the price at which the stock will be bought or sold when the option is exercised. Strike price is used in the case of options only; it is not used for futures or forwards.

2.4.4 Expiration date (T)

In the case of Futures, Forwards, Index and Stock Options, Expiration Date is the date on which settlement takes place. It is also called the final settlement date.

2.4.5 Types of options

Options can be divided into two different categories depending upon the primary exercise styles associated with options. These categories are:

European Options: European options are options that can be exercised only on the expiration date.

American options: American options are options that can be exercised on any day on or before the expiry date. They can be exercised by the buyer on any day on or before the final settlement date or the expiry date.

2.4.6 Contract size

As futures and options are standardized contracts traded on an exchange, they have a fixed contract size. One contract of a derivatives instrument represents a certain number of shares of the underlying asset. For example, if one contract of BHEL consists of 300 shares of BHEL, then if one buys one futures contract of BHEL, then for every Re 1 increase in BHEL's futures price, the buyer will make a profit of 300 X 1 = Rs 300 and for every Re 1 fall in BHEL's futures price, he will lose Rs 300.

2.4.7 Contract Value

Contract value is notional value of the transaction in case one contract is bought or sold. It is the contract size multiplied but the price of the futures. Contract value is used to calculate margins etc. for contracts. In the example above if BHEL futures are trading at Rs. 2000 the contract value would be Rs. 2000 x 300 = Rs. 6 lacs.

2.4.8 Margins

In the spot market, the buyer of a stock has to pay the entire transaction amount (for purchasing the stock) to the seller. For example, if Infosys is trading at Rs. 2000 a share and an investor wants to buy 100 Infosys shares, then he has to pay Rs. 2000 X 100 = Rs. 2,00,000 to the seller. The settlement will take place on T+2 basis; that is, two days after the transaction date.

In a derivatives contract, a person enters into a trade today (buy or sell) but the settlement happens on a future date. Because of this, there is a high possibility of default by any of the parties. Futures and option contracts are traded through exchanges and the counter party risk is taken care of by the clearing corporation. In order to prevent any of the parties from defaulting on his trade commitment, the clearing corporation levies a margin on the buyer as well as seller of the futures and option contracts. This margin is a percentage (approximately 20%) of the total contract value. Thus, for the aforementioned example, if a person wants to buy 100 Infosys futures, then he will have to pay 20% of the contract value of Rs 2,00,000 = Rs 40,000 as a margin to the clearing corporation. This margin is applicable to both, the buyer and the seller of a futures contract.

2.5 Moneyness of an Option

"Moneyness" of an option indicates whether an option is worth exercising or not i.e. if the option is exercised by the buyer of the option whether he will receive money or not. "Moneyness" of an option at any given time depends on where the spot price of the underlying is at that point of time relative to the strike price. The premium paid is not taken into consideration while calculating moneyness of an Option, since the premium once paid is a sunk cost and the profitability from exercising the option does not depend on the size of the premium. Therefore, the decision (of the buyer of the option) whether to exercise the option or not is not affected by the size of the premium. The following three terms are used to define the moneyness of an option.

2.5.1 In-the-money option

An option is said to be in-the-money if on exercising the option, it would produce a cash inflow for the buyer. Thus, Call Options are in-the-money when the value of spot price of the underlying exceeds the strike price. On the other hand, Put Options are in-the-money when the spot price of the underlying is lower than the strike price. Moneyness of an option should not be confused with the profit and loss arising from holding an option contract. It should be noted that while moneyness of an option does not depend on the premium paid, profit/loss do. Thus a

holder of an in-the-money option need not always make profit as the profitability also depends on the premium paid.

2.5.2 Out-of-the-money option

An out-of-the-money option is an opposite of an in-the-money option. An option-holder will not exercise the option when it is out-of-the-money. A Call option is out-of-the-money when its strike price is greater than the spot price of the underlying and a Put option is out-of-the-money when the spot price of the underlying is greater than the option's strike price.

2.5.3 At-the-money option

An at-the-money-option is one in which the spot price of the underlying is equal to the strike price. It is at the stage where with any movement in the spot price of the underlying, the option will either become in-the-money or out-of-the-money.

Illustration

Consider some Call and Put options on stock XYZ. As on 13 August, 2009, XYZ is trading at Rs 116.25. The table below gives the information on closing prices of four options, expiring in September and December, and with strike prices of Rs. 115 and Rs. 117.50.

Table 2.3: Moneyness of call and put options

Strike Price	September Call option	December Call option	September Put option	December Put option
Rs 115.00	**Rs.** 8.35	Rs. 12.30	**Rs.** 4.00	Rs. 8.00
Rs 117.50	**Rs.** 4.00	Rs. 8.15	**Rs.** 8.00	Rs. 12.00

Suppose the spot price of the underlying (closing share price) as at end of September is Rs. 116 and at end of December is Rs. 118. On the basis of the rules stated above, which options are in-the-money and which ones are out-of-the-money are given in the following table.

Table 2.4: Moneyness of call and put options

In-the-money Options		Out-of-money Options	
Option	**Justification**	**Option**	**Justification**
September 115 Call	Rs. 115 < Rs. 116	September 115 Put	Rs. 115 < Rs. 116
September 117.50 Put	Rs. 117.50 > Rs. 116	September 117.50 Call	Rs. 117.50 > Rs. 116
December 115 Call	Rs 115 < Rs 118	December 115 Put	Rs 115 < Rs 118
December 117.50 Call	Rs 117.50 < Rs 118	December 117.50 Put	Rs 115 < Rs 118

It may be noted that an option which is in-the-money at a particular instance may turn into out-of-the-money (and vice versa) at another instance due to change in the price of the underlying asset.

CHAPTER 3: Applications of Derivatives

In this chapter, we look at the participants in the derivatives markets and how they use derivatives contracts.

3.1 Participants in the Derivatives Market

As equity markets developed, different categories of investors started participating in the market. In India, equity market participants currently include retail investors, corporate investors, mutual funds, banks, foreign institutional investors etc. Each of these investor categories uses the derivatives market to as a part of risk management, investment strategy or speculation.

Based on the applications that derivatives are put to, these investors can be broadly classified into three groups:

- Hedgers
- Speculators, and
- Arbitrageurs

We shall now look at each of these categories in detail.

3.1.1 Hedgers

These investors have a position (i.e., have bought stocks) in the underlying market but are worried about a potential loss arising out of a change in the asset price in the future. Hedgers participate in the derivatives market to lock the prices at which they will be able to transact in the future. Thus, they try to avoid price risk through holding a position in the derivatives market. Different hedgers take different positions in the derivatives market based on their exposure in the underlying market. A hedger normally takes an opposite position in the derivatives market to what he has in the underlying market.

Hedging in futures market can be done through two positions, viz. short hedge and long hedge. ***Short Hedge***

A short hedge involves taking a short position in the futures market. Short hedge position is taken by someone who already owns the underlying asset or is expecting a future receipt of the underlying asset.

For example, an investor holding Reliance shares may be worried about adverse future price movements and may want to hedge the price risk. He can do so by holding a short position in the derivatives market. The investor can go short in Reliance futures at the NSE. This protects him from price movements in Reliance stock. In case the price of Reliance shares falls, the investor will lose money in the shares but will make up for this loss by the gain made in Reliance Futures. Note that a short position holder in a futures contract makes a profit if the price of the underlying asset falls in the future. In this way, futures contract allows an investor to manage his price risk.

Similarly, a sugar manufacturing company could hedge against any probable loss in the future due to a fall in the prices of sugar by holding a short position in the futures/ forwards market. If the prices of sugar fall, the company may lose on the sugar sale but the loss will be offset by profit made in the futures contract.

Long Hedge

A long hedge involves holding a long position in the futures market. A Long position holder agrees to buy the underlying asset at the expiry date by paying the agreed futures/ forward price. This strategy is used by those who will need to acquire the underlying asset in the future.

For example, a chocolate manufacturer who needs to acquire sugar in the future will be worried about any loss that may arise if the price of sugar increases in the future. To hedge against this risk, the chocolate manufacturer can hold a long position in the sugar futures. If the price of sugar rises, the chocolate manufacture may have to pay more to acquire sugar in the normal market, but he will be compensated against this loss through a profit that will arise in the futures market. Note that a long position holder in a futures contract makes a profit if the price of the underlying asset increases in the future.

Long hedge strategy can also be used by those investors who desire to purchase the underlying asset at a future date (that is, when he acquires the cash to purchase the asset) but wants to lock the prevailing price in the market. This may be because he thinks that the prevailing price is very low.

For example, suppose the current spot price of Wipro Ltd. is Rs. 250 per stock. An investor is expecting to have Rs. 250 at the end of the month. The investor feels that Wipro Ltd. is at a very attractive level and he may miss the opportunity to buy the stock if he waits till the end of the month. In such a case, he can buy Wipro Ltd. in the futures market. By doing so, he can lock in the price of the stock. Assuming that he buys Wipro Ltd. in the futures market at Rs. 250 (this becomes his locked-in price), there can be three probable scenarios:

Scenario I: Price of Wipro Ltd. in the cash market on expiry date is Rs. 300.

As futures price is equal to the spot price on the expiry day, the futures price of Wipro would be at Rs. 300 on expiry day. The investor can sell Wipro Ltd in the futures market at Rs. 300. By doing this, he has made a profit of 300 - 250 = Rs. 50 in the futures trade. He can now buy Wipro Ltd in the spot market at Rs. 300. Therefore, his total investment cost for buying one share of Wipro Ltd equals Rs.300 (price in spot market) - 50 (profit in futures market) = Rs.250. This is the amount of money he was expecting to have at the end of the month. If the investor had not bought Wipro Ltd futures, he would have had only Rs. 250 and would have been unable to buy Wipro Ltd shares in the cash market. The futures contract helped him to lock in a price for the shares at Rs. 250.

Scenario II: Price of Wipro Ltd in the cash market on expiry day is Rs. 250.

As futures price tracks spot price, futures price would also be at Rs. 250 on expiry day. The investor will sell Wipro Ltd in the futures market at Rs. 250. By doing this, he has made Rs. 0 in the futures trade. He can buy Wipro Ltd in the spot market at Rs. 250. His total investment cost for buying one share of Wipro will be = Rs. 250 (price in spot market) + 0 (loss in futures market) = Rs. 250.

Scenario III: Price of Wipro Ltd in the cash market on expiry day is Rs. 200.

As futures price tracks spot price, futures price would also be at Rs. 200 on expiry day. The investor will sell Wipro Ltd in the futures market at Rs. 200. By doing this, he has made a loss of 200 - 250 = Rs. 50 in the futures trade. He can buy Wipro in the spot market at Rs. 200. Therefore, his total investment cost for buying one share of Wipro Ltd will be = 200 (price in spot market) + 50 (loss in futures market) = Rs. 250.

Thus, in all the three scenarios, he has to pay only Rs. 250. This is an example of a Long Hedge.

3.1.2 Speculators

A Speculator is one who bets on the derivatives market based on his views on the potential movement of the underlying stock price. Speculators take large, calculated risks as they trade based on anticipated future price movements. They hope to make quick, large gains; but may not always be successful. They normally have shorter holding time for their positions as compared to hedgers. If the price of the underlying moves as per their expectation they can make large profits. However, if the price moves in the opposite direction of their assessment, the losses can also be enormous.

Illustration

Currently ICICI Bank Ltd (ICICI) is trading at, say, Rs. 500 in the cash market and also at Rs. 500 in the futures market (assumed values for the example only). A speculator feels that post the RBI's policy announcement, the share price of ICICI will go up. The speculator can buy the stock in the spot market or in the derivatives market. If the derivatives contract size of ICICI is 1000 and if the speculator buys one futures contract of ICICI, he is buying ICICI futures worth Rs 500 X 1000 = Rs. 5,00,000. For this he will have to pay a margin of say 20% of the contract value to the exchange. The margin that the speculator needs to pay to the exchange is 20% of Rs. 5,00,000 = Rs. 1,00,000. This Rs. 1,00,000 is his total investment for the futures contract. If the speculator would have invested Rs. 1,00,000 in the spot market, he could purchase only 1,00,000 / 500 = 200 shares.

Let us assume that post RBI announcement price of ICICI share moves to Rs. 520. With one lakh investment each in the futures and the cash market, the profits would be:

- (520 - 500) X 1,000 = Rs. 20,000 in case of futures market and
- (520 - 500) X 200 = Rs. 4000 in the case of cash market.

It should be noted that the opposite will result in case of adverse movement in stock prices, wherein the speculator will be losing more in the futures market than in the spot market. This is because the speculator can hold a larger position in the futures market where he has to pay only the margin money.

3.1.3 Arbitrageurs

Arbitrageurs attempt to profit from pricing inefficiencies in the market by making simultaneous trades that offset each other and capture a risk-free profit. An arbitrageur may also seek to make profit in case there is price discrepancy between the stock price in the cash and the derivatives markets.

For example, if on 1st August, 2009 the SBI share is trading at Rs. 1780 in the cash market and the futures contract of SBI is trading at Rs. 1790, the arbitrageur would buy the SBI shares (i.e. make an investment of Rs. 1780) in the spot market and sell the same number of SBI futures contracts. On expiry day (say 24 August, 2009), the price of SBI futures contracts will close at the price at which SBI closes in the spot market. In other words, the settlement of the futures contract will happen at the closing price of the SBI shares and that is why the futures and spot prices are said to converge on the expiry day. On expiry day, the arbitrageur will sell the SBI stock in the spot market and buy the futures contract, both of which will happen at the closing price of SBI in the spot market. Since the arbitrageur has entered into off-setting positions, he will be able to earn Rs. 10 irrespective of the prevailing market price on the expiry date.

There are three possible price scenarios at which SBI can close on expiry day. Let us calculate the profit/ loss of the arbitrageur in each of the scenarios where he had initially (1 August) purchased SBI shares in the spot market at Rs 1780 and sold the futures contract of SBI at Rs. 1790:

Scenario I: SBI shares closes at a price greater than 1780 (say Rs. 2000) in the spot market on expiry day (24 August 2009)

SBI futures will close at the same price as SBI in spot market on the expiry day i.e., SBI futures will also close at Rs. 2000. The arbitrageur reverses his previous transaction entered into on 1 August 2009.

Profit/ Loss (-) in spot market = 2000 - 1780 = Rs. 220

Profit/ Loss (-) in futures market = 1790 - 2000 = Rs. (-) 210

Net profit/ Loss (-) on both transactions combined = 220 - 210 = Rs. 10 profit.

Scenario II: SBI shares close at Rs 1780 in the spot market on expiry day (24 August 2009)

SBI futures will close at the same price as SBI in spot market on expiry day i.e., SBI futures will also close at Rs 1780. The arbitrageur reverses his previous transaction entered into on 1 August 2009.

Profit/ Loss (-) in spot market = 1780 - 1780 = Rs 0

Profit/ Loss (-) in futures market = 1790 - 1780 = Rs. 10

Net profit/ Loss (-) on both transactions combined = 0 + 10 = Rs. 10 profit.

Scenario III: SBI shares close at Rs. 1500 in the spot market on expiry day (24 August 2009)

Here also, SBI futures will close at Rs. 1500. The arbitrageur reverses his previous transaction entered into on 1 August 2009.

Profit/ Loss (-) in spot market = 1500 - 1780 = Rs. (-) 280

Profit/ Loss (-) in futures market = 1790 - 1500 = Rs. 290

Net profit/ Loss (-)on both transactions combined = (-) 280 + 290 = Rs. 10 profit.

Thus, in all three scenarios, the arbitrageur will make a profit of Rs. 10, which was the difference between the spot price of SBI and futures price of SBI, when the transaction was entered into. This is called a "risk less profit" since once the transaction is entered into on 1 August, 2009 (due to the price difference between spot and futures), the profit is locked.

Irrespective of where the underlying share price closes on the expiry date of the contract, a profit of Rs. 10 is assured. The investment made by the arbitrageur is Rs. 1780 (when he buys SBI in the spot market). He makes this investment on 1 August 2009 and gets a return of Rs. 10 on this investment in 23 days (24 August). This means a return of 0.56% in 23 days. If we annualize this, it is a return of nearly 9% per annum. One should also note that this opportunity to make a risk-less return of 9% per annum will not always remain. The difference between the spot and futures price arose due to some inefficiency (in the market), which was exploited by the arbitrageur by buying shares in spot and selling futures. As more and more such arbitrage trades take place, the difference between spot and futures prices would narrow thereby reducing the attractiveness of further arbitrage.

3.2 Uses of Derivatives

3.2.1 Risk management

The most important purpose of the derivatives market is **risk management.** Risk management for an investor comprises of the following three processes:

- Identifying the desired level of risk that the investor is willing to take on his investments;
- Identifying and measuring the actual level of risk that the investor is carrying; and
- Making arrangements which may include trading (buying/selling) of derivatives contracts that allow him to match the actual and desired levels of risk.

The example of hedging discussed above illustrates the process of risk management through futures.

3.2.2 Market efficiency

Efficient markets are fair and competitive and do not allow an investor to make risk free profits. Derivatives assist in improving the efficiency of the markets, by providing a self-correcting mechanism. Arbitrageurs are one section of market participants who trade whenever there is an opportunity to make risk free profits till the opportunity ceases to exist. Risk free profits are not easy to make in more efficient markets. When trading occurs, there is a possibility that some amount of mispricing might occur in the markets. The arbitrageurs step in to take advantage of this mispricing by buying from the cheaper market and selling in the higher market. Their actions quickly narrow the prices and thereby reducing the inefficiencies.

3.2.3 Price discovery

One of the primary functions of derivatives markets is price discovery. They provide valuable information about the prices and expected price fluctuations of the underlying assets in two ways:

- First, many of these assets are traded in markets in different geographical locations. Because of this, assets may be traded at different prices in different markets. In derivatives markets, the price of the contract often serves as a proxy for the price of the underlying asset. For example, gold may trade at different prices in Mumbai and Delhi but a derivatives contract on gold would have one value and so traders in Mumbai and Delhi can validate the prices of spot markets in their respective location to see if it is cheap or expensive and trade accordingly.

- Second, the prices of the futures contracts serve as prices that can be used to get a sense of the market expectation of future prices. For example, say there is a company that produces sugar and expects that the production of sugar will take two months from today. As sugar prices fluctuate daily, the company does not know if after two months the price of sugar will be higher or lower than it is today. How does it predict where the price of sugar will be in future? It can do this by monitoring prices of derivatives contract on sugar (say a Sugar Forward contract). If the forward price of sugar is trading higher than the spot price that means that the market is expecting the sugar spot price to go up in future. If there were no derivatives price, it would have to wait for two months before knowing the market price of sugar on that day. Based on derivatives price the management of the sugar company can make strategic and tactical decisions of how much sugar to produce and when.

CHAPTER 4: Trading Futures

To understand futures trading and profit/loss that can occur while trading, knowledge of pay-off diagrams is necessary. Pay-off refers to profit or loss in a trade. A pay-off is positive if the investor makes a profit and negative if he makes a loss. A pay-off diagram represents profit/loss in the form of a graph which has the stock price on the X axis and the profit/ loss on the Y axis. Thus, from the graph an investor can calculate the profit or loss that his position can make for different stock price values. Forwards and futures have same pay-offs. In other words, their profit/loss values behave in a similar fashion for different values of stock price. In this chapter, we shall focus on pay-offs of futures contracts.

4.1 Pay-off of Futures

The Pay-off of a futures contract on maturity depends on the spot price of the underlying asset at the time of maturity and the price at which the contract was initially traded. There are two positions that could be taken in a futures contract:

a. Long position: one who buys the asset at the futures price (F) takes the long position and

b. Short position: one who sells the asset at the futures price (F) takes the short position

In general, the pay-off for a long position in a futures contract on one unit of an asset is:

$$\text{Long Pay-off} = Sj - F$$

Where F is the traded futures price and S_T is the spot price of the asset at expiry of the contract (that is, closing price on the expiry date). This is because the holder of the contract is obligated to buy the asset worth Sj for F.

Similarly, the pay-off from a short position in a futures contract on one unit of asset is:

$$\text{Short Pay-off} = F - S_T$$

4.1.1 Pay-off diagram for a long futures position

The Figure 4.1 depicts the payoff diagram for an investor who is long on a futures contract. The investor has gone long in the futures contract at a price F.

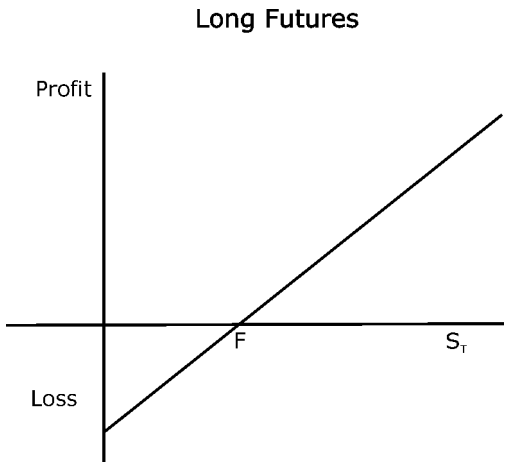


Figure 4.1: Payoff for Long Futures

The long investor makes profits if the spot price (S_T) at expiry exceeds the futures contract price F, and makes losses if the opposite happens. In the above diagram, the slanted line is a 45 degree line, implying that for every one rupee change in the price of the underlying, the profit/ loss will change by one rupee. As can be seen from the diagram, if S_T is less than F, the investor makes a loss and the higher the S_T , the lower the loss. Similarly, if S_T is greater than F, the investor makes a profit and higher the S_T, the higher is the profit.

4.1.2 Pay-off diagram for a short position

Figure 4.2 is the pay-off diagram for someone who has taken a short position on a futures contract on the stock at a price F.

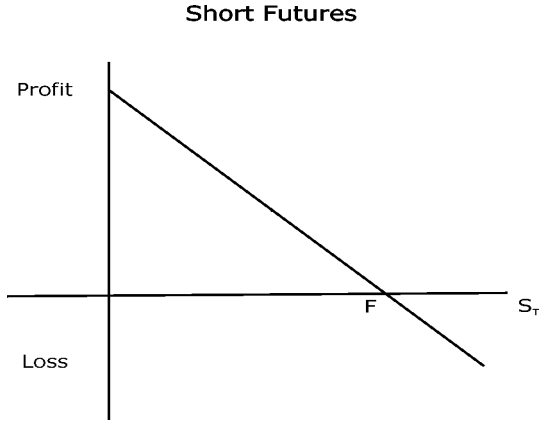


Figure 4.2: Payoff for Short Futures

Here, the investor makes profits if the spot price (S_T) at expiry is below the futures contract price F, and makes losses if the opposite happens. Here, if S_T is less than F, the investor makes

a profit and the higher the S_T , the lower the profit. Similarly, if S_T is greater than F, the investor makes a loss and the higher the Sj, the lower is the profit.

As can be seen from the pay-off diagrams for futures contracts, the pay-off is depicted by a straight line (both buy and sell). Such pay-off diagrams are known as linear pay-offs.

4.2 A theoretical model for Future pricing

While futures prices in reality are determined by demand and supply, one can obtain a theoretical Futures price, using the following model:

$$F = Se^{rT}$$

Where:

F = Futures price

S = Spot price of the underlying asset

r = Cost of financing (using continuously compounded interest rate)

T = Time till expiration in years

e = 2.71828

Example: Security XYZ Ltd trades in the spot market at Rs. 1150. Money can be invested at 11% per annum. The fair value of a one-month futures contract on XYZ is calculated as follows:

$$\begin{aligned} F &= Se^{rT} \\ &= 1150 * e^{0.11 * 1/12} \\ &= 1160 \end{aligned}$$

This model is also called the cost of carry model of pricing futures. It calculates the Fair Value of futures contract (Rs. 1160) based on the current spot price of the underlying asset (Rs. 1150), interest rate and time to maturity. Every time the market price for futures (which is determined by demand and supply) deviates from the fair value determined by using the above formula, arbitragers enter into trades to capture the arbitrage profit. For example, if the market price of the Future is higher than the fair value, the arbitrageur would sell in the futures market and buy in the spot market simultaneously and hold both trades till expiry and book riskless profit. As more and more people do this, the Future price will come down to its fair value level.

CHAPTER 5: Trading Options

In this chapter we will discuss payouts for various strategies using options and strategies which can be used to improve returns by using options.

5.1 Option Payout

There are two sides to every option contract. On the one side is the option buyer who has taken a long position (i.e., has bought the option). On the other side is the option seller who has taken a short position (i.e., has sold the option). The seller of the option receives a premium from the buyer of the option. It may be noted that while computing profit and loss, premium has to be taken into consideration. Also, when a buyer makes profit, the seller makes a loss of equal magnitude and vice versa. In this section, we will discuss payouts for various strategies using options.

5.1.1 A long position in a call option

In this strategy, the investor has the **right** to buy the asset in the future at a predetermined strike price i.e., strike price (K) and the option seller has the obligation to sell the asset at the strike price (K). If the settlement price (underlying stock closing price) of the asset is above the strike price, then the call option buyer will exercise his option and buy the stock at the strike price (K). If the settlement price (underlying stock closing price) is lower than the strike price, the option buyer will not exercise the option as he can buy the same stock from the market at a price lower than the strike price.

5.1.2 A long position in a put option

In this strategy, the investor has bought the **right** to sell the underlying asset in the future at a predetermined strike price (K). If the settlement price (underlying stock closing price) at maturity is lower than the strike price, then the put option holder will exercise his option and sell the stock at the strike price (K). If the settlement price (underlying stock closing price) is higher than the strike price, the option buyer will not exercise the option as he can sell the same stock in the market at a price higher than the strike price.

5.1.3 A short position in a call option

In this strategy, the option seller has an **obligation** to sell the asset at a predetermined strike price (K) if the buyer of the option chooses to exercise the option. The buyer of the option will exercise the option if the spot price at maturity is any value higher than (K). If the spot price is lower than (K), the buyer of the option will not exercise his/her option.

5.1.4 A short position in a put option

In this strategy, the option seller has an **obligation** to buy the asset at a predetermined strike price (K) if the buyer of the option chooses to exercise his/her option. The buyer of the option will exercise his option to sell at (K) if the spot price at maturity is lower than (K). If the spot price is higher than (K), then the option buyer will not exercise his/her option.

Table 5.1: Explanation of pay-offs for long options

Option Position	Buyer's Pay-off	Explanation
Long Call Option	Max (S_T - K, 0) -Premium	If the closing spot price on any day on or before expiry is at a value above the strike price of the option, then the option buyer can make profit equal to the difference between the spot price and strike price; else he makes zero profit
Long Put Option	Max (K - S_T, 0) -Premium	If the closing spot price on any day on or before expiry is at a value lower than the strike price of the option, then the option buyer makes profit equal to the difference between the strike and spot price; else he make zero profit

The buyer's profit is equal to the seller's loss. Therefore, in the above table the seller's loss is S_T - K for a short call option if the spot price closes at a value above the strike price of the option and is K -$S_T$for a short put option if the spot price closes at a value lower than the strike price of the option. The above four positions and their pay-offs are depicted in the figure below:

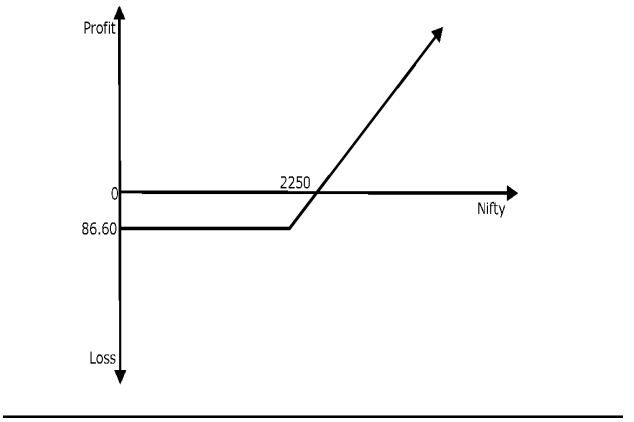


Figure 5.1: Pay-off for a buyer of a call option

The figure shows the profits/losses for a buyer of a three-month Nifty 2250 call option. As can be seen, as the spot Nifty rises, the call option is in-the-money. If upon expiration, Nifty closes above the strike of 2250, the buyer would exercise his option and profit to the extent of the difference between the Nifty-close and the strike price. The profits possible on this option are potentially unlimited. However, if Nifty falls below the strike of 2250, the buyer lets the option expire. His losses are limited to the extent of the premium that he paid for buying the option.

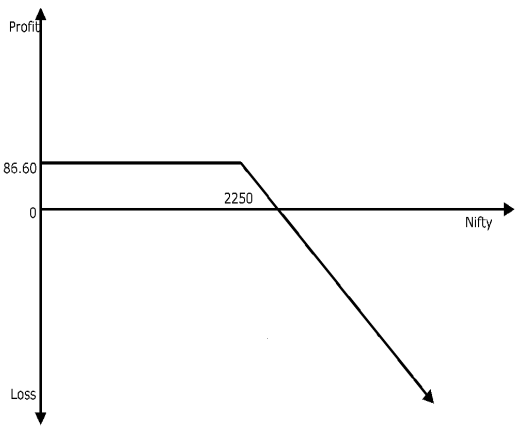


Figure 5.2: Pay-off for a seller of a call option

The figure shows the profits/losses for a seller of a three-month Nifty 2250 call option. As the spot Nifty rises, the call option is in-the-money and the writer starts making losses. If upon expiration, Nifty closes above the strike of 2250, the buyer would exercise his option on the writer who would suffer a loss to the extent of the difference between the Nifty-close and the strike price. The loss that can be incurred by the writer of the option is potentially unlimited, whereas the maximum profit is limited to the extent of the upfront option premium charged by him.

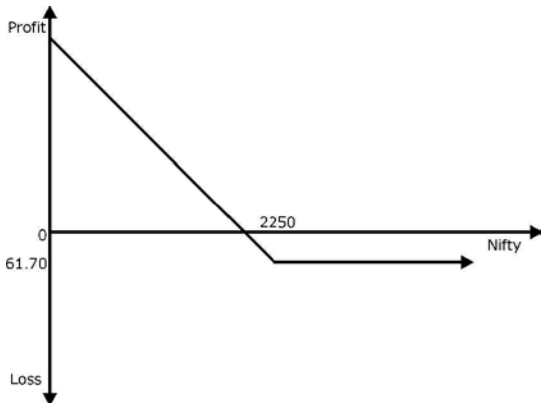


Figure 5.3: Pay-off for a buyer of a put option

The figure shows the profits/losses for a buyer of a three-month Nifty 2250 put option. As can be seen, as the spot Nifty falls, the put option is in-the-money. If upon expiration, Nifty closes below the strike of 2250, the buyer would exercise his option and profit to the extent of the difference between the strike price and Nifty-close. The profits possible on this option can be as high as the strike price. However, if Nifty rises above the strike of 2250, he lets the option expire. His losses are limited to the extent of the premium he paid for buying the option.

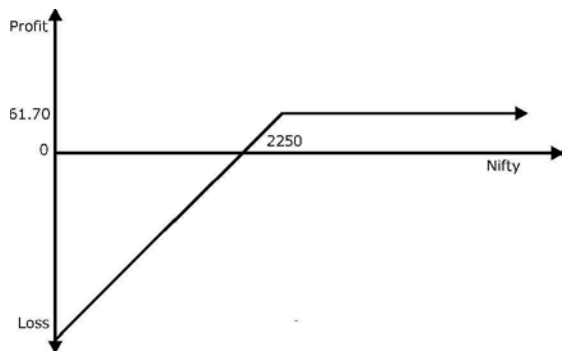


Figure 5.4: Pay-off for a seller of a put option

The figure shows the profits/losses for a seller of a three-month Nifty 2250 put option. As the spot Nifty falls, the put option is in-the-money and the writer starts making losses. If upon expiration, Nifty closes below the strike of 2250, the buyer would exercise his option on the writer who would suffer a loss to the extent of the difference between the strike price and Nifty-close. The loss that can be incurred by the writer of the option is a maximum extent of the strike price (since the worst that can happen is that the asset price can fall to zero) whereas the maximum profit is limited to the extent of the upfront option premium of charged by him.

5.2 Option Strategies

An option strategy is implemented to try and make gains from the movement in the underlying price of an asset. As discussed above, options are derivatives that give the buyer the right to exercise the option at a future date. Unlike futures and forwards which have linear pay-offs and do not require an initial outlay (upfront payment), options have non linear pay-offs and do require an initial outlay (or premium). In this section we discuss various strategies which can be used to maximize returns by using options.

5.2.1 Long option strategy

A long option strategy is a strategy of buying an option according to the view on future price movement of the underlying. A person with a bullish opinion on the underlying will buy a call option on that asset/security, while a person with a bearish opinion on the underlying will buy a put option on that asset/security. An important characteristic of long option strategies is limited risk and unlimited profit potential. An option buyer can only lose the amount paid for the option premium. At the same time, theoretically, the profit potential is unlimited.

Calls

An investor having a bullish opinion on underlying can expect to have positive returns by buying a call option on that asset/security. When a call option is purchased, the call option holder is exposed to the stock performance in the spot market without actually possessing the stock and does so for a fraction of the cost involved in purchasing the stock in the spot market. The cost incurred by the call option holder is the option premium. Thus, he can take advantage of a smaller investment and maximize his profits.

Consider the purchase of a call option at the price (premium) c. We take

$$S_T = \text{Spot price at time } T$$

$$K = \text{Strike price}$$

The payout in two scenarios is as follows:

$$\text{Profit/Loss} = -c \text{ if } S_T < K$$

$$\text{Profit/Loss} = (S_T - K) - c \text{ if } S_T > K$$

Let us explain this with some examples. Mr. A buys a Call on an index (such as Nifty 50) with a strike price of Rs. 2000 for premium of Rs. 81. Consider the values of the index at expiration as 1800, 1900, 2100, and 2200.

For S_T= 1800, Profit/Loss = 0 - 81 = - 81 (maximum loss = premium paid)

For S_T = 1900, Profit/Loss = 0 - 81 = - 81 (maximum loss = premium paid)

For S_T = 2100, Profit/Loss = 2100 - 2000 - 81 = 19

For S_T = 2200, Profit/Loss = 2200 - 2000 - 81 = 119

As we can see from the example, the maximum loss suffered by the buyer of the Call option is Rs. 81, which is the premium that he paid to buy the option. His maximum profits are unlimited and they depend on where the underlying price moves.

Puts

An investor having a bearish opinion on the underlying can expect to have positive returns by buying a put option on that asset/security. When a put option is purchased, the put option buyer has the right to sell the stock at the strike price on or before the expiry date depending on where the underlying price is.

Consider the purchase of a put option at price (premium) p. We take

$$S_T = \text{Spot price at time T}$$

$$K = \text{exercise price}$$

The payout in two scenarios is as follows:

$$\text{Profit/Loss} = (K - S_T) - p \text{ if } S_T < K$$

$$\text{Profit/Loss} = - p \text{ if } S_T > K$$

Let us explain this with some examples. Mr. X buys a put at a strike price of Rs. 2000 for a premium of Rs. 79. Consider the values of the index at expiration at 1800, 1900, 2100, and 2200.

For S_T= 1800, Profit/Loss = 2000 - 1800 - 79 = 121

For S_T = 1900, Profit/Loss = 2000 - 1900 - 79 = 21

For S_T = 2100, Profit/Loss = - 79 (maximum loss is the premium paid)

For S_T = 2200, Profit/Loss = - 79 (maximum loss is the premium paid)

As we can see from the example, the maximum loss suffered by the buyer of the Put option is Rs. 79, which is the premium that he paid to buy the option. His maximum profits are unlimited and depend on where the underlying price moves.

5.2.2 Short options strategy

A short options strategy is a strategy where options are sold to make money upfront with a view that the options will expire out of money at the expiry date (i.e., the buyer of the option will not exercise the same and the seller can keep the premium). As opposed to a long options strategy, here a person with a bullish opinion on the underlying will sell a put option in the hope that prices will rise and the buyer will not exercise the option leading to profit for the seller. On the other hand, a person with a bearish view on the underlying will sell a call option in the hope that prices will fall and the buyer will not exercise the option leading to profit for the seller. As opposed to a long options strategy where the downside was limited to the price paid for the option, here the downside is unlimited and the profit is limited to the price of selling the option (the premium).

Call

An investor with a bearish opinion on the underlying can take advantage of falling stock prices by selling a call option on the asset/security. If the stock price falls, the profit to the seller will be the premium earned by selling the option. He will lose in case the stock price increases above the strike price.

Consider the selling of a call option at the price (premium) c. We take

S_T = Spot price at time T

K= exercise price

The payout in two scenarios is as follows:

Profit/Loss = c if $S_T < K$

Profit/Loss = c - (S_T - K) if $S_T > K$

Now consider this example: A sells a call at a strike price of Rs 2000 for a premium of Rs 81. Consider values of index at expiration at 1800, 1900, 2100, and 2200.

For S_T= 1800, Profit/Loss = 81 (maximum profit = premium received)

For S_T= 1900, Profit/Loss = 81 (maximum profit = premium received)

For S_T = 2100, Profit/Loss = 81 - (2100 - 2000) = - 19

For S_T= 2200, Profit/Loss = 81 - (2100 - 2200) = - 119

As we can see from the example above, the maximum loss suffered by the seller of the Call option is unlimited (this is the reverse of the buyer's gains). His maximum profits are limited to the premium received.

Puts

An investor with a bullish opinion on the underlying can take advantage of rising prices by selling a put option on the asset/security. If the stock price rises, the profit to the seller will be the premium earned by selling the option. He will lose in case the stock price falls below the strike price.

Consider the sale of a put option at the price (premium) p. We take:

S_T = Spot price at time T

K = exercise price

The payout in two scenarios is as follows:

Profit/Loss = p - (K - S_T) if S_T < K

Profit/Loss = p if S_T > K

We sell a put at a strike price of Rs. 2000 for Rs. 79. Consider values of index at expiration as 1800, 1900, 2100, and 2200.

For S_T = 1800, Profit/Loss = 79 - (2000 - 1800) = (-) 121

For S_T = 1900, Profit/Loss = 79 - (2000 - 1900) = (-) 21

For S_T = 2100, Profit/Loss = 79 (maximum profit = premium received)

For S_T = 2200, Profit/Loss = 79 (maximum profit = premium received)

As we can see from the example above the maximum loss suffered by the seller of the Put option is unlimited (this is the reverse of the buyer's gains). His maximum profits are limited to the premium received.

5.3 Determination of option prices

Like in case of any traded good, the price of any option is determined by the demand for and supply of that option. This price has two components: intrinsic value and time value.

5.3.1 Intrinsic value and time value

- **Intrinsic value of an option:** Intrinsic value of an option at a given time is the amount the holder of the option will get if he exercises the option at that time. In other words, the intrinsic value of an option is the amount the option is in-the-money (ITM). If the option is out-of-the-money (OTM), its intrinsic value is zero. Putting it another way, the intrinsic value of a call is Max [0, (S_t — K)] which means that the intrinsic value of a call is the greater of 0 or (St — K). Similarly, the intrinsic value of a put is Max [0, K — S_t] i.e., the greater of 0 or (K — St) where K is the strike price and S_t is the spot price.

- **Time value of an option:** In addition to the intrinsic value, the seller charges a "time value' from the buyers of the option. This is because the more time there is for the contract to expire, the greater the chance that the exercise of the contract will become more profitable for the buyer. This is a risk for the seller and he seeks compensation for it by demanding a "time value'. The time value of an option can be obtained by taking the difference between its premium and its intrinsic value. Both calls and puts have time value. An option that is Out-of-the-money (OTM) or At-the-money (ATM) has only time value and no intrinsic value. Usually, the maximum time value exists when the option is ATM. The longer the time to expiration, the greater is an option's time value, all else being equal. At expiration, an option has no time value.

Illustration

In the following two tables, five different examples are given for call option and put option respectively. As stated earlier, premium is determined by demand and supply. The examples show how intrinsic value and time value vary depending on underlying price, strike price and premium.

Table 5.2: Intrinsic and Time Value for Call Options: Examples

Underlying Price (Rs.)	Strike Price (Rs.)	Premium (Rs.)	Intrinsic Value (Rs.)	Time Value (Rs.)
100	**90**	**12**	**10**	**2**
101	**90**	**13**	**11**	**2**
103	**90**	**14**	**13**	**1**
88	**90**	**1**	**0**	**1**
95	**90**	5.50	**5**	0.50

Table 5.3: Intrinsic and Time Value for Put Options: Examples

Underlying Price (Rs.)	Strike Price (Rs.)	Premium (Rs.)	Intrinsic Value (Rs.)	Time Value (Rs.)
100	110	**12**	**10**	2
99	110	**13**	**11**	2
97	110	**14**	**13**	1
112	110	**1**	**0**	1
105	110	5.50	**5**	0.50

5.3.2 Factors impacting option prices

The supply and demand of options and hence their prices are influenced by the following factors:

- The underlying price,
- The strike price,
- The time to expiration,
- The underlying asset's volatility, and
- Risk free rate

Each of the five parameters has a different impact on the option pricing of a Call and a Put.

The underlying price: Call and Put options react differently to the movement in the underlying price. As the underlying price increases, intrinsic value of a call increases and intrinsic value of a put decreases. Thus, in the case of a Call option, the higher the price of the underlying asset from strike price, the higher is the value (premium) of the call option. On the other hand, in case of a put option, the higher the price of the underlying asset, the lower is the value of the put option.

The strike price: The strike price is specified in the option contract and does not change over time. The higher the strike price, the smaller is the intrinsic value of a call option and the greater is the intrinsic value of a put option. Everything else remaining constant, as the strike price increases, the value of a call option decreases and the value of a put option increases. Similarly, as the strike price decreases, the price of the call option increases while that of a put option decreases.

Time to expiration: Time to expiration is the time remaining for the option to expire. Obviously, the time remaining in an option's life moves constantly towards zero. Even if the underlying price is constant, the option price will still change since time reduces constantly and

the time for which the risk is remaining is reducing. The time value of both call as well as put option decreases to zero (and hence, the price of the option falls to its intrinsic value) as the time to expiration approaches zero. As time passes and a call option approaches maturity, its value declines, all other parameters remaining constant. Similarly, the value of a put option also decreases as we approach maturity. This is called "time-decay".

Volatility: Volatility is an important factor in the price of an option. Volatility is defined as the uncertainty of returns. The more volatile the underlying higher is the price of the option on the underlying. Whether we are discussing a call or a put, this relationship remains the same.

Risk free rate: Risk free rate of return is the theoretical rate of return of an investment which has no risk (zero risk). Government securities are considered to be risk free since their return is assured by the Government. Risk free rate is the amount of return which an investor is guaranteed to get over the life time of an option without taking any risk. As we increase the risk free rate the price of the call option increases marginally whereas the price of the put option decreases marginally. It may however be noted that option prices do not change much with changes in the risk free rate.

The impact of all the parameters which affect the price of an option is given in the table below:

With an increase in the parameter:	**Price of Call Option**	**Price of Put Option**
Asset Price		
Exercise Price		
Time to expiration		
Volatility		
Risk free rate		

Even though option prices are determined by market demand and supply, there are various models of getting a fair value of the options, the most popular of which is the Black Scholes-Merton Model. In this model, the theoretical value of the options is obtained by inputting into a formula values of the above-mentioned five factors. It may be noted that the prices arrived at by using this model are only indicative.

CHAPTER 6: Derivatives Trading On Exchange

Futures and options contracts are traded on the NSE's F&O Segment. The F&O Segment of NSE is a very liquid market clocking high turnover daily.

6.1 Derivatives Trading on NSE

The F&O segnnent on NSE provides trading facilities for the following derivative instruments:

- Index futures,
- Index options,
- Individual stock futures, and
- Individual stock options.

As an investor one can invest in any of these products. All these products have different contract specifications.

6.1.1 Contract specifications for index based futures

Index futures are futures contracts on an index, like the Nifty. The underlying asset in case of index futures is the index itself. For example, Nifty futures traded in NSE track spot Nifty returns. If the Nifty index rises, so does the pay off of the long position in Nifty futures. Apart from Nifty other indices such as CNX IT, Bank Nifty etc. are also traded on the NSE. They have one-month, two-month, and three-month expiry cycle: a one-month Nifty futures contract would expire in the current month, a two-month contract the next month, and a three-month contract the month after. All contracts expire on the last Thursday of every month, or the previous trading day if the last Thursday is a trading holiday. Thus, a September 2009 contract would expire on the last Thursday of September 2009, which would be the final settlement date of the contract. Table 6.1 summarizes contract specifications for CNX Nifty Index Futures.

Table 6.1: Contract Specification for CNX Nifty Index Futures

Underlying Index	**CNX Nifty**
Exchange of trading	National Stock Exchange of India Limited
Security Descriptor	FUTIDX NIFTY
Contract Size	Permitted lot size is 50 (minimum value Rs 2 lakh)
Trading Cycle	The future contracts have a maximum of three month trading cycle - the near month (one), the next month (two), and the far month (three). New contracts are introduced on the next trading day following the expiry of the near month contract.
Expiry Day	The last Thursday of the expiry month or the previous trading day if the last Thursday is a trading holiday
Settlement Basis	Mark-to-market and final settlement are cash settled on T+I basis
Settlement Price	Daily Settlement price is the closing price of the futures contracts for the trading day and the final settlement price is the value of the underlying index on the last trading day

6.1.2 Contract specifications for index based options

Index based options are similar to index based futures as far as the underlying is concerned i.e., in both the cases the underlying security is an Index. As the value of the index increases, the value of the call option on index increases, while put option value reduces. All index based options traded on NSE are European type options and expire on the last Thursday of the expiry month. They have expiries of one month or two months, or three months. Longer dated expiry contracts with expiries up to 3.5 years have also been introduced for trading. Table 6.2 summarizes contract specifications for CNX Nifty Index Options.

Table 6.2: Contract Specification for CNX Nifty Options

Underlying Index	CNX Nifty
Security Descriptor	OPTIDX NIFTY
Contract Size	Permitted lot size is 50 (minimum value Rs. 2 lakh)
Trading Cycle	The Option contracts have a maximum of three month trading cycle—the near month (one), the next month (two), and the far month (three). New contracts are introduced on the next trading day following the expiry of the near month contract.
Expiry Day	The last Thursday of the expiry month or the previous trading day if the last Thursday is a trading holiday
Settlement Basis	Cash Settlement on T+l basis
Style of Option	European
Daily Settlement	Not Applicable
Final Settlement price	Closing value of the index on the last trading day.

6.1.3 Contract specifications for stock based futures

Stock based futures are futures based on individual stocks. The underlying on these futures are the individual company stocks traded on the Exchange. The expiration cycle of the stock futures is same as that of index futures. Table 6.3 summarizes the contract Specification for Stock Futures.

Table 6.3: Contract Specification for Stock Futures

Underlying	Individual Securities
Exchange of Trading	NSE
Security Descriptor	FUTSTK
Contract Size	As specified by the exchange (minimum value of Rs. 2 lakh)
Trading Cycle	The futures contracts have a maximum of three month trading cycle—the near month (one), the next month (two), and the far month (three). New contracts are introduced on the next trading day following the expiry of the near month contract
Expiry Day	The last Thursday of the expiry month or the previous day if Thursday is a trading holiday
Settlement Basis	Mark to market and final settlement is cash settled on T+l basis
Settlement Price	Daily settlement price is the closing price of the futures contracts for the trading day and the final settlement price is the closing price of the underlying security on the last trading day.

6.1.4 Contract specifications for stock based options

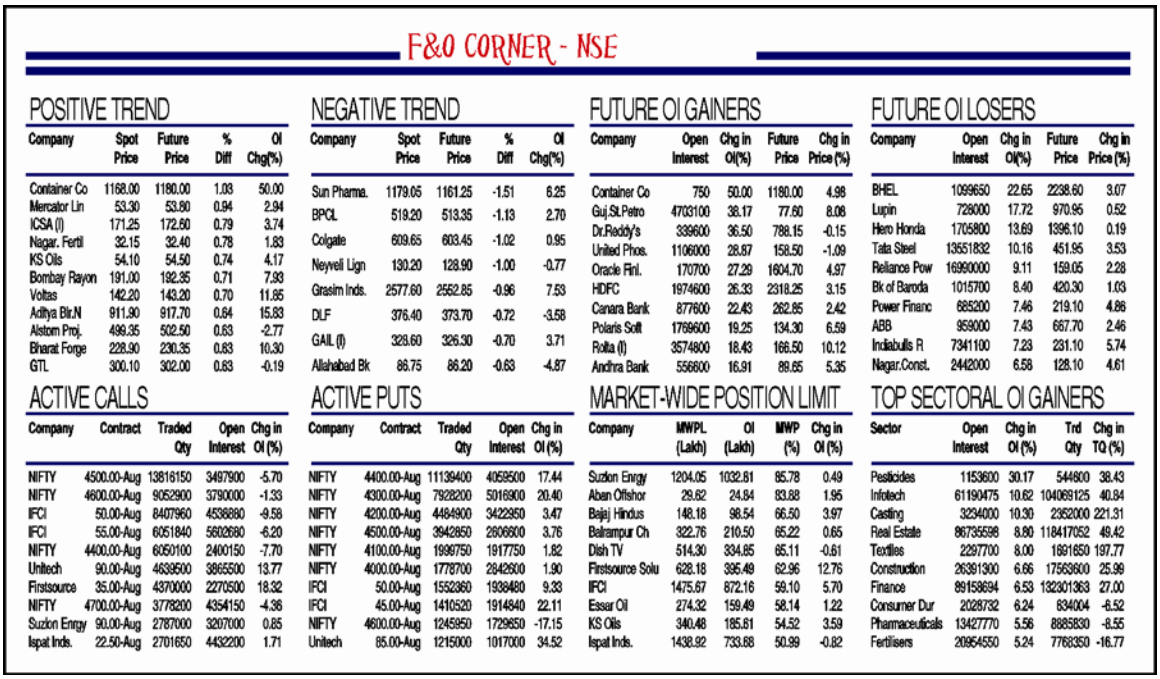
Stock based options are options for which the underlying is individual stocks. All the stock based options at the NSE have European style settlement. Table 6.4 summarizes the contract specification for Stock Options.

Table 6.4: Contract Specification for Stock Options

Underlying	Individual Securities available for trading in cash market
Security Descriptor	OPTSTK
Style of Option	European
Contract size	As specified by the exchange (minimum value of Rs 2 lakh)
Trading Cycle	The options contracts have a maximum of three month trading cycle—the near month (one), the next month (two), and the far month (three). New contracts are introduced on the next trading day following the expiry of near month contract
Expiry Day	The last Thursday of the expiry month or the previous trading day if the last Thursday is a trading holiday
Settlement Basis	Daily Settlement on T+l basis and final option exercise settlement on T+l basis
Daily Settlement	Premium value (net)
Final Settlement price	Closing price of underlying on exercise day or on expiry day

6.2 Using Daily Newspapers to Track Futures and Options

Business newspapers can be used to track the end of day prices and trends in F&O. The prices of F&O can be tracked in the F&O section in all the major business dailies such as Economic Times, Business Standard, Financial Express etc. An extract of a financial newspaper is given below.



F&O CORNER - NSE

POSITIVE TREND

Company	Spot Price	Future Price	% Diff	OI Chg(%)
Container Co	1168.00	1180.00	1.03	50.00
Mercator Lin	53.30	53.80	0.94	2.94
ICSA (I)	171.25	172.60	0.79	3.74
Nagar. Fertil	32.15	32.40	0.78	1.83
KS Oils	54.10	54.50	0.74	4.17
Bombay Rayon	191.00	192.35	0.71	7.93
Voltas	142.20	143.20	0.70	11.85
Aditya Birl.N	911.90	917.70	0.64	15.83
Alstom Proj.	499.35	502.50	0.63	-2.77
Bharat Forge	228.90	230.35	0.63	10.30
GTL	300.10	302.00	0.63	-0.19

NEGATIVE TREND

Company	Spot Price	Future Price	% Diff	OI Chg(%)
Sun Pharma.	1179.05	1161.25	-1.51	6.25
BPCL	519.20	513.35	-1.13	2.70
Colgate	609.65	603.45	-1.02	0.95
Neyveli Lign	130.20	128.90	-1.00	-0.77
Grasim Inds.	2577.60	2552.85	-0.96	7.53
DLF	376.40	373.70	-0.72	-3.58
GAIL (I)	328.60	326.30	-0.70	3.71
Allahabad Bk	86.75	86.20	-0.63	-4.87

FUTURE OI GAINERS

Company	Open Interest	Chg in OI(%)	Future Price	Chg in Price (%)
Container Co	750	50.00	1180.00	4.98
Guj.St.Petro	4703100	38.17	77.60	8.08
Dr.Reddy's	339600	36.50	788.15	-0.15
United Phos.	1106000	28.87	158.50	-1.09
Oracle Finl.	170700	27.29	1604.70	4.97
HDFC	1974600	26.33	2318.25	3.15
Canara Bank	877600	22.43	262.85	2.42
Polaris Soft	1769600	19.25	134.30	6.59
Rolta (I)	3574800	18.43	166.50	10.12
Andhra Bank	556600	16.91	89.65	5.35

FUTURE OI LOSERS

Company	Open Interest	Chg in OI(%)	Future Price	Chg in Price (%)
BHEL	1099650	22.65	2238.60	3.07
Lupin	728000	17.72	970.95	0.52
Hero Honda	1705800	13.69	1396.10	0.19
Tata Steel	13551832	10.16	451.95	3.53
Reliance Pow	16990000	9.11	159.05	2.28
Bk of Baroda	1015700	8.40	420.30	1.03
Power Financ	685200	7.46	219.10	4.86
ABB	959000	7.43	667.70	2.46
Indiabulls R	7341100	7.23	231.10	5.74
Nagar.Const.	2442000	6.58	128.10	4.61

ACTIVE CALLS

Company	Contract	Traded Qty	Open Interest	Chg in OI (%)
NIFTY	4500.00-Aug	13816150	3497900	-5.70
NIFTY	4600.00-Aug	9052900	3790000	-1.33
IFCI	50.00-Aug	8407960	4536880	-9.58
IFCI	55.00-Aug	6051840	5602680	-6.20
NIFTY	4400.00-Aug	6050100	2400150	-7.70
Unitech	90.00-Aug	4639500	3865500	13.77
Firstsource	35.00-Aug	4370000	2270500	18.32
NIFTY	4700.00-Aug	3778200	4354150	-4.36
Suzlon Engy	90.00-Aug	2787000	3207000	0.85
Ispat Inds.	22.50-Aug	2701650	4432200	1.71

ACTIVE PUTS

Company	Contract	Traded Qty	Open Interest	Chg in OI (%)
NIFTY	4400.00-Aug	11139400	4059500	17.44
NIFTY	4300.00-Aug	7928200	5016900	20.40
NIFTY	4200.00-Aug	4484900	3422950	3.47
NIFTY	4500.00-Aug	3942850	2606600	3.76
NIFTY	4100.00-Aug	1998750	1917750	1.82
NIFTY	4000.00-Aug	1778700	2842600	1.90
IFCI	50.00-Aug	1552360	1938480	9.33
IFCI	45.00-Aug	1410520	1914840	22.11
NIFTY	4600.00-Aug	1245950	1729650	-17.15
Unitech	85.00-Aug	1215000	1017000	34.52

MARKET-WIDE POSITION LIMIT

Company	MWPL (Lakh)	OI (Lakh)	MWP (%)	Chg in OI (%)
Suzlon Engy	1204.05	1032.81	85.78	0.49
Aban Offshor	29.62	24.84	83.88	1.95
Bajaj Hindus	148.18	98.54	66.50	3.97
Balrampur Ch	322.76	210.50	65.22	0.65
Dish TV	514.30	334.85	65.11	-0.61
Firstsource Solu	628.18	395.49	62.96	12.76
IFCI	1475.67	872.16	59.10	5.70
Essar Oil	274.32	159.49	58.14	1.22
KS Oils	340.48	185.81	54.52	3.59
Ispat Inds.	1438.92	733.68	50.99	-0.82

TOP SECTORAL OI GAINERS

Sector	Open Interest	Chg in OI (%)	Trd Qty	Chg in TQ (%)
Pesticides	1153600	30.17	544800	38.43
Infotech	61190475	10.62	104069125	40.84
Casting	3234000	10.30	2352000	221.31
Real Estate	86735598	8.80	118417052	49.42
Textiles	2297700	8.00	1891650	197.77
Construction	26391300	6.66	17563600	25.99
Finance	89158694	6.53	132301363	27.00
Consumer Dur	2028732	6.24	834004	-6.52
Pharmaceuticals	13427770	5.56	8885830	-8.55
Fertilisers	20954550	5.24	7768350	-16.77

There are various fields in this section, for example:

- Company: It is the name of the underlying company or index whose futures are traded.
- Spot Price: Spot price of the underlying security or index.
- Futures Price: Future price of the underlying security or index.
- % Diff: Percentage change in the price of the future from the previous day.
- OI Change %: Percentage change in the open interest of a derivative contract in a day.

What is Open Interest (OI) and Contract in the enclosed charts?

Open interest is the total number of options and/or futures contracts that are not closed out on a particular day, that is contracts that have been purchased and are still outstanding and not been sold and *vice versa.* A common misconception is that open interest is the same thing as volume of options and futures trades. This is not correct since there could be huge volumes but if the volumes are just because of participants squaring off their positions then the open interest would not be large. On the other hand, if the volumes are large because of fresh positions being created then the open interest would also be large.

The Contract column tells us about the strike price of the call or put and the date of their settlement. For example, the first entry in the Active Calls section (4500.00-August) means it is a Nifty call with Rs 4500 strike price, that would expire in August. It is interesting to note from the newspaper extract given above is that it is possible to have a number of options at different

strike prices but all of them have the same expiry date. For example, there are a number of call options on Nifty with different strike prices, but all of them expiring on the same expiry date in August.

There are different tables explaining different sections of the F&O markets.

1. Positive trend: It gives information about the top gainers in the futures market.
2. Negative trend: It gives information about the top losers in the futures market.
3. Future 01 gainers: It lists those futures whose % increases in open interest are among the highest on that day.
4. Future 01 losers: It lists those futures whose % decreases in open interest are among the highest on that day.
5. Active Calls: Calls with high trading volumes on that particular day.
6. Active Puts: Puts with high trading volumes on that particular day.

6.3 Settlement of Derivatives

Settlement refers to the process through which trades are cleared by the payment/receipt of currency, securities or cash flows on periodic payment dates and on the date of the final settlement. The settlement process is somewhat elaborate for derivatives instruments which are exchange traded. (They have been very briefly outlined here. For a more detailed explanation, please refer to NCFM Derivatives Markets (Dealers) Module). The settlement process for exchange traded derivatives is standardized and a certain set of procedures exist which take care of the counterparty risk posed by these instruments. At the NSE, the National Securities Clearing Corporation Limited (NSCCL) undertakes the clearing and settlement of all trades executed on the F&O segment of NSE. It also acts as a legal counterparty to all trades on the F&O segment and guarantees their financial settlement. There are two clearing entities in the settlement process: Clearing Members and Clearing Banks.

6.3.1 Clearing members

A Clearing member (CM) is the member of the clearing corporation i.e., NSCCL. These are the members who have the authority to clear the trades executed in the F&O segment in the exchange. There are three types of clearing members with different set of functions:

1) **Self-clearing Members:** Members who clear and settle trades executed by them only on their own accounts or on account of their clients.
2) **Trading cum Clearing Members:** They clear and settle their own trades as well as trades of other trading members (TM).
3) **Professional Clearing Members (PCM):** They only clear and settle trades of others but do not trade themselves. PCMs are typically Financial Institutions or Banks who are admitted by the Clearing Corporation as members.

6.3.2 Clearing banks

Some commercial banks have been designated by the NSCCL as Clearing Banks. Financial settlement can take place only through Clearing Banks. All the clearing members are required to open a separate bank account with an NSCCL designated clearing bank for the F&O segment. The clearing members keep a margin amount in these bank accounts.

6.4 Settlement of Futures

When two parties trade a futures contract, both have to deposit margin money which is called the initial margin. Futures contracts have two types of settlement: (i) the mark-to-market (MTM) settlement which happens on a continuous basis at the end of each day, and (ii) the final settlement which happens on the last trading day of the futures contract i.e., the last Thursday of the expiry month.

6.4.1 Mark to market settlement

To cover for the risk of default by the counterparty for the clearing corporation, the futures contracts are marked-to-market on a daily basis by the exchange. Mark to market settlement is the process of adjusting the margin balance in a futures account each day for the change in the value of the contract from the previous day, based on the daily settlement price of the futures contracts (Please refer to the Tables given below.). This process helps the clearing corporation in managing the counterparty risk of the future contracts by requiring the party incurring a loss due to adverse price movements to part with the loss amount on a daily basis. Simply put, the party in the loss position pays the clearing corporation the margin money to cover for the shortfall in cash. In extraordinary times, the Exchange can require a mark to market more frequently (than daily).

To ensure a fair mark-to-market process, the clearing corporation computes and declares the official price for determining daily gains and losses. This price is called the "settlement price" and represents the closing price of the futures contract. The closing price for any contract of any given day is the weighted average trading price of the contract in the last half hour of trading.

Illustration of mark to market settlement

To illustrate this concept, let us consider a futures contract that has been bought on the XYZ Ltd. at an initial price of Rs. 1000. The exchange sets two margins; Initial Margin and Maintenance Margin. Both parties to a derivative contract have to pay a certain Margin the moment they enter into the Contract; it is called Initial Margin. Maintenance margin is the level at which the margin has to be always maintained. In case the margin falls to maintenance

margin or below, additional funds are called for to take have to take the margin to the Initial margin level.

Let us say, Initial Futures Price = Rs. 1000; Initial Margin requirement = Rs. 500; Maintenance Margin Requirement = Rs. 300; Contract size = 10 (that is, one futures contract has 10 shares of XYZ. How the end of day margin balance of the holder of (i) a long position of a contract and (ii) a short position of a contract, varies with the changes in settlement price from day to day is given below.

Table 6.5 Mark to market margin of a long position

Day	Beginning Balance (Rs.)	Funds Deposited (Rs.)	Settlement Price (Rs.)	Future Price Change (A)(Rs.)	Gain/Loss = (A) X Contract Size (Rs.)	Ending Balance (Rs.)
0	0	500	1000			
1	500	**0**	992	**-8**	**-80**	420
2	420	**0**	960	**-32**	-320	100
3	100	400	1010	50	500	1000
4	1000	**0**	1035	**25**	250	1250
5	1250	**0**	1030	**-5**	-50	1200
6	1200	**0**	1040	10	100	1300

Table 6.6 Mark to market margin of a long position

Day	Beginning Balance (Rs.)	Funds Deposited (Rs.)	Settlement Price (Rs.)	Future Price Change (A)(Rs.)	Gain/Loss = (A) X Contract Size (Rs.)	Ending Balance (Rs.)
0	**0**	500	1000			
1	500	**0**	992	**8**	**80**	580
2	580	**0**	960	**32**	320	900
3	900	**0**	1010	-50	-500	400
4	400	**0**	1035	-25	-250	150
5	150	350	1030	**5**	50	550
6	550	**0**	1040	-10	-100	450

6.4.2 Final settlement for futures

After the close of trading hours on the expiry day of the futures contracts, NSCCL marks all positions of clearing members to the final settlement price and the resulting profit/loss is settled in cash. Final settlement loss is debited and final settlement profit is credited to the relevant clearing bank accounts on the day following the expiry date of the contract. Suppose the above contract closes on day 6 (that is, it expires) at a price of Rs. 1040, then on the day of expiry, Rs. 100 would be debited from the seller (short position holder) and would be transferred to the buyer (long position holder).

6.5 Settlement of Options

In an options trade, the buyer of the option pays the option price or the option premium. The options seller has to deposit an initial margin with the clearing member as he is exposed to unlimited losses.

There are basically two types of settlement in stock option contracts: daily premium settlement and final exercise settlement. Options being European style, they cannot be exercised before expiry.

6.5.1 Daily premium settlement

Buyer of an option is obligated to pay the premium towards the options purchased by him. Similarly, the seller of an option is entitled to receive the premium for the options sold by him. The same person may sell some contracts and buy some contracts as well. The premium payable and the premium receivable are netted to compute the net premium payable or receivable for each client for each options contract at the time of settlement.

6.5.2 Exercise settlement

Normally most option buyers and sellers close out their option positions by an offsetting closing transaction but a better understanding of the exercise settlement process can help in making better judgment in this regard. Stock and index options can be exercised only at the end of the contract.

Final Exercise Settlement

On the day of expiry, all in the money options are exercised by default. An investor who has a long position in an in-the-money option on the expiry date will receive the exercise settlement value which is the difference between the settlement price and the strike price. Similarly, an investor who has a short position in an in-the-money option will have to pay the exercise settlement value.

The final exercise settlement value for each of the in the money options is calculated as follows:

Call Options = Closing price of the security on the day of expiry - strike price (if closing price > strike price, else 0)

Put Options = Strike price - closing price of the security on the day of expiry (if closing price < strike price, else 0)

Example: Suppose a call option on Reliance Industries has a Strike price of Rs. 2200, and the closing price is Rs. 2500 on the day of expiry, then the final exercise settlement value of the call option is:

V = 2500 - 2200 = 300.

6.6 Accounting and Taxation of Derivatives

The Institute of Chartered Accountants of India (ICAI) has issued guidance notes on accounting of index future contracts from the view point of parties who enter into such future contracts as buyers or sellers. For other parties involved in the trading process, like brokers, trading members, clearing members and clearing corporations a trade in equity index futures is similar to a trade in, say shares, and accounting remains similar as in the case of buying or selling of shares.

6.*6.1* *Taxation of derivative instruments*

Prior to the year 2005, the Income Tax Act did not have any specific provision regarding taxability of derivatives. The only tax provisions which had indirect bearing on derivatives transactions were sections 73(1) and 43(5). Under these sections, trade in derivatives was considered "speculative transactions" for the purpose of determining tax liability. All profits and losses were taxed under the speculative income category. Therefore, loss on derivatives transactions could be set off only against other speculative income and the same could not be set off against any other income. This resulted in high tax liability.

Finance Act, 2005 has amended section 43(5) so as to exclude transactions in derivatives carried out in a "recognized stock exchange" from "speculative transaction'. This implies that derivatives transactions that take place in a "recognized stock exchange" are not taxed as speculative income or loss. They are treated under the business income head of the Income tax Act. Any losses on these activities can be set off against any business income in the year and the losses can be carried forward and set off against any other business income for the next eight years.

MODEL TEST

EQUITY DERIVATIVES: A BEGINNER'S MODULE

Q:1 An investor is long 2 contracts of Nifty futures purchased at Rs. 5035 each. The next morning a scam is disclosed of a large company because of which markets sell off and Nifty futures goes down to Rs. 4855. What is the mark to market for the investor? (1 Nifty contract is 50 shares). [3 Marks]

(a) Rs. -18000
(b) Rs. 18000
(c) Rs. -9000
(d) Rs. 9000

Q:2 If SBI is trading at Rs. Rs 2200 a share in the spot market and an investor wants to buy 200 SBI shares then he has to make a payment of _____. [2 Marks]

(a) Depends on the initial margin of SBI
(b) Rs. 2200
(c) Rs. 4400
(d) Rs. 440000

Q:3 An investor buys a 4 lots of TATASTEEL futures at Rs. 545 each and sells it at Rs. 447 each. If one contract is 764 shares what is the Profit/ Loss in the transaction? [2 Marks]

(a) Profit Rs. 74872
(b) Loss 74872
(c) Loss Rs. 299488
(d) Profit Rs. 299488

Q:4 What are the types of settlement (s) in forward contracts? [3 Marks]

(a) Physical and Cash
(b) Cash
(c) Physical
(d) There are no settlements for forward contracts

Q:5 An investor sells 3 lots of Nifty futures at Rs. 5231 each. On that day Nifty closes at Rs. 5310 in the futures market. What is the mark to market for the investor if any? One lot of Nifty is 50 shares [1 Mark]

(a) Profit of Rs. 11000
(b) Loss of Rs. 11850
(c) Loss of Rs. 10000
(d) Profit of Rs. 13000

Q:6 In a business daily to get information about the top gainers in the futures market, one has to look in the heading : [2 Marks]

(a) Contract details
(b) Positive trend
(c) Open Interest
(d) Negative trend

Q:7 An investor bought a put option on a stock with a strike price Rs. 2000 for Rs. 200. The option will be in the money when _____ . [1 Mark]

(a) The stock price is less than Rs. 2000
(b) The stock price is greater than Rs. 2200
(c) The stock price is greater than Rs. 2000
(d) The stock price is less than Rs. 1800

Q:8 All Stock Options are American in nature. [2 Marks]

(a) TRUE
(b) FALSE

Q:9 On 3rd August, NTPC is trading at Rs. 200 and 200 strike call option for one month is trading at Rs. 7.50. An investor who is bearish on NTPC sells the call option. NTPC on that month's expiry closes at Rs. 207.5. What is the investor's Profit / Loss in the trade? 1 lot of NTPC is 1625 shares. [2 Marks]

(a) Rs. -12187
(b) Rs. 10000
(c) Rs. 12187
(d) No Profit no Loss

Q:10 In futures trading initial margin is paid by : [3 Marks]

(a) buyer only
(b) clearing member
(c) seller only
(d) buyer and seller

Q:11 An investor has Unitech shares in her portfolio. RBI is increasing interest rates which is negative for the stock. She wants to protect the downside in the stock as she feels RBI will decide on increasing interest rates in the next 3 months. What should she do? [1 Mark]

(a) Buy 3 month call option of Unitech
(b) Buy 2 month put option of Unitech
(c) Buy 1 month put option of Unitech
(d) Buy 3 month put option of Unitech

Q:12 In India, all Options traded on a stock are : [1 Mark]

(a) Continental Options
(b) Asian Options
(c) European options
(d) American options

Q:13 SBI is trading at Rs. 1800 in the cash market. What would be the price of SBI futures expiring three months from today. Risk free rate = 8% p.a. [1 Mark]

(a) 1844
(b) 1895
(c) 1814
(d) 1836

Q:14 All December 2009 stock Futures contracts traded on NSE will expire on : [2 Marks]

(a) Last Thursday of December 2009
(b) Exchanges decides on expiry day and will update the investors on 1st December 2009
(c) Last Friday of December 2009
(d) 3rd Thursday of December 2009

Q:15 In India, all Options traded on Nifty are : [1 Mark]

(a) Asian Options
(b) American options
(c) Continental Options
(d) European options

Q:16 Nifty futures is trading at Rs. 3325 and an investor buys a 3400 call for current month for Rs. 100. What should be the closing price of Nifty only above which the investor starts to make Profits if he holds his long option position? 1 lot of Nifty = 50 shares. [2 Marks]

(a) 3425
(b) 3400
(c) 3325
(d) 3500

Q:17 Which of the following is an exchange traded contract? [3 Marks]

(a) Futures on Nifty
(b) Forward contract on oil
(c) An interest rate swap
(d) A 10 year loan

Q:18 As more and more _____trades take place, the difference between spot and futures prices would narrow. [3 Marks]

(a) hedge
(b) delta
(c) arbitrage
(d) speculative

Q:19 Nifty is at 5200. A put option at 5000 strike price is trading at Rs. 150. What is the intrinsic value of the option? [1 Mark]

(a) 200 (b)0
(c) 350
(d) 150

Q:20 Nifty is currently at 5100. An investor feels Nifty will not go beyond 4500 in next three months. He sells two lots of 5100 strike call on Nifty for Rs. 200 a lot. Because of good industrial production data, Nifty rallies to 5200 on the option's expiry day. What is the Profit/ Loss to the investor? (1 lot = 50 shares) [3 Marks]

(a) Rs. 10000
(b) Rs. -10000
(c) Rs. 20000
(d) Rs. -20000

Q:21 On 1st November, SBI is trading at Rs. 2300. An investor is bearish on the company because of the earnings of last quarter and sells a SBI futures at Rs. 2325. He buys back SBI futures at Rs. 2300. What is the Profit / Loss for the investor if 1 lot of SBI is 250 shares?
[3 Marks]

(a) Rs. 6250
(b) Rs. 0
(c) Rs. -6250
(d) Rs. -10000

Q:22 Which of the following is NOT a hedge for a long position in an underlying stock?
[2 Marks]

(a) Sell call option
(b) Sell futures
(c) Sell put option
(d) Buy Put option

Q:23 When the strike price is lower than the spot price of the underlying, a call option will be ____ . [1 Mark]

(a) At the money
(b) In the money
(c) Out of the money
(d) American Type

Q:24 On 1st January, SBI is trading at Rs. 2310. An investor is bullish on the company because of the earnings of last quarter and buys a SBI futures at Rs. 2310. He sells SBI futures at Rs. 2335. What is the Profit / Loss for the investor if 1 lot of SBI is 250 shares? [2 Marks]

(a) Rs. -10000
(b) Rs. -6250
(c) Rs. 6250
(d) Rs. 0

Q:25 An investor buys TCS for Rs. 575 in the futures market. At the end of the day TCS futures closes at Rs. 500 in the futures market. What is the mark to market the investor is making/ losing ? (1 lot of TCS = 1000 shares) [2 Marks]

(a) Rs. 500000
(b) Rs. 575000
(c) Rs. -75000
(d) Rs. 75000

Q:26 An investor buys a 4 lots of Nifty at Rs. 5100 each. He sells 2 lots at Rs. 5050 and carries 2 lots for next day. On that day Nifty futures closes at Rs. 5000. What is his total Loss including mark to market Loss? One lot of Nifty is 50 shares . [1 Mark]

(a) Loss of Rs. 5000
(b) Profit of Rs. 5000
(c) Profit of Rs. 2000
(d) No Loss, no Profit

Q:27 Infosys is trading at Rs. 1500 in the cash market. What should be the fair price of Infosys futures expiring 90 days from today. Risk free rate is 8% p.a. [3 Marks]

(a) 1550
(b) 1515
(c) 1530
(d) 1540

Q:28 An investor buys a 1 lot of Nifty futures at Rs. 4927 and sells it at Rs. 4567 If one contract is 50 shares what is the Profit/ Loss in the transaction? [2 Marks]

(a) Loss Rs. 22000
(b) Profit Rs. 22000
(c) Loss Rs. 18000
(d) Profit Rs. 18000

Q:29 Which of the following positions has a limited downside_____ . [2 Marks]

(a) Sell futures
(b) Buy Call Option
(c) Sell stock
(d) Sell Call option

Q:30 Reliance is trading at Rs. 1520 in the cash market. What should be the fair price of Reliance futures expiring 90 days from today. Risk free rate is 8% p.a. [3 Marks]

(a) 1529
(b) 1537
(c) 1551
(d) 1563

Q:31 Like Futures contracts there is daily settlement of options contracts. [2 Marks]

(a) TRUE
(b) depends on the expiry
(c) FALSE
(d) depends if the option is call or put

Q:32 TCS is trading at Rs. 420 in the spot market and Rs. 435 in the futures market. Is there an arbitrage opportunity? The Futures contract is settling today. [1 Marks]

(a) No
(b) Depends on Market Sentiment
(c) Yes

Q:33 Reliance Capital is trading at Rs. 1000 in cash market. What should be the price of Reliance capital futures expiring 60 days from today. Risk free rate is 8% p.a. [2 Marks]

(a) 1087
(b) 1013
(c) 1081
(d) 1121

Q:34 An investor buys 2 contracts of TCS futures for Rs. 570 each. He sells of one contract at Rs. 585. TCS futures closes the day at Rs. 550. What is the net payment the investor has to pay/ receive from his broker? 1 TCS contract = 1000 shares [2 Marks]

(a) Pay Rs. 20000 to the broker
(b) Pay Rs. 5000 to the broker
(c) Receive Rs. 5000 from the broker
(d) Receive Rs. 15000 from the broker

Q:35 The value of a put option is positively related to all of the following EXCEPT: [2 Marks]

(a) exercise price
(b) risk-free rate
(c) time to maturity

Q:36 If a farmer expects to sell his wheat in three months time in anticipation of a harvest. He wants to hedge his risk, he needs to: [3 Marks]

(a) buy wheat futures now
(b) buy wheat now
(c) sell wheat now
(d) sell wheat futures now

Q:37 DLF is trading at Rs. 380 in the spot market and Rs. 395 in the futures market. Is there an arbitrage opportunity? The Futures contract is settling today. [1 Mark]

(a) Depends on Market Sentiment
(b) Yes
(c) No

Q:38 Security descriptor for stock Futures contract is : [2 Marks]

(a) FUTSTK
(b) OPTIDX
(c) OPTSTK
(d) FUTIDX

Q:39 Derivatives help in _____ . [2 Marks]

(a) Risk Management
(b) Price Discovery of the underlying
(c) Improving Market Efficiency
(d) All of the above

Q:40 Nifty is at 3900. What should be the fair price of Nifty futures expiring 180 days from today. Risk free rate is 8% p.a. [3 Marks]

(a) 4027
(b) 4083
(c) 4031
(d) 4059

Q:41 The maximum expiry for individual stock options contract is : [2 Marks]

(a) 2 months
(b) 6 months
(c) 1 months
(d) 3 months

Q:42 The parties for the Futures contract have the flexibility of closing out the contract prior to the maturity by squaring off the transactions in the market. State true or false. [3 Marks]

(a) TRUE
(b)FALSE

Q:43 Nifty is at 3375. What should be the fair price of Nifty futures expiring 30 days from today. Risk free rate is 8% p.a. [2 Marks]

(a) 3367
(b) 3377
(c) 3398
(d) 3352

Q:44 Nifty futures is trading at Rs. 4955. An investor feels the market will not go beyond 5100. He can_____ . [2 Marks]

(a) Sell 5000 Nifty call
(b) Sell 5100 Nifty put
(c) Sell 5000 Nifty put
(d) Sell 5100 Nifty Call

Q:45 Arbitrage is a _____ . [2 Marks]

(a) Risk free Strategy
(b) High Risk Strategy

Q:46 If an option is out of the money and the strike price of the option is lower than the spot price of the underlying, then we are referring to_____ . [1 Mark]

(a) A Put Option
(b) An European Option
(c) A Call option
(d) An American option

Q:47 Nifty is at 5000. An investor buys a 5000 strike price put option for Rs. 170. The option is currently ___ . [1 Mark]

(a) Out of the money
(b) American Type
(c) At the money
(d) In the money

Q:48 Nifty futures is trading at Rs. 3975 and an investor buys a 4000 call for current month for Rs. 100. What should be the closing price of Nifty only above which the investor starts to make Profits if he holds his long option position? 1 lot of Nifty = 50 shares. [3 Marks]

(a) 3975
(b) 4000
(c) 4075
(d) 4100

Q:49 Price that is agreed upon at the date of the contract for the delivery of an asset at a specific futures date is called _____ . [2 Marks]

(a) Spot Price
(b) Discount Price
(c) Cash market price
(d) Futures Price

Q:50 Price of an option expiring three months from today will be higher than price of an option expiring in two months from today. [2 Marks]

(a) Incomplete data
(b) Depends if it is call or put option
(c) TRUE
(d) FALSE

Correct Answer :

Question No.	Answers	Question No.	Answers
1	(a)	26	(a)
2	(d)	27	(c)
3	(c)	28	(c)
4	(a)	29	(b)
5	(b)	30	(c)
6	(b)	31	(c)
7	(a)	32	(c)
8	(b)	33	(b)
9	(d)	34	(b)
10	(d)	35	(b)
11	(d)	36	(d)
12	(c)	37	(b)
13	(d)	38	(a)
14	(a)	39	(d)
15	(d)	40	(d)
16	(d)	41	(d)
17	(a)	42	(a)
18	(c)	43	(c)
19	(b)	44	(d)
20	(a)	45	(a)
21	(a)	46	(a)
22	(c)	47	(c)
23	(b)	48	(d)
24	(c)	49	(d)
25	(c)	50	(c)

Notes

Notes

Notes