Derivatives and Risk Management

DMGT513

Edited by:
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LOVELY PROFESSIONAL UNIVERSITY

DERIVATIVES & RISK MANAGEMENT

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SYLLABUS

Derivatives & Risk Management

Objectives: To provide a basic understanding of financial derivatives as well the application of derivatives, trading mechanism, uses as hedging instruments, risks involved and legal, controlling and regulatory framework.

To provide knowledge, understanding of practical investments and corporate financial management strategies (such as hedging or risk mitigation) using various derivatives in a manner which will allow students to apply these concepts and skills in their careers.

Sr. No.	Description
1.	**Introduction to derivatives:** Definition, types of derivatives, Uses of derivatives, Exchange-traded vs. OTC derivatives, Derivatives in India, Regulation for derivatives trading and SEBI guidelines related to derivatives trade.
2.	**Introduction to Forwards and Futures:** BasicHedging practices, Forward contracts, Limitations of forward markets, Introduction to futures, Stock Index futures, Commodity Futures and Currency Futures, Distinction between futures and forwards contracts, pay-offs, Cash settlement vs Physical settlement, Pricing Principles, Beta and Optimal Hedge Ratio.
3.	**Introduction to Options:** Option terminology and Types, Index derivatives, European and American calls and puts, Exotic and Asian Options, Stretagies and Pay-offs, Option Pricing and Put-Call parity.
4.	**Swaps:** Meaning, overview, interest rate swaps, currency swaps, credit risk, mechanics of swaps.
5.	**Interest Rate Derivatives & Euro-Dollar Derivatives:** T-Bill and T-bond Futures, Euro-Dollar Derivatives, Forward Rate Agreement (FRA), Duration, Convexity.
6.	**Credit Derivatives:** Types of Credit Derivatives**,** Credit Default Swaps, Collateralized Debt Obligations, The Indian Scenario, credit risk mitigation, Weather and Energy Derivatives.
7.	**Risk Management with Derivatives:** Hedging Using Greeks (Delta-Gamma Hedging), Hedging with Futures (Strategies of hedging, speculation and arbitrage): Index Options and futures, VaR, Historical Simulations, Risk management structure and policies in India.
8.	**Management of Derivatives Exposure:** Introduction, nature of derivatives trading, setting of Risk-vision, reasons for managing derivatives risk and types of risk in derivative trading. Futures and options trading system, Basis of trading.

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Unit 1: Introduction to Derivatives

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1.3 Uses of Derivatives

1.4 Exchange Traded vs. OTC Derivatives

1.5 Summary

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1.7 Review Questions

1.8 Further Readings

Objectives

After studying this unit, you will be able to:

- Define derivatives
- Identify the types of derivatives
- Describe the uses of derivatives
- Compare exchange traded vs OTC derivatives

Introduction

In recent decades, financial markets have been marked by excessive volatility. As foreign exchange rates, interest rates and commodity prices continue to experience sharp and unexpected movements, it has become increasingly important that corporations exposed to these risks be equipped to manage them effectively. Price fluctuations make it hard for businesses to estimate their future production costs and revenues. Derivative securities provide them a valuable set of tools for managing this risk. Risk management, the managerial process that is used to control such price volatility, has consequently risen to the top of financial agendas. It is here that derivative instruments are of utmost utility.

As instruments of risk management, these generally do not influence the fluctuations in the underlying asset prices. However, by locking-in asset prices, derivative products minimize the impact of fluctuations in asset prices on the profitability and cash flow situation of risk-averse investors.

Notes

Caution The word 'derivatives' originated in mathematics and refers to a variable that has been derived from another variable. For example, a measure of distance in kilometers could be derived from a measure of distance in miles by dividing by 1.61, or similarly a measure of temperature in Celsius could be derived from a measure of temperature in Fahrenheit. In financial sense, a derivative is a financial product which had been derived from a market for another product.

1.1 Meaning and Definitions of Derivatives

A derivative security is a financial contract whose value is derived from the value of something else, such as a stock price, a commodity price, an exchange rate, an interest rate, or even an index of prices.

Various Definitions of Derivatives

1. Derivatives are financial contracts whose value/price is dependent on the behaviour of the price of one or more basic underlying assets (often simply known as the underlying). These contracts are legally binding agreements, made on the trading screen of stock exchanges, to buy or sell an asset in future. The asset can be a share, index, interest rate, bond, rupee dollar exchange rate, sugar, crude oil, soyabean, cotton, coffee and what you have.
2. Thus, a 'derivative' is a financial instrument, or contract, between two parties that derived its value from some other underlying asset or underlying reference price, interest rate, or index. A derivative by itself does not constitute ownership, instead it is a promise to convey ownership.

   The Underlying Securities for Derivatives are:

   (a) Commodities (Castor seed, Grain, Coffee beans, Gur, Pepper, Potatoes)

   (b) Precious Metals (Gold, Silver)

   (c) Short-term Debt Securities (Treasury Bills)

   (d) Interest Rate

   (e) Common Shares/Stock

   (f) Stock Index Value (NSE Nifty)

In the Indian context the Securities Contracts (Regulation) Act, 1956 (SC(R)A) defines "derivative" 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. Derivatives are securities under the SC(R)A and hence the trading of derivatives is governed by the regulatory framework under the SC(R)A.

A very simple example of derivatives is curd, which is derivative of milk. The price of curd depends upon the price of milk which in turn depends upon the demand and supply of milk.

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Notes **Derivatives vs Shares**

The subtle, but crucial, difference is that while shares are assets, derivatives are usually contracts (the major exception to this are warrants and convertible bonds, which are similar to shares in that they are assets). Well, we can define financial assets (e.g. shares, bonds) as: claims on another person or corporation; they will usually be fairly standardized and governed by the property or securities laws in an appropriate country. On the other hand, a contract is merely an agreement between two parties, where the contract details may not be standardized. Possibly because it is thought that investors may be wary of the woolly definition of derivatives, one frequently comes across references to "derivatives securities" or "derivatives products". These "securities" and "products" sound fairly solid, tangible things. But in many cases there terms are rather inappropriately applied to what are really contracts.

Self Assessment

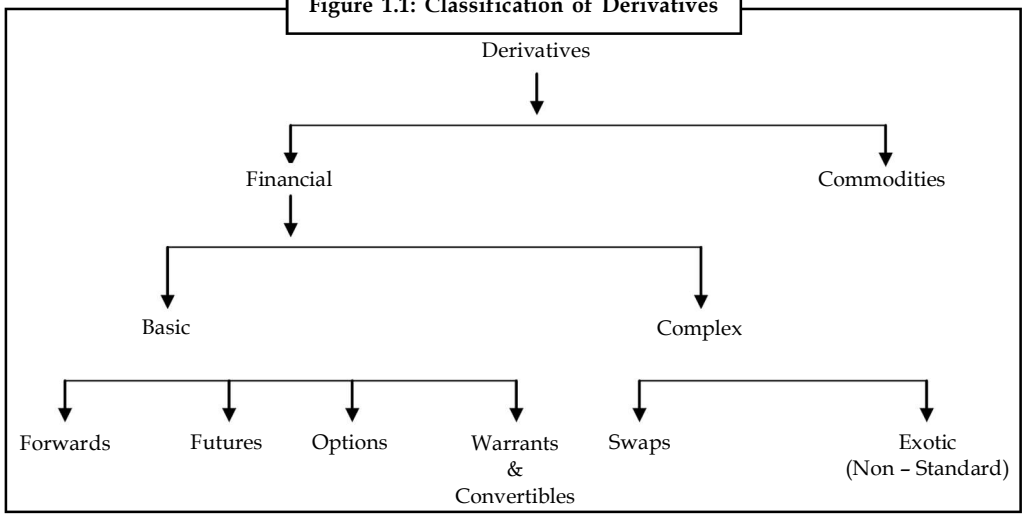
Fill in the blanks:

1. Derivatives are …….. whose value/price is dependent on the behaviour of the price of one or more basic underlying assets.
2. A derivative by itself does not constitute ……..... .
3. A …… is merely an agreement between two parties.

1.2 Types of Derivatives

It is observed that financial derivatives are those assets whose values are determined by the value of some other assets, called as the underlying. Presently, there are bewilderingly complex varieties of derivatives already in existence, and the markets are innovating newer and newer ones continuously. For example, various types of financial derivatives based on their different properties like, plain, simple or straightforward, composite, joint or hybrid, synthetic, leveraged, mildly leveraged, customized or OTC traded, standardized or organized exchange traded, etc., are available in the market.

Figure 1.1: Classification of Derivatives



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Due to complexity in nature, it is very difficult to classify the financial derivatives, so in the present context, the basic financial derivatives which are popular in the market have been described in brief. The details of their operations, mechanism and trading, will be discussed in the forthcoming respective units. In simple form, the derivatives can be classified into different categories which are shown in the Figure 1.1

One form of classification of derivative instruments is between commodity derivatives and financial derivatives. The basic difference between these is the nature of the underlying instrument or asset. In a commodity derivatives, the underlying instrument is a commodity which may be wheat, cotton, pepper, sugar, jute, turmeric, corn, soybeans, crude oil, natural gas, gold, silver, copper and so on. In a financial derivative, the underlying instrument may be treasury bills, stocks, bonds, foreign exchange, stock index, gilt-edged securities, cost of living index, etc. It is to be noted that financial derivative is fairly standard and there are no quality issues whereas in commodity derivative, the quality may be the underlying matters. However, the distinction between these two from structure and functioning point of view, both are almost similar in nature.

Another way of classifying the financial derivatives is into basic and complex derivatives. In this, forward contracts, futures contracts and option contracts have been included in the basic derivatives whereas swaps and other complex derivatives are taken into complex category because they are built up from either forwards/futures or options contracts, or both. In fact, such derivatives are effectively derivatives of derivatives.

1.2.1 Popular Derivative Instruments

The most popularly used derivatives contracts are Forwards, Futures, Options and Swaps, which we shall discuss in detail later. Here we take a brief look at various derivatives contracts that have come to be used.

1. ***Forwards:*** A forward contract is a customized contract between two entities, where settlement takes place on a specific date in the future at today's pre-agreed price. The rupee-dollar exchange rates is a big forward contract market in India with banks, financial institutions, corporate and exporters being the market participants.

Caution Forward contracts are generally traded on OTC.

2. ***Futures:*** A futures contract is an agreement between two parties to buy or sell an asset at a certain time in the future at a certain price. Futures contracts are special types of forward contracts in the sense that the former are standardized exchange-traded contracts. Unlike forward contracts, the counterparty to a futures contract is the clearing corporation on the appropriate exchange. Futures often are settled in cash or cash equivalents, rather than requiring physical delivery of the underlying asset. Parties to a Futures contract may buy or write options on futures.

3. ***Options:*** An option represents the right (but not the obligation) to buy or sell a security or other asset during a given time for a specified price (the "strike price"). Options are of two types - calls and puts. Calls give the buyer the right but not the obligation to buy a given quantity of the underlying asset, at a given price on or before a given future date. Puts give the buyer the right, but not the obligation to sell a given quantity of the underlying asset at a given price on or before a given date.

4. ***Swaps:*** Swaps are private agreements between two parties to exchange cash flows in the future according to a prearranged formula. They can be regarded as portfolios of forward

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contracts. Swaps generally are traded OTC through swap dealers, which generally consist of large financial institution, or other large brokerage houses. There is a recent trend for swap dealers to mark to market the swap to reduce the risk of counterparty default. The two commonly used swaps are:

(a) *Interest rate swaps:* These entail swapping only the interest related cash flows between the parties in the same currency.

Example: Suppose Party A holds a 10-year ₹ 10,000 home loan that has a fixed interest rate of 7 %, and Party B holds a 10-year ₹ 10,000 home loan that has an adjustable interest rate that will change over the "life" of the mortgage. If Party A and Party B were to exchange interest rate payments on their otherwise identical mortgages, they would have engaged in an interest rate swap.

(b) *Currency swaps:* These entail swapping both principal and interest between the parties, with the cash flows in one direction being in a different currency than those in the opposite direction. Swaps may involve cross-currency payments (U.S. Dollars vs. Mexican Pesos) and crossmarket payments, e.g., U.S. short-term rates vs. U.K. short-term rates.

1.2.2 Other Types of Financial Derivatives

1. ***Warrants:*** Options generally have lives of up to one year, the majority of options traded on options exchanges having a maximum maturity of nine months. Longer-dated options are called warrants and are generally traded over-the-counter.
2. ***LEAPS:*** The acronym LEAPS means Long-term Equity Anticipation Securities. These are options having a maturity of up to three years.
3. ***Baskets:*** Basket options are options on portfolios of underlying assets. The underlying asset is usually a moving average of a basket of assets. Equity index options are a form of basket options.

Notes Table 1.1 lists the major developments in financial derivatives.

Table 1.1: The Global Derivatives Industry: Chronology of Instruments

Year	Financial Instruments
1972	Foreign Currency Futures.
1973	Equity futures: Futures on Mortgage-backed bonds.
1974	Equity futures, Equity options
1975	T-bill futures on mortgage backed bonds
1977	T-bond Futures
1979	Over-the-Counter Currency Options
1980	Currency Swaps
1981	Equity Index Futures: Options on T-bond futures; Bank CD Futures, T-note Futures; Euro-dollar Futures: Interest-rate Swaps
1982	Exchange listed Currency Options

Contd...

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1983	Interest-rate Caps and Floor; Options on T-note, Futures; Currency Futures: Equity Index Futures
1985	Euro Dollar Options; SwapOptions; Futures on US Dollar & Municipal Bond Indices
1987	Average Options, Commodity Swaps, Bond Futures, Compound Options, OTC Compound Options, OTC Average Options
1989	Three-month Euro-DM Futures Captions ECU ;Interest-rate Futures on Interest rate Swaps
1990	Equity Index Swaps
1991	Portfolio Swaps
1992	Differential Swaps
1993	Captions; Exchange listed FLEX Options
1994	Credit Default Options
1995	Credit Derivatives
1996-98	Exotic Derivatives
2003-04	Energy Derivatives, Weather Derivatives

Self Assessment

Fill in the blanks:

4. In a ……. derivatives, the underlying instrument is a commodity which may be wheat, cotton, pepper, sugar, jute, turmeric, corn, soybeans, crude oil, natural gas, gold, silver, copper and so on.
5. In a ……derivative, the underlying instrument may be treasury bills, stocks, bonds, foreign exchange, stock index, gilt-edged securities, cost of living index, etc.
6. A …….. contract is a customized contract between two entities, where settlement takes place on a specific date in the future at today's pre-agreed price.
7. A futures contract is an agreement between two parties to buy or sell an asset at a certain time in the future at a …….... .
8. An ……..represents the right (but not the obligation) to buy or sell a security or other asset during a given time for a specified price.
9. …… are private agreements between two parties to exchange cash flows in the future according to a prearranged formula.
10. Basket options are options on …… of underlying assets.

1.3 Uses of Derivatives

Futures and options, as all derivatives, have come into existence because nearly every business has its risk. Rates of return are meaningful only in the context of how probable it is to achieve. Researchers usually distinguish between systemic Risk or Market Risk and Idiosyncratic Risk. The former refers to the risks which are common to all such securities, commodities and investments of the same class.

Futures and options have arisen from the need to manage the risk arising from movements in markets beyond our control, such as commodities and foreign exchange, which may severely

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impact the revenues and cost of our firm. An oil refiner might find himself paying more for crude oil, or a jewelry manufacturer more for gold. Such movements may adversely affect his or her business, and even threaten its viability. Derivatives, usually in the form of options and futures are, therefore, used as means to protect against key business risks which are beyond one's control. Systemic risks are part and parcel of being in business, and it is for accepting such risks that the market rewards us with a return. We can expect that when a firm's performance varies systematically with those of firms in the industry, (a high positive beta), options and futures may be used to enhance its value by managing such risks. They are, therefore, of use to anyone wishing to reduce or limit the impact with which such risks may have. The need to manage external risk is the primary reason for the existence of futures and options. Now, parties wishing to manage their risks are known as hedgers. The importance of derivatives is primarily for hedging risk exposure as used by hedgers.

The derivatives market performs a number of economic functions:

1. ***Discovery of Prices:*** Prices in an organized derivatives market reflect the perception of market participants about the future and lead the prices of underlying to the perceived future level. The prices of derivatives converge with the prices of the underlying at the expiration of the derivative contract. Thus derivatives help in discovery of future as well as current prices.
2. ***Transfer of Risk:*** The derivatives market helps to transfer risks from those who have them but may not like them to those who have an appetite for them. i.e., from Hedgers to Speculators.
3. ***Liquidity and Volume Trading:*** Third, derivatives, due to their inherent nature, are linked to the underlying cash markets. With the introduction of derivatives, the underlying market witnesses higher trading volumes because of participation by more players who would not otherwise participate for lack of an arrangement to transfer risk.
4. ***Trading Catalyst:*** An important incidental benefit that flows from derivatives trading is that it acts as a catalyst for new entrepreneurial activity. The derivatives have a history of attracting many bright, creative, well-educated people with an entrepreneurial attitude. They often energize others to create new businesses, new products and new employment opportunities, the benefits of which are immense.

Self Assessment

State the following are true or false:

11. Rates of return are meaningful only in the context of how probable it is to achieve.
12. The importance of derivatives is primarily for hedging risk exposure as used by hedgers.
13. Derivatives are used to discover the future price only.

1.4 Exchange Traded vs. OTC Derivatives

Derivatives that trade on an exchange are called exchange traded derivatives, whereas privately negotiated derivative contracts are called OTC contracts. The OTC derivatives markets have witnessed rather sharp growth over the last few years, which have accompanied the modernization of commercial and investment banking and globalization of financial activities. The recent developments in information technology have contributed to a great extent to these developments. While both exchange-traded and OTC derivative contracts offer many benefits, the former have rigid structures compared to the latter. It has been widely discussed that the

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highly leveraged institutions and their OTC derivative positions were the main cause of turbulence in financial markets in 1998. These episodes of turbulence revealed the risks posed to market stability originating in features of OTC derivative instruments and markets.

The OTC derivatives markets have the following features compared to exchange-traded derivatives:

1. The management of counter-party (credit) risk is decentralized and located within individual institutions,
2. There are no formal centralized limits on individual positions, leverage, or margining,
3. There are no formal rules for risk and burden-sharing,
4. There are no formal rules or mechanisms for ensuring market stability and integrity, and for safeguarding the collective interests of market participants, and
5. The OTC contracts are generally not regulated by a regulatory authority and the exchange's self- regulatory organization, although they are affected indirectly by national legal systems, banking supervision and market surveillance.

Some of the features of OTC derivatives markets embody risks to financial market stability. The following features of OTC derivatives markets can give rise to instability in institutions, markets, and the international financial system:

(i) the dynamic nature of gross credit exposures;

(ii) information asymmetries;

(iii) the effects of OTC derivative activities on available aggregate credit;

(iv) the high concentration of OTC derivative activities in major institutions; and

(v) the central role of OTC derivatives markets in the global financial system.

Instability arises when shocks, such as counter-party credit events and sharp movements in asset prices that underlie derivative contracts occur, which significantly alter the perceptions of current and potential future credit exposures. When asset prices change rapidly, the size and configuration of counter-party exposures can become unsustainably large and provoke a rapid unwinding of positions.

There has been some progress in addressing these risks and perceptions. However, the progress has been limited in implementing reforms in risk management, including counter- party, liquidity and operational risks, and OTC derivatives markets continue to pose a threat to international financial stability. The problem is more acute as heavy reliance on OTC derivatives creates the possibility of systemic financial events, which fall outside the more formal clearing house structures. Moreover, those who provide OTC derivative products, hedge their risks through the use of exchange traded derivatives. In view of the inherent risks associated with OTC derivatives, and their dependence on exchange traded derivatives, Indian law considers them illegal.

OTC Derivatives market	Exchange trades
• 1980s – Currency forwards	• June, 2000 – Equity index futures
• 1997 – Long term foreign currency-rupee swaps	• June, 2001 – Equity index option
• July, 1999 – Interest rate swaps and FRAs	• July, 2001 – Stock Option
• July, 2003 – FC-rupee options	• June, 2003 – Interest rate futures

Notes

Task Mr. Ramesh is speculating on SBI (currently trading at ₹850) and is holding one share of SBI. Three-month short futures on SBI are ₹840 while a put option at ₹842 is also available at premium of ₹3. What should Ramesh do? (For simplicity, there is no margin requirement under futures trading).

Self Assessment

State the following are true or false:

14. Privately negotiated derivative contracts are called exchange traded derivatives.

15. The OTC contracts are generally not regulated by a regulatory authority.

1.5 Summary

- In this unit, we have taken the basics of derivatives.
- Derivatives are the instruments which derive their values from the underlying assets.
- The underlying assets may be financial assets like individual stock, stock indices, interest rate, currencies, etc. or commodities like metals, cotton, coffee, etc.
- Common derivatives include options, forward contracts, futures contracts, and swaps.
- A forward contract is a customized contract between two entities, where settlement takes place on a specific date in the future at today's pre-agreed price.
- A futures contract is an agreement between two parties to buy or sell an asset at a certain time in the future at a certain price.
- An option represents the right (but not the obligation) to buy or sell a security or other asset during a given time for a specified price (the "Strike" price).
- Options are of two types-calls and puts.
- Swaps are private agreements between two parties to exchange cash flows in the future according to a prearranged formula.
- Derivatives that trade on an exchange are called exchange traded derivatives, whereas privately negotiated derivative contracts are called OTC contracts.
- The OTC derivatives markets have witnessed rather sharp growth over the last few years, which have accompanied the modernization of commercial and investment banking and globalization of financial activities.

1.6 Keywords

Basket Option: A type of option whose underlying asset is a basket of commodities, securities, or currencies.

Currency Swaps: An arrangement in which two parties exchange specific amounts of different currencies initially, and a series of interest payments on the initial cash flows are exchanged.

Derivative: A derivative security is a financial contract whose value is derived from the value of something else, such as a stock price, a commodity price, an exchange rate, an interest rate, or even an index of prices.

Notes

Forwards: A forward contract is a customized contract between two entities, where settlement takes place on a specific date in the future at today's pre-agreed price.

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

Interest Rate Swaps: An agreement between two parties (known as counter-parties) where one stream of future interest payments is exchanged for another based on a specified principal amount.

Options: An option represents the right (but not the obligation) to buy or sell a security or other asset during a given time for a specified price (the "strike "price).

OTC contracts: Privately negotiated derivative contracts are called OTC contracts.

Swaps: Swaps are private agreements between two parties to exchange cash flows in the future according to a prearranged formula.

1.7 Review Questions

1. Explain the term 'derivatives', using suitable examples.
2. What are the underlying assets for a derivative instrument?
3. What are the various important features of derivatives?
4. Discuss the growth and developments of derivatives in the Indian context.
5. Explain the different types of derivatives along with their features, in brief.
6. 'Derivatives are effective risk management tools'. Comment on the statement.
7. 'Future contracts are obligations, whereas options are rights'. Do you agree?
8. Bring out the similarities and dissimilarities between Forwards, Futures, Options and Swaps.
9. Can you think of a cash market in which options or futures could be useful but does not yet exist?
10. Highlight the various functions of derivatives and its significance.

Answers: Self Assessment

1. Financial contracts
2. Ownership
3. Contract
4. Commodity
5. Financial
6. Forward
7. Certain price
8. Option
9. Swaps
10. Portfolios
11. True
12. True
13. False
14. False
15. True

1.8 Further Readings

Notes

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Unit 2: Evolution of Derivatives in India

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Objectives

Introduction

2.1 Derivatives in India

2.2 Regulations for Derivatives Trading

2.2.1 SEBI Act 1992

2.2.2 Government Securities Act (GSA) 2006

2.3 Traders in Derivative Markets

2.4 SEBI Guidelines Related to Derivative Trade

2.5 Summary

2.6 Keywords

2.7 Review Questions

2.8 Further Readings

Objectives

After studying this unit, you will be able to:

- Discuss the evolution of derivatives in India
- Know the regulation of derivatives trading in India
- Describe the SEBI guidelines related to derivative trade

Introduction

The most notable of development in the history of secondary segment of the Indian stock market is the commencement of derivatives trading in June, 2000. The SEBI approved derivatives trading based on futures contracts at National Stock Exchange (NSE) and Bombay Stock Exchange (BSE) in accordance with the rules/bye-laws and regulations of the stock exchanges. To begin with, the SEBI permitted equity derivatives named stock index futures. The BSE introduced on 9 June, 2000 stock index futures based on the sensitive Index named BSX, and NSE started on June 12, 2000 stock index future based on its index S&P CNX NIFTY in the name of NFUTIDX NIFTY.

Did u know? **How many scripts are included in SENSEX and S&P CNX NIFTY?**

SENSEX comprised 30 and S&P CNX NIFTY comprised 50 scripts.

2.1 Derivatives in India

India has been trading derivatives contracts in silver, gold, spices, coffee, cotton and oil etc. for decades in the grey market. Trading derivatives contracts in organized market were legal before Morarji Desai's government (1977) which banned forward contracts. Derivatives on stocks were traded in the form of Teji and Mandi in unorganized markets. Recently futures contracts in

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various commodities were allowed to trade on exchanges. For example, now cotton and oil futures trade in Mumbai, soyabean futures trade in Bhopal, pepper futures in Kochi, coffee futures in Bangalore etc. In June 2000, the National Stock Exchange and the Bombay Stock Exchange started trading in futures on Sensex and Nifty. Options trading on Sensex and Nifty commenced in June 2001. Very soon thereafter, trading began on options and futures in 31 prominent stocks in the month of July and November respectively. Currently there are 41 stocks trading on NSE Derivative and the list keeps growing.

Caution A primary motivation for pre-arranging a buyer or seller for a stock of commodities in early forward contracts was to lessen the possibility that large swings would inhibit marketing the commodity after a harvest.

The major commodity futures markets currently existing in India are given in Table 2.1.

Table 2.1: Commodity Futures Market in India

Commodity	Name of Association	Location
Castor Seed	Bombay Oilseeds & Oils Exchange	Mumbai
	Ahmedabad Seeds Merchants	Ahmedabad
	Rajkot Seeds, Oil and Bullion Merchants	Rajkot
Gur	Bhathinda Oil Exchange	Bhathinda
	Chamber of Commerce, Hapur	Hapur
	Vijai Beopar	Muzaffarnagar
Hessian	East India Jute & Hessian Exchange	Kolkata
Pepper	Indian Pepper & Spice Trade	Kochi
Potatoes	Chamber of Commerce, Hapur	Hapur
Turmeric	Spice & Oilseeds Exchange, Sangli	Sangli

SEBI set up a 24-member committee under the chairmanship of Dr. L.C. Gupta on November 18, 1996 to develop appropriate regulatory framework for derivatives trading in India, submitted its report on March 17, 1998. The committee recommended that the derivatives should be declared as 'securities' so that regulatory framework applicable to trading of 'securities' could also govern trading of derivatives.

SEBI also set up a group in June 1998 under the chairmanship of Prof. J.R. Varma, to recommend measures for risk containment in derivatives market in India. The report, which was submitted in October 1998, worked out the operational details of margining system, methodology for charging initial margins, broker net worth, deposit requirement and real-time monitoring requirements.

The Securities Contracts Regulation Act (SCRA) was amended in December 1999 to include derivatives within the ambit of 'securities' and the act also made it clear that derivatives shall be legal and valid only if such contracts are traded on a recognized stock exchange, thus precluding OTC derivatives. The government also rescinded in March 2000, the three-decade old notification, which prohibited forward trading in securities. Derivatives trading commenced in India in June 2000 after SEBI granted the final approval to this effect in May 2000. SEBI permitted the derivative segments of two stock exchanges - NSE and BSE, and their clearing house/corporation to commence trading and settlement in approved derivatives contracts.

To begin with, SEBI approved trading in index futures contracts based on S&P CNX Nifty and BSE-30 (Sensex) index. This was followed by approval for trading in options based on these two

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indices and options on individual securities. The trading in index options commenced in June 2001 and the trading in options on individual securities commenced in July 2001. Futures contracts on individual stocks were launched in November 2001.

Table 2.2: Salient features of Index Futures Contracts at NSE

S. No.	Items	NSE
1.	Date of Introduction	June 12, 2000
2.	Name of security	N FUTIDX NIFY
3.	Underlying asset	S&P CNX NIFTY
4.	Contract size	200 or multiples of 200
5.	Tick size/Price step	₹ 0.05
6.	Minimum price fluctuations	Not applicable
7.	Price Bands	NA
8.	Expiration months	3-nears months
9.	Trading cycle	As in previous column
10.	Last trading/Expiry day	As in previous column
11.	Settlement	As in previous column
12.	Final Statement price	1st trading day(s)
13.	Daily settlement price	Closing of future contract
14.	Trading hours	-
15.	Margin	As in previous column

Self Assessment

Fill in the blanks:

1. The most notable of development in the history of secondary segment of the Indian stock market is the commencement of derivatives trading in …….. .
2. The BSE introduced on 9 June, 2000 stock index futures based on the sensitive Index named ……..... .
3. The trading in index …….. commenced in June 2001 and the trading in options on individual securities commenced in July 2001.
4. Futures contracts on individual stocks were launched in …….. .
5. A primary motivation for ……..a buyer or seller for a stock of commodities in early forward contracts was to lessen the possibility that large swings would inhibit marketing the commodity after a harvest.

2.2 Regulations for Derivatives Trading

All futures transactions in the United States are regulated by the Commodity Futures Trading Commission (CFTC), an independent agency of the United States Government. The Commission has the right to hand out fines and other punishments for an individual or company who breaks any rule. Although by law the commission regulates all transactions, each exchange can have their own rule, and under contract can fine companies for different things or extend the fine that the CFTC hands out. The CFTC publishes weekly reports containing details of the

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open interest of market participants for each market-segment, which has more than 20 participants. These reports are released every Friday and contain data on open interest split by reportable and non-reportable open interest as well as commercial and non-commercial open interest. This type of report is referred to as 'Commitments-Of-Traders'-Report, COT-Report or simply COTR.

2.2.1 SEBI Act 1992

SEBI Act, 1992 provides for establishment of Securities and Exchange Board of India (SEBI) with statutory powers for (a) protecting the interests of investors in securities (b) promoting the development of the securities market and (c) regulating the securities market. Its regulatory jurisdiction extends over corporates in the issuance of capital and transfer of securities, in addition to all intermediaries and persons associated with securities market.

SEBI has been obligated to perform the aforesaid functions by such measures as it thinks fit. In particular, it has powers for:

1. Regulating the business in stock exchanges and any other securities markets.
2. Registering and regulating the working of stock brokers, sub-brokers etc.
3. Promoting and regulating self-regulatory organizations.
4. Prohibiting fraudulent and unfair trade practices.
5. Calling for information from, undertaking inspection, conducting inquiries and audits of the stock exchanges, mutual funds and other persons associated with the securities market and intermediaries and self-regulatory organizations in the securities market.
6. Performing such functions and exercising according to Securities Contracts (Regulation) Act, 1956, as may be delegated to it by the Central Government.

L.C Gupta Committee Recommendations for Derivative Trading

SEBI set up a 24-member committee under the Chairmanship of Dr. L. C. Gupta to develop the appropriate regulatory framework for derivatives trading in India. On May 11, 1998 SEBI accepted the recommendations of the committee and approved the phased introduction of derivatives trading in India beginning with stock index futures.

The provisions in the SC(R)A and the regulatory framework developed thereunder govern trading in securities. The amendment of the SC(R)A to include derivatives within the ambit of 'securities' in the SC(R)A made trading in derivatives possible within the framework of that Act.

In India, following are the major regulations for trading of derivatives:

1. Any exchange fulfilling the eligibility criteria as prescribed in the L.C. Gupta committee report may apply to SEBI for grant of recognition under Section 4 of the SC(R)A, 1956 to start trading derivatives. The derivatives exchange/segment should have a separate governing council and representation of trading/clearing members shall be limited to a maximum of 40% of the total members of the governing council. The exchange shall regulate the sales practices of its members and will obtain prior approval of SEBI before start of trading in any derivative contract.
2. The exchange shall have minimum 50 members.
3. The members of an existing segment of the exchange will not automatically become the members of derivative segment. The members of the derivative segment need to fulfill the eligibility conditions as laid down by the L.C. Gupta committee.

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4. The clearing and settlement of derivatives trades shall be through a SEBI approved clearing corporation/house.

5. Derivative brokers/dealers and clearing members are required to seek registration from SEBI. This is in addition to their registration as brokers of existing stock exchanges. The minimum net worth for clearing members of the derivatives clearing corporation/ house shall be ₹ 300 lakh. The net worth of the member shall be computed as follows:

   Capital + Free reserves – non-allowable assets viz.,

   (a) Fixed assets; (b) Pledged securities; (c) Member's card; (d) Non-allowable securities (unlisted securities); (e) Bad deliveries; (f) Doubtful debts and advances; (g) Prepaid expenses; (h) Intangible assets; (i) 30% marketable securities.

6. The minimum contract value shall not be less than ₹ 2 lakh. Exchanges should also submit details of the futures contract they propose to introduce.

7. The initial margin requirement, exposure limits linked to capital adequacy and margin demands related to the risk of loss on the position shall be prescribed by SEBI/Exchange from time to time.

8. The L.C.Gupta committee report requires strict enforcement of "Know your customer" rule and requires that every client shall be registered with the derivatives broker. The members of the derivatives segment are also required to make their clients aware of the risks involved in derivatives trading by issuing to the client the Risk Disclosure Document and obtain a copy of the same duly signed by the client.

9. The trading members are required to have qualified approved user and sales person who have passed a certification programme approved by SEBI.

J. R Verma Committee Recommendations for Derivative Trading

The Securities and Exchange Board of India (SEBI) appointed a committee under the chairmanship of Dr. L.C. Gupta in November, 1996 to "develop appropriate regulatory framework for derivatives trading in India". In March, 1998, the L.C. Gupta Committee (LCGC) submitted its report recommending the introduction of derivatives markets in a phased manner beginning with the introduction of index futures. The SEBI Board while approving the introduction of index futures trading mandated the setting up of a group to recommend measures for risk containment in the derivative market in India. Accordingly, SEBI constituted a group in June, 1998, with Prof. J.R. Varma, as Chairman. The group submitted its report in the same year. The group began by enumerating the risk containment issues that assume importance in the Indian context while setting up an index futures market. The recommendations of the group as covered by its report are as under:

Estimation of Volatility (Clause 2.1)

Several issues arise in the estimation of volatility:

1. Volatility in Indian market is quite high as compared to developed markets.

2. The volatility in Indian market is not constant and is varying over time.

3. The statistics on the volatility of the index futures markets do not exist (as these markets are yet to be introduced), and therefore, in the initial period, reliance has to be made on the volatility in the underlying securities market. The LCGC has prescribed that no cross

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margining would be permitted and separate margins would be charged on the position in the futures market and the underlying securities market. In the absence of cross margining, index arbitrage would be costly, and therefore, possibly inefficient.

Calendar Spreads (Clause 2.2)

In developed markets, calendar spreads are essentially a play on interest rates with negligible stock market exposure. As such margins for calendar spreads are very low. However, in India, the calendar basis risk could be high because of the absence of efficient index arbitrage and the lack of channels for the flow of funds from the organized money market into the index future market.

Trader Net Worth (Clause 2.3)

Even an accurate 99 percent "value at risk" model would give rise to end of day mark to market losses exceeding the margin approximately once every six months. Trader net worth provides an additional level of safety to the market and works as a deterrent to the incidence of defaults. A member with high net worth would try harder to avoid defaults as his own net worth would be at stake. The definition of net worth needs to be made precise having regard to prevailing accounting practices and laws.

Margin Collection and Enforcement (Clause 2.4)

Apart from the correct calculation of margin, the actual collection of margin is also of equal importance. Since initial margins can be deposited in the form of bank guarantee and securities, the risk containment issues in regard to these need to be tackled.

Clearing Corporation (Clause 2.5)

The clearing corporation provides novation and becomes the counter party for each trade. In the circumstances, the credibility of the clearing corporation assumes importance and issues of governance and transparency need to be addressed.

Position Limit (Clause 2.6)

It may be necessary to prescribe position limits for the market as a whole and for the individual clearing member/trading member/client.

Margining System (Clause 3.1)

Mandating a margin methodology not specific margins (Clause 3.1.1): The LCGC recommended that margins in the derivatives markets would be based on a 99 percent Value at Risk (VAR) approach. It is decided that the SEBI should authorize the use of a particular VAR estimation methodology but should not mandate a specific minimum margin level.

Initial methodology (Clause 3.1.2): The group has evaluated and approved a particular risk estimation methodology that is described in Clause 3.2. The derivatives exchange and clearing corporation should be authorized to start index futures trading using this methodology for fixing margins.

Continuous refining (Clause 3.1.3): The derivatives exchange and clearing corporation should be encouraged to refine this methodology continuously on the basis of further experience. Any proposal for changes in the methodology should be filed with SEBI and released to the public for

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comments along with detailed comparative backtesting results of the proposed methodology and the current methodology. The proposal shall specify the date from which the new methodology will become effective and this effective date shall not be less than three months after the date of filing with SEBI. At any time up to two weeks before the effective date, SEBI may instruct the derivatives exchange and clearing corporation not to implement the change, or the derivatives exchange and clearing corporation may on its own decide not to implement the change.

Initial Margin Fixation Methodology (Clause 3.2)

The group took on record the estimation and backtesting results provided by Prof. Varma from his ongoing research work on value at risk calculations in Indian financial markets. The group, being satis fied with these backtesting results, recommends the following margin fixation methodology as the initial methodology for the purposes of Clause 3.1.1.

The exponential moving average method would be used to obtain the volatility estimate everyday.

Daily Changes in Margins (Clause 3.3)

The group recommends that the volatility estimated at the end of the day's trading would be used in calculating margin calls at the end of the same day. This implies that during the course of trading, market participants would not know the exact margin that would apply to their position. It was agreed, therefore, that the volatility estimation and margin fixation methodology would be clearly made known to all market participants so that they can compute what the margin would be for any given closing level of the index. It was also agreed that the trading software would itself provide this information on a real time basis on the trading workstation screen.

2.2.2 Government Securities Act (GSA) 2006

'Government security' means a security created and issued by the Government for the purpose of raising a public loan or for any other purpose as may be notified by the Government in the Official Gazette.

A Government security may be issued in the form of a:

1. Government promissory note
2. Bearer bond payable to bearer
3. Stock
4. Bond held in a bond ledger account

A stock means a Government security (i) registered in the books of the RBI for which a stock certificate is issued; or (ii) held at the credit of the holder in the subsidiary general ledger account including the constituent's subsidiary general ledger account maintained in the books of the RBI, and transferable by registration in the books of the RBI.

A transfer of a government security shall be valid only if it purports to convey the full title to the security. The transfer of the Government securities shall be made in such form and in such manner as may be prescribed.

Government Securities Regulation Act 2007

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Government Securities Regulations, 2007 have been made by the Reserve Bank of India to carry out the purposes of the Government Securities Act.

The Government Securities Regulations, 2007 provides for transfer of Government securities held in different forms. Government security held in the form of Government Promissory Notes is transferable by endorsement and delivery. A bearer bond is transferable by delivery and the person in possession of the bond shall be deemed to be the holder of the bond. Government securities held in the form of Stock Certificate, Subsidiary General Ledger account including a constituent Subsidiary General Ledger Account) & Bond Ledger Account are transferable, before maturity, by execution of forms – III, IV & V respectively appended to the Government Securities Regulations.

Government securities held in subsidiary general ledger account including a constituents' subsidiary general ledger account or bond ledger account, shall also be transferable by execution of a deed in an electronic form under digital signature.

A person unable to write, execute or endorse a document, may apply to the Executive Magistrate to execute the document or make endorsement on his behalf after producing sufficient documentary evidence about his identity and satisfying the Executive Magistrate that he has understood the implications of such execution or endorsement.

Self Assessment

Fill in the blanks:

6. All futures transactions in the ……..are regulated by the Commodity Futures Trading Commission (CFTC).
7. The derivatives exchange/segment should have a separate governing council and representation of trading/clearing members shall be limited to a maximum of …….of the total members of the governing council.
8. The exchange shall have minimum ……..members.
9. The minimum contract value shall not be less than …….

2.3 Traders in Derivates Markets

Those who trade or participate in derivative/underlying security transaction may be broadly classified into three categories:

1. Hedgers (Those who desire to off-load their risk exposure on a position)
2. Speculators (Those willing to absorb risk of hedgers for a cost)
3. Arbitragers (Those who wish to have riskless gain in the transaction of hedgers and speculators)

Example: Suppose Mr. A is currently possessing 50 shares of SBI currently trading at ₹ 1,000 per share. Mr. A has purchased those at ₹ 950 before 3 months. Mr. A has 3 possibilities or courses of actions: to sell now, wait for further appreciation of price, hedge the long position (holds shares) and pay a small price for that. If Mr. A sells now, he is just like any other investor

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who wants to book a definite known profit on investment. If Mr. A waits, he is speculating on his position which may expose him to uncertain gain/loss. If Mr. A decides to hedge, he can use one of the derivative instruments (as discussed above).

Let us discuss in detail, the three market participants in derivative trading.

1. ***Hedgers:*** Hedgers are those traders who wish to eliminate price risk associated with the underlying security being traded. The objective of these kind of traders is to safeguard their existing positions by reducing the risk. They are not in the derivatives market to make profits. Apart from equity markets, hedging is common in the foreign exchange markets where fluctuations in the exchange rate have to be taken care of in the foreign currency transactions or could be in the commodities market where spiralling oil prices have to be tamed using the security in derivative instruments.

Example: An investor holding shares of ITC and fearing that the share price will decrease in future, takes an opposite position (sell futures contracts) to minimize the extent of loss if the share will to dwindle.

2. ***Speculators:*** While hedgers might be adept at managing the risks of exporting and producing petroleum products around the world, there are parties who are adept at managing and even making money out of such exogenous risks. Using their own capital and that of clients, some individuals and organizations will accept such risks in the expectation of a return. But unlike investing in business along with its risks, speculators have no clear interest in the underlying activity itself. For the possibility of a reward, they are willing to accept certain risks. They are traders with a view and objective of making profits. These are people who take positions (either long or short positions) and assume risks to profit from fluctuations in prices. They are willing to take risks and they bet upon whether the markets would go up or come down. Speculators may be either day traders or position traders. The former speculate on the price movements during one trading day, while the latter attempt to gain keep their position for longer time period to gain from price fluctuations.

Example: In the previous example (ITC), it is also possible to short futures without actually owning shares in spot market. The speculator does so because he expects ITC to fall and by entering into short futures, he gains if price falls. The speculator is not required to pay the entire value i.e., (No. of futures contracts × shares under each contract × delivery price). Only margin money which accounts for 5-10 % of total transacted value is paid upfront by speculator. Thus, futures are highly levered instruments. For example, if margin money required is 10 %, the speculator can take 10 contracts by paying the price of 1 contract.

3. ***Arbitrageurs:*** The third players are known as arbitrageurs. From the French for arbitrage or judge, these market participants look for mis-pricing and market mistakes, and by taking advantage of them; they disappear and never become too large. If you have even purchased a produce of a green grocer only to discover the same produce somewhat cheaper at the next grocer, you have an arbitrage situation. Arbitrage is the process of simultaneous purchase of securities or derivatives in one market at a lower price and sale thereof in another market at a relatively higher price.

Example: On maturity if the pepper futures contracts is ₹ 650 per k.g. and the spot price is ₹ 642, then the arbitragers will buy pepper in spot and short sell futures, thereby gaining riskless profit of 650-642 i.e., ₹ 8 per k.g. Here, the two markets are spot and futures market. Thus, riskless profit making is the prime goal of arbitrageurs.

Self Assessment

Notes

State the following are true or false:

10. Speculators are those traders who wish to eliminate price risk associated with the underlying security being traded.

11. The position traders speculate on the price movements during one trading day.

12. Arbitrage is the process of simultaneous purchase of securities or derivatives in one market at a lower price and sale thereof in another market at a relatively higher price.

2.4 SEBI Guidelines Related to Derivative Trade

The following are the key guidelines issued by SEBI for derivative trading:

1. Derivative trading to take place through an on screen based trading system.

2. The derivatives exchange/segment should have on-line surveillance capability to monitor positions, prices and volumes on a real time basis so as to deter market manipulation.

3. The derivatives exchange/segment should have arrangements for dissemination of information about trades, quantities and quotes on a real time basis through at least two information vending networks, which are easily accessible to investors across the country.

4. The derivatives exchange/segment should have arbitration and investor grievances redressal mechanism operative from all the four areas/regions of the country.

5. The derivatives exchange/segment should have satisfactory system of monitoring investor complaints and preventing irregularities in trading.

6. The derivative segment of the exchange would have a separate Investor Protection Fund.

7. The clearing corporation/house will perform full novation, i.e., the clearing corporation/ house will interpose itself between both legs of every trade, becoming the legal counterparty to both or alternatively should provide an unconditional guarantee for settlement of all trades.

8. The clearing corporation/house should have the capacity to monitor the overall position of members across both derivatives market and the underlying securities market for those members who are participating in both.

9. The level of initial margin on index futures contracts will be related to the risk of loss on the position. The concept of value-at-risk will be used in calculating the required level of initial margins. The initial margins should be large enough to cover the one-day loss that can be encountered on the position on 99 percent of the days.

10. The clearing corporation/house will establish facilities for Electronic Funds Transfer (EFT) for swift movement of margin payments.

11. In the event of a member defaulting in meeting its liabilities, the clearing corporation/ house shall transfer client positions and assets to another solvent member or close-out all open positions.

12. The clearing corporation/house should have capabilities to segregate initial margins deposited by clearing members for trades on their own account and on account of his

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client. The clearing corporation/house will hold the clients' margin money in trust for the client purposes only and should not allow its diversion for any other purpose.

13. The clearing corporation/house should have a separate Trade Guarantee Fund for the trades executed on derivative exchange/segment.

Task Make a comparison between Indian derivatives market with the US Derivatives market.

Self Assessment

Fill in the blanks:

13. Derivative trading to take place through an on ……trading system.
14. The derivative segment of the exchange would have a separate ……..
15. The clearing corporation/house will establish facilities for …… for swift movement of margin payments.

2.5 Summary

- The most notable of development in the history of secondary segment of the Indian stock market is the commencement of derivatives trading in June, 2000.
- India has been trading derivatives contracts in silver, gold, spices, coffee, cotton and oil etc. for decades in the grey market.
- Recently futures contracts in various commodities were allowed to trade on exchanges.
- All futures transactions in the United States are regulated by the Commodity Futures Trading Commission (CFTC), an independent agency of the United States Government.
- SEBI set up a 24-member committee under the chairmanship of Dr.L.C.Gupta on November 18, 1996 to develop appropriate regulatory framework for derivatives trading in India, submitted its report on March 17, 1998.
- Hedgers are those traders who wish to eliminate price risk associated with the underlying security being traded.
- Speculators include those who willing to absorb risk of hedgers for a cost.
- Arbitrage is the process of simultaneous purchase of securities or derivatives in one market at a lower price and sale thereof in another market at a relatively higher price.

2.6 Keywords

Arbitrage: Arbitrage is the process of simultaneous purchase of securities or derivatives in one market at a lower price and sale thereof in another market at a relatively higher price.

Government Securities: 'Government security' means a security created and issued by the Government for the purpose of raising a public loan or for any other purpose as may be notified by the Government in the Official Gazette.

Hedgers: Hedgers are those traders who wish to eliminate price risk associated with the underlying security being traded.

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Index Futures: Index futures mean a future contract on a stock or financial index. For each index there may be a different multiple for determining the price of the futures contract.

SCRA: The Securities Contracts Regulation Act.

SEBI: Securities and Exchange Board of India.

Speculators: Speculators include those who willing to absorb risk of hedgers for a cost.

2.7 Review Questions

1. Discuss the evolution of derivatives trading in India.
2. What are the key regulatory guidelines issued by SEBI for derivative trading?
3. State the difference between hedgers and speculators.
4. Arbitrage is the process of simultaneous purchase of securities or derivatives in one market at a lower price and sale thereof in another market at a relatively higher price. Discuss.
5. Write a note on organisation and functioning of derivatives in India.
6. The objective of hedgers is to safeguard their existing positions by reducing the risk. Discuss.
7. Why is it necessary to regulate the derivative market?
8. Is there any difference between derivative trading and equity trading? Discuss.

Answers: Self Assessment

1.	June, 2000	2.	BSX
3.	Options	4.	November 2001
5.	Pre-arranging	6.	United States
7.	40%	8.	50
9.	₹ 2 lakh	10.	False
11.	False	12.	True
13.	Screen based	14.	Investor Protection Fund
15.	Electronic Funds Transfer (EFT)		

2.8 Further Readings

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Online links

www.managementstudyguide.com

www.nse.org

http://www.nseindia.com/content/ncfm/ncfm_modules.htm

Unit 3: Forward Contracts

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3.6 Review Questions

3.7 Further Readings

Objectives

After studying this unit, you will be able to:

- Know the basic hedging practices
- Describe forward contracts
- Identify the limitations of forward market

Introduction

A Forward Contract is a contract made today for delivery of an asset at a pre-specified time in the future at a price agreed upon today. The buyer of a forward contract agrees to take delivery of an underlying asset at a future time (T), at a price agreed upon today. No money changes hands until time T. The seller agrees to deliver the underlying asset at a future time T, at a price agreed upon today. Again, no money changes hands until time T. A forward contract, therefore, simply amounts to setting a price today for a trade that will occur in the future. In other words, a forward contract is a contract between two parties who agree to buy/sell a specified quantity of a financial instrument/commodity at a certain price at a certain date in future.

3.1 Basic Hedging Practices

Corporations in which individual investors place their money have exposure to fluctuations in all kinds of financial prices, as a natural by-product of their operations. Financial prices include foreign exchange rates, interest rates, commodity prices and equity prices. The effect of changes in these prices on reported earnings can be overwhelming. Often, you will hear companies say

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in their financial statements that their income was reduced by falling commodity prices or that they enjoyed a windfall gain in profit attributable to the decline of the Canadian dollar.

One reason why companies attempt to hedge these price changes is because they are risks that are peripheral to the central business in which they operate.

Example: An investor buys the stock of a pulp-and-paper company in order to gain from its management of a pulp-and-paper business. She does not buy the stock in order to take advantage of a falling Canadian dollar, knowing that the company exports over 75% of its product to overseas markets. This is the insurance argument in favour of hedging. Similarly, companies are expected to take out insurance against their exposure to the effects of theft or fire.

By hedging, in the general sense, we can imagine the company entering into a transaction whose sensitivity to movements in financial prices offsets the sensitivity of their core business to such changes. As we shall see in this article and the ones that follow, hedging is not a simple exercise nor is it a concept that is easy to pin down. Hedging objectives vary widely from firm to firm, even though it appears to be a fairly standard problem, on the face of it. And the spectrum of hedging instruments available to the corporate Treasurer is becoming more complex every day.

Another reason for hedging the exposure of the firm to its financial price risk is to improve or maintain the competitiveness of the firm. Companies do not exist in isolation. They compete with other domestic companies in their sector and with companies located in other countries that produce similar goods for sale in the global marketplace. Again, a pulp-and-paper company based in Canada has competitors located across the country and in any other country with significant pulp-and-paper industries, such as the Scandinavian countries.

Caution **Hedging Problem**

The core problem when deciding upon a hedging policy is to strike a balance between uncertainty and the risk of opportunity loss. It is in the establishment of balance that we must consider the risk aversion, the preferences, of the shareholders. Make no mistake about it. Setting hedging policy is a strategic decision, the success or failure of which can make or break a firm.

3.1.1 Objectives of Hedging

Earlier, we noted that a hedge is a financial instrument whose sensitivity to a particular financial price offsets the sensitivity of the firm's core business to that price. Straightaway, we can see that there are a number of issues that present themselves.

First, what is the hedging objective of the firm?

Some of the best-articulated hedging programmes in the corporate world will choose the reduction in the variability of corporate income as an appropriate target. This is consistent with the notion that an investor purchases the stock of the company in order to take advantage of their core business expertise.

Other companies just believe that engaging in a forward outright transaction to hedge each of their cross-border cash flows in foreign exchange is sufficient to deem themselves hedged. Yet, they are exposing their companies to untold potential opportunity losses. And this could impact their relative performance pejoratively.

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Second, what is the firm's exposure to financial price risk?

It is important to measure and to have on a daily basis some notion of the firm's potential liability from financial price risk. Financial institutions whose core business is the management and acceptance of financial price risk have whole departments devoted to the independent measurement and quantification of their exposures. It is no less critical for a company with billions of dollars of internationally driven revenue to do so.

There are three types of risk for every particular financial price to which the firm is exposed.

1. Transactional risks reflect the pejorative impact of fluctuations in financial prices on the cash flows that come from purchases or sales. This is the kind of risk we described in our example of the pulp-and-paper company concerned about their US$10 million contract. Or, we could describe the funding problem of the company as a transactional risk. How do they borrow money? How do they hedge the value of a loan they have taken once it is on the books?
2. Translation risks describe the changes in the value of a foreign asset due to changes in financial prices, such as the foreign exchange rate.
3. Economic exposure refers to the impact of fluctuations in financial prices on the core business of the firm. If developing market economies devalue sharply while retaining their high technology manufacturing infrastructure, what effect will this have on an Ottawa-based chip manufacturer that only has sales in Canada? If it means that these countries will flood the market with cheap chips in a desperate effort to obtain hard currency, it could mean that the domestic manufacturer is in serious jeopardy.

Third, what are the various hedging instruments available to the corporate treasurer and how do they behave in different pricing environments?

When it is best to use which instrument is a question the corporate treasurer must answer. The difference between a mediocre corporate treasury and an excellent one is their ability to operate within the context of their shareholder-delineated limits and choose the optimal hedging structure for a particular exposure and economic environment. Not every structure will work well in every environment. The corporate treasury should be able to tailor the exposure using derivatives so that it fits the preferences and the view of the senior management and the board of directors.

3.1.2 Hedge Fund Strategies

The predictability of future results shows a strong correlation with the volatility of each strategy. Future performance of strategies with high volatility is far less predictable than future performance from strategies experiencing low or moderate volatility.

1. ***Aggressive Growth:*** Hedge fund investors invest in equities expected to experience acceleration in growth of earnings per share. These are generally high P/E ratios, low or no dividends; often smaller and micro cap stocks, which are expected to experience rapid growth. These include sector specialist funds such as technology, banking, or biotechnology. Hedges by shorting equities where earnings disappointment is expected or by shorting stock indexes tends to be "long-biased." Expected Volatility: High.
2. ***Distressed Securities:*** Investors buy equity, debt, or trade claims at deep discounts of companies in or facing bankruptcy or reorganization. Profits from the market's lack of understanding of the true value of the deeply discounted securities and because the majority of institutional investors cannot own below investment grade securities. (This selling pressure creates the deep discount.) Results generally not dependent on the direction of the markets. Expected Volatility: Low - Moderate.

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3. ***Emerging Markets:*** Hedge funders invest in equity or debt of emerging (less mature) markets, which tend to have higher inflation and volatile growth. Short selling is not permitted in many emerging markets, and, therefore, effective hedging is often not available, although bad debt can be partially hedged via Indian Treasury futures and currency markets. Expected Volatility: Very High.
4. ***Fund of Funds:*** Mixes and matches hedge funds and other pooled investment vehicles. This blending of different strategies and asset classes aims to provide a more stable long-term investment return than any of the individual funds. The mix of underlying strategies and funds can control returns, risk and volatility. Capital preservation is generally an important consideration. Volatility depends on the mix and ratio of strategies employed. Expected Volatility: Low - Moderate.
5. ***Income:*** Invests with primary focus on yield or current income rather than solely on capital gains. May utilize leverage to buy bonds and sometimes fixed income derivatives in order to profit from principal appreciation and interest income. Expected Volatility: Low.
6. ***Macro:*** Aims to profit from changes in global economies typically brought about by shifts in government policy, which impact interest rates, in turn affecting currency, stock, and bond markets. Participates in all major markets equities, bonds, currencies and commodities - though not always at the same time. Uses leverage and derivatives to accentuate the impact of market moves. Utilizes hedging, but leveraged directional bets tend to make the largest impact on performance. Expected Volatility: Very High.
7. ***Market Neutral - Arbitrage:*** Attempts to hedge out most market risk by taking offsetting positions, often in different securities of the same issuer. Investors may also use futures to hedge out interest rate risk. Focuses on obtaining returns with low or no correlation to both the equity and bond markets. These relative value strategies include fixed income arbitrage, mortgage backed securities, capital structure arbitrage, and closed-end fund arbitrage. Expected Volatility: Low.
8. ***Market Neutral - Securities Hedging:*** Invests equally in long and short equity portfolios generally in the same sectors of the market. Market risk is greatly reduced, but effective stock analysis and stock picking is essential to obtaining meaningful results. Leverage may be used to enhance returns. Usually low or no correlation to the market. Sometimes uses market index futures to hedge out systematic (market) risk. Relative benchmark index usually T-bills. Expected Volatility: Low.
9. ***Market Timing:*** Allocates assets among different asset classes depending on the manager's view of the economic or market outlook. Portfolio emphasis may swing widely between asset classes. Unpredictability of market movements and the difficulty of timing entry and exit from markets add to the volatility of this strategy. Expected Volatility: High.
10. ***Opportunistic:*** Investment theme changes from strategy to strategy as opportunities arise to profit from events such as IPOs, sudden price changes often caused by an interim earnings disappointment, hostile bids, and other event-driven opportunities. Investors may utilize several of these investing styles at a given time and is not restricted to any particular investment approach or asset class. Expected Volatility: Variable.
11. ***Multi-Strategy:*** Investment approach is diversified by employing various strategies simultaneously to realize short and long-term gains. Other strategies may include systems trading such as trend following and various diversified technical strategies. This style of investing allows the manager to overweight or underweight different strategies to best capitalize on current investment opportunities. Expected Volatility: Variable.
12. ***Short Selling:*** Sells securities short in anticipation of being able to re-buy them at a future date at a lower price due to the manager's assessment of the overvaluation of the securities,

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or the market, or in anticipation of earnings disappointments often due to accounting irregularities, new competition, change of management, etc. Often used as a hedge to offset long-only portfolios and by those who feel the market is approaching a bearish cycle. High risk. Expected Volatility: Very High.

13. ***Special Situations:*** Invests in event-driven situations such as mergers, hostile takeovers, reorganizations, or leveraged buy-outs. Investors May involve simultaneous purchase of stock in companies being acquired, and the sale of stock in its acquirer, hoping to profit from the spread between the current market price and the ultimate purchase price of the company. May also utilize derivatives to leverage returns and to hedge out interest rate and/or market risk. Results generally are not dependent on direction of market. Expected Volatility: Moderate.

14. ***Value:*** Invests in securities perceived to be selling at deep discounts to their intrinsic or potential worth. Such securities may be out of favour or underfollowed by analysts. Long-term holding, patience, and strong discipline are often required until the market recognizes the ultimate value. Expected Volatility: Low - Moderate.

Self Assessment

Fill in the blanks:

1. …… risks reflect the pejorative impact of fluctuations in financial prices on the cash flows that come from purchases or sales.
2. …….refers to the impact of fluctuations in financial prices on the core business of the firm.
3. ……..risks describe the changes in the value of a foreign asset due to changes in financial prices, such as the foreign exchange rate.
4. Investors buy equity, debt, or trade claims at ……..of companies in or facing bankruptcy or reorganization.
5. Future performance of strategies with ……..volatility is far less predictable than future performance from strategies experiencing …….volatility.

3.2 Basics of Forward Contracts

A forward contract is an agreement between two parties to buy or sell underlying assets at a pre determined future date at a price agreed when the contract is entered into. Forward contracts are not standardized products. They are over-the-counter (not traded in recognized stock exchanges) derivatives that are tailored to meet specific user needs. The underlying assets of this contract include:

1. Traditional agricultural or physical commodities
2. Currencies (foreign exchange forwards)
3. Interest rates (forward rate agreements or FRAs)

Example: Suppose you decide to subscribe to cable TV. As the buyer, you enter into an agreement with the cable company to receive a specific number of cable channels at a certain price every month for the next year. This contract made with the cable company is similar to a futures contract, in that you have agreed to receive a product at a future date, with the price and terms for delivery already set. You have secured your price for now and the next year-even if the

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price of cable rises during that time. By entering into this agreement with the cable company, you have reduced your risk of higher prices.

3.2.1 Classification of Forward Contracts

Forward contracts in India are broadly governed by the Forward Contracts (regulation) Act, 1952. According to this act, forward contracts are of the following three major categories.

1. ***Hedge Contracts:*** These are freely transferable contracts which do not require specification of a particular lot size, quality or delivery standards for the underlying assets. Most of these are necessary to be settled through delivery of underlying assets.
2. ***Transferable Specific Delivery Forward Contracts:*** Apart from being freely transferable between parties concerned, these forward contracts refer to a specific and predetermined lot size and variety of the underlying asset. It is compulsory for delivery of the underlying assets to take place at expiration of contract.
3. ***Non-transferable Specific Delivery Forward Contracts:*** These contracts are normally exempted from the provision of regulation under Forward Contract Act, 1952 but the Central Government reserves the right to bring them back under the Act when it feels necessary. These are contracts which cannot be transferred to another party. The contracts, the consignment lot size, and quality of underlying asset are required to be settled at expiration through delivery of the assets.

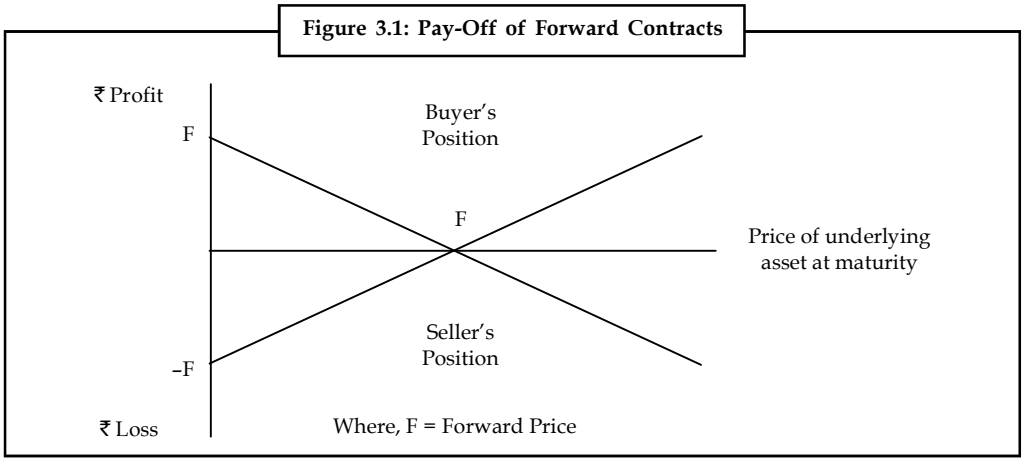
3.2.2 Forward Contract Mechanism

The trading mechanism of forward contracts can be better understood through the following example.

Example: Suppose Mr X is a wholesale sugar dealer and Mr Y is the prospective buyer. The current price (on 1st April, 2006) of sugar per kg. is ₹ 23. Mr Y agrees to buy 50 kgs. of sugar at ₹ 25 per kg after three months (1st July, 2006).

The price is arrived at on the basis of prevailing market conditions and future perceptions about the price of sugar. If on 1st July, 2006). The market price of sugar is ₹ 30 per kg, then Mr Y is a gainer by ₹ 5 per kg and if the price of sugar is ₹ 20 per kg, then Mr X is a gainer by ₹ 5 per kg. One party's gain is another part's loss by the same amount. Hence, the profit/loss payoff is symmetrical as shown in Figure 3.1.

Figure 3.1: Pay-Off of Forward Contracts



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Did u know? **Does this mean one party has to lose?**

No. Because by limiting my losses, I am in better control of my business. Let us understand this from the perspective of both Mr X and Mr Y. Mr X will gain even if the price of sugar is ₹ 20 a kg because at the time of entering the contract with Mr Y, Mr X did not know what exactly the price of sugar would be after three months (i.e., on 1st July, 2006). So, by agreeing to sell sugar at ₹ 25 a kg, Mr X is assured of a certain earning, based on which he can now plan the financial needs of his business. Similarly, Mr Y also knows that he will have to sell out a fixed amount, based on which he too can take care of the financial needs of his business. It will help Mr Y to control his cost.

The important terminologies used in forward contracts are described below.

1. ***Underlying Asset:*** This refers to the asset on which forward contract is made i.e., the long position holder buys this asset in future and the short position holder sells this asset in future. The various underlying assets are equity shares, stock indices, commodity, currency, interest rate, etc. For example, in the above case, sugar (a commodity) is the underlying asset.
2. ***Long Position:*** The party that agrees to buy an underlying asset (e.g. stock, commodity, stock index, etc.) in a future date is said to have a long position. For example, in the above case, Mr.Y is said to hold a long position. The long position holder on the contract agrees to buy the underlying asset on the future date because they are betting the price will go up.
3. ***Short Position:*** The party that agrees to sell an underlying asset (e.g. stock, commodity, indices, etc.) in future date is said to have a short position. For example, in the above case, Mr. X is said to hold a short position. The short position on the contract agrees to sell the security on the future date because they are betting the price will go down.
4. ***Spot Position:*** This is the quoted price of the underlying asset for buying and selling at the spot time or immediate delivery. For example, in the above case, the spot price of sugar (underlying asset) is ₹ 23 per kg.
5. ***Future Spot Price:*** This is the spot price of the underlying asset on the date the forward contract expires and it depends on the market condition prevailing at the expiration date. For example, in the above case, we have considered two situations for futures spot price i.e, ₹ 30 and ₹ 20.
6. ***Expiration Date:*** This is the date on which the forward contract expires, or also referred to as maturity date of the contract. For example, in the above case, the expiry date is 1st July, 2006.
7. ***Delivery Price:*** The prespecified price of the underlying assets at which the forward contract is settled on expiration is said to be delivery price. For example, in the above case, the delivery price is ₹ 25 per kg. of sugar.

3.2.3 Features of Forward Contracts

The salient features of forward contracts are:

1. They are bilateral negotiated contract between two parties and hence exposed to counter party risk.

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Example: Trade takes place between party A and party B for X kgs. of a commodity. The pre-specified delivery price is ₹ 100 per kg., and the maturity is 1 month. After 1 month, the commodity is trading at ₹ 120 per kg. If A was the buyer, he would gain ₹ 20 and B suffer have a loss of ₹ 20. In case B defaults (refuses to sell at ₹ 100 per kg. as promised), party A is exposed to counter-party risk i.e. risk of foregoing the deserving gain of ₹ 20 per kg. In case of future contracts, the stock/commodity exchange (through a clearing house) gives a guarantee even if the counter party defaults. This is done through a system of daily margins.

2. Each contract is custom designed, and hence is unique in terms of contract size, expiration date and the asset type, quality, etc.
3. A contract has to be settled in delivery or cash on expiry date.
4. The contract price is generally not available in the public domain.
5. If the party wishes to reverse the contract, it has to compulsorily go to the same counterparty, which often results in high prices being charged.

Forward contracts can be worth less than zero. If I have the long position on an expiring forward contract for ₹ 100 and the price is ₹ 90, this will cost me ₹ 10. The fact that certain options can go negative mandates margin requirements, where the owner must put money in escrow to prove they can cover the losses.

Notes **Forward as a Zero-sum-Game**

In essence, a forward transaction typically involves a contract, most often with a bank, under which both the buyer and holder of the contract and the seller (or writer) of the contract are obligated to execute a transaction at a specified price on a pre-specified date. This means that the seller is 'obligated' to deliver a specified asset to the buyer on a specified date in the future, and the buyer is 'obligated' to pay the seller a specified price upon delivery. This specified price is known as the 'forward price'.

At the inception of the contract, the contract value is zero in the eyes of both the buyer and the seller. But the value of the underlying asset changes throughout the life of the contract, and as such there is a change in the value of the contract vis-à-vis the buyer and the seller. The value changes for the benefit of one party and at the expense of the other. This property of the forward contract makes it a "zero-sum-game" for the buyer and seller. This zero-sum characteristic can be better understood through an illustration.

Example: Consider a forward contract written on a specified asset with a forward exercise price for the asset of ₹ 50. If there is a sudden upswing in the asset's price to ₹ 55, how will it affect both parties' views of the value of the contract? The seller of the forward contract views the contract to have lost value because the price at which he is obligated to sell the asset (₹ 50) is lesser than that which could be received in the spot market (₹ 55) On the other hand; the buyer of the contract views the contact as having gained value. As the spot price of the asset increases, there is a better chance that the forward exercise price will be below the prevailing spot market price in the future when the forward contract matures and the asset is delivered. If this market condition prevails until the specified delivery date, the seller's loss equals the buyer's gain.

Self Assessment

Notes

Fill in the blanks:

6. A …… contract is an agreement between two parties to buy or sell underlying assets at a pre determined future date at a price agreed when the contract is entered into.
7. Forward contracts are not …… products.
8. Forward contracts are bilateral negotiated contract between two parties and hence exposed to …….. .
9. According to ……the value changes for the benefit of one party and at the expense of the other.
10. Forward contracts can be worth less than …….. .

3.3 Limitations of Forward Markets

Forward markets world-wide are afflicted by several problems:

1. Lack of centralization of trading,
2. Illiquidity, and
3. Counterparty risk

In the first of these two, the basic problem is that of too much flexibility and generality. The forward market is like a real estate market in that any two consenting adults can form contracts against each other. This often makes them design terms of the deal which are very convenient in that specific situation, but makes the contracts non-tradable. Counterparty risk arises from the possibility of default by any one party to the transaction. When one of the two sides to the transaction declares bankruptcy, the other suffers. Even when forward markets trade standardized contracts, and hence avoid the problem of illiquidity, the counterparty risk still remains a very serious issue.

Task Collect the data of forward agreements for 2010 and analyse the growth of forward contracts in India in comparison to other developing countries.

Self Assessment

State the following are true or false:

11. Counterparty risk arises from the possibility of default by both the party to the transaction.
12. The party that agrees to buy an underlying asset (e.g. stock, commodity, stock index, etc.) in a future date is said to have a short position.
13. Spot position is the quoted price of the underlying asset for buying and selling at the spot time or immediate delivery.
14. The prespecified price of the underlying assets at which the forward contract is settled on expiration is said to be delivery price.
15. The party that agrees to sell an underlying asset (e.g. stock, commodity, indices, etc.) in future date is said to have a short position.

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3.4 Summary

- A cash market transaction is one in which a seller agrees to deliver a specific cash commodity to a buyer at some point in the future.
- Unlike futures contracts (which occur through a clearing firm), forward contracts are privately negotiated and are not standardized.
- Further, the two parties must bear each other's credit risk, which is not the case with a futures contract.
- Also, since the contracts are not exchange-traded, there is no marking to market requirement, which allows a buyer to avoid almost all capital outflows initially (though some counterparties might set collateral requirements).
- Given the lack of standardization in these contracts, there is very little scope for a secondary market in forwards.
- The price specified in a forward contract for a specific commodity.
- The forward price makes the forward contract have no value when the contract is written.
- The forward market is like a real estate market in that any two consenting adults can form contracts against each other.
- This often makes them design terms of the deal which are very convenient in that specific situation, but makes the contracts non-tradable.

3.5 Keywords

Delivery Price: The pre-specified price of the underlying assets at which the forward contract is settled on expiration is said to be delivery price.

Economic exposure: Economic exposure refers to the impact of fluctuations in financial prices on the core business of the firm.

Future Spot Price: This is the spot price of the underlying asset on the date the forward contract expires and it depends on the market condition prevailing at the expiration date.

Long Position: The party that agrees to buy an underlying asset (e.g. stock, commodity, stock index, etc.) in a future date is said to have a long position.

Short Position: The party that agrees to sell an underlying asset (e.g. stock, commodity, indices, etc.) in future date is said to have a short position.

Transactional risks: Transactional risks reflect the pejorative impact of fluctuations in financial prices on the cash flows that come from purchases or sales.

Translation risks: Translation risks describe the changes in the value of a foreign asset due to changes in financial prices, such as the foreign exchange rate.

3.6 Review Questions

1. We noted that a hedge is a financial instrument whose sensitivity to a particular financial price offsets the sensitivity of the firm's core business to that price. Discuss.
2. Future performance of strategies with high volatility is far less predictable than future performance from strategies experiencing low or moderate volatility. Explain.

Notes

3. What do you mean by a Forward Contract? Explain using a suitable example.
4. "Forward contracts act as fore-runners of futures market". Critically evaluate the statement in the light of growth of forward market worldwide.
5. Taking a hypothetical example, discuss the payoff profile from the forward contract.
6. Write a detailed note on classification of forward contracts with examples.
7. Briefly discuss the trading mechanism of the forward market.
8. What are important terms used in trading forward contract? Explain.
9. List the major features of forward contracts.
10. Explain the statement: "Forwards are zero-sum games".
11. Explain the various uses of forward contract with suitable examples.

Answers: Self Assessment

1.	Transaction	2.	Economic exposure
3.	Translation	4.	deep discounts
5.	high, low or moderate	6.	forward
7.	standardized	8.	counter party risk
9.	zero-sum-game	10.	zero
11.	False	12.	False
13.	True	14.	True
15.	True		

3.7 Further Readings

Books

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Online links

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Unit 4: Future Contracts

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Objectives

After studying this unit, you will be able to:

- Define futures
- Explain stock index futures, commodity futures and currency futures
- Make distinction between futures and forward contracts
- Describe pay-offs
- Compare cash settlement vs physical settlement

Introduction

After explaining the forwards contracts in previous unit, let us now discuss the futures contacts. Unlike forwards contracts, futures are standardized contracts traded on exchanges through a clearing house and avoid counter party risk through margin money, and much more.

What we know as the futures market of today originated from some humble beginnings. Trading in futures originated in Japan during the eighteenth century and was primarily used for the

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trading of rice and silk. It wasn't until the 1850s that the U.S. started using futures markets to buy and sell commodities such as cotton, corn and wheat. Today's futures market is a global marketplace for not only agricultural goods, but also for currencies and financial instruments such as treasury bonds and securities (securities futures). It's a diverse meeting place of farmers, exporters, importers, manufacturers and speculators.

4.1 Introduction to Futures

A futures contract is a type of derivative instrument, or financial contract, in which two parties agree to transact a set of financial instruments or physical commodities for future delivery at a particular price. If you buy a futures contract, you are basically agreeing to buy something that a seller has not yet produced for a set price. But participating in the futures market does not necessarily mean that you will be responsible for receiving or delivering large inventories of physical commodities - remember, buyers and sellers in the futures market primarily enter into futures contracts to hedge risk or speculate rather than to exchange physical goods (which is the primary activity of the cash/spot market). That is why futures are used as financial instruments by not only producers and consumers but also by speculators.

A future contract is a standardized agreement between the seller (short position) of the contract and the buyer (long position), traded on a futures exchange, to buy or sell a certain underlying instrument at a certain date in future, at a pre-set price. The future date is called the delivery date or final settlement date. The pre-set price is called the futures price. The price of the underlying asset on the delivery date is called the settlement price.

Thus, futures is a standard contract in which the seller is obligated to deliver a specified asset (security, commodity or foreign exchange) to the buyer on a specified date in future and the buyer is obligated to pay the seller the then prevailing futures price upon delivery.

Did u know? **How to price a future contract?**

Pricing can be based on an open cry system, or bids and offers can be matched electronically. The futures contract will state the price that will be paid and the date of delivery.

4.1.1 Nature of Future Contracts

A futures contract gives the holder the right and the obligation to buy or sell. Contrast this with an options contract, which gives the buyer the right, but not the obligation, and the writer (seller) the obligation, but not the right. In other words, an option buyer can choose not to exercise when it would be uneconomical for him/her. The holder of a futures contract and the writer of an option, do not have a choice. To exit the commitment, the holder of a future position has to sell his long position or buy back his short position, effectively closing the position. Futures contracts or simply futures are exchange-traded derivatives. The exchange acts as counterparty on all contracts, sets margin requirements, etc.

Futures contracts, unlike forwards, are traded on organized exchanges. They are traded in three primary areas:

1. Agricultural Commodities
2. Metals and Petroleum, and
3. Financial Assets (individual stocks, indices, interest rate, currency)

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4.1.2 Characteristics of Futures Contracts

Following are the salient features of futures contracts:

1. Futures are highly standardised contracts that provide for performance of contracts through either deferred delivery of asset or final cash settlement;
2. These contracts trade on organized futures exchanges with a clearing association that acts as a middleman between the contracting parties;
3. Contract seller is called 'short' and purchaser 'long'. Both parties pay margin to the clearing association. This is used as performance bond by contracting parties;
4. Margins paid are generally marked to market-price everyday;
5. Each futures contract has an associated month that represents the month of contract delivery or final settlement. These contracts are identified with their delivery months like July-Treasury bill, December $/DM etc.
6. Every futures contract represents a specific quantity. It is not negotiated by the parties to the contract. One can buy or sell a number of futures contracts to match one's required quantity. Because of this feature, 100% hedging is not possible. There may be over or under-hedging to some extent.

Self Assessment

Fill in the blanks:

1. If you buy a …… contract, you are basically agreeing to buy something that a seller has not yet produced for a set price.
2. The future date is called the …… date or final settlement date.
3. Futures contracts, unlike forwards, are traded on …….
4. …….. paid are generally marked to market-price everyday.
5. Contract seller is called ……and purchaser ……..

4.2 Types of Future Contracts

Futures contracts are of three major categories:

4.2.1 Stock Index Futures

These futures contract without actual delivery were introduced only in 1982 and are the most recent major futures contract to emerge. In the United States, these contracts trade on several market indices like Standard and Poor's 500, a major market index, the NYSE Index and the Value Line Index. Numerous contracts on industry indices are now trading as well.

A stock index futures contract is a contract to buy or sell the face value of the underlying stock index where the face value is defined as being the value of index multiplied by the specified monetary amount.

This device makes it possible to equate the value of the stock index with that of a specific basket of shares with the following specifications.

1. The total value of shares must match the monetary value of the index.

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2. The shares selected must correspond to the set of shares used to create the index.
3. The amount of each holding must be in proportion to the market capitalisation of the companies.

Caution The profit or loss from a futures contract that is settled at delivery is the difference between the value of the index at delivery and the value when originally purchased or sold. It is important to emphasise that the delivery at settlement cannot be in the underlying stocks but must be in cash. The futures index at expiration is set equal to the cash index on that day.

4.2.2 Commodity Futures

The commodity futures include:

1. ***Agricultural futures contracts:*** These contracts are traded in grains, oil and meal, livestock, forest products, textiles and foodstuff. Several different contracts and months for delivery are available for different grades or types of commodities in question. The contract months depend on the seasonality and trading activity.
2. ***Metallurgical futures contract:*** This category includes genuine metal and petroleum contracts. Among the metals, contracts are traded on gold, silver, platinum and copper. Of the petroleum products, only heating oil, crude oil and gasoline are traded.

4.2.3 Currency Futures

Currency future is the price of a particular currency for settlement at a specified future date. Currency futures are traded on future exchanges and the exchanges where the contracts are fungible (or transferable freely) are very popular. The two most popular future exchanges are the Singapore International Monetary Exchange (SIMEX) and the International Money Market, Chicago (IMM). Other exchanges are in London, Sydney, Frankfurt, New York, Philadelphia, etc.

The first exchange-traded foreign currency futures contracts were launched on the International Monetary Market (IMM) – now part of the Chicago Mercantile Exchange (CME) – in 1972. Seven currencies were traded and others have since been added. The CME remains the most active market in these contracts to this day, though a number of other exchanges have launched their own contracts. The figure 4.1 shows the monthly price chart of CME British Pound.

Today, there are financial futures on debt instruments called interest rate futures, foreign exchange rate called currency futures and stock market averages called stock index futures. Financial futures are different from commodity futures in several ways. The most important difference is that many financial futures are not deliverable. The fact that very few contracts are actually delivered led many exchanges to consider eliminating the delivery feature all together. Till date this has not happened in commodity futures, but many financial futures are created as non-deliverable instruments. Stock index futures and interest rate futures are such futures. In place of delivery, these contracts are cash settled on specific final delivery dates. Badla trading in India was the predecessor of futures and forwards trading.

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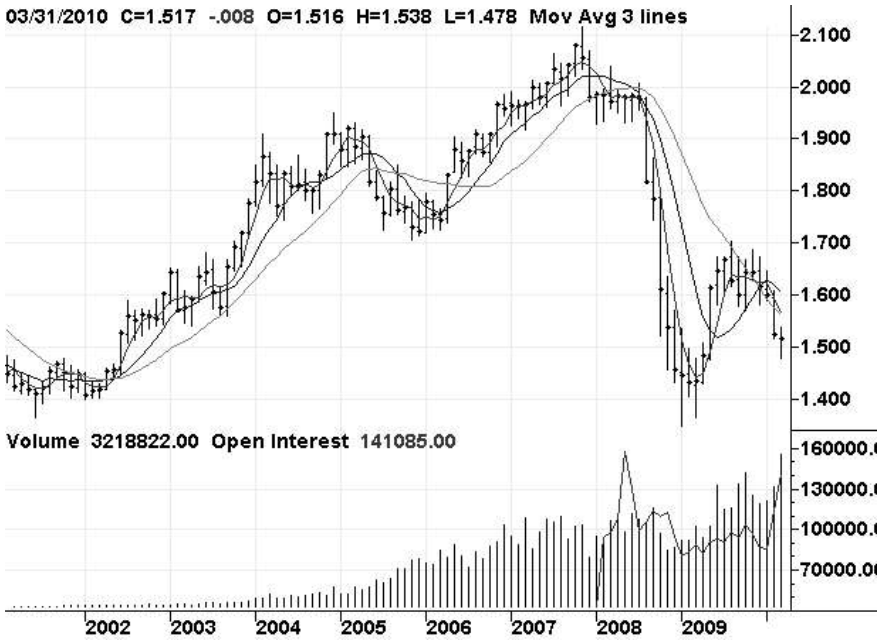
Figure 4.1: CME British Pound (B6, Globex)



Source: www.tfc-chartsw2d.com

Did u know? **What are interest rate futures?**

Interest rate futures contract allows the buyer of the contract to lock in a future investment rate; not a borrowing rate as many believe. Interest rate futures are based off an underlying security which is a debt obligation and moves in value as interest rates change.

When interest rates move higher, the buyer of the futures contract will pay the seller in an amount equal to that of the benefit received by investing at a higher rate versus that of the rate specified in the futures contract. Conversely, when interest rates move lower, the seller of the futures contract will compensate the buyer for the lower interest rate at the time of expiration.

Self Assessment

Fill in the blanks:

6. A ……futures contract is a contract to buy or sell the face value of the underlying stock index.
7. The first exchange-traded foreign currency futures contracts were launched on the ……..
8. The futures index at expiration is set equal to the ……..on that day.

4.3 Distinction between Future and Forward Contracts

The basic form of the futures contract mirrors that of the forward contract: both parties are obligated under the terms of the contract either to deliver a specified asset or pay the specified

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price of the asset on the contract maturity date. Added to this, the futures contract entails the following two obligations, both of which help to minimize the default (or credit) risk inherent in forward contracts.

Did u know? **How is a futures contract different from a forward contract?**

1. The value of the futures contract is 'settled' (i.e., paid or received) at the end of each trading day. In the language of the futures markets, the futures contract is 'cash settled', or 'mark/marked-to-market' daily. The marked-to-market provision effectively reduces the performance period of the contract to a day, thereby minimizing the risk of default.
2. Both buyers and sellers are required to post a performance bond called 'margin'. At the end of each trading day, gains and losses are added to and taken away from the margin account, respectively. The margin account must remain above an agreed upon minimum or the account will be closed. The margin provision prevents the depletion of accounts, which, in turn, largely eliminates the risk of default.

The following are the distinguishing features between forwards and futures:

1. Delivery of the underlying is the hallmark of a forward contract. To the contrary the vast majority of futures contracts – even though they provide for delivery – are satisfied by entering into an offsetting contract or selling the contract on the exchange – namely, no delivery. This is the primary distinguishing feature of the forwards as given by the CFTC. Forwards also typically have been described by reference to the commercial natures of the counterparties which have the capacity to make or take delivery.
2. A forward contract is entered into for commercial purposes related to the business of the party wanting to enter into the forward. The producer, processor, fabricator, refiner, or merchandiser may want to purchase or sell a commodity for deferred shipment or delivery as part of the conduct of its business. In contrast, futures contracts are undertaken principally to assume or shift price risk without transferring the underlying commodity.
3. A forward contract is privately and individually negotiated between two principals. A futures contract is an exchange-traded contract, with standardized provisions including: commodity units; margin requirements related to price movements; clearing organizations that guarantee counterparty performance; open and competitive trading on exchanges; and public dissemination of price.
4. A forward contract generally is not assignable without the consent of the contracting parties and does not provide for an exchange-style offset. A futures contract is fungible, because of its standardized form, and hence can be traded on an exchange.
5. With a forward contract, no clearing house, no settlement system, and – according to CFTC – no variation margining is involved. All of these features apply to a futures contract.

Futures contracts are standardized contracts that are traded on organized futures markets. Because contract sizes and maturities are standardized, all participants in the market are familiar with the types of contracts available, and trading is facilitated. Forward contracts, on the other hand, are private deals between two individuals who can sign any type of contract they agree on.

The organization of futures trading with a clearing house reduces the default risks of trading. The exchange members, in effect, guarantee both sides of a contract. In contrast, a forward contract is a private deal between two parties and is subject to the risk that either side may default on the terms of the agreement.

Notes

Profits and losses of futures contracts are settled everyday at the end of trading, a practice called 'marking the market'. Daily settlements reduce the default risk of futures contracts relative to forward contracts. On a daily basis, futures investors must pay over any losses or receive any gains from the day's price movements. An insolvent investor with an unprofitable position would be forced into default after only one day's trading, rather than being allowed to build up huge losses that lead to one large default at the time the contract matures (as could occur with a forward contact).

Futures contracts can also be closed out easily with an 'offsetting trade'. For example, if a company's long position in $ futures has proved to be profitable, it need not literally take delivery of the $ at the time the contract matures. Rather, the company can sell futures contracts on a like amount of $ just prior to the maturity of the long position. The two positions cancel on the books of the futures exchange and the company receives its profit in cash.

These and other differences between forwards and futures are summarized below in Table 4.1

Table 4.1: Distinction between Forwards and Futures

Criteria/Factors		Forwards	Futures
1.	Trading	Traded by telephone or telex (OTC)	Traded in a competitive arena(recognized exchange)
2.	Size of contracts	Decided between buyer and seller	Standardized in each futures market
3.	Price of contract	Remains fixed till maturity	Changes everyday
4.	Mark to Market	Not done	Marketed to market everyday
5.	Margin	No margin required	Margins are to be paid by both buyer and sellers
6.	Counter Party Risk	Present	Not present
7.	No.of contracts in a year	There can be any number of contracts	Number of contracts in a year is fixed.
8.	Frequency of Delivery	90% of all forward contracts are settled by actual delivery.	Very few future contracts are settled by actual delivery
9.	Hedging	These are tailor –made for specific date and quantity. So, it is perfect	Hedging is by nearest month and quantity contracts. So, it is not perfect.
10.	Liquidity	Not liquidity	Highly liquid
11.	Nature of Market	Over the Counter	Exchange traded
12.	Mode of Delivery	Specifically decided. Most of the contracts result in delivery	Standardized. Most of the contracts are cash-settled.
13.	Transactional Costs	Costs are based on bid-ask spread	Include brokerage fees for buy and sell others

Task Do you think that a web-enabled foreign exchange market would revolutionize the forex trading practices in the future? Elucidate with examples.

Notes

Self Assessment

State the following are true or false:

9. The value of the futures contract is 'settled' (i.e., paid or received) at the end of each trading day.
10. A forward contract is an exchange-traded contract.
11. The organization of futures trading with a clearing house reduces the default risks of trading.

4.4 Pay-Offs

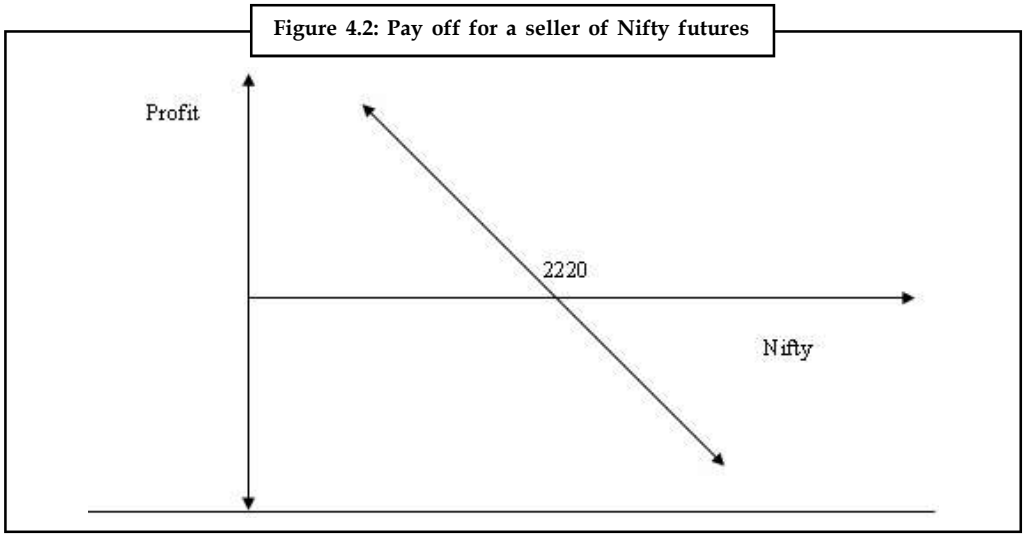
The pay-offs can be categorised as follows:

4.4.1 Payoff for Buyer of Futures: Long Futures

The payoff for a person who buys a futures contract is similar to the payoff for a person who holds an asset. He has a potentially unlimited upside as well as a potentially unlimited downside. Take the care of a speculator who buys a two-month Nifty futures contract when the Nifty stands at 2220. The underlying asset in this case is the Nifty portfolio. When the index moves up, the long futures position starts making profits, and when the index moves down it starts making losses.

The figure shows the profits/losses for a short futures position. The investor sold futures when the index was at 2220. If the index goes down, his futures position starts making profit. If the index rises, his futures start showing losses.

Figure 4.2: Pay off for a seller of Nifty futures



4.4.2 Payoff for Seller of Futures: Short Futures

The payoff for a person who sells a futures contract is similar to the payoff for a person who shorts an asset. He has a potentially unlimited upside as well as a potentially unlimited downside. Take the case of a speculator who sells a two-month Nifty index futures contract when the Nifty stands at 2220. The underlying asset in this case is the Nifty portfolio. When the index moves down, the short futures position starts making profits, and when the index moves up, it starts making losses.

Notes

Notes **Hedging: Long Security, Sell Futures**

Take the case of an investor who holds the shares of a company and gets uncomfortable with market movements in the short run. He sees the value of his security falling from ₹ 450 to ₹ 390. In the absence of stock futures, he would either suffer the discomfort of a price fall or sell the security in anticipation of a market upheaval. With security futures he can minimize his price risk. All he need do is enter into an offsetting stock futures position, in this case, take on a short futures position. Assume that the spot price of the security he holds is ₹ 390. Two-month futures cost him ₹ 402. For this he pays an initial margin. Now if the price of the security falls any further, he will suffer losses on the security he holds. However, the losses he suffers on the security will be offset by the profits he makes on his short futures position. Take for instance that the price of his security falls to ₹ 350. The fall in the price of the security will result in a fall in the price of futures. Futures will now trade at a price lower than the price at which he entered into a short futures position. Hence his short futures position will start making profits. The loss of ₹ 40 incurred on the security he holds, will be made up by the profits on his short futures position.

Self Assessment

State the following are true or false:

12. When the index moves up, the long futures position starts making losses.

13. The payoff for a person who sells a futures contract is similar to the payoff for a person who shorts an asset.

4.5 Cash Settlement vs Physical Settlement

Settlement is the act of consummating the contract, and can be done in the following ways:

1. ***Physical delivery:*** The amount specified of the underlying asset of the contract is delivered by the seller of the contract to the exchange, and by the exchange to the buyers of the contract. Physical delivery is common with commodities and bonds. In practice, it occurs only on a minority of contracts. Most are cancelled out by purchasing a covering position- that is, buying a contract to cancel out an earlier sale (covering a short), or selling a contract to liquidate an earlier purchase (covering a long). This form of settlement involves delivery of contract, and is most popular in commodity futures. The party with the short position (seller) sends a notice of intention to the exchange who then selects a party with outstanding long position to accept the delivery.

2. ***Cash settlement:*** Cash payment is made based on the underlying reference rate, such as a short term interest rate index such as Euribor, or the closing value of a stock market index. This is mostly used for settling stock indices futures. Stock indices cannot be delivered physically. This is because that will involve transaction in constituent stocks (underlying the index) in various proportions, which is not practically possible and involves higher transaction cost. On expiry of the settlement period, the exchange sets the final settlement price equal to the spot price of the asset on that day. For example, suppose an investor takes long position in near month NSE Nifty Futures with delivery price at 3100. On maturity, if the index is at 3200 with near month short futures at 3225, then the investor gains ₹ 100 through cash settlement.

Notes

Notes **Offsetting Position**

This type of settlement is evidenced in 90% of futures settlement worldwide. Affecting an offsetting futures transaction means entering into a reverse trade of the initial position. The initial buyer (long) liquidates his position by selling (going short) a similar future contract, and initial seller (short) goes for buying (long) an identical contract. In our previous example, the long investor enters into a short Nifty Futures at delivery price of 3225. This is because the investor does not wish to take delivery (or rather cash settle) the futures. Offsetting is a process of carrying forward the transaction by changing sides.

Self Assessment

Fill in the blanks:

14. …… delivery is common with commodities and bonds.
15. …….cannot be delivered physically.
16. Affecting an offsetting futures transaction means entering into a …… trade of the initial position.

4.6 Summary

- The futures market is a global market place, initially created as a place for farmers and merchants to buy and sell commodities for either spot or future delivery.
- This was done to lessen the risk of both waste and scarcity.
- Rather than trade in physical commodities, futures markets buy and sell futures contracts, which state the price per unit, type, value, quality and quantity of the commodity in question, as well as the month the contract expires.
- The players in the futures market are hedgers and speculators.
- A hedger tries to minimize risk by buying or selling now in an effort to avoid rising or declining prices.
- Conversely, the speculator will try to profit from the risks by buying or selling now in anticipation of rising or declining prices.
- Futures accounts are credited or debited daily, depending on profits or losses incurred.
- The futures market is also characterized as being highly leveraged due to its margins; although leverage works as a double-edged sword.
- It's important to understand the arithmetic of leverage when calculating profit and loss, as well as the minimum price movements and daily price limits at which contracts can trade.
- "Going long," "going short," and "spreads" are the most common strategies used when trading on the futures market.

4.7 Keywords

Commodity Future Contract: An agreement to buy or sell a set amount of a commodity at a predetermined price and date.

Notes

Currency future: Currency future is the price of a particular currency for settlement at a specified future date.

Mark to Market: The accounting act of recording the price or value of a security, portfolio or account to reflect its current market value rather than its book value.

Offset: Elimination or reduction of a current long or short position by making an opposite transaction of the same security.

Portfolio: The group of assets - such as stocks, bonds and mutual funds - held by an investor.

4.8 Review Questions

1. What is a futures contract? Explain with examples. Also discuss the types of financial futures contracts.
2. Discuss the types of traders in futures markets with suitable examples.
3. Bring out the difference between a long futures position and short futures position. Illustrate the same with an example.
4. Discuss the statement 'The basic function of futures contract is hedging'.
5. Define futures contract and explain its uses.
6. Discuss the process of marking-to-market used in futures trading.
7. Briefly highlight on the various methods of settling future contracts.
8. Compare and contrast between forward contracts and futures contracts with suitable examples.
9. The payoff for a person who buys a futures contract is similar to the payoff for a person who holds an asset. Discuss with suitable example.
10. If the index goes down, his futures position starts making profit. If the index rises, his futures start showing losses. Discuss.

Answers: Self Assessment

1.	Futures	2.	Delivery
3.	Organized exchanges	4.	Margins
5.	Short, long	6.	Stock index
7.	International Monetary Market (IMM)	8.	Cash index
9.	True	10.	False
11.	True	12.	False
13.	True	14.	Physical
15.	Stock indices	16.	Reverse

4.9 Further Readings

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Unit 5: Pricing of Future Contracts

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Objectives

After studying this unit, you will be able to:

- Describe the pricing principles
- Define beta
- Compute optimal hedge ratio

Introduction

Futures contracts are like forward contracts, except that price movements are marked-to-market each day rather than receiving a single, once-and-for-all settlement on the expiry of the contract. Obviously, the sum of the daily mark-to-market price moves over the life of the futures equals the overall price movement of a forward with the same maturity. With the futures position, however, the mark-to-market profits (losses) are invested (carried) at the risk-free interest rate until the futures expire. The value of the futures position at time T, therefore, may be greater or less than the terminal value of the forward position, depending on the path that futures price follows over the life of the contract.

A futures contract is a standardized agreement to buy or sell a commodity at a date in the future. It is an obligation. The contract specifies the commodity (live cattle, feeder cattle), the product quantity (40,000 or 50,000 pounds of live animals), the product quality (specific U.S. grades and yields), the delivery points (only for live cattle-there are no delivery points for feeder cattle), and the delivery date (within the month that contract terminates).

5.1 Pricing Principles

We will study here about how the pricing of futures contracts are made. Before discussing valuation of futures contracts, we must make a clear distinction in pricing method used for

Notes

whether the underlying asset is held for investment or for consumption. Assets underlying individual stock futures are for investment purpose, whereas those like rice futures (commodity) are exclusively for consumption.

The basic principle of futures pricing involve the requirement of 'no arbitrage opportunities'. The price of a future is determined via arbitrage arguments. The future price represents the expected future value of the underlying discounted at the risk free rate-as any deviation from the theoretical price will afford investors a riskless profit opportunity and should be arbitraged away.

Thus, for a simple, non-dividend paying asset, the value of the future, F(t), will be found by discounting the present value S(t) at time t to maturity (T) by the rate of risk-free return (r).

$$F(t) = S(t) \times (1 + r)^{T-t} \quad ...(5.1)$$

or, with continuous compounding

$$F(t) = S(t)e^{r(T-t)} \quad ...(5.2)$$

This relationship may be modified for storage costs, dividends, dividend yields, and convenience yields.

In a perfect market, the relationship between futures and spot prices depends only on the above variables. In practice, there are various market imperfections (transaction costs, differential borrowing and lending rates, restrictions on short selling) that prevent complete arbitrage. All of these are discussed at the end of this unit. Thus, the futures price in fact varies within arbitrage boundaries around the theoretical price.

Did u know? **What is the concept of basis?**

The relationship between the futures market price and the cash price is called basis. In formula:

Basis = Cash Price – Futures Price

The difficulty with basis is not computing it 'after the fact', but the problem is encountered when basis must be estimated 'ahead of time'.

Self Assessment

Fill in the blanks:

1. The value of the futures position at time T may be greater or less than the ……..of the forward position, depending on the path that futures price follows over the life of the contract.
2. A ……. contract is a standardized agreement to buy or sell a commodity at a date in the future.
3. The basic principle of futures pricing involve the requirement of …….
4. The future price represents the expected future value of the underlying discounted at the …….
5. The relationship between the futures market price and the cash price is called …….

5.2 Cost of Carry Model

Notes

Cost-of-carry model is an arbitrage-free pricing model. Its central theme is that futures contract is so priced as to preclude arbitrage profit. In other words, investors will be indifferent to spot and futures market to execute their buying and selling of underlying asset because the prices they obtain are effectively the same. Expectations do influence the price, but they influence the spot price and, through it, the futures price. They do not directly influence the futures price. If the investor does not book a futures contract, the alternative form to him is to buy at the spot market and hold the underlying asset. In such a contingency he would incur a cost equal to the spot price + the cost of carry. The theoretical price of a futures contract is spot price of the underlying plus the cost of carry. Please note that futures are not about predicting future prices of the underlying assets.

This model stipulates that future prices equal to sum of spot prices and carrying costs involved in buying and holding the underlying asset, and less the carry return (if any). We use fair value calculation of futures to decide the no-arbitrage limits on the price of a futures contract. According to the cost-of-carry model, the futures price is given by:

Futures price = Spot Price + Carry Cost – Carry Return ...(5.3)

This can also be expressed as: $F= S(1+ r)^t$ ...(5.4)

where: r is the cost of financing, t is the time till expiration.

Caution Carry cost (CC) is the interest cost of holding the underlying asset (purchased in spot market) until the maturity of futures contract. Carry return (CR) is the income (e.g, dividend) derived from underlying asset during the holding period.

The Cost of Carry is the sum of all costs incurred if a similar position is taken in cash market and carried to expiry of the futures contract less any revenue that may arise out of holding the underlying asset. The cost typically includes interest cost in case of financial futures (insurance and storage costs are also considered in case of commodity futures). Revenue may be in the form of dividend. Though one can calculate the theoretical price, the actual price may vary depending upon the demand and supply of the underlying asset.

In simple words, the cost of carry refers to the difference between the costs and the benefits that accrue while holding an asset. Suppose a sugarcane producer needs 1,000 kgs. of sugarcane for processing in two months. To lock in the price of the sugarcane today, he can buy it and carry it for two months. One cost of this strategy is the opportunity cost of funds. To come up with the purchase price, he must either borrow money or reduce his earning assets by that amount. Beyond interest cost, however, carry costs vary depending upon the nature of the asset. For a physical asset such as wheat, he incurs storage costs (e.g., rent and insurance). At the same time, by storing wheat, he avoids the costs of possibly running out of his regular inventory before two months are up and having to pay extra for emergency deliveries. This benefit is called convenience yield. Thus, the cost of carry for a physical asset equals interest cost plus storage costs less convenience yield, that is:

Carry costs = Cost of funds + storage cost – convenience yield ... (5.5)

For a financial asset such as a stock or a bond, storage costs are negligible. Moreover, income (yield) accrues in the form of quarterly cash dividends or semi-annual coupon payments. The cost of carry for a financial asset is:

Carry costs = Cost of funds – income ...(5.6)

Notes

Carry costs and benefits are modelled either as continuous rates or as discrete flows. Some costs/benefits such as the cost of funds (i.e., the risk-free interest rate) are best modelled continuously. The dividend yield on a broad-based stock portfolio and the interest income on a foreign currency deposit also fall into this category. Other costs/benefits like quarterly cash dividends on individual common stocks, semi-annual coupons on bonds, and warehouse rent payments for holding an inventory of grain are best modelled as discrete cash flows. In the interest of brevity, only continuous costs are considered here.

Thus, the futures price (F) should be equal to spot price (S) plus carry cost minus carry return. If it is otherwise, there will be arbitrage opportunities as follows.

1. ***When F > (S + CC – CR):*** Sell the (overpriced) futures contract, buy the underlying asset in spot market and carry it until the maturity of futures contract. This is called "cash-and-carry" arbitrage.
2. ***When F < (S + CC – CR):*** Buy the (under priced) futures contract, short-sell the underlying asset in spot market and invest the proceeds of short-sale until the maturity of futures contract. This is called "reverse cash-and-carry" arbitrage. The "reverse cash-and-carry" arbitrage assumes that the short-sellers receives the full proceeds of short-sale. In practice, this may be only partially true or even impossible.

Thus, it makes no difference whether we buy or sell the underlying asset in spot or futures market. If we buy it in spot market, we require cash but also receive cash distributions (e.g., dividend) from the asset. If we buy it in futures market, the delivery is postponed to a later day and we can deposit the cash in an interest-bearing account but will also forego the cash distributions (like dividend) from the underlying asset. However, the difference in spot and futures price is just equal to the interest cost and the cash distributions.

5.2.1 Pricing Model for Index Futures

We have so far considered the futures contract on a stock. Futures on stock index is somewhat different. Index futures pose additional problems to arbitrage play. The problems stem from the fact that the index futures does not exist physically (which, of course, is the reason that the index futures is compulsorily cash-settled). Nevertheless, we can replicate the index by buying or selling all the component stocks in proportion to their value in index. This may be further simplified by buying or selling just one stock as proxy for the index after considering its beta. This is a technical issue and is beyond the scope of the present unit. Let us confine our discussion now to the pricing of index futures.

Carry cost for index futures is similar – it is simply the interest cost of holding the index at current market price. The first term in the equation will, therefore, continue to be SerT. The second term, carry return, needs some adjustment. Because there are many component stocks and all of them may have cash dividend during the life of futures contract, we will have to sum the present-value of all such cash distributions. Thus,

$$\text{Carry Return} = D_1 e^{-rt_1} + D_2 e^{-rt_2} + ... + D_n e^{-rt_n} \quad \text{... (5.7)}$$

where D_1, D_2 ... are different cash dividends from component stocks to be paid on t_1, t_2 ...t_n dates, respectively. The value of e is 2.7183. We can simplify the pricing equation for index futures if the following three conditions are met.

1. Index is broad-based
2. All component stocks pay dividend
3. Dates on which dividend is paid are uniformly distributed without being bunched

Notes

Under such circumstances, we may treat the dividend to be a rate (d) rather than a discrete amount (D). In other words, dividend is paid everyday from index and the rate at which dividend is paid is the average of individual dividend amounts. Just like the stock price falls on ex-dividend date by (approximately) dividend amount, we may consider that index will fall every day at (approximately) the dividend yield. We can then simplify the pricing equation as follows.

$$F = Se^{(r-d)T} \quad \text{... (5.8)}$$

Example: Suppose, the current price of BSE-SENSEX is 12400. The dividend yield (d) on index is 1% pa and the yield on risk-free assets (r) is 10% pa, both on simple interest rate basis. Their continuously compounded equivalents are, respectively, 0.995% pa and 9.53% pa. The price of 90-day (0.246575 year) index futures will be

$$12400\ e^{(0.0953-0.00995)0.246575} = 12{,}664.$$

Academic literature uses equation (5.8) to price index futures. However, if the index is not broad-based or ex-dividend dates are bunched together, we should equation (5.6) in conjunction with equation (5.5).

A stock index traces the changes in the value of a hypothetical portfolio of stocks. The value of a futures contract on a stock index may be obtained by using the cost of carry model. For such contracts, the spot price is the "spot index value", the carry cost represents the interest on the value of the dividends receivables between the day of valuation and the delivery date. Accordingly, indices are thought of as securities that pay dividends, and the futures contracts valued accordingly.

Case 1: When the securities included in the index are not expected to pay any dividends during the life of the contract: Here we have,

$$F = S_0e^{rt}$$

where F is the value of futures contract, S_0 is the spot value of index, r is the continuously compounded risk-free rate of return, and t is the time to maturity (in years).

Case 2: When dividend is expected to be paid by one or more of the securities included in the index during the life of the contract: In the event of dividends expected to be paid on some securities, the dividend amount is discounted to present value terms and then the rule of pricing securities with known income is applied. Thus,

$$F=(S_O{}^{-I})e^{rt}$$

where I is the discounted value of the dividend and other symbols are same as in case 1.

Case 3: When dividend on the securities included in the index is assumed to be paid continuously during the life of the contract: If the dividends may be assumed to be paid continuously, with the dividend yield rate being Y, then the futures price, F, would be given by

$$F=S_Oe^{(r-y)t}$$

5.2.2 Pricing Model for Commodity Futures

Stocks and stock indices are not the only assets. They are not even the only financial assets on which futures contracts exist. Let us examine the pricing of commodity futures, which were matter-of-fact the first futures contracts. When we buy the commodity in spot and hold it until the maturity of futures contract, we need to store it in a secure warehouse and buy insurance against contingent dangers like theft, fire, floods, etc. Accordingly, the storage and insurance cost will be additional component in carry cost. There is another component, which is peculiar

Notes

and specific to commodities. It is called the convenience yield, which refers to the "benefit" the holder derives from physical possession of commodity. Consider, for example, a manufacturer that uses the commodity as raw material. He would like to always store certain quantity of raw material to ensure that the production process is not halted for want of raw material. We say that there is a convenience yield by possessing the raw material.

The futures price of a commodity is now given by

Futures Price = Spot Price + Interest Cost + Storage & Insurance Cost – Cash Yield – Convenience Yield

Thus, storage and insurance is the additional component in carry cost, and convenience yield is the additional component in carry return. Unlike all other components, convenience yield is not computable. We can compute it only if the futures price is given. This brings us to the important point that the futures prices are an important source of information. From the traded futures price, we can estimate the convenience yield of a commodity, which is otherwise not computable or even readily observable.

Self Assessment

Fill in the blanks:

6. Cost-of-carry model is an ……pricing model.
7. The theoretical price of a futures contract is spot price of the underlying plus the ……...
8. Carry costs = Cost of funds + …….. – convenience yield.
9. A …… traces the changes in the value of a hypothetical portfolio of stocks.
10. ……= Spot Price + Interest Cost + Storage & Insurance Cost – Cash Yield – Convenience Yield.

5.3 Beta

Beta is a measure of the systematic risk of a security that cannot be avoided through diversification. Beta is a relative measure of risk-the risk of an individual stock relative to the market portfolio of all stocks. If the security's returns move more (less) than the market's returns as the latter changes, the security's returns have more (less) volatility (fluctuations in price) than those of the market. It is important to note that beta measures a security's volatility, or fluctuations in price, relative to a benchmark, the market portfolio of all stocks.

Securities with different slopes have different sensitivities to the returns of the market index. If the slope of this relationship for a particular security is a 45-degree angle, the beta is 1.0. This means that for every one per cent change in the market's return, on average this security's returns change 1%. The market portfolio has a beta of 1.0. A security with a beta of 1.5 indicates that, on average, security returns are 1.5 times as volatile as market returns, both up and down. This would be considered an aggressive security because when the overall market return rises or falls 10%, this security, on average, would rise or fall 15%. Stocks having a beta of less than 1.0 would be considered more conservative investments than the overall market.

Beta is useful for comparing the relative systematic risk of different stocks and, in practice, is used by investors to judge a stock's riskiness. Stocks can be ranked by their betas. Because the variance of the market is constant across all securities for a particular period, ranking stocks by beta is the same as ranking them by their absolute systematic risk. Stocks with high betas are said to be high-risk securities.

Risks in the Futures Markets

Notes

As we have already seen, one the most important applications of the futures is for hedging. Futures contracts were initially introduced to help farmers who did not want to bear the risk of price fluctuations. The farmer could short hedge in March (agree to sell his crop) for a September delivery. This effectively locks in the price that the farmer receives. On the other side, a cereal company may want to guarantee in March the price that it will pay for grain in September. The cereal company will enter into a long hedge.

There are a number of important insights that should be reviewed. The first is that we should be careful about what we consider the investment in a futures contract. It is unlikely that the margin is the investment for most traders. It is rare that somebody plays the futures with a total equity equal to the margin. It is more common to invest some of your capital in a money market fund and draw money out of that account as you need it for margin and add to that account as you gain on the futures contract. It is also uncommon to put the full value of the underlying contract in the money market fund. It is more likely that the futures investor will put a portion of the value of the futures contract into a money market fund. The ratio of the value of the underlying contract to the equity invested in the money market fund is known as the leverage. The leverage is a key determinant of both the return on investment and on the volatility of the investment. The higher the leverage, the more volatile are the returns on your portfolio of money market funds and futures.

The most extreme leverage is to include no money in the money market fund and only commit your margin. The concept of basis risk was introduced earlier. It is extremely unlikely that you can create a perfect hedge.

Did u know? **What is perfect hedge?**

A perfect hedge is when the loss on your cash position is exactly offset by the gain in the futures position.

Self Assessment

State the following are true or false:

11. Beta is a measure of the systematic risk of a security that cannot be avoided through diversification.
12. Beta is a relative measure of risk – the risk of an individual stock relative to the market portfolio of all stocks.
13. If the security's returns move more (less) than the market's returns as the latter changes, the security's returns have less (more) volatility (fluctuations in price) than those of the market.

5.4 Optimal Hedge Ratio

The Hedge Ratio (HR) is the number of futures contacts one should use to hedge a particular exposure in the spot market. In other words, the hedge ratio is the ratio of the size of the position taken in futures contracts to the size of the exposure.

Hedge Ratio (HR) = Quantity of Futures Position (QF)/Quantity of Cash Position(QS)

Notes

The number of futures contract, which minimizes risk, is given by

$$NFC = (Q_F/Q_S)*Q_{FC} \quad \text{... (5.9)}$$

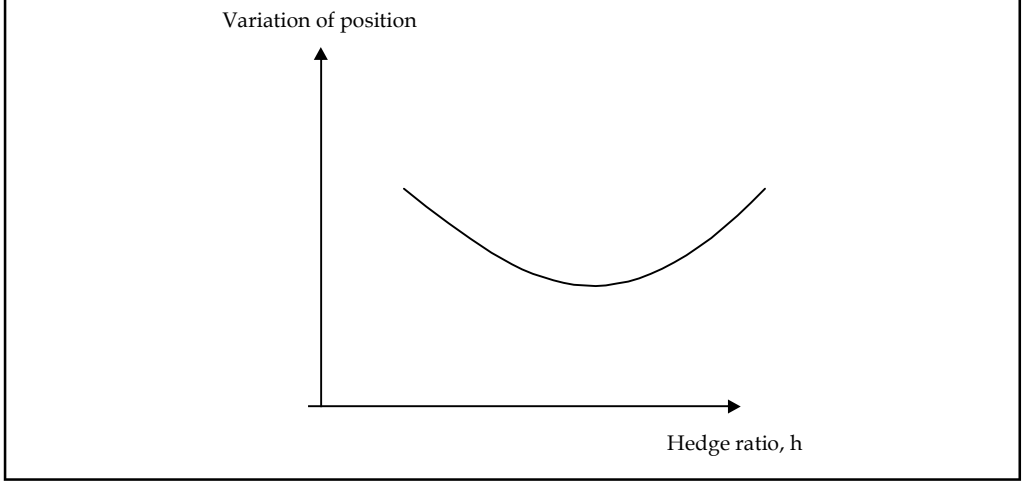
Where Q_{FC} is the quantity (or units) of the underlying asset represented by each futures contract.

Generally the hedge ratio is 1.0. In case of perfect hedging (absence of asset mismatch and maturity mismatch), the hedge ratio should be one because the futures profit or loss matches the spot profit or loss. In simple form, the Hedge Ratio (HR) is defined as the ratio of size of futures contract position to the size of cash position (size of exposure). Size refers to the product of number of contract with the quantity (units) of the asset (underlying) represented by the contact (futures/spot).

If the objective of the hedger is to minimize risk, a hedger ratio of 1.0 is not necessarily optimal. If hedgers wish to minimize the variance of their total positions, it may be optimal to use a hedge ratio different from 1.0 when there is no liquid futures contract that matures later than the expiration of the hedge. A strategy known as rolling the hedge forward is sometimes used.

The optimal hedge ratio is the product of the coefficient of correlation between the change in spot price during a period of time equal to life of the hedge and change in futures price during a period of time equal to life of the hedge and the ratio of the standard deviation of change in spot price during a period of time equal to life of the hedge to the standard deviation of change in futures price during a period of time equal to life of the hedge.

Figure 5.1: Dependence of Variance of Hedgers' Position on Hedge Ratio



If the coefficient of correlation between the change in spot price during a period of time equal to life of the hedge and change in futures price during a period of time equal to life of the hedge is equal to 1 and standard deviation of change in spot price during a period of time equal to life of the hedge and the standard deviation of change in futures price during a period of time equal to life of the hedge are equal, the optimal hedge ratio, h, is 1.0. This is to be expected because in this case the futures price mirrors the spot price perfectly. If the coefficient of correlation between the change in spot price during a period of time equal to life of the hedge and change in futures price during a period of time equal to life of the hedge is equal to 1 and the standard deviation of change in futures price during a period of time equal to life of the hedge is two times of the standard deviation of change in spot price during a period of time equal to life of the hedge, the optimal hedge ratio, h, is 0.5. This result is also as expected because in this case the futures price always changes by twice as much as the spot price.

Methods of Calculating Hedge Ratio

Notes

It is important to know that no one is certain about the relationship in future between the cash and future prices of the underlying asset being hedged. One can simply make a study of the past price behaviour and its relationship of these prices with an expectation that the same trend will continue in future. A proper study of the concept of hedge ratio and its calculation is essential for effective hedging purpose. Now, we discuss two methods for estimating hedge ratio.

1. ***The Naive Method:*** This method is based on two types of information, which are:

   (a) Current market condition and forecast of futures market scenario.

   (b) Relation between spot and futures prices, as evidenced from past data.

   Under this approach, we assume that the minimum variance hedge ratio is equal to 1, which is not always possible.

2. ***Regression Method:*** Another important method that may be used to determine the minimum variance hedge ratio is regression analysis. This method is specifically designed to provide the best linear relationship between two prices i.e., futures price and the price to be hedged. The following linear equation can be used to find out the relationship.

$$DS_t = a + bDF_t + e_t \quad \text{... (5.10)}$$

   where DS_t is the change in spot price, DF_t is change in future price, e_t is standard error form with zero mean, a and b are estimated co-efficients.

Example: Let us consider the hedging of a long cash position of 5,000 tones of rice by selling wheat futures. Assume that for ₹100 change in wheat futures price, the Re is ₹ 80. change in rice cash prices. In order to establish the minimum variance hedge ratio, we need to calculate the number of futures contract to sell.

Given, $Q_F = 80$, and $Q_S = 100$; $Q_{FC} = 1000$ (1 ton = 1000 kgs.)

So, Hedge Ratio HR = $Q_F/Q_S = 80/100 = 0.8$

The number of futures contract (NFC) that minimizes risk is given by

$$NFC = (Q_C / Q_{FC}) * HR \quad \text{… (5.11)}$$

$$= (5000 / 1000) * 0.8 = 4 \text{ contracts}$$

Tasks NSE Nifty is currently trading in spot market at 3200. The cost of financing is 12% per annum. Calculate the fair value of 3-month futures of Nifty, when the dividend yield is 3% per annum.

Self Assessment

State the following are true or false:

14. The hedge ratio (HR) is the number of futures contacts one should use to hedge a particular exposure in the spot market.

15. Generally the hedge ratio is 0.5.

Notes

5.5 Summary

- This unit begins with a short review of the basics of futures contracts for clear understanding of futures pricing.
- Futures contracts are like forward contracts, except that price movements are marked-to-market each day rather than receiving a single, once-and-for-all settlement on the contract's expiration day.
- The relationship between the futures market price and the cash price is called basis.
- The unit makes a clear distinction in pricing method used for whether the underlying asset is held for investment or for consumption.
- The basic principle of futures pricing involve the requirement of 'no arbitrage opportunities'.
- Cost-of-carry model is an arbitrage-free pricing model.
- Its central theme is that futures contract is so priced as to preclude arbitrage profit.
- This model stipulates that future prices are equal to sum of spot price and carrying costs involved in buying and holding the underlying asset, and less the carry return (if any).

5.6 Keywords

Beta: Beta is a measure of the systematic risk of a security that cannot be avoided through diversification.

Carry Cost (CC): Carry cost is the interest cost of holding the underlying asset (purchased in spot market) until the maturity of futures contract.

Carry Return (CR): Carry return is the income (e.g, dividend) derived from underlying asset during the holding period.

Hedge Ratio (HR): The Hedge Ratio (HR) is the number of futures contacts one should use to hedge a particular exposure in the spot market.

Leverage: The ratio of the value of the underlying contract to the equity invested in the money market fund is known as the leverage.

Perfect Hedge: A perfect hedge is when the loss on your cash position is exactly offset by the gain in the futures position.

5.7 Review Questions

1. Define the term 'Basis'. How is basis relevant in futures pricing?
2. 'Pricing of futures is based on no-arbitrage principle'. Explain this statement.
3. Explain the basic principles of cost of carry model for pricing of futures.
4. How is valuation of financial futures different from pricing of commodity futures?
5. Illustrate the valuation of stock index futures by citing an example.
6. What are the three case situations under which index futures valuation is made?
7. Discuss the importance of convenience yield in pricing commodity futures.

Notes

8. State the basic calculation for finding the lower and upper bounds of futures price, in the presence of transaction cost and commissions. Illustrate your answer with an example.
9. If the objective of the hedger is to minimize risk, a hedger ratio of 1.0 is not necessarily optimal. Discuss.
10. Discuss the role of beta in making investment decisions.

Answers: Self Assessment

1.	terminal value	2.	futures
3.	'no arbitrage opportunities'	4.	risk free rate
5.	basis	6.	arbitrage-free
7.	cost of carry	8.	storage cost
9.	stock index	10.	Futures Price
11.	False	12.	True
13.	False	14.	True
15.	False		

5.8 Further Readings

Books

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Das, Satyajit: *Swap & Derivative Financing*, Probus.

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FRB, "Overview of Derivative Disclosures by Major US Banks," Federal Reserve

Online links

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Unit 6: Introduction to Options

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Objectives

After studying this unit, you will be able to:

- Define options
- Describe the terminology and types of options
- State the meaning of index derivatives
- Illustrate European and American calls and puts
- Describe exotic and Asian options

Introduction

An option is a contract that gives the buyer the right, but not the obligation, to buy or sell an underlying asset at a specific price on or before a certain date. An option, just like a stock or bond, is a security. It is also a binding contract with strictly defined terms and properties. Say, for example, that you discover a house that you would love to purchase. Unfortunately, you do not have the cash to buy it for another three months. You talk to the owner and negotiate a deal that gives you an option to buy the house in three months for a price of ₹ 200,000. The owner agrees, but for this option, you pay a price of ₹ 3,000.

Now, consider two theoretical situations that might arise:

1. It has been discovered that the house is of historical importance and as a result, the market value of the house skyrockets to ₹ 10,00,000. Because the owner sold you the option, he is obligated to sell you the house for ₹ 200,000. In the end, you stand to make a profit of ₹ 7,97,000 (₹ 10,00,000 – ₹ 2,00,000 – ₹ 3,000).

Notes

2. While touring the house, you discover that the house is not in proper living conditions. Though you originally thought you had found the house of your dreams, you now consider it worthless. On the upside, because you bought an option, you are under no obligation to go through with the sale. Of course, you still lose the ₹ 3,000 price of the option, that is non-refundable.

This example demonstrates two very important points.

First, when you buy an option, you have a right but not an obligation to do something. You can always let the expiration date go by, at which point the option becomes worthless. If this happens, you lose 100% of your investment (option premium), which is the money you used to pay for the option.

Second, an option is merely a contract that deals with an underlying asset. For this reason, options are called derivatives, which mean an option derives its value from something else. In our example, the house is the underlying asset.

Notes **Options vs Futures**

In case of futures, both the buyer and the seller are under obligation to fulfill the contract. They have unlimited potential to gain if the price of the underlying moves in their favour. On the contrary, they are subject to unlimited risk of losing if the price of the underlying moves against their views. In case of options, however, the buyer of the option has the right and not the obligation. Thus he enjoys an asymmetric risk profile. He has unlimited potential to profit if the price of the underlying moves in his favour. But a limited potential to lose, to the extent of the premium paid, in case the price of the underlying moves against the view taken. Similarly, the seller of the option is under obligation. He has limited potential to profit, to the extent of the premium received, in case the price of the underlying moves in his favour, but an unlimited risk of losing in case the price of the underlying moves against the view taken.

Further with regards to behaviour of prices, trading in futures is one-dimensional as the price of futures depends upon the price of the underlying only. Trading in options is two-dimensional as the price of an option depends upon both the price and the volatility of the underlying.

6.1 Options Terminology

The following are the key terms used in options:

1. ***Buyer of an option:*** The option buyer is the person who acquires the rights conveyed by the option: the right to purchase the underlying futures contract if the option is a call or the right to sell the underlying futures contract if the option is a put. In other words, the buyer of an option is the one who by paying the option premium, buys the right but not the obligation to exercise his option on the seller/writer.
2. ***Writer of an option:*** The option seller (also known as the option writer or option grantor) is the party that conveys the option rights to the option buyer. In other words, the writer of a call/put option is the one who receives the option premium and is thereby obliged to sell/buy the asset if the buyer exercises on him.
3. ***Option Class:*** All calls and puts on a given underlying security or index represent an "option class." In other words, all calls and puts on XYZ stock are one class of options, while all calls and puts on ZYX index are another class.

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4. ***Option Series:*** All options of a given type (calls or puts) with the same strike price and expiration date are classified as an "option series."

   For example, all XYZ June 110 calls would be an individual series, while all XYZ June 110 puts would be another series.

5. ***Contract Size of Equity Options:*** The contract size of an option refers to the amount of the underlying asset covered by the options contract. For each unadjusted equity call or put option, 100 shares of stock (usually, but this may differ from stocks to stocks) will change hands when one contract is exercised by its owner. These 100 shares of underlying stock are also referred to as the contract's "unit of trade."

6. ***Contract Size of Index Options:*** The contract size of a cash-settled index option is determined by its multiplier. The multiplier determines the aggregate value of each point of the difference between the exercise price of the option and the exercise settlement value of the underlying interest.

   For example, a multiplier of 100 means that for each point by which a cash-settled option is in the money upon exercise, there is a $100 increase in the cash settlement amount.

7. ***Option price:*** Option price is the price which the option buyer pays to the option seller. It is also referred to as the option premium.

8. ***Expiration date:*** The date specified in the options contract is known as the expiration date, the exercise date, the strike date or the maturity.

9. ***Strike Price(K):*** Also known as the "exercise price," this is the stated price at which the buyer of a call has the right to purchase a specific futures contract or at which the buyer of a put has the right to sell a specific futures contract. The exchanges decide the strike price at which call and put options are traded. Generally, to simplify matters, the exchanges specify the strike price interval for different levels of underlying prices, meaning the difference between one strike price and the next strike price over and below it.

Example: The strike price interval for Bharat Heavy Electricals is ₹ 10. This means that there would be strike prices available with an interval of ₹ 10. Typically, the investor can see options on Bharat Heavy Electricals with strike prices of ₹ 150, ₹ 160, ₹ 170, ₹ 180, ₹ 190 etc.

Following Table 6.1 shows the strike price intervals specified by exchanges.

Table 6.1: Strike Price Intervals for Options

Price level of Underlying	Strike Price Interval (in Rs.)
Less than or equal to 50	2.5
Above 50 to 250	5.0
Above 250 to 500	10.0
Above 500 to 1000	20.0
Above 1000 to 2500	30.0
Above 2500	50.0

As the price of underlying moves up or down, the exchanges introduce more strike prices in keeping with the strike price interval rules. At any point in time, there are at least five strike prices (one near the stock price, two above the stock price and two below the stock price) available for trading in one-, two- and three-month contracts.

Notes

10. ***American options:*** American options are options that can be exercised at any time upto the expiration date. Most exchange-traded options are American.

11. ***European options:*** European options are options that can be exercised only on the expiration date itself. European options are easier to analyze than American options, and properties of an American option are frequently deduced from those of its European counterpart.

12. ***Index options:*** These options have the index as the underlying. Some options are European while others are American. Like index futures contracts, index options contracts are also cash settled.

13. ***Stock options:*** Stock options are options on individual stocks. Options currently trade on over 500 stocks in the United States. A contract gives the holder the right to buy or sell shares at the specified price.

14. ***Option Premium:*** The "price" an option buyer pays and an option writer receives is known as the premium. Premiums are arrived at through open competition between buyers and sellers according to the rules of the exchange where the options are traded. A basic knowledge of the factors that influence option premiums is important for anyone considering options trading. The premium cost can significantly affect whether the investor realize a profit or incur a loss.

Did u know? **What is Option Premium?**

The premium is the price at which an option trades, and is paid by the buyer to the writer (seller) of the contract.

The premium paid by the buyer is non-refundable payment for the rights inherent in he long contract. The writer (seller) of an option contract keeps the premium received, whether assigned or not, and is in turn obligated to fulfill the short contract's obligations if assignment is received. The two components of an option's total premium are intrinsic value and time value.

15. ***Moneyness:*** In finance, moneyness is a measure of the degree to which a derivative is likely to have positive monetary value at its expiration, in the risk-neutral measure.

Three are three positions in an options: In-the-money; At-the-money; and Out-of-the-money.

(a) *In-the-money option:* An in-the-money (ITM) option is an option that would lead to a positive cashflow to the holder if it were exercised immediately. A call option on the index is said to be in-the-money when the current index stands at a level higher than the strike price (i.e. spot price >strike price). If the index is much higher than the strike price, the call is said to be deep ITM. In the case of a put, the put is ITM if the index is below the strike price.

(b) *Out-of-the-money option:* An out-of-the-money (OTM) option is an option that would lead to a negative cashflow if it were exercised immediately. A call option on the index is out-of-the-money when the current index stands at a level which is less than the strike price (i.e. spot price < strike price). If the index is much lower than the strike price, the call is said to be deep OTM. In the case of a put, the put is OTM if the index is above the strike price.

An out-of-the-money option currently has no intrinsic value -e.g. a call option is out-the-money if the strike price ("the strike") is higher than the current underlying

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price. An in-the-money option conversely does have intrinsic value. The strike price of an in-the-money call option is lower than the current underlying price.

(c) *At-the-money option:* An at-the-money (ATM) option is an option that would lead to zero cashflow if it were exercised immediately. An option on the index is at-the-money when the current index equals the strike price (i.e. spot price = strike price). In other words, an option is at-the-money if the strike price, i.e., the price the option holder must pay to exercise the option, is the same as the current price of the underlying security on which the option is written.

Example: Suppose the current stock price of SBI is ₹ 1,000. A call or put option with a strike of ₹ 1,000 is at-the-money. A call option with a strike of ₹ 800 is in-the-money (1000 – 800 = 200 > 0). A put option with a strike at ₹ 800 is out-of-the-money (800 – 1000 = –200 < 0). Conversely, a call option with a ₹ 1200 strike is out-of-the-money and a put option with a ₹ 1,200 strike is in-the-money.

16. ***Intrinsic value of an option:*** The option premium can be broken down into two components – intrinsic value and time value. The intrinsic value of a call is the amount the option is ITM, if it is ITM. If the call is OTM, its intrinsic value is zero. Putting it another way, the intrinsic value of a call is Max [0, $(S_t - K)$] which means the intrinsic value of a call is the greater of 0 or $(S_t - K)$. Similarly, the intrinsic value of a put is, Max [0, $(K - S_t)$] i.e. the greater value of 0 or $(K - S_t)$. S_t is the spot price at time t; K is the strike price.

17. ***Time value of an option:*** The time value of an option is the difference between its option premium and its intrinsic value. Both calls and puts have time value. An option that is OTM or ATM has only time 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 should have no time value.

Self Assessment

Fill in the blanks:

1. ……is also referred to as the option premium.
2. …… options are options that can be exercised at any time upto the expiration date.
3. ……..options are options that can be exercised only on the expiration date itself.
4. The option premium can be broken down into two components - intrinsic value and …… .
5. A call option on the index is out-of-the-money when the current index stands at a level which is less than the ……..

6.2 Types of Options

There are two basic types of options-call options and put options.

1. ***Call option:*** A call option gives the holder the right but not the obligation to buy an asset by a certain date for a certain price.
2. ***Put option:*** A put option gives the holder the right but not the obligation to sell an asset by a certain date for a certain price.

The price of options is decided between the buyers and sellers on the trading screens of the exchanges in a transparent manner. The investor can see the best five orders by price and

Notes

quantity. The investor can place a market limit order, stop loss order, etc. The investor can modify or delete his pending orders. The whole process is similar to that of trading in shares.

In simple words, a call option gives the holder the right to buy an asset at a certain price within or at the end of a specific period of time. Calls are similar to having a long position on a stock. Buyers of calls hope that the stock will increase substantially before the option expires.

Similarly, a put option gives the holder the right to sell an asset at a certain price within or at the end of a specific period of time. Puts are similar to having a short position on a stock. Buyers of put options hope that the stock will decrease substantially before the option expires.

An investor with a long equity call or put position may exercise that contract at any time before the contract expires, up to and including the Friday (in the Indian stock market) before its expiration. To do so, the investor must notify his brokerage firm of intent to exercise in a manner, and by the deadline specified by that particular firm.

Any investor with an open short position in a call or put option may nullify the obligations inherent in that short (or written) contract by making an offsetting closing purchase transaction of a similar option (same series) in the marketplace. This transaction must be made before the assignment is received, regardless of whether you have been notified by your brokerage firm to this effect or not.

Notes **Other Types of Options**

Various other types of options are listed below:

1. ***Real options:*** A real option is a choice that an investor has when investing in the real economy (i.e. in the production of goods or services, rather than in financial contracts). This option may be something as simple as the opportunity to expand production, or to change production inputs. Real options are an increasingly influential tool in corporate finance. The liquidity of this kind of exchange-traded options is relatively lower.
2. ***Traded options - (Exchange-Traded Options):*** Traded Options are, Exchange-traded derivatives, as the name implies. As for other classes of exchange traded derivatives, they have: standardized contracts; quick systematic pricing and are settled through a clearing house (ensuring fulfillment).
3. ***Vanilla and exotic options:*** Generally speaking, a vanilla option is a 'simple' or well understood option, whereas an exotic option is more complex, or less easily understood (hybrid options). European options and American options on stock and bonds are usually considered to be "plain vanilla". Asian options, lookback options, barrier options are often considered to be exotic, especially if the underlying instrument is more complex than simple equity or debt.

Self Assessment

State the following are true or false:

6. A put option gives the holder the right but not the obligation to buy an asset by a certain date for a certain price.
7. A call option gives the holder the right but not the obligation to sell an asset by a certain date for a certain price.

Notes

8. European options and American options on stock and bonds are usually considered to be "plain vanilla".
9. Asian options, lookback options, barrier options are often considered to be exotic, especially if the underlying instrument is more complex than simple equity or debt.
10. The price of options is decided between the buyers and sellers on the trading screens of the exchanges in a transparent manner.

6.3 Index Derivatives

Index derivatives are derivative contracts which derive their value from an underlying index. The two most popular index derivatives are index futures and index options. Index derivatives have become very popular worldwide. Index derivatives offer various advantages and hence have become very popular.

Institutional and large equity-holders need portfolio-hedging facility. Index-derivatives are more suited to them and more cost-effective than derivatives based on individual stocks. Pension funds in the US are known to use stock index futures for risk hedging purposes.

Index derivatives offer ease of use for hedging any portfolio irrespective of its composition. Stock index is difficult to manipulate as compared to individual stock prices, more so in India, and the possibility of cornering is reduced. This is partly because an individual stock has a limited supply, which can be concerned. Stock index, being an average, is much less volatile than individual stock prices. This implies much lower capital adequacy and margin requirements.

Caution Index derivatives are cash settled, and hence do not suffer from settlement delays and problems related to bad delivery, forged/fake certificates.

Self Assessment

Fill in the blanks:

11. ……are derivative contracts which derive their value from an underlying index.
12. Index derivatives are ……settled.

6.4 European and American Calls and Puts

There are two kinds of options based on the date. The first is the European Option, which can be exercised only on the maturity date. The second is the American Option, which can be exercised before or on the maturity date.

In most exchanges the options trading starts with European Options, as they are easy to execute and keep track of. This is the case in the BSE and the NSE. Cash settled options are those where, the buyer is paid the difference between stock price and exercise price (call) or between exercise price and stock price (put). Delivery settled options are those where the buyer takes delivery of undertaking (calls) or offers delivery of the undertaking (puts).

The distinction between American and European options has nothing to do with geographic location. European options can be exercised only at expiration time. American options can be

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exercised at any moment prior to maturity (expiration). A third form of exercise, which is occasionally used with OTC (over the counter) options, is Bermudan exercise. A Bermuda option can be exercised on a few specific dates prior to expiration. The name 'Bermuda' was chosen perhaps because Bermuda is half way between America and Europe.

Example: On March 1, the price of Wheat $ 1800 per tonne. A apprehends a rise in price and buys an American option on June Wheat (maturity date June 15) at a strike price of $1800. The prices subsequently are as follows:

May 15:$ 2100

June 15: $ 1700

As the option is an American option, A exercise it on May 15, and sells the Wheat at a profit of $300 per tonne.

Example: All the other facts are as above, but the option is a European option. In this case A cannot exercise the option on May 15 because he only has the right to do so on the maturity date. He therefore does not have the profit opportunity that he had in the previous example.

It will be clear that an American option has a greater profit potential than a European option for the buyer. Thus leads to premia being higher for American options.

There are hundreds of different types of options which differ in their payoff structures, path-dependence, and payoff trigger and termination conditions. Pricing some of these options represent a complex mathematical problem. Let us briefly discuss the various other types of options.

6.4.1 Call Options

The following example would clarify the basics on Call Options.

A call option give the buyer the right but not the obligation to buy a given quantity of the underlying asset, at a given price known as 'exercise price' or 'strike price' on or before a given future date called the 'maturity date' or 'expiry date'. A call option gives the buyer the right to buy a fixed number of shares/commodities in a particular security at the exercise price up to the date of expiration of the contract. The seller of an option is known as 'writer.' Unlike the buyer, the writer has no choice regarding the fulfilment of the obligations under the contract. If the buyer wants to exercise his right, the writer must comply. For this asymmetry of privilege, the buyer must pay the writer the option price, which is known as 'premium.'

Example: An investor buys one European Call option on one share of Reliance Petroleum at a premium of ₹ 2 per share on July 31. The strike price is ₹ 60 and the contract matures on September 30. The pay-off table shows the pay-offs for the investor on the basis of fluctuating spot prices at any time. It may be clear from the following graph that even in the worst-case scenario, the investor would only lose a maximum of ₹ 2 per share, which he/she had paid for the premium. The upside to it has an unlimited profit opportunity.

On the other hand, the seller of the call option has a pay-off chart completely reverse of the call options buyer. The maximum loss that he can have is unlimited, though the buyer would make a profit of ₹ 2 per share on the premium payment.

Notes

Table 6.2

Pay-off from Call Buying/Long (₹)				
S	X_t	c	Payoff	Net Profit
57	60	2	0	-2
58	60	2	0	-2
59	60	2	0	-2
60	60	2	0	-2
61	60	2	1	-1
62	60	2	2	0
63	60	2	3	1
64	60	2	4	2
65	60	2	5	3
66	60	2	6	4

A European call option gives the following payoff to the investor: max ($S - X_t$, 0).

The seller gets a payoff of: -max ($S - X_t$, 0) or min ($X_t - S$, 0).

Notes

S - Stock Price

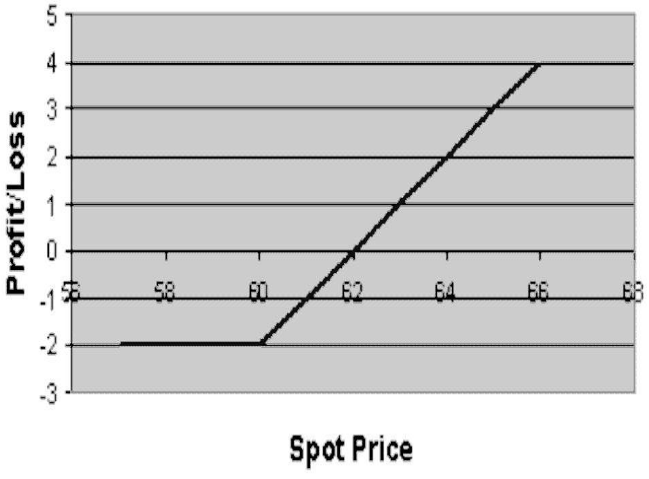
X_t - Exercise Price at time 't'

C - European Call Option Premium

Pay-off - Max ($S - X_t$, O)

Net Profit - Payoff minus 'c'

Figure 6.1: Payoff from Call Buying/Long



Notes

Notes **Option Position and Strategies**

The Call option gives the buyer a right to buy the requisite shares on a specific date at a specific price. This puts the seller under the obligation to sell the shares on that specific date and specific price. The Call buyer exercises his option only when he/she feels it is profitable. This process is called "exercising the option." This leads us to the fact that if the spot price is lower than the strike price then it might be profitable for the investor to buy the share in the open market and forgo the premium paid.

The implications for a buyer are that it is his/her decision whether to exercise the option or not. In case the investor expects prices to rise far above the strike price in the future then he/she would surely be interested in buying call options. On the other hand, if the seller feels that his shares are not giving the desired returns and they are not going to perform any better in the future, a premium can be charged and returns from selling the call option can be used to make up for the desired returns. At the end of the options contract there is an exchange of the underlying asset. In the real world, most of the deals are closed with another counter or reverse deal. There is no requirement to exchange the underlying assets then as the investor gets out of the contract just before its expiry.

6.4.2 Put Options

The European Put Option is the reverse of the call option deal. Here, there is a contract to sell a particular number of underlying assets on a particular date at a specific price. An example would help understand the situation a little better:

Example: An investor buys one European Put Option on one share of Reliance Petroleum at a premium of ₹ 2 per share on July 31. The strike price is ₹ 60 and the contract matures on September 30. The pay-off table shows the fluctuations of net profit with a change in the spot price.

Table 6.3

Pay-off from Put Buying/Long (₹)				
S	X_t	p	Payoff	Net Profit
55	60	2	5	3
56	60	2	4	2
57	60	2	3	1
58	60	2	2	0
59	60	2	1	-1
60	60	2	0	-2
61	60	2	0	-2
62	60	2	0	-2
63	60	2	0	-2
64	60	2	0	-2

The pay-off for the put buyer is: max (X_t – S, 0)

The pay-off for a put writer is: -max (X_t – S, 0) or min (S – X_t, 0)

Notes

These are the two basic options that form the whole gamut of transactions in the options trading. These in combination with other derivatives create a whole world of instruments to choose from depending on the kind of requirement and the kind of market expectations.

Self Assessment

Fill in the blanks:

13. ……..options can be exercised only at expiration time.

14. …….settled options are those where the buyer takes delivery of undertaking (calls) or offers delivery of the undertaking (puts).

6.5 Exotic and Asian Option

Exotic Options are often mistaken to be another kind of option. They are nothing but non-standard derivatives and are not a third type of option. The Exotic Options component is designed to deal with a range of "exotic" option contracts. The following are important types of exotic options:

1. ***Asian Options:*** An Asian option has its payoff linked to the average price of an asset over a period of time. As a result, Asian options have a lower volatility than standard options and therefore cost less.

2. ***Barrier Options:*** Barrier options are path-dependent options that are either initiated (knocked-in) or eliminated (knocked-out) upon reaching a certain barrier level.

3. ***Binary Options:*** Binary options, sometimes referred to as digital or bet options, are options that pay out either a fixed amount (if they expire in the money), or nothing (if they expire out of the money).

4. ***Chooser Options:*** Chooser Options are options that allow the holder to choose whether the option is a call or a put at some future date.

5. ***Exchange Options:*** Exchange options allow the holder to exchange one asset for another.

6. ***Extendible Options:*** Extendible options are options that can be extended by either the holder or writer of the option.

7. ***Foreign Equity Options:*** Foreign Equity options are options in which the underlying asset is a foreign equity. Quanto options are also supported.

8. ***Lookback Options:*** Lookback options are a type of path-dependent option. A Lookback Call (Put) allows the holder to buy (sell) the underlying asset at the lowest (highest) price reached during the term of the option.

9. ***MinMax Options:*** MinMax options are options on the maximum or minimum of an asset

10. ***Ratchet Options:*** A cliquet option or ratchet option is an option consisting of a set of serialized forward start options.

11. ***Spread Options:*** Spread options have a payoff determined by the difference between the prices of two assets and a fixed strike price.

Task Consider a put option on 200 ounces of gold struck at USD 400. What will be the put's USD expiration value, if the market price of gold is USD 380 when the option expires?

Self Assessment

Notes

Fill in the blanks:

15. An ……..option has its payoff linked to the average price of an asset over a period of time.

16. ……. options are a type of path-dependent option.

6.6 Summary

- An option is a contract that gives the buyer the right, but not the obligation, to buy or sell an underlying asset at a specific price on or before a certain date.
- An option, just like a stock or bond, is a security. There are two basic types of options – call options and put options.
- There are three main categories of options: European, American and Bermudan.
- There are four types of participants in options markets namely, Buyers of calls, Sellers of calls, Buyers of puts and Sellers of puts.
- The Options Clearing Corporation is the sole issuer of all options listed at the Chicago Board of Options Exchange (CBOE) and other U.S. options exchanges.
- In India, NSE has an associated clearing house attached to it for futures and options trading. Some of the important terms used in option trading are: Option Class, Option price, Strike Price, Expiration date and others.
- There are three positions in an options – In-the-money; At-the-money; and Out-of-the-money.
- The option premium can be broken down into two components – intrinsic value and time value.

6.7 Keywords

American Options: American options are options that can be exercised at any time upto the expiration date. Most exchange-traded options are American.

At-the-money Option: An at-the-money (ATM) option is an option that would lead to zero cashflow if it were exercised immediately.

Call Option: A call option gives the holder the right but not the obligation to buy an asset by a certain date for a certain price.

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

Expiration Date: The date specified in the options contract is known as the expiration date, the exercise date, the strike date or the maturity.

Index Derivatives: Index derivatives are derivative contracts which derive their value from an underlying index.

Option Premium: The "price" an option buyer pays and an option writer receives is known as the premium.

Option: An option is a contract that gives the buyer the right, but not the obligation, to buy or sell an underlying asset at a specific price on or before a certain date.

Notes

Put Option: A put option gives the holder the right but not the obligation to sell an asset by a certain date for a certain price.

6.8 Review Questions

1. What do you mean by options and option market? Discuss with suitable examples.
2. Discuss in detail the historical background and uses of option market.
3. Discuss the difference between futures and option contract with suitable examples.
4. Write a detailed note on the important terms and trading mechanism of option market.
5. Distinguish between American Options and European Options.
6. List and explain the role of market players in option trading.
7. "Options contracts are relatively more safe derivative instruments". Explain this statement.
8. Illustrate 'in-the-money' and 'out-of-the-money' positions in both call option and put option.
9. Write short notes on:
   (a) Option Premium
   (b) Vanilla Options
   (c) Real Options
10. What do you understand by option value? Discuss the concept of time value and intrinsic value.

Answers: Self Assessment

1.	Option price	2.	American
3.	European	4.	Time value
5.	Strike price	6.	False
7.	False	8.	True
9.	True	10.	True
11.	Index derivatives	12.	Cash
13.	European	14.	Delivery
15.	Asian	16.	Lookback

6.9 Further Readings

Books

Apte, P.G., *International Financial Management*, Tata McGraw-Hill Publishing

Avadhani,V.A. : *Securities Analysis and Portfolio Management.*

Avadhani,V.A. : *Capital Market Management.*

Avadhani,V.A. : *Investments and Securities Markets in India.*

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Bhole,L.M. : *Financial Institutions and Markets*.

Chance, Don M: *An Introduction to Derivatives*, Dryden Press, International Edition

Chew, Lilian: *Managing Derivative Risk*, John Wiley, New Jersey.

Company Limited, New Delhi, 1997.

Das, *Satyajit: Swap & Derivative Financing*, Probus.

"Derivatives Market" NCFM Module, NSE India Publications

FRB, "Overview of Derivative Disclosures by Major US Banks," Federal Reserve

Online links

www.managementstudyguide.com

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www.ncfm-india.com

http://www.nseindia.com/content/ncfm/ncfm_modules.htm

Notes

Unit 7: Option Strategies and Pay-offs

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Objectives

After studying this unit, you will be able to:

- Describe option strategies
- Analyse pay-offs

Introduction

An option strategy combines one or more option positions and zero or more underlying positions. The option positions used are almost always long and/or short positions in calls and/or puts at various strikes. Choosing the right option strategy is one of the most difficult decisions for an investor. The best strategy is the one that directly matches the investor's set of risk and reward expectation with the possible movements of the underlying asset.

Options can be used for a wide range of strategies, and each of these strategies has a different risk/reward profile. Combining any of the above four basic kinds of option trades (possibly with different exercise prices) and the two basic kinds of stock trades (long and short) allows a variety of options strategies. Simple strategies usually combine only a few trades, while more complicated strategies can combine several.

Generally, an Option Based Hedging Strategy involves the simultaneous purchase and/or sale of different option contracts, also known as an Option Combination. Generally because there are such a wide variety of option strategies that use multiple legs as their structure, however, even a one-legged Long Call Option can be viewed as an option strategy. We divide these strategies into three ways:

Notes

1. Bullish Strategies
2. Bearish Strategies and
3. Neutral Strategies.

7.1 Bullish Strategies

Seven kinds of bullish option strategies are discussed below. They are:

1. Long Call
2. Short Put
3. Covered Call
4. Protective Put
5. Call Bull Spread
6. Put Bull Spread
7. Straps

1. ***Long Call (Buy Call):*** A long call is simply the purchase of one call option. A long call option is the simplest way to benefit if we believe that the market will make an upward move and is the most common choice among first time investors. Being long a call option means that we will benefit if the stock/future rallies, however, our risk is limited on the downside if the market makes a correction.

   From the graph (Figure 7.1) we can see that if the stock/future is below the strike price at expiration, our only loss will be the premium paid for the option. Even if the stock goes into liquidation, we will never lose more than the option premium that we paid initially at the trade date. Not only will our losses be limited on the downside, we will still benefit infinitely if the market stages a strong rally.

Caution A long call has unlimited profit potential on the upside.

When you are very bullish, buy a call option. When you are very bullish on the market as a whole, buy a call option on indices (Nifty/Sensex). When you are very bullish on a particular stock, buy a call option on that stock. The more bullish you are, the more out of the money (higher strike price) should be the option you buy. No other position gives you as much leveraged advantage in a rising market with limited downside.

Maximum Loss: Limited to the premium paid up front for the option.

Maximum Gain: Unlimited as the market rallies.

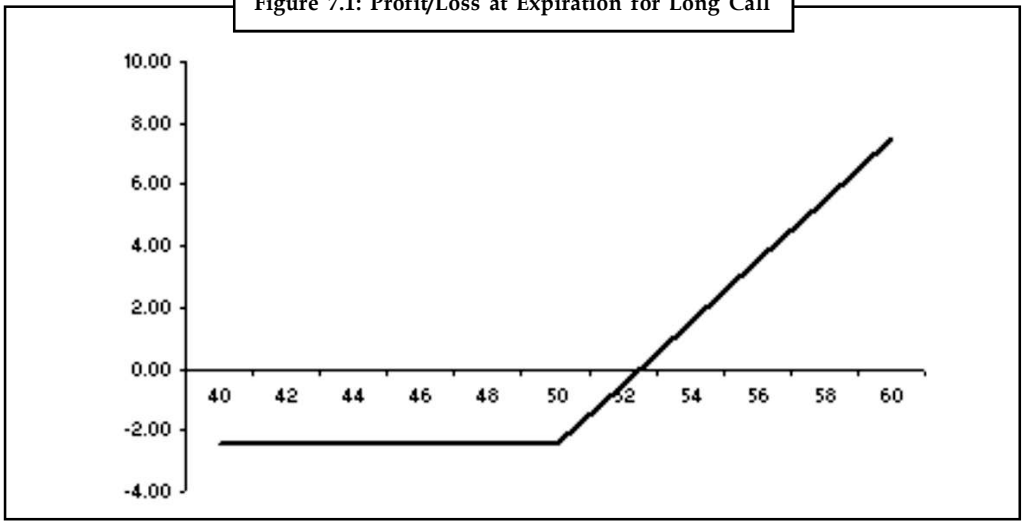
When to use: When we are bullish on market direction and also bullish on market volatility.

Upside potential: The price of the option increases as the price of the underlying rises. You can book profit by selling the same option at higher price whenever you think that the underlying price has come to the level you expected. At expiration the break-even underlying price is the strike price plus premium paid for buying the option.

Downside risk: your loss is limited to the premium you have paid. The maximum you can lose is the premium, if the underlying price is below the strike price at expiry of the option.

Notes

Figure 7.1: Profit/Loss at Expiration for Long Call



In summary, Long Call is used when the investor expects market to be very bullish and the underlying stock/index/asset to be very volatile. It is advised to buy the lowest strike price call option (in-the-money) and choose sufficient holding period. But in case, the expected bullishness does not take place, the investor must exit the position immediately or create another position to offset the loss.

2. ***Short Put:*** A short put is simply the sale of a put option. Like the Short Call Option, selling naked puts can be a very risky strategy as our losses are unlimited in a falling market. The written put can provide the investor with extra income (premium received on put option) in stable to rising markets. Most investors use this strategy as a method of buying stocks at cheaper rate. Short put is used when the investor expects the share price/index to remain steady or be slightly bullish over the life of the option.

   When you firmly believe that the underlying is not going to fall, sell a put option. When you firmly believe that index (Nifty/Sensex) is not going to fall, sell a put option on the index. When you firmly believe that a particular stock is not going to fall, sell put option on that stock. Sell out-of-the-money (lower strike price) options if you are only somewhat convinced; sell at-the-money options if you are very confident that the underlying would remain at the current level or rise.

   Maximum Loss: Unlimited in a falling market.

   Maximum Gain: Limited to the premium received for selling the put option.

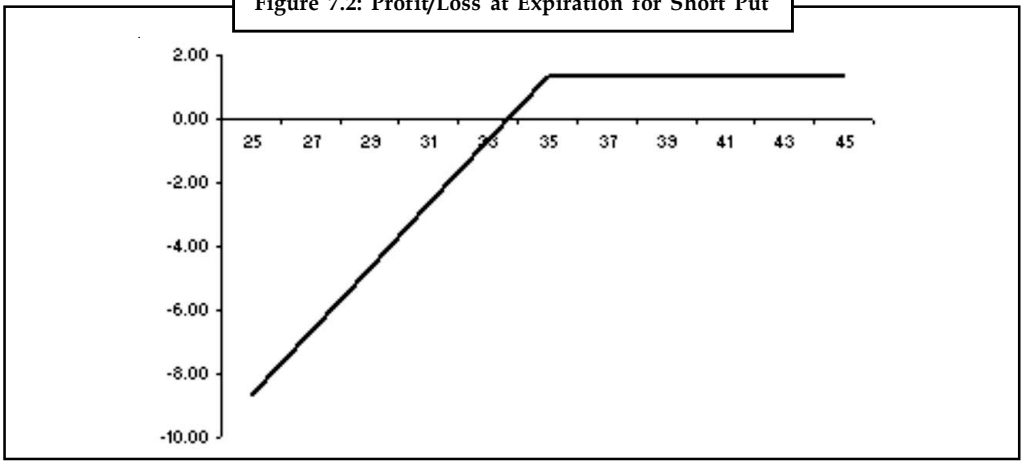
   When to use: When we are bullish on market direction and bearish on market volatility.

   Upside potential: Your profit is limited to the premium received. At expiration, the break-even is strike price minus premium. Maximum profit is realized if the underlying price is above the strike price.

   Downside risk: The price of the option increases as the underlying falls. You can cut your losses by buying the same option if you think that your view is going to be wrong. Losses keep on increasing as the underlying falls and are virtually unlimited. Such a position must be monitored closely. The investor must write puts only if he has the financial capacity to buy the underlying shares should they be exercised by the put buyer.

Notes

Figure 7.2: Profit/Loss at Expiration for Short Put



3. ***Covered Call:*** This is the result of long underlying asset and short call options. This strategy is used by many investors who hold stock. It is also used by many large funds as a method of generating consistent income from the sold options.

   The idea behind a Covered Call (also called Covered Write) is to hold stock over a long period of time and every month or so sell out-of-the-money call options. Even though the payoff diagram (Figure 7.3) shows an unlimited loss potential, we must remember that many investors implementing this type of strategy have bought the stock long ago and hence the call option's strike price may be a long way from the purchase price of the stock.

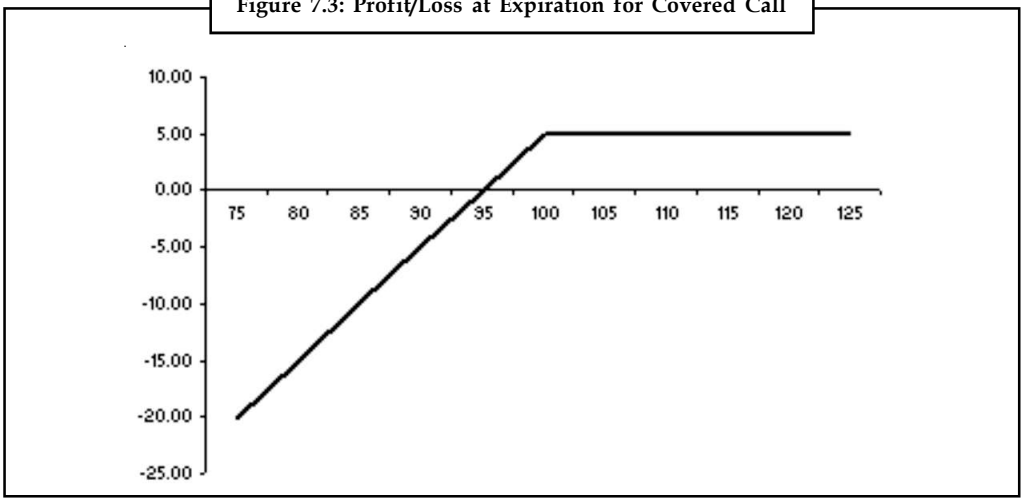
Example: Say we bought SBI last year at ₹ 925 and today it is trading at ₹ 940. We might decide write a ₹ 945 call option. Even if the market sells off temporarily it will have a long way to go before we start seeing losses on the underlying. Meanwhile, the call option expires worthless and we pocket the premium received from the spread.

Maximum Loss: Unlimited on the downside.

Maximum Gain: Limited to the premium received from the sold call option.

When to use: When we own the underlying stock (or futures contract) and wish to lock in profits.

Figure 7.3: Profit/Loss at Expiration for Covered Call



Notes

4. ***Protective Put:*** This is the result of long the underlying asset and long put options. A Protective Put strategy has a very similar pay off profile to the Long Call. The maximum loss is limited to the premium paid for the option and we have an unlimited profit potential.

Protective Puts are ideal for investors who are very risk averse, i.e. they hold stock and are concerned about a stock market correction. So, if the market does sell off rapidly, the value of the put options that the trader holds will increase while the value of the stock will decrease. If the combined position is hedged then the profits of the put options will offset the losses of the stock and all the investor will loose the premium paid.

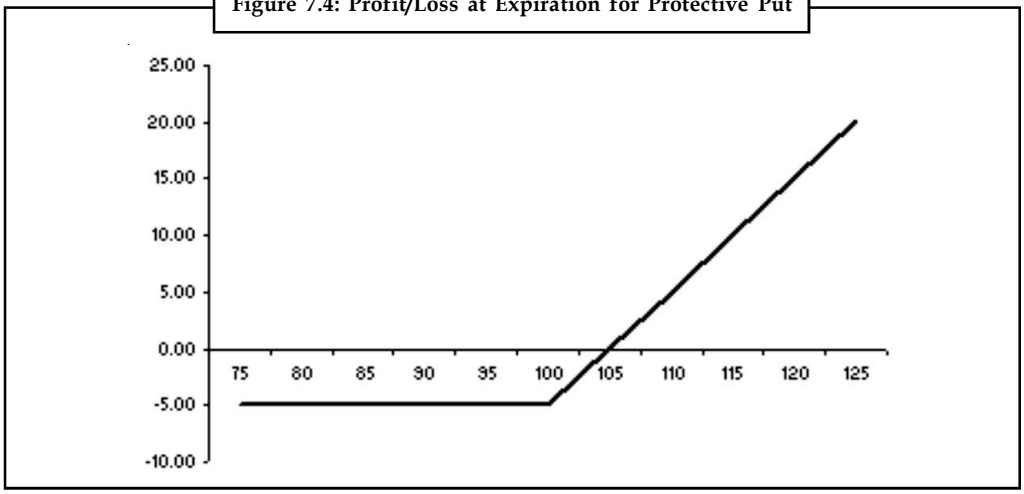
However, if the market rises substantially past the exercise price of the put options, then the puts will expire worthless while the stock position increases. But, the loss of the put position is limited, while the profits gained from the increase in the stock position are unlimited (see Figure 7.4). So, in this case the losses of the put option and the gains form the stock do not offset each other: the profits gained from the increase in the underlying outweigh the loss sustained from the put option premium.

Maximum Loss: Limited to the premium paid for the put option.

Maximum Gain: Unlimited as the market rallies.

When to use: When the investor is long stock and wants to protect against a market correction.

Figure 7.4: Profit/Loss at Expiration for Protective Put



Options Spreads Strategy: Option spread means taking a position in two or more options of the same type (either calls or puts) on the same underlying asset (share/index). In other words, an option spread trading strategy involves taking a position in two or more options of the same type, that is, two or more calls or two or more puts, having the same expiration date, but different exercise prices.

Option spreads may be classified under three categories: vertical spreads, horizontal spreads, and diagonal spreads. These are discussed below:

(a) *Vertical Spread:* This is an option spread made by combination of options (either call option or put option) having different strike prices but the same expiration date.

Example: An investor may buy a March Put option on TISCO with strike price of ₹ 650 and simultaneously sell a March Put option on TISCO with strike price at ₹ 645.

Notes

(b) *Horizontal Spread:* Unlike vertical spread, this strategy involves taking option position in similar options (either call/put) having different expiration dates but the same strike prices.

Example: A horizontal option spread is made when an investor simultaneously buys a June Put option on SBI with a strike price of ₹ 990 and sells July Put option on same SBI scrip with the same strike price of ₹ 990.

(c) *Diagonal Spread:* A diagonal option spread is made when the investor takes position in options (of the same type) with different strike prices and differing expiration dates. For example, suppose the investor sells a September call option on WIPRO scrip at a strike price of ₹ 700 and buys a October call option on the same WIPRO at a strike price ₹ 720.

Caution For a bullish expected market, the investor has a choice of bull spreads which are of two kinds: Call Bull Spread and Put Bull Spread. Both of these strategies are discussed below.

For a bearish expected market, the investor has a choice of bear spreads which are of two kinds: Call Bear Spread and Put Bear Spread. These strategies are explained later under the bearish strategies.

Bull Spreads: A spread that is designed to profit if the price goes up is called a bull spread. These are times when the investor thinks that the market is going to rise over the next two months; however in the event that the market does not rise, he would like to limit his downside. One way you could do this is by entering into a spread. The buyer of a bull spread buys a call with an exercise price below the current index level and sells a call option with an exercise price above the current index level. The spread is a bull spread because the trader hopes to profit from a rise in the index. The trade is a spread because it involves buying one option and selling a related option.

Broadly, we can have three types of bull spreads:

Type-I: Both calls initially out-of-the-money,

Type-II: One call initially in-the-money and one call initially out-of-the-money, and

Type-III: Both calls initially in-the-money.

The decision about which of the three spreads to undertake depends upon how much risk the investor is willing to take. The most aggressive bull spreads are of type 1. They cost very little to set up, but have a very small probability of giving a high payoff. Compared to buying the underlying asset itself, the bull spread with call options limits the trader's risk, but the bull spread also limits the profit potential. In short, it limits both the upside potential as well as the downside risk. The cost of the bull spread is the cost of the option that is purchased, less the cost of the option that is sold.

Example: Possible expiration day profit for a bull spread created by buying one market lot of calls at a strike of 1,260 (S1) and selling a market lot of calls at a strike of 1,350 (S2). The cost of setting up the spread is the call premium paid (PP) (₹ 70) minus the call premium received (PR) (₹ 30), which is ₹ 40. This is the maximum loss that the position will make. On the other hand, the maximum profit on the spread is limited to ₹ 50. Beyond an index level of 1,350, any profits made on the long call position will be cancelled by losses made on the short call position, effectively limiting the profit on the combination.

Notes

Maximum Loss = PP-PR (-ve sign)

Maximum Profit = S2-S1- Max. Loss

5. ***Call Bull Spread:*** This is the result of long one call option with a low strike price and short one call option with a higher strike price. A call spread (also called a bull spread) comprises a long call at one strike price and a short call at a higher strike price. Both options are for the same expiration. A call spread is an inexpensive alternative to simply buying a call. It has limited upside potential, but income from selling the high-strike call offsets the cost of purchasing the low-strike call.

   Mechanism of Bull Call Spread: In this type of spread, the user of a commodity would buy a call option at a particular strike price and sell a call option at a higher strike. Typically, both options are traded in the same contract month. The maximum loss is limited to the difference between the cost of the call option bought and the call option sold plus commissions (i.e., the net cost of the two options). The maximum gain is limited to the difference between the strike price of the call option bought and the strike price of the call option sold less commissions.

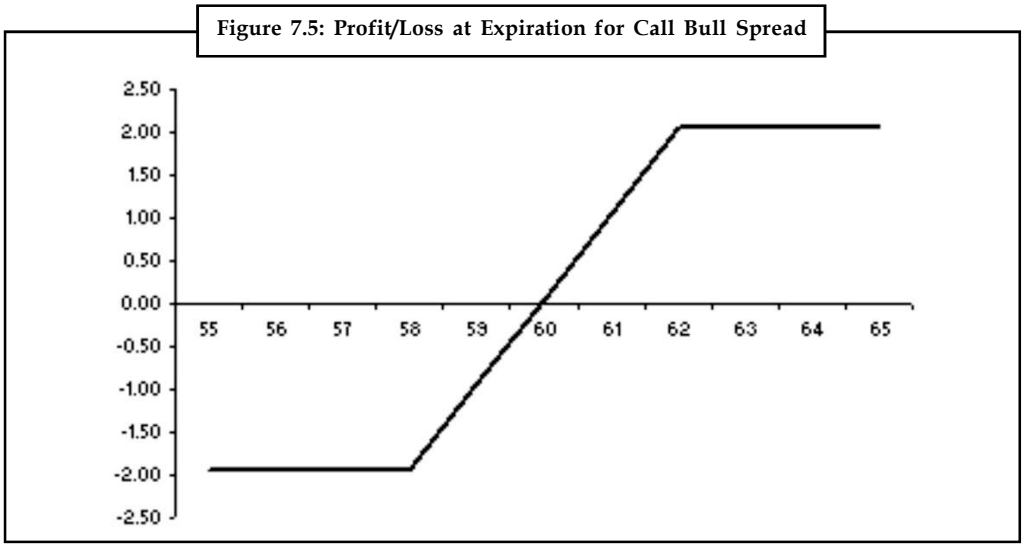
   Maximum Loss: Limited to premium paid for the long option minus the premium received for the short option.

   Maximum Gain: Limited to the difference between the two strike prices minus the net premium paid for the spread.

   When to use: When we are mildly bullish on market price and/or volatility.

   Profit/Loss at Expiration for Call Bull Spread: A bull call spread should be used when the marketer is bullish on a market up to a point. This strategy can be used when a producer wants to hedge an input cost such as corn, or to regain ownership of a commodity once the commodity has been sold on the cash market or forward contracted. We can see from the Figure 7.5 that a call bull spread can only be worth as much as the difference between the two strike prices. So when putting on a bull spread remember that the wider the strikes the more we can make. But the downside to this is that we will end up paying more for the spread. So, the deeper in the money calls we buy relative to the call options that we sell means a greater maximum loss if the market sells off.

Figure 7.5: Profit/Loss at Expiration for Call Bull Spread



Notes

As we have mentioned, a call bull spread is a very cost effective way to take a position when we are bullish on market direction. The cost of the bought call option will be partially offset by the premium received by the sold call option. This does, however, limit our potential gain if the market does rally but also reduces the cost of entering into this position. This type of strategy is suited to investors who want to go long on market direction and also have an upside target in mind. The sold call acts as a profit target for the position. So, if the trader sees a short term move in an underlying but doesn't see the market going past ₹ X, then a bull spread is ideal. With a bull spread he can easily go long without the added expenditure of an outright long stock and can even reduce the cost by selling the additional call option.

Example: Let us consider SBI scrip trading at ₹ 940. An investor can purchase SBI 1-month 940 call at ₹ 18 and sell SBI 1-month 980 at ₹ 9. The cost of this strategy is ₹ 18 – ₹ 9 = ₹ 9. Let us show the net profit-loss for the following stock prices: ₹ 910, 920, 930, 940, 950, 960, 980, 990 and 1,020.

Stock Price	Profit/Loss on Call purchased	Profit/Loss on Call sold	Net Profit/Loss
910	-18 (NE)	+9 (NE)	-9
920	-18 (NE)	+9 (NE)	-9
930	-18 (NE)	+9 (NE)	-9
940	-18 (NE)	+9 (NE)	-9
950	-8	+9 (NE)	+1
960	2	+9 (NE)	+11
980	22	+9 (NE)	+31
990	32	-1	+31
1020	62	-31	+31

NE: not exercised
Thus the maximum profit is ₹ 31 and maximum loss is ₹ 9.

6. ***Put Bull Spread:*** This is the result of long one put option and short another put option with a higher strike price. A Put Bull Spread has the same payoff as the Call Bull Spread except the contracts used are put options instead of call options. Even though bullish, a trader may decide to place a put spread instead of a call spread because the risk/reward profile may be more favourable. This may be the case if the ITM call options have a higher implied volatility than the OTM put options. In this case, a call spread would be more expensive to initiate and hence the trader might prefer the lower cost option of a put spread. The profit and loss position for put bull spread is shown in Figure 7.6.

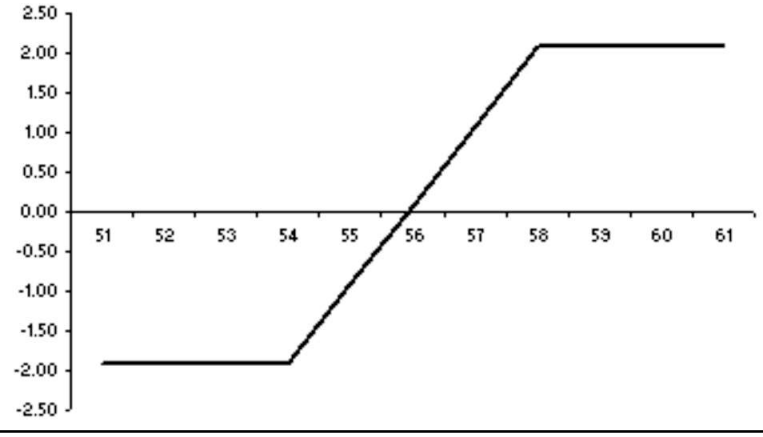
   Maximum Loss: Limited to the difference between the two strike prices minus the net premium received for the position.

   Maximum Gain: Limited to the net credit received for the spread, i.e. the premium received for the short option less the premium paid for the long option.

   When to use: When we are bullish on market direction.

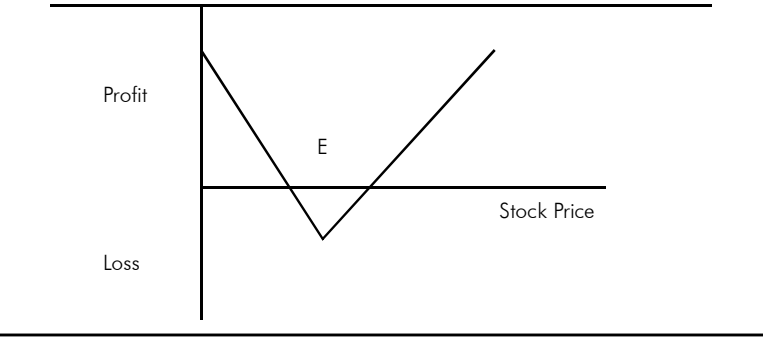
Notes

Figure 7.6: Profit/Loss at Expiration for Put Bull Spread



7. ***Straps:*** If the investor expects that a big price change would occur in the stock price but feels that there is a relatively greater possibility of increase in price (bullish) then decrease in price, then the investor would consider the strategy of Straps. A strap consists of a long position in two calls and one put with the same exercise price (E) and expiration date. The profit and loss profile under strap is shown in figure 7.7.

Figure 7.7: Profit/Loss at Expiration for Straps



Self Assessment

State the following are True or False:

1. A short call has unlimited profit potential on the upside.
2. A long put is simply the sale of a put option.
3. Protective Puts are ideal for investors who are very risk averse.
4. Option spread means taking a position in two or more options of the same type (either calls or puts) on the same underlying asset (share/index).
5. A spread that is designed to profit if the price goes up is called a bear spread.
6. A strap consists of a long position in two calls and one put with the same exercise price (E) and expiration date.

7.2 Bearish Strategies

Notes

Five kinds of bullish option strategies are discussed below. They are:

1. Short Call
2. Long Put
3. Call Bear Spread
4. Put Bear Spread
5. Strips

1. ***Short Call:*** A short call is simply the sale of one call option. A selling option is also known as "writing" an option. A short is also known as a naked call. Naked calls are considered very risky positions because our risk is unlimited.

   When you firmly believe that the underlying is not going to rise, sell a call option. When you firmly believe that index (Nifty/Sensex) is not going to rise, sell a call option on index. When you firmly believe that a particular stock is not going to rise, sell call option on that stock. Sell out-of-the-money (higher strike price) options if you are only somewhat convinced; sell at-the-money options if you are very confident that the underlying would remain at the current level or fall.

   Upside potential: Your profit is limited to the premium received. At expiration the break-even is strike price plus premium. Maximum profit is realised if the underlying price is below the strike price.

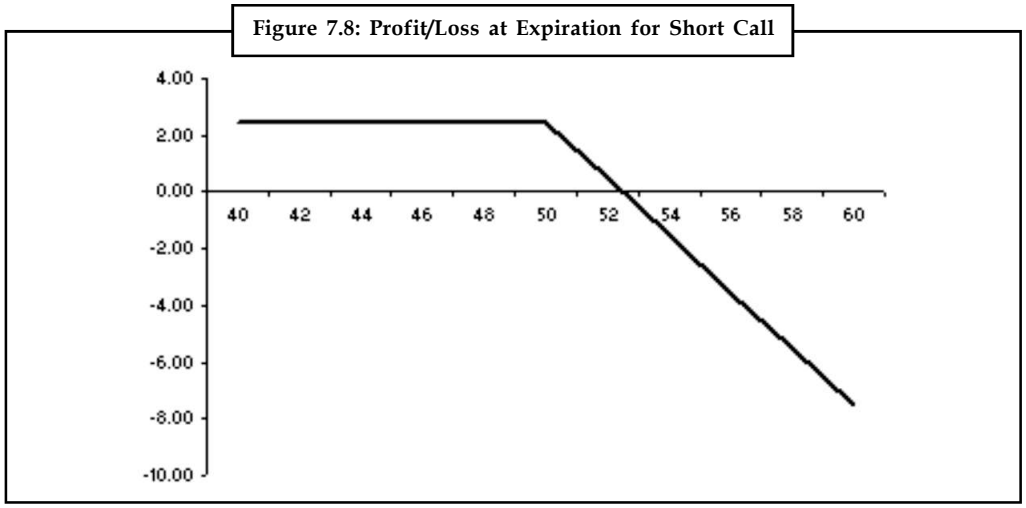
   Downside risk: The price of the option increases as the underlying price rises. You can cut your losses by buying the same option if you think that your view is going wrong. Losses keep on increasing as the underlying rises and are virtually unlimited. Such a position must be monitored closely.

   Maximum Loss: Unlimited as the market rises.

   Maximum Gain: Limited to the premium received for selling the option.

   When to use: When we are bearish on market direction and also bearish on market volatility.

Figure 7.8: Profit/Loss at Expiration for Short Call



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2. ***Long Put:*** A long put is simply the purchase of one put option. Like the long call, a long put is a nice simple way to take a position on market direction without risking everything. Except with a put option we want the market to decrease in value. Buying put options is a fantastic way to profit from a down turning market without shorting stock. Even though both methods will make money if the market sells off, buying put options can do this with limited risk.

   When you are very bearish, buy a put option. When you are very bearish on the market as a whole, buy put option on indices (Nifty/Sensex). When you are very bearish on a particular stock, buy put option on that stock. The more bearish you are, the more out of the money (lower strike price) should be the option you buy. No other position gives you as much leveraged advantage in a falling market with limited downside. The pay-off for long put is depicted in Figure 7.9.

   Upside potential: the price of the option increases as the price of the underlying price falls. You can square up your position by selling the same option at a higher price whenever you think that the underlying price has come to the level you expected. At expiration the break-even underlying price is the strike price minus premium paid for buying the option.

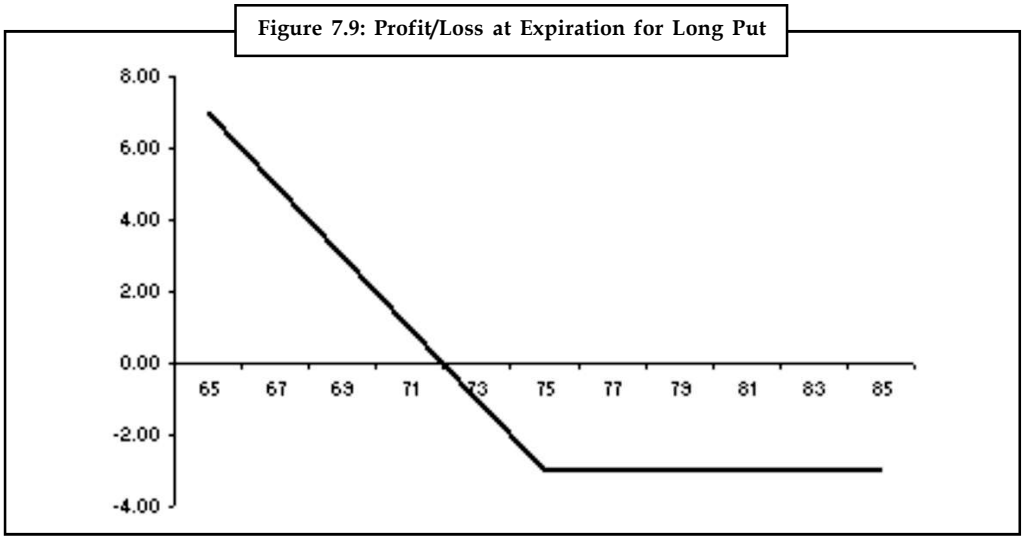
   Downside risk: Your loss is limited to the premium you have paid. The maximum you can lose is the premium, if the underlying price is above the strike price at expiry of the option.

   Maximum Loss: Limited to the net premium paid for the option.

   Maximum Gain: Unlimited as the market sells off.

   When to use: When we are bearish on market direction and bullish on market volatility.

Figure 7.9: Profit/Loss at Expiration for Long Put



Example: Let us consider TISCO currently trading at ₹ 540. An investor believes a future bearish trend in stock market, and thus is interested in a Long Put strategy for hedging. The investor can buy a TISCO 1-month 540 put for ₹ 12. Let us illustrate the pay-off profile of Long put for the following stock prices: ₹ 495, 505, 515, 525, 535, 540, 550, 570, 575 and 590.

Notes

Stock Price	Profit/Loss on Put option purchased	Premium paid	Net Profit /Loss
495	+45	-12	+ 33
505	+35	-12	+23
515	+25	-12	+13
525	+15	-12	+3
535	+5	-12	-7
540	0	-12	-12
550	0 (NE)	-12	-12
570	0 (NE)	-12	-12
575	0 (NE)	-12	-12
590	0 (NE)	-12	-12

NE: not exercised

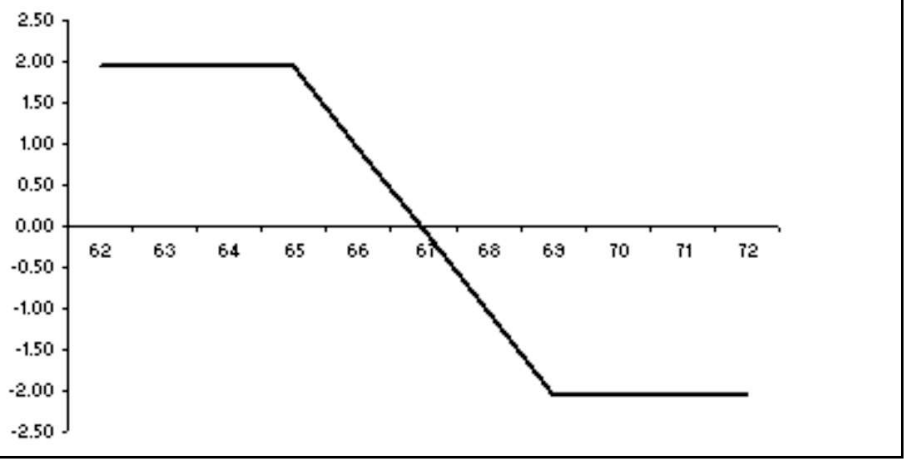
The maximum profit is ₹ 528 i.e., when the stock price takes hypothetical zero value. The maximum loss is limited to option premium paid, i.e, ₹ 12.

3. ***Call Bear Spread:*** A spread that is designed to profit if the price goes down (during the bear phase in stock markets) is called a bear spread. The buyer of a bear spread buys a call with an exercise price above the current index level and sells a call option with an exercise price below the current index level.

   A Call Bear Option spread is formed by short one call option with a low strike price and long one call option with a higher strike price. Bear spreads can also be created by buying a put with a high strike price and selling a put with a low strike price. A call bear spread is usually a credit spread. A credit spread is where the net cost of the position results in the investor receiving money up front for the trade. i.e. we sell one call option (receive ₹ 5) and the buy one call option (₹ 4). The net effect is a credit of Re.1.

   This type of spread is used when we are mildly bearish on market direction. It is the same idea as the Call Bull Spread but reversed-i.e. , we think the market will go down but think that the cost of a short stock or long put is too expensive. The pay-off for Call Bear spread is depicted in Figure 7.10.

Figure 7.10: Profit/Loss at Expiration for Call Bear Spread



Notes

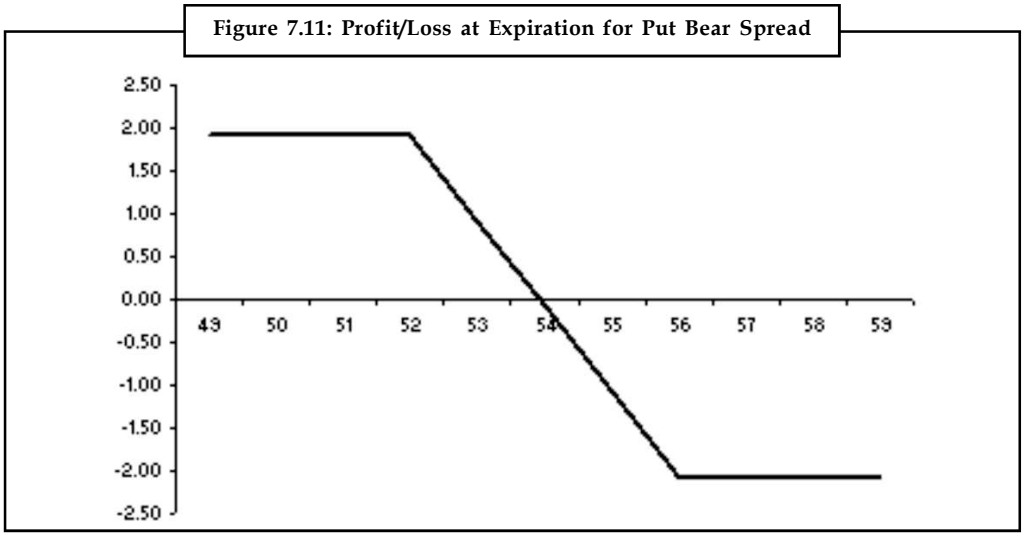
Maximum Loss: Limited to the difference between the two strikes minus the net premium.

Maximum Gain: Limited to the net premium received for the position i.e., the premium received for the short call minus the premium paid for the long call.

When to use: When we are mildly bearish on market direction.

4. ***Put Bear Spread:*** This is formed by short one put option at a lower strike price and long one put option at a higher strike price. A Put Bear Spread has the same payoff as the Call Bear Spread as both strategies hope for a decrease in market prices. The choice as to which spread to use, however, comes down to risk/reward. A good tip is to compare the market prices of both spreads to determine which has the better payoff for us. The pay-off for put bear spread is depicted in Figure 7.11.

Figure 7.11: Profit/Loss at Expiration for Put Bear Spread



Maximum Loss: Limited to the net amount paid for the spread. i.e. the premium paid for the long position less the premium received for the short position.

Maximum Gain: Limited to the difference between the two strike prices minus the net paid for the position.

When to use: When we are bearish on market direction.

The basic features of Bear Put Spread are as follows:

(a) Bear Put Spread is created by buying a put option at a particular strike price and simultaneously selling a put option with a lower strike price within the same contract month.

(b) A Bear Put Spread should be used when the marketer is bearish on a market down to a certain point. The strike price of the sold put option should be below a known support plane on the associated futures chart.

(c) Speaking strictly of the spread strategy, there are limited losses and gains. The loss is limited to the initial cost of creating the position (premium of the purchased put option minus the premium of the sold put option plus commission costs). The spread gain is limited to the difference between the strike price of the put option purchased and the strike price of the put option sold minus commissions and the net premium paid.

Notes

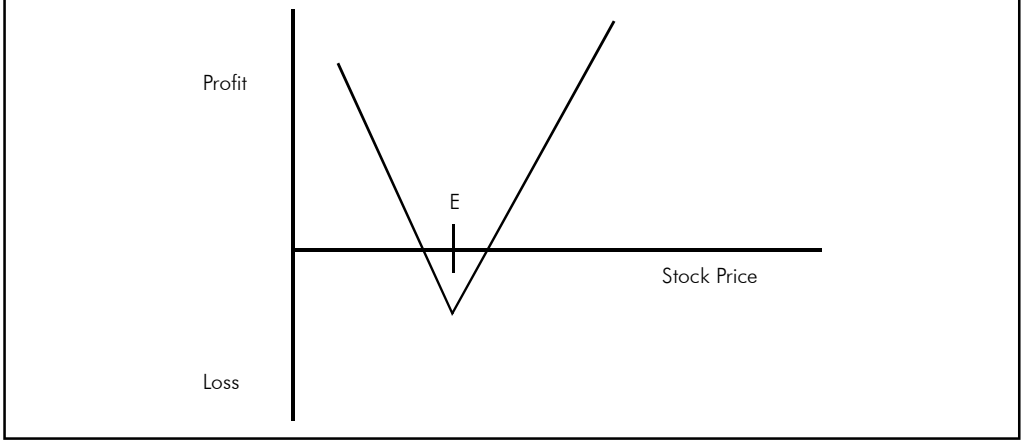
(d) In protecting a net price received (cash price plus the gain or loss from the Bear Put strategy), marketers need to understand that the Bear Put Spread protects a net price down to the strike price of the put option sold.

(e) Ordinarily, margin deposits are required for writing options. However, in the case of the Bear Put Spread, no margin money is necessary as long as both positions are maintained. The rationale for this is that the premium of the purchased put option will always be higher than the premium of the sold put option premium.

(f) A Bear Put Spread is less expensive than an outright purchase of a put option. However, there are limited gains from this strategy itself and this strategy offers less downside price protection than the outright purchase of a put option.

5. ***Strips:*** Strips as an option trading strategy is used when the investor is expecting that there would be big price change in the stock price as a result of which the prices would relatively decrease more than increase, thus effecting a bearish trend. A strip is that option combination where a long position in one call is joined with a long position in two puts, with same exercise price (E) and date of expiration. The profit-loss pattern for strips is depicted in Figure 7.12.

Figure 7.12: Profit/Loss at Expiration for Strips



Self Assessment

Fill in the blanks:

7. A selling option is also known as ……..an option.

8. …….are considered very risky positions because our risk is unlimited.

9. A spread that is designed to profit if the price goes down (during the bear phase in stock markets) is called a …… spread.

10. A ……..spread is where the net cost of the position results in the investor receiving money up front for the trade.

7.3 Neutral Strategies

Neutral option trading strategies denote that option combinations which are used by investors when there is no clear, distinct direction expectation of price movements of the underlying asset

Notes

(stocks or index). This means that the prices cannot be expected to be solely bullish or bearish, and may either witness stable price structure or more volatile fluctuations in either direction.

Fourteen kinds of neutral option strategies as listed below are elaborately discussed.

1. Long Straddle
2. Short Straddle
3. Long Strangle
4. Short Strangle
5. Call Time Spread
6. Put Time Spread
7. Call Ratio Vertical Spread
8. Put Ratio Vertical Spread
9. Long Call Butterfly
10. Short Call Butterfly
11. Long Put Butterfly
12. Short Put Butterfly
13. Box Spread
14. Condor Spread

Notes **Straddle**

In finance, a straddle is an investment strategy involving the purchase or sale of particular option derivatives that allows the holder to profit based on the magnitude of price movement in the underlying security, regardless of the direction of price movement.

Straddle is an appropriate strategy for an investor who expects a large move in the index but does not know in which direction the move will be. This involves the simultaneous holding of the two following positions:

1. Buy call options on the index at a strike K and maturity T, and
2. Buy put options on the index at the same strike K and of maturity T.

Example: Consider an investor who feels that the index which currently stands at 1,252 could move significantly in three months. The investor could create a straddle by buying both a put and a call with a strike close to 1,252 and an expiration date in three months. Suppose a three-month call at a strike of 1,250 costs ₹ 95.00 and a three month put at the same strike cost ₹ 57.00. To enter into this position, the investor faces a cost of ₹ 152.00. If at the end of three months, the index remains at 1,252, the strategy costs the investor ₹ 150. (An up-front payment of ₹ 152, the put expires worthless and the call expires worth ₹ 2). If at expiration the index settles around 1,252, the investor incurs losses. However, if as expected by the investors, the index jumps or falls significantly, he profits. For a straddle to be an effective strategy, the investor's beliefs about the market movement must be different from those of most other market participants. If the general view is that there will be a large jump in the index, this will reflect in the prices of the options.

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The key neutral strategies are as follows:

1. ***Long Straddle:*** This is formed by buy one call option and buys one put option at the same strike price. A long straddle is an excellent strategy to use when we think the market is going to move but don't know which way. A long straddle is like placing an each-way bet on price action: we make money if the market goes up or down. But, the market must move enough in either direction to cover the cost of buying both options. Buying straddles is best when implied volatility is low or we expect the market to make a substantial move before the expiration date - for example, before an earnings announcement.

   A long straddle involves going long (i.e. buying) both a call option and a put option on some stock, interest rate, index or other underlying. The two options are typically bought at the same strike price and expire at the same time. The owner of a long straddle makes a profit if the underlying price moves a long way from the strike price, either above or below. Thus, an investor may take a long straddle position if he thinks the market is highly volatile, but does not know in which direction it is going to move. It is one of the simplest ways of taking a view on volatility. Total losses are limited to the costs of the options, whereas total gains are theoretically unlimited, since the underlying's price can theoretically move up forever. The pay-off for long straddle is depicted in Figure 7.13.

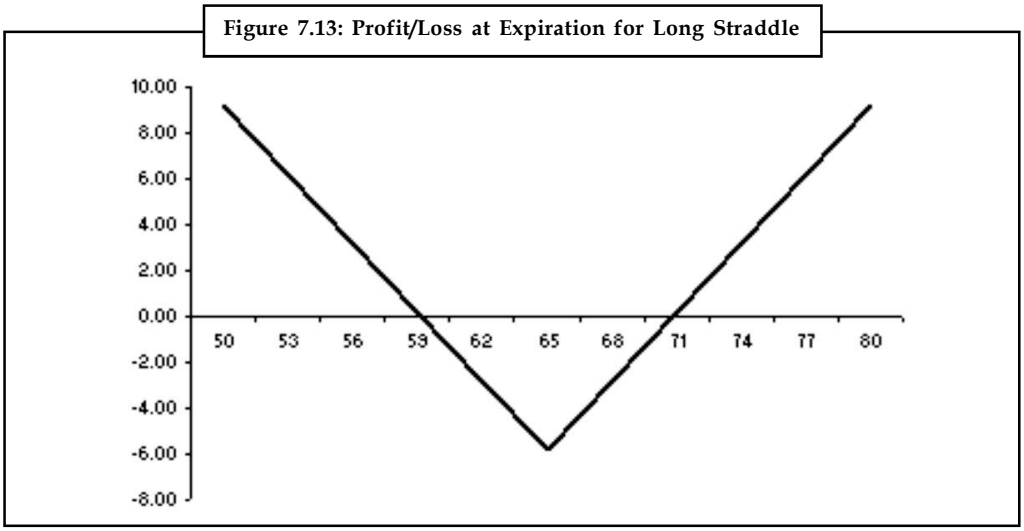
Example: Company XYZ is set to release its quarterly financial results in two weeks. A trader believes that the release of these results will cause a large movement in the price of XYZ's stock, but the trader does not know whether the results will be positive or negative, and so does not know in which direction the price will move. The trader can enter into a long straddle, where a profit will be realized no matter which way the price of XYZ stock moves, so long as the magnitude of the movement is sufficiently large in either direction.

Maximum Loss: Limited to the total premium paid for the call and put options.

Maximum Gain: Unlimited as the market moves in either direction.

When to use: When we are bullish on volatility but are unsure of market direction.

Figure 7.13: Profit/Loss at Expiration for Long Straddle



2. ***Short Straddle:*** This is formed by short one call option and short one put option at the same strike price. Short straddles are a great way to take advantage of time decay and also if we think the market price will trade sideways over the life of the option.

   Conversely, a short straddle is the exact opposite position, i.e. going short (selling) both options. The investor makes a profit if the underlying price is close to the strike at expiry.

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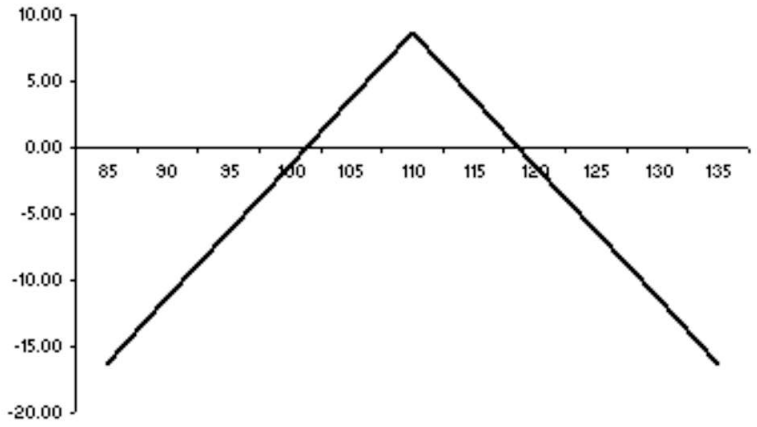
Thus, the investor thinks the markets are unlikely to move much between purchase and expiry of the options. A short straddle position is highly risky, because the potential loss is unlimited, whereas profitability is limited to the premium gained by the initial sale of the options. The pay-off for short straddle is depicted in Figure 7.14.

Maximum Loss: Unlimited as the market moves in either direction.

Maximum Gain: Limited to the net premium received for selling the options.

When to use: When we are bearish on volatility and think market prices will remain stable.

Figure 7.14: Profit/Loss at Expiration for Short Straddle



Strangle: A strangle is an options strategy similar to a straddle, but with different strike prices on the call and put options. This is used to bias the profitability of the strategy towards one particular direction of price movement in the underlying, while still offering some (reduced) protection against a movement in the other direction.

Example: The trader in the example above might enter into a strangle if he believes that XYZ's financial statement will probably be positive, but he is not certain and still wants to hedge some of the risk of a negative statement (and is willing to pay for this privilege).

Notes **Nick Leeson and the Barings Bank collapse**

Nick Leeson took short straddle positions when chasing losses he had run up for his employer, Barings Bank. He had initially invested in futures on the Nikkei 225 stock index. Following a dramatic fall in the market, largely due to the Kobe earthquake, Leeson lost millions. He tried to re-coup these losses by investing in the higher risk, but potentially more rewarding, straddles. He bet that the Nikkei would stabilise and stay in a range around 19,000. His bet failed and losses escalated to $1.4bn, causing the bankruptcy of Barings.

3. ***Long Strangle:*** This is formed by buying one call option with a lower strike price and buying one put option at a higher strike price. A long strangle is similar to a straddle except the strike prices are further apart, which lowers the cost of putting on the spread but

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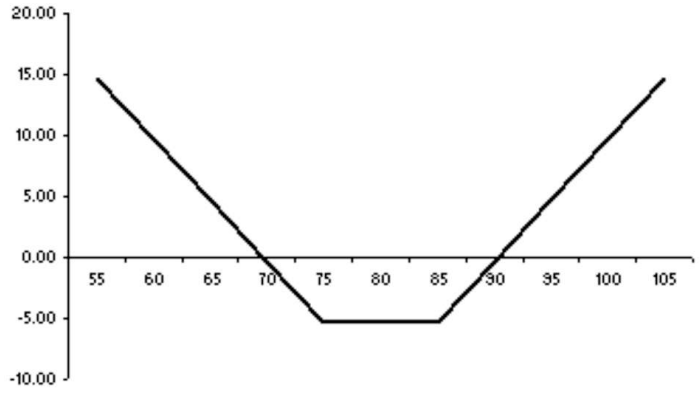
also widens the gap needed for the market to rise/fall beyond in order to be profitable. Like long straddles, buying strangles is best when implied volatility is low or we expect a large movement of market price in either direction. The pay-off for long strangle is depicted in Figure 7.15.

Maximum Loss: Limited to the total premium paid for the call and put options.

Maximum Gain: Unlimited as the market moves in either direction.

When to use: When we are bullish on volatility but are unsure of market direction.

Figure 7.15: Profit/Loss at Expiration for Long Strangle



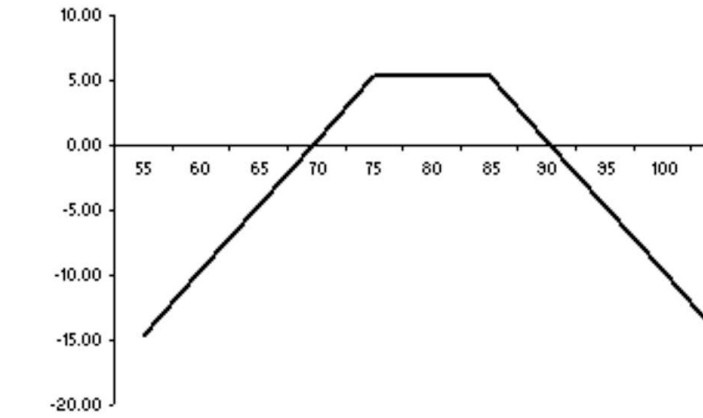
4. ***Short Strangle:*** This is formed by short one call option with a lower strike price and short one put option with a higher strike price. A short strangle is similar to the Short Straddle except the strike prices are further apart, which lowers the premium received but also increases the chance of a profitable trade. The pay-off for short strangle is depicted in Figure 7.16.

   Maximum Loss: Unlimited as the market moves in either direction.

   Maximum Gain: Limited to the net premium received for selling the options.

   When to use: When we are bearish on volatility and think market prices will remain stable.

Figure 7.16: Profit/Loss at Expiration for Short Straddle



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Example: An investor thinks that the market is becoming stable and thus the stock price is likely to be trading in a range near the current price. Suppose INFOSYS is currently trading at. ₹ 1,850. The investor wises to go for a short strangle. He sells one INFOSYS 1-month 1,880 call at ₹ 15 and sells one INFOSYS 1-month 1,820 put at ₹ 5. Let us see the profit-loss position of short strangle for the following stock prices: ₹ 1,790, 1,805, 1,815, 1,825, 1,835, 1,855, 1,865, 1,890, 1,900, and ₹ 1,910.

Stock Price	Profit/Loss for Call option sold	Profit/Loss for Put option sold	Net profit-Loss
1790	+15 (NE)	-25	-10
1805	+15 (NE)	-10	+5
1815	+15 (NE)	0	+15
1825	+15 (NE)	+5 (NE)	+20
1835	+15 (NE)	+5 (NE)	+20
1855	+15 (NE)	+5 (NE)	+20
1865	+15 (NE)	+5 (NE)	+20
1880	+15 (NE)	+5 (NE)	+20
1890	+5	+5 (NE)	+10
1900	-5	+5 (NE)	0
1910	-15	+5 (NE)	-10

The maximum profit is ₹ 20 and maximum loss is unlimited.

5. ***Call Time Spread (Time spreads are also known as calendar spreads):*** This is formed by short one front month call option and long one far month call option. (i.e. the option we sell is to be closer to expiration than the option we are buying).

   We have to note that with this payoff graph (Figure 7.17, the net theoretical result is shown only at the first expiration date when with the underlying trading at 100, which is the best result: the near month call will expire worthless and we will still have a long call ATM position. Traders use time spreads to take advantage of time decay-the property of options being a decaying asset. However, due to the risk involved in selling naked options, a time spread protects the position by buying an option in the next month. The long back month option position offsets large losses that can result from being short options when the underlying market moves unfavourably.

   It is best to implement a time spread when there are < 30 days to expiration in the front month. That is for the short side i.e. selling an option with 30 days or less to expiration. The pay-off for call time spread is depicted in Figure.

   Maximum Loss: Limited on both down and upside for market direction.

   Maximum Gain: Limited.

   When to use: When we are bearish on volatility and neutral to bearish on market price.

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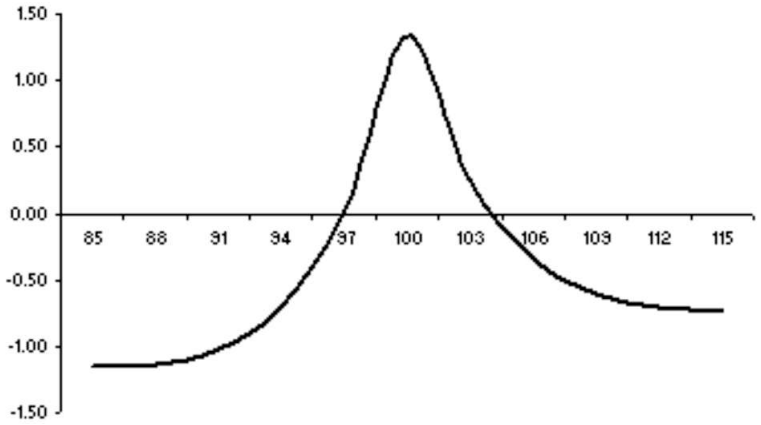
Figure 7.17: Profit/Loss at Expiration for Call Time Spread



6. ***Put Time Spread:*** This is formed by short one front month put option and long one far month put option. (i.e. the option we sell is to be closer to expiry than the option we are buying).

We have to note that with the payoff graph (Figure 7.18), is shown the net theoretical result only at the first expiration date when with the underlying trading at 70, which is the best result: the near month call will expire worthless and we will still have a long at put position.

A put time spread is similar to Call Time Spread except that we want the market to decrease rather than increase. So, a put time spread is used to take advantage of time decay. However, due to the risk involved in selling naked options, a time spread protects the position by buying an option in the next month.

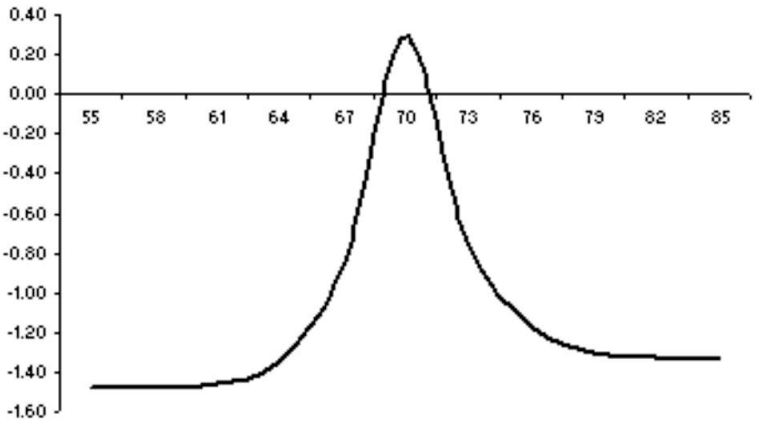
It is best to implement a time spread when there are < 30 days to expiration in the front month. Also, look to sell options that are out-of-the-money.

Maximum Loss: Limited;

Maximum Gain: Limited.

When to use: When we are bearish on volatility and neutral to bearish on market price.

Figure 7.18: Profit/Loss at Expiration for Put Time Spread



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7. ***Call Ratio Vertical Spread:*** This is formed by long one ITM call option and short two OTM call option.

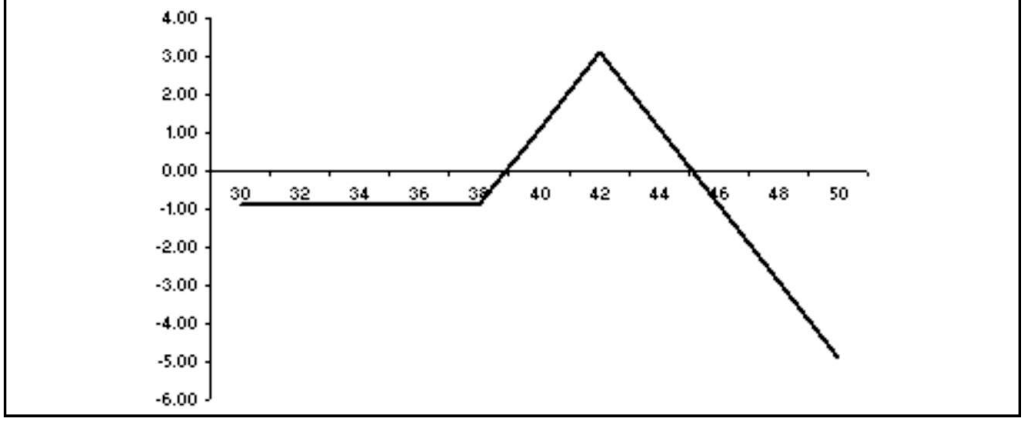
   Even though a Call Ratio Vertical Spread is the reverse of a Call Backspread, it is generally not referred to as being short a Call Backspread as a Call Ratio Spread requires up front payment and is hence a long strategy. We will notice that it is very similar to a Short Strangle, except that the risk is limited on the downside.

   Maximum Loss: Unlimited on the upside and limited on the downside.

   Maximum Gain: Limited to the premium received.

   When to use: When we are bearish on volatility and neutral on market direction.

Figure 7.19: Profit/Loss at Expiration for Call Ratio Vertical Spread



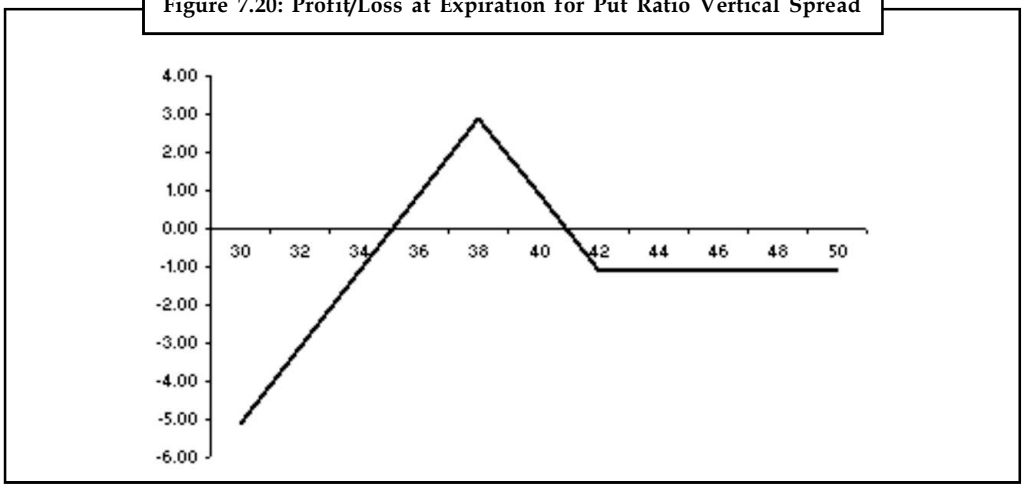
8. ***Put Ratio Vertical Spread:*** This is formed by short two OTM put options and long one ITM put option.

   Maximum Loss: Unlimited on the downside and limited to the net premium paid on the upside.

   Maximum Gain: The difference between the two strike prices less the premium paid for the position.

   When to use: When we are neutral on market direction and bearish on volatility.

Figure 7.20: Profit/Loss at Expiration for Put Ratio Vertical Spread



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9. ***Long Call Butterfly (Butterfly's are three legged option combinations):*** This is formed by short two ATM (at-the-money) call options, long one ITM call option and long one OTM call option.

A long butterfly is similar to a short straddle, except that our losses are limited. This means that we make money when the market remains flat over the life of the options.

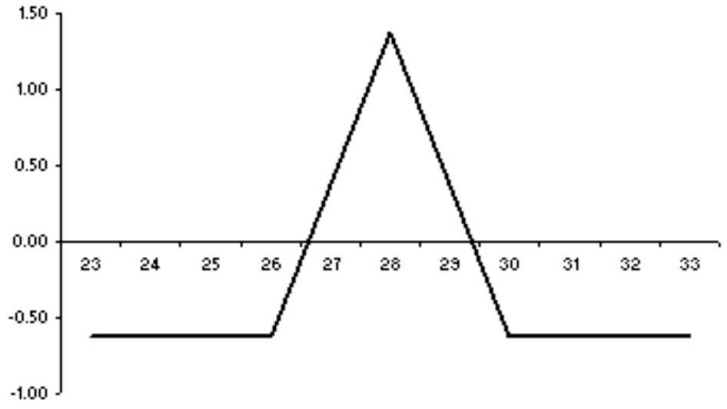
The difference between a Long Butterfly and a Short Straddle is the premium-a Long Butterfly will cost us money (or premium) to establish whereas a Short Straddle won't cost us anything as we receive money (premium) up front for putting on the position.

Maximum Loss: Limited to the ATM strike less the ITM strike less the net premium paid for the Spread.

Maximum Gain: Limited to the net premium received from the spread.

When to use: When we are neutral on market direction and bearish on volatility.

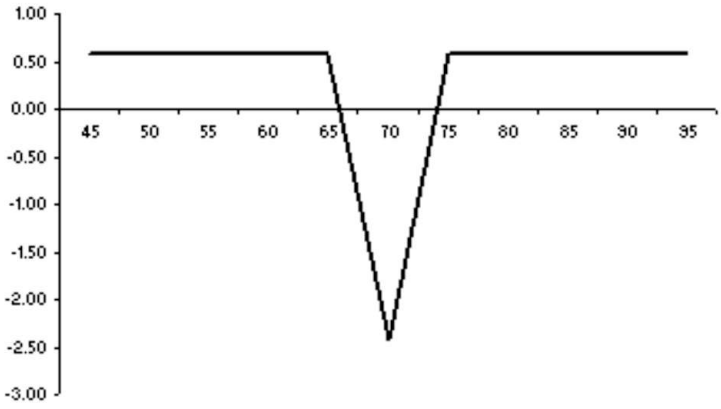
Figure 7.21: Profit/Loss at Expiration for Put Ratio Vertical Spread



10. ***Short Call Butterfly:*** This is formed by long two ATM call options, short one ITM call option and short one OTM call option.

Short Call Butterflies have a similar pay off to the Short Straddle except that the downside risk is limited. Short Straddles have unlimited downside risk: a Short Butterfly's risk is limited to the premium paid for the three options.

Figure 7.22: Profit/Loss at Expiration for Short Call Butterfly



Notes

Maximum Loss: Limited to the net difference between the ATM strike less the ITM strike less the premium received for the position.

Maximum Gain: Limited to the net premium received for the option spread.

When to use: When we are neutral on market direction and bullish on volatility. Neutral on market direction meaning that we want the market to move in either direction-i.e. bullish and bearish at the same time.

11. ***Long Put Butterfly:*** This is formed by selling two ATM put options, buying one ITM put option and buying one OTM put option. This strategy is the same as the Long Call Butterfly, except that we use put options instead of call options.

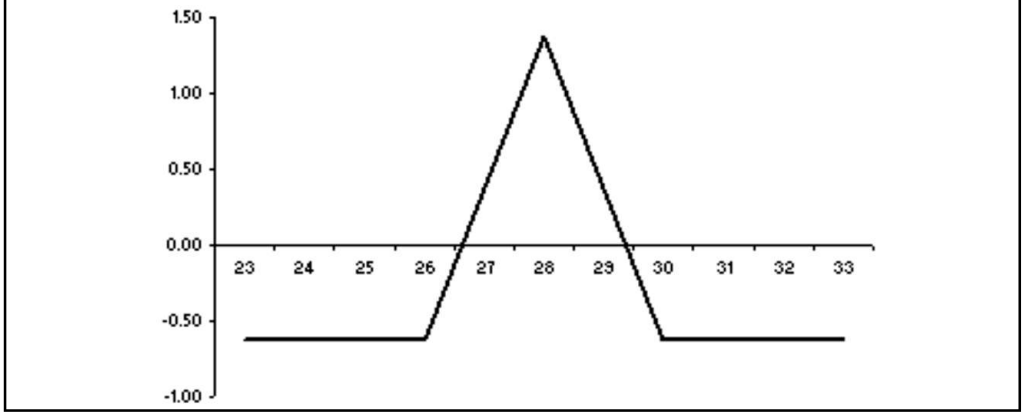
A Long Put Butterfly is used with similar intentions to the Short Straddle-except that our losses are limited if the market moves out of our favour. Whereas a Short Straddle has unlimited losses if the market moves.

Maximum Loss: Limited to the ATM strike less the ITM strike less the net premium paid for the spread.

Maximum Gain: Limited to the net premium received from the spread.

When to use: When we are neutral on market direction and bearish on volatility.

Figure 7.23: Profit/Loss at Expiration for Long Put Butterfly



12. ***Short Put Butterfly:*** This is formed by long two ATM put options, short one ITM put option and short one OTM put option. Short put butterfly's have the same characteristics as the Short Call Butterfly-the only difference is that we use put options instead of call options.

Short butterfly's are an excellent strategy if we expect the market to move, however, we are unsure about what direction the market will move. For example, say there is an announcement due regarding earnings or a government figure is to be released. We might be nervous about market activity and expecting a large move in either direction. In these types of situations we might want to consider implementing a short butterfly strategy-even though our profits are limited they are inexpensive to establish, therefore giving us a higher return on investment.

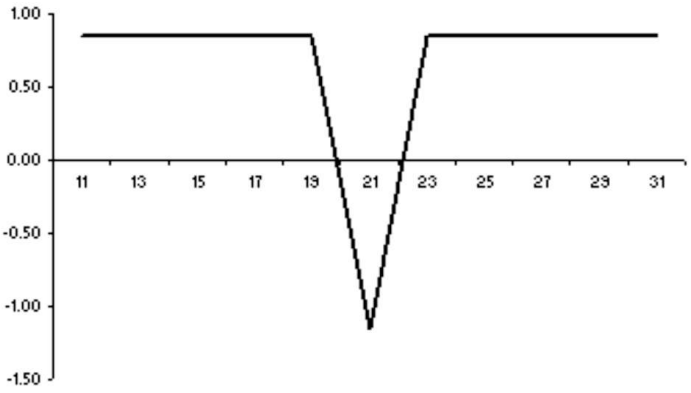
Maximum Loss: Limited to the net difference between the ATM strike less the ITM strike less the premium received for the position.

Maximum Gain: Limited to the net premium received for the option spread.

When to use: When we are bullish or bearish on market direction and bullish on volatility.

Notes

Figure 7.24: Profit/Loss at Expiration for Short Put Butterfly



13. ***Box Spread:*** A box spread is a combination of bull and bear spread with calls and puts respectively, with the same set of exercise prices. Generally, the risk-averse investors adopt this type of strategy that always gives a pay-off of the difference the higher and the lower strike prices. In a box spread strategy, the profit and loss made is independent of the movement in the stock price and thus this strategy is called a neutral option strategy.

14. ***Condor Spread:*** A condor spread strategy is very much similar to butterfly spread involving four options of the same type but with a small difference. In a condor spread, two options are bought at the extreme strike prices and two are sold at two intermediate strike prices. Condor spreads are of two types: long condor and short condor. A long condor can be created with either call options or put options alone. A long condor with call options is made by buying a call option with very low exercise price with another call option with comparatively higher exercise price, and simultaneously selling two call options, one with high exercise price and another with low exercise price. On the other hands, a short condor is just opposite to the long condor. It involves selling two call options at two extremes strike prices (one higher and other lower) and simultaneously buying two calls at intermediate strike prices. The profit and loss position out of condor spread gives limited gains, unlike strangle where the pay-off is very high for large deviations in stock prices.

Task An American call option on a non-dividend paying stock with one month to expiration trades in the market. Stock price is ₹ 50. Strike price is ₹ 40. You think the stock is overpriced. What should you do?

Self Assessment

Fill in the Blanks:

11. A ……is an excellent strategy to use when we think the market is going to move but don't know which way.

12. The difference between a Long Butterfly and a Short Straddle is the ……...

13. A ……is a combination of bull and bear spread with calls and puts respectively, with the same set of exercise prices.

14. A ……strategy is very much similar to butterfly spread involving four options of the same type but with a small difference.

Notes

7.4 Options Pay-offs

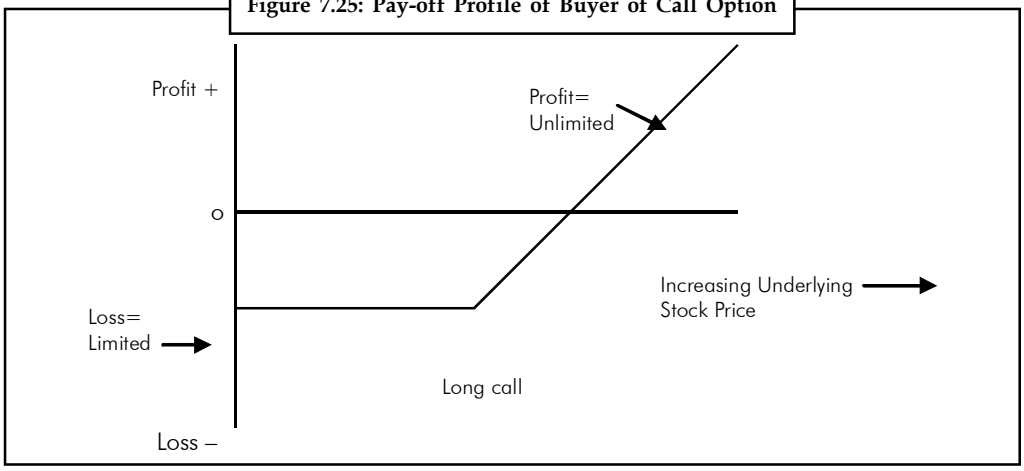
The opportunity characteristic of options results in a non-linear payoff for options. In simple words, it means that the losses for the buyer of an option are limited, however the profits are potentially unlimited. For a writer, the payoff is exactly the opposite. His profits are limited to the options premium; however his losses are potentially unlimited. These non-linear payoffs are fascinating as they lend themselves to be used to generate various payoffs by using combinations of options and the underlying.

The following points explains the pay-offs form both the buyer and sellers point of view:

7.4.1 Buyer of Call Option

The buyer of an equity call option has purchased the right, but not the obligation, to buy 100 shares of the underlying stock at the stated exercise price at any time before the option expires. Once the option is purchased, the buyer is then "long" the call contract, and to purchase 100 underlying shares he notifies his brokerage firm of his intent to exercise the call contract. For example, the buyer of one XYZ June 60 call option has the right to purchase 100 shares of XYZ stock at ₹ 60 per share up until the June expiration.

Figure 7.25: Pay-off Profile of Buyer of Call Option



Potential Profit: Unlimited as the underlying stock price increases.

Potential Loss: Limited to premium paid for call option.

7.4.2 Writer (Seller) of Call Option

An investor who sells an option contract that he does not already own is known as the option "writer," and is then "short" the contract. The writer of an equity call option, commonly referred to as the "seller," has the obligation to sell 100 shares of the underlying stock at the stated exercise price if assigned an exercise notice at any time before the option expires.

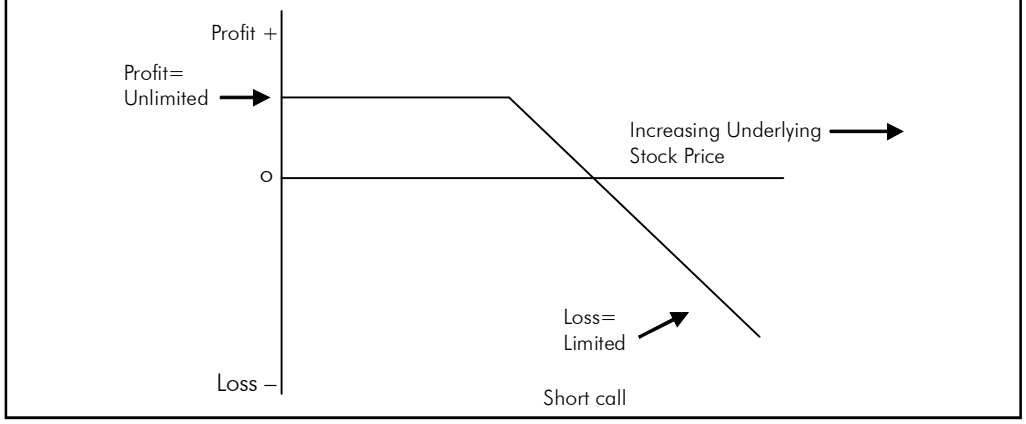
For example, the writer of an XYZ June 75 call option has the obligation to sell 100 shares of XYZ stock at ₹ 75 per share if assigned at any time until June expiration.

Potential Profit: Limited to premium received from call's initial sale

Potential Loss: Unlimited as the underlying stock price increases.

Notes

Figure 7.26: Pay-off Profile of Seller of Call Option



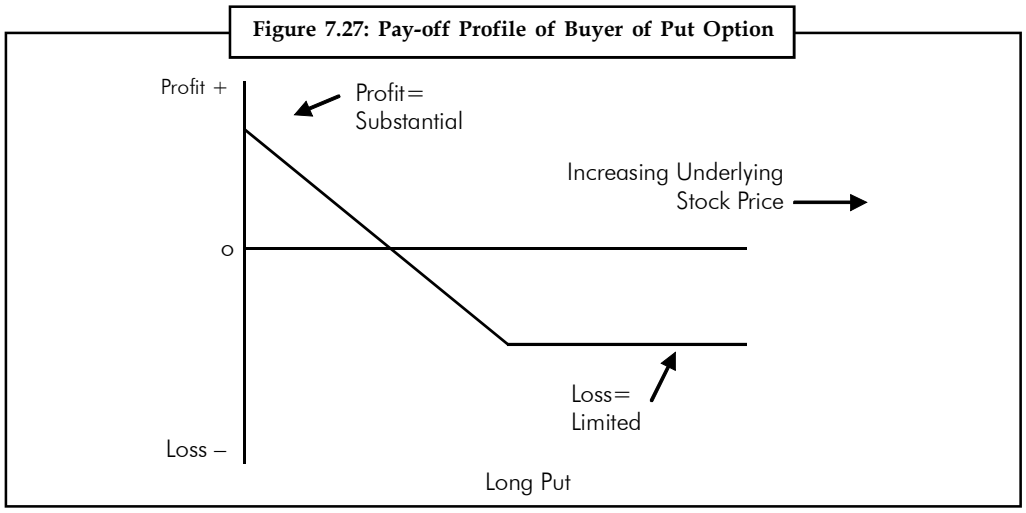
7.4.3 Buyer of Put Option

A put option gives the holder the right to sell an asset at a certain price within a specific period of time. Puts are very similar to having a short position on a stock. Buyers of puts hope that the price of the stock will fall before the option expires.

The buyer of an equity put option has purchased the right, but not the obligation, to sell 100 shares of the underlying stock at the stated exercise price at any time before the option expires. Once the option is purchased the buyer is then "long" the put contract, and to sell 100 underlying shares he notifies his brokerage firm of his intent to exercise the put contract.

Example: The buyer of one XYZ June 70 put option has the right to sell 100 shares of XYZ stock at ₹ 70 per share up until the June expiration.

Figure 7.27: Pay-off Profile of Buyer of Put Option



Potential Profit: Substantial and increases as the underlying stock price decreases to zero.

Potential Loss: Limited to premium paid for put.

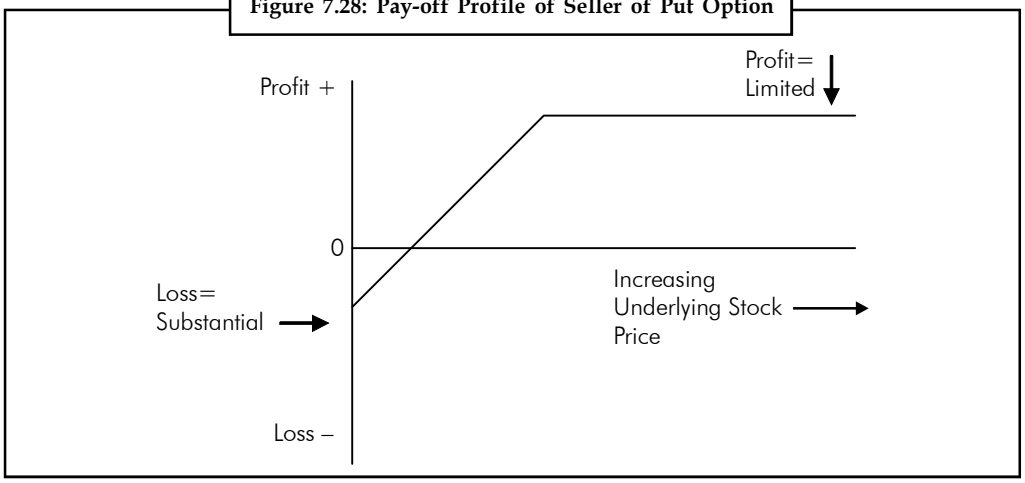
Notes

7.4.4 Writer (Seller) of Put Option

An investor who sells an option contract that he does not already own is known as the option "writer," and is then "short" the contract. The writer of an equity put option, commonly referred to as the "seller," has the obligation to purchase 100 shares of the underlying stock at the stated exercise price if assigned an exercise notice at any time before the option expires.

Example: The writer of an XYZ June 80 put option has the obligation to purchase 100 shares of XYZ stock at ₹ 80 per share if assigned at any time until June expiration.

Figure 7.28: Pay-off Profile of Seller of Put Option



Potential Profit: Limited to premium received from put's initial sale.

Potential Loss: Substantial and increases as the underlying stock price decreases to zero.

Options are the most flexible of all types of derivatives because they give an option-holder a multiple choice at various moments during the lifetime of the option contract. However, an option seller does not have such flexibility and always has to fulfil the option holder's requests. For this reason, the option buyer has to pay a premium to the option seller.

Self Assessment

State the following are true or false:

15. The buyer of an equity call option has purchased both the right and obligation of the underlying stock.

16. A call option gives the holder the right to sell an asset at a certain price within a specific period of time.

7.5 Summary

- This unit provides a detailed discussion of the various option-based hedging strategies used by investors to hedge their position.
- A hedging strategy can be initiated to reduce a potential loss on the investment, and sometimes to make a profit out of the said position.

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- There are four basic kinds of option trades namely: long call, short call, long put and short put. An Option Based Hedging Strategy involves the simultaneous purchase and/or sale of different option contracts, also known as an option combination.
- Choosing the right option strategy is one of the most difficult decisions for an investor. The best strategy is the one that directly matches the investor's set of risk and reward expectation with the possible movements of the underlying asset.
- Broadly, option strategies can be classified as Bullish, Bearish and Neutral strategies.
- The bullish strategies discussed in this unit are long call, short put, covered call, protective put, call bull spread, put bull spread and Strips.
- Option spreads may be classified under three categories: vertical spreads, horizontal spreads, and diagonal spreads. While vertical spreads are option combinations with different strike prices but same expiration date, horizontal spreads are made by option combinations with different expiration date but same strike prices.
- A spread that is designed to profit if the price goes up is called a bull spread. Put Bull Spread has the same payoff as the Call Bull Spread except the contracts used are put options instead of call options.
- The bearish strategies discussed in this unit are: short call, long put, call bear spread, put bear spread and straps.
- A spread that is designed to profit if the price goes down (during the bear phase in stock markets) is called a bear spread.
- The buyer of a bear spread buys a call with an exercise price above the current index level and sells a call option with an exercise price below the current index level.
- A Bear Put Spread is less expensive than an outright purchase of a put option. However, there are limited gains from this strategy itself and this strategy offers less downside price protection than the outright purchase of a put option.
- The opportunity characteristic of options results in a non-linear payoff for options. In simple words, it means that the losses for the buyer of an option are limited, however the profits are potentially unlimited.
- These non-linear payoffs are fascinating as they lend themselves to be used to generate various payoffs by using combinations of options and the underlying.

7.6 Keywords

Box Spread: A box spread is a combination of bull and bear spread with calls and puts respectively, with the same set of exercise prices.

Bull Spreads: A spread that is designed to profit if the price goes up is called a bull spread.

Condor Spread: A condor is an options strategy that also has a bear and a bull spread, except that the strike prices on the short call and short put are different.

Long Call: A long call is simply the purchase of one call option.

Long Put: A long put is simply the purchase of one put option.

Short Call: A short call is simply the sale of one call option.

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Short Put: A short put is simply the sale of a put option.

Straddle: In finance, a straddle is an investment strategy involving the purchase or sale of particular option derivatives that allows the holder to profit based on the magnitude of price movement in the underlying security, regardless of the direction of price movement.

Strips: Strips as an option trading strategy is used when the investor is expecting that there would be big price change in the stock price as a result of which the prices would relatively decrease more than increase, thus effecting a bearish trend.

7.7 Review Questions

1. What is an option strategy? Explain the significance of choosing a right option strategy.
2. List and explain the four basic kinds of option trades used by an investor for hedging purposes.
3. 'Long call and short put are strategies for the bullish market'. Explain this statement.
4. Draw the differences between long call and short put in the light of the profit/loss position at expiration of the option contracts.
5. What is a Covered Call? Why it is so called? Using a example, state the maximum profit and maximum loss out of covered call position.
6. When is a Protective Put as an option strategy used by investors? Is this similar to having a long position in Call Option?
7. What is an Option Spread? Distinguish between vertical option spread and horizontal option spread.
8. When is a Bull Spread used for hedging? What is the cost involved in talking a position in bull spread?
9. List and explain the salient features of a C all Bull spread. Explain the profit/loss position at expiration for call bull spread.
10. Discuss the basic types of pay-offs with suitable figures.

Answers: Self Assessment

1.	False	2.	False
3.	True	4.	True
5.	False	6.	True
7.	"writing"	8.	Naked calls
9.	bear	10.	credit
11.	long straddle	12.	premium
13.	box spread	14.	condor spread
15.	False	16.	False

7.8 Further Readings

Notes

Books

Apte, P.G., *International Financial Management*, Tata McGraw-Hill Publishing

Avadhani,V.A. : *Securities Analysis and Portfolio Management.*

Avadhani,V.A. : *Capital Market Management.*

Avadhani,V.A. : *Investments and Securities Markets in India.*

Bhole,L.M. : *Financial Institutions and Markets.*

Chance, Don M: *An Introduction to Derivatives*, Dryden Press, International Edition

Chew, Lilian: *Managing Derivative Risk*, John Wiley, New Jersey.

Company Limited, New Delhi, 1997.

Das, Satyajit: *Swap & Derivative Financing*, Probus.

"Derivatives Market" NCFM Module, NSE India Publications

FRB, "Overview of Derivative Disclosures by Major US Banks," Federal Reserve

Online links

www.managementstudyguide.com

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Unit 8: Option Pricing

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Objectives

After studying this unit, you will be able to:

- Identify the primary option pricing factors
- Describe put-call parity
- Explain the option pricing model

Introduction

Modern option pricing techniques are often considered among the most mathematically complex of all applied areas of finance. Financial analysts have reached the point where they are able to calculate, with alarming accuracy, the value of a stock option. Most of the models and techniques employed by today's analysts are rooted in a model developed by Fischer Black and Myron Scholes in 1973.

The price of an option contract is that amount which is paid by the option buyer to the option seller. This is otherwise, known as option premium. Like, other price mechanism the premium (option price) on a particular option contract is computed by the demand and supply of the underlying asset (option). There are two types of option price i.e., intrinsic value and time value. The intrinsic value of a call option is that amount by which stock price exceeds the strike price, whenever the option is in-the-money. This intrinsic value will be zero when the stock price is less than the option strike price. On the other hand, the intrinsic value of put option is that amount by which strike price exceeds the stock price, whenever the option is in-the-money. This intrinsic value of put option will be zero when the strike price is less than the stock price.

Did u know? **What is the time value of an option?**

Time value of an option is the excess of option price over the intrinsic value.

8.1 Primary Option Pricing Factors

Notes

Various factors affect the price of options on stocks. We shall look at the impact of changes in each of these factors on option prices one at a time, assuming that all other factors remain the same. For a given type and style of option contract, there are six primary factors affecting its price. They are:

1. ***Current Stock Price:*** The option price changes as per changing stock price. In case of a call option the payoff for the buyer is Max ($S - X_t$, 0) therefore, more the spot price, more is the payoff and it is favourable for the buyer.

Example: For a call option the option price rises as the stock price increases and vice-versa. As the current stock price goes up, the higher is the probability that the call will be in the money. As a result, the call price will increase. The effect will be in the opposite direction for a put. As the stock price goes up, there is a lower probability that the put will be in the money. So the put price will decrease.

2. ***Exercise Price:*** In the case of a call, as the exercise price increases, the stock price has to make a larger upward move for the option to go in-the-money. Therefore, for a call option, as the exercise price increases, options become less valuable and as the strike price decreases they become more valuable. The higher the exercise price, the lower the probability that the call will be in the money. So for call options that have the same maturity, the call with the price that is closest (and greater than) the current price will have the highest value. The call prices will decrease as the exercise prices increase. For the put, the effect runs in the opposite direction. A higher exercise price means that there is higher probability that the put will be in the money. So the put price increases as the exercise price increases.

3. ***Volatility:*** The volatility of a stock price represents the uncertainty attached to its future movement. This measures the degree to which the price of the underlying instruments tends to fluctuate over time. Both the call and put option will increase in price as the underlying asset becomes more volatile. As volatility increases, the likelihood that the stock will do very well or very poorly increases. The value of both calls and puts therefore increase as volatility increases. The buyer of the option receives full benefit of favourable outcomes but avoids the unfavourable ones (option price value has zero value).

4. ***Risk free Interest Rates:*** The risk-free interest rate is the interest rate that may be obtained in the marketplace with virtually no risk. The affect of the risk-free interest rate is less clear-cut. It is found that put option prices decline as the risk-free rate increases whereas the prices of calls always increase as the risk-free interest rate increases. The higher the interest rate, the lower the present value of the exercise price. As a result, the value of the call will increase. The opposite is true for puts. The decrease in the present value of the exercise price will adversely affect the price of the put option. All other factors remaining constant, the higher the interest rate the greater the cost of buying the underlying asset and carrying it to the expiration date of the call option. Hence, the higher the short risk free interest rate, the greater the price of a call option.

5. ***Cash Dividends:*** Dividends have the effect of reducing the stock price on the ex-dividend date. This has a negative effect on the value of call options and a positive effect on the value of put options. When dividends are announced then the stock prices on ex-dividend are reduced. This is favourable for the put option and unfavourable for the call option. On ex-dividend dates, the stock price will fall by the amount of the dividend. So the higher the dividends, the lower the value of a call relative to the stock. This effect will work in the

Notes

opposite direction for puts. As more dividends are paid out, the stock price will jump down on the ex-date which is exactly what you are looking for with a put.

6. ***Time to Expiration:*** Generally, both calls and puts will benefit from increased time to expiration. The reason is that there is more time for a big move in the stock price. Consider the case of two options that differ only as far as their expiration date is concerned. The owner of the long-life option has all the exercise opportunities open to the owner of the short-life option and more. The long-life option must therefore always be worth at least as much as the short life option As the time to expiration increases, the present value of the exercise price decreases. This will increase the value of the call and decrease the value of the put. Also, as the time to expiration increases, there is a greater amount of time for the stock price to be reduced by a cash dividend. This reduces the call value but increases the put value.

Let's summarize these effects in Table 8.1 as given below. The table shows all effects on the buyer side of the contract.

Table 8.1: Determinants of Option Value

Sl.No.	Factors	Effect of Increase on	
		Value of Call Option	Value of Put Option
1	Current Stock/Spot Price	Increase	Decrease
2	Exercise Price	Decrease	Increase
3	Volatility	Increase	Increase
4	Risk-free Interest Rate	Increase	Decrease
5	Dividends	Decrease	Increase
6	Time to Expiration	Increase	Increase

Notes **Basic Principles of Option Valuation**

The two basic principles/rules of option valuation are as follows:

1. If one portfolio of securities gives a higher future payoff than another portfolio in every possible circumstance, then the first portfolio must have a higher current value than the second portfolio.
2. If two portfolios of securities give the same future payoff in every possible circumstance, then they must have the same current value.

Self Assessment

Fill in the blanks:

1. The …….. of an option contract is that amount which is paid by the option buyer to the option seller.
2. The option price is also known as ……...
3. The option price changes as per changing …… price.

Notes

4. The ……..interest rate is the interest rate that may be obtained in the marketplace with virtually no risk.

5. The higher the interest rate, the lower the ……of the exercise price.

8.2 Put-Call Parity

Put-call is nothing but a relationship that must exist between the prices of European put and call options having same underlying assets, strike price and expiration date. That relationship is derived by the help of arbitrage arguments. Put-call parity is a classic application of arbitrage-based pricing – it does not instruct us on how to price either put or call options, but it gives us an iron law linking the two prices. Hence, if call options can be somehow priced, then the price of the put option is immediately known.

Since put-call parity is a canonical arbitrage argument, we will spell it out in detail here.

Suppose a person has one share of Reliance and buys a put option at ₹ 300 which can be exercised T years in the future. In this case, the person faces no future downside risk below ₹ 300, since the put option gives him the right to sell Reliance at ₹ 300. Suppose, in addition, the person sells a call option on Reliance at ₹ 300. In this case, if the price goes above ₹ 300, the call holder will exercise the call option and take away the share at ₹ 300. The sale of the call eliminates upside risk above ₹ 300.

Hence, the following portfolio {one share, plus a put option at ₹ 300, minus a call option at ₹ 300} risklessly obtains ₹ 300 on date T. This payoff is identical to a simple bond which yields ₹ 300 on date T.

Suppose the interest rate in the economy is r, then this bond has the present price $300/(1 + r)^T$. This is a situation to which the law of one price applies: we have two portfolios which yield the identical payoff:

1. $300 /(1 + r)^T$ invested in a simple bond, which turns into ₹ 300 on date T for sure, and

2. A portfolio formed of S + P – C, which turns into ₹ 300 on date T for sure.

By the law of one price, if two portfolios yield the identical payoffs then they must cost the same. Hence we get the formula : $S + P – C = X/ (1 + r)^T$, where S is the spot price, P is the put price, C is the call price, X is the exercise price and T is the time to expiration.

If prices in any economy ever violate this formula, then riskless profits can be obtained by a suitable combination of puts, calls and shares. In summary, put-call parity links up the price of a call and the price of a put. If one is known, then we can infer the other.

The put-call parity states that the difference in price between a call-option and a put-option with the same terms should equal the price of the underlying asset less the present discounted value of the exercise price. A put and call option written on the same stock with the same exercise price and maturity date must sustain, if there are to be no riskless arbitrage opportunities. This condition is known as the 'put-call parity' (Kester and Backstrand, 1995). This relationship can be expressed as follows:

$$V_c – V_p = P_a – X$$

where,

V_c = the price of a call option,

V_p = the price of a put option,

Notes

P_a = the price of the underlying asset,

X = present discounted value of the exercise price.

Caution If call or put option prices deviated substantially then, transactions in them would drive prices up or down until the arbitrage is eliminated.

Below we discuss put-call parity under two different cases i.e., with no dividends and with dividends.

Case 1: Put-Call Parity (no dividends)

The price of a call and a put are linked via the put-call parity relationship. The idea here is that holding the stock and buying a put is going to deliver the exact same payoffs as buying one call and investing the present value of the exercise price. Let's demonstrate this. Consider the payoffs of two portfolios. Portfolio A contains the stock and a put. Portfolio B contains a call and an investment of the present value of the exercise price.

The value of Portfolio A on expiration date is shown in Table 8.2 and that of Portfolio B is shown in Table 8.3.

Table 8.2: Portfolio A

	Value on the Expiration Date	
Action Today	$S^*<=k$	$S^*>k$
Buy one share	S^*	S^*
Buy one put	$k - S^*$	0
Total	**k**	**S^***

Table 8.3: Portfolio B

	Value on the Expiration Date	
Action Today	$S^*<=k$	$S^*>k$
Buy one call	0	S^*-k
Invest of PV of k	k	k
Total	**k**	**S^***

Case 2: Put-Call Parity (with dividends)

We can also use the put-call parity theory for a stock that pays dividends. The idea is very similar to the no dividend case. The value of the call will be exactly equal to the value of a portfolio that includes the stock, a put, and borrowing the present value of the dividend and the present value of the exercise price. Consider the payoffs of two portfolios. Portfolio A just contains the call option. Portfolio B contains the stock, a put and borrowing equal to the present value of the exercise price and the present value of the dividend.

Notes

The value of Portfolio A on expiration date is shown in Table 8.4 and that of Portfolio B is shown in Table 8.5.

Table 8.4: Portfolio A

	Value on the Expiration Date	
Action Today	$S^*<=k$	$S^*>k$
Buy one call	0	S^*-k
Total	**0**	**S^*-k**

Table 8.5: Portfolio B

	Value on the Expiration Date	
Action Today	$S^*<=k$	$S^*>k$
Buy one share	S^*	S^*
Buy one put	$k- S^*$	0
Borrow the PV of k and d	-k	-k
Total	**0**	**S^*-k**

Since the portfolios always have the same final value, they must have the same current value. Again, this is the rule of no arbitrage. Note that this arrangement of the portfolios is slightly different from the case with no dividends. In the no dividends case, we had the stock and a put in portfolio A. In the dividends case, we have just the call in portfolio A. But clearly, we could have constructed the no dividends case with just a call in the portfolio A – it would have no impact on the result. Further note, that as the result of borrowing the present value of both the dividend and the exercise price, we only payoff the exercise price. The reason for this is that if you get the dividend payment before expiration, then you use it to reduce your total debt. In fact, you use it to exactly pay off that part of the debt that is related to the dividend part of the borrowing.

We can express the put-call parity relation as:

$$c = S + p - PV(k) - PV(d)$$

where PV(k) is the present value of the exercise price and PV(d) is the present value of the dividend.

Before discussing the details of various option pricing models, we must understand the upper and lower limits of both call and put options. These are discussed below.

This put-call parity can be further explained by the help of suitable diagrams by comparing the expiration value of two portfolios i.e., 1) The call option and an amount of cash equal to the present value of the strike price ; and 2) The put option and the underlying assets.

Source: A.N. Sridhar, pg. 144- diagrams on put-call parity.

Notes

Self Assessment

Fill in the blanks:

6. Put-call is nothing but a relationship that must exist between the prices of ……..put and call options having same underlying assets, strike price and expiration date.
7. Put-call parity is a classic application of …….
8. The put-call parity states that the difference in price between a call-option and a put-option with the same terms should equal the price of the underlying asset less the present ……..value of the exercise price.
9. If call or put option prices deviated substantially then, transactions in them would drive prices up or down until the …… is eliminated.
10. ……..links up the price of a call and the price of a put.

8.3 Options Pricing Models

Option pricing theory – also called Black-Scholes theory or derivatives pricing theory – traces its roots to Bachelier (1900) who invented Brownian motion to model options on French government bonds. This work anticipated Einstein's independent use of the Brownian motion in physics by five years.

The following are the key option pricing models:

8.3.1 Binomial Options Pricing Model (BOPM)

In finance, the binomial options pricing model provides a generalisable numerical method for the valuation of options. The binomial model was first proposed by Cox, Ross and Rubinstein (1979). This model is an important technique of pricing a stock option by constructing a binomial tree. The binomial tree represents different possible paths that may be followed by the stock price over the life of the option. At the end of the tree i.e., at the expiration of the option, the final possible stock prices are simply equal to their intrinsic values. This model will consider the time to expiry of an option as being one-period, two-periods and multiple periods.

Notes **Assumptions**

1. The current selling price of the stock (S) can only take two possible values i.e., an upper value (Su) and a lower value (Sd).
2. We are operating in a perfect and competitive market, i.e.
   (a) There are no transaction costs, taxes or margin requirements.
   (b) The investors can lend or borrow at the risk-less rate of interest, r, which is the only interest rate prevailing.
   (c) The securities are tradable in fractions, i.e. they are divisible infinitely.
   (d) The interest rate (r) and the upswings/downswings in the stock prices are predictable.

Contd...

Notes

3. The value of (1+r) is greater than d , but smaller than u i.e., u<1+r<d. This condition or assumption ensures that there is no arbitrage opportunity.
4. The investors are prone to wealth maximization and lose no time in exploiting the arbitrage opportunities.

8.3.2 The Black and Scholes Model

In the early 1970s, Fischer Black, Myron Scholes, and Robert Merton made a major breakthrough in the pricing of stock options by developing what has become known as the Black-Scholes Model. The Black-Scholes model, often simply called Black-Scholes, is a model of the varying price over time of financial instruments, and in particular stock options. The Black-Scholes formula is a mathematical formula for the theoretical value of so-called European put and call stock options that may be derived from the assumptions of the model. The equation was derived by Fischer Black and Myron Scholes in their paper "The Pricing of Options and Corporate Liabilities" published in 1973.

The Black and Scholes Option Pricing Model didn't appear overnight, in fact, Fisher Black started out working to create a valuation model for stock warrants. This work involved calculating a derivative to measure how the discount rate of a warrant varies with time and stock price. They built on earlier research by Paul Samuelson and Robert C. Merton. The fundamental insight of Black and Scholes is that the call option is implicitly priced if the stock is traded. The use of the Black-Scholes model and formula is pervasive in financial markets.

The value of call option is calculated as follows:

$C = S_0 N(d_1) - E e^{-rt} N(d_2)$

C = Theoretical Call Premium

S = Current Stock Price

T = Time until option expiration

K = Option Striking Price

r = Risk-Free Interest Rate

N = Cumulative standard normal Distribution

e = exponential term (2.7183)

$$d_1 = \frac{I_n(S/K) + (r + \sigma^2/2)}{\sigma\sqrt{T}}$$

$$d_2 = \frac{I_n(S/K) + (r - \sigma^2/2)T}{\sigma\sqrt{T}} = d_1 - \sigma\sqrt{T}$$

C (S, T) = price of the European call option,

P (S, T) = price of the European put option,

σ = the annualized standard deviation of underlying asset price.

The price of a put option may be computed from this by put-call parity and simplifies to

$$P(S, T) = Ke^{-rT}N(-d_2) - SN(-d_1).$$

Notes

Notes **Assumptions Underlying Black-Scholes Model**

The key assumptions of the Black-Scholes model are:

1. The risk-free interest rate exists and is constant (over the life of the option), and the same for all maturity dates.
2. The short selling of securities with full use of proceeds is permitted.
3. There is no transactions cost and there are no taxes. All securities are perfectly divisible (e.g. it is possible to buy 1/100th of a share).
4. There is no riskless arbitrage opportunities; security trading is continuous.
5. The underlying security pays no dividends during the life of the option, the higher the yield of dividend, the lower the call premium as thus, the market prices of the calls are not likely to be the same.
6. The volatility of the underlying instrument (may be the equity share or the index) is known and constant over the life of the option.
7. The distribution of the possible share prices (or index levels) at the end of a period of time is log normal or, in other words, a share's continuously compounded rate of return follows a normal distribution. Essentially, this means that the share in question has the same likelihood to double in value as it to halve with the added implication that the share prices cannot become negative.
8. The price of the underlying instrument follows a geometric Brownian motion St, in particular with constant drift ì (expected gain) and volatility ó:
9. The market is an efficient on. This implies that as a rule, the people cannot predict the direction of the market or any individual stock.

Black-Scholes European Model

The original Black-Scholes option-pricing model was developed to value options primarily on equities. This model has a number of restrictive assumptions including the limitation that the underlying asset pays no dividends. The model has since been "modified" to value European options on dividend paying equities, as well as on bonds, foreign exchange, futures and commodities. This enhanced model is known as the Modified Black-Scholes European model. It prices European options or options that may only be exercised at expiration.

The Modified Black-Scholes European model makes the following assumptions:

1. The option may not be exercised prior to its expiration date.
2. The price changes of the underlying asset are lognormally distributed.
3. The risk-free interest rate is fixed over the life of the option.
4. Dividend payments are not discrete; rather, the underlying asset yields cash flows on a continuous basis.

Black-Scholes American Model

An American-style option is an option that may be exercised at any time during the life of the option. The Modified Black-Scholes American option-pricing model is the same as the Modified

Notes

Black-Scholes European model except that it checks to see if the value returned is below the intrinsic value of the option. If this is the case, then the Modified Black-Scholes model returns the intrinsic value of the option.

Black-Scholes American = Max (Black-Scholes European, Intrinsic Value)

The Modified Black-Scholes American model makes the following additional assumptions:

1. The price the option may be exercised prior to its expiration date.
2. Changes of the underlying asset are lognormally distributed.
3. The risk-free interest rate is fixed over the life of the option.
4. Dividend payments are not discrete; rather, the underlying asset yields a continuous constant amount.

Example: Consider the situation where the stock price six months from the expiration of an option is \$42, the exercise price of the option is \$40, the risk free interest rate is 10 % per annum and the volatility is 20 % per annum. This means that,

Current price of the share, S_0 = ₹ 42

Exercise price of the option, E = ₹ 40

Time period to expiration = 6 months. Thus, t = 0.5 years.

Standard deviation of the distribution of continuously compounded rates of return, $\sigma = 0.2$

Continuously compounded risk-free interest rate, r = .10

$$d_1 = \frac{\text{Ln } (42/40) + (0.10 + 0.5 \times 0.2^2)(0.50)}{0.2\sqrt{0.50}} = 0.7693$$

$$d_2 = \frac{\text{Ln } (42/40) + (0.10 - 0.5 \times 0.2^2)(0.50)}{0.2\sqrt{0.50}} = 0.6278$$

And $Ke^{-rt} = 40e^{-(0.1*0.5)} = 38.049$

Hence, if the option is a European call, its value C is given by

C = 42N(0.7693) – 38.049N(-0.7693)

If the option is European Put, its value P is given by

P = 38.049N(–0.6278) – 42N(–0.7693)

Using the Polynomial approximation

N (0.7693)=0.7791 N (–0.7693)=0.2209

N (0.6278)=0.7349 N (–0.6278)=0.2651

So that,

C= 4.76 P= 0.81

The value of European call is ₹ 4.76 and the value of European put option is ₹ 0.81.

Notes

Task Consider a European call option on a stock when there are ex-dividend dates in two months and five months. The dividend on each ex-dividend date is expected to be $ 0.5. The current price is $ 40, the exercise price is $40, the stock price volatility is 30% per annum, the risk free rate of interest is 9% per annum, and the time to maturity is six months.

Self Assessment

State the following are true or false:

11. In finance, the binomial options pricing model provides a generalisable numerical method for the valuation of options.
12. The Black and Scholes Model was first proposed by Cox, Ross and Rubinstein (1979).
13. The fundamental insight of Black and Scholes is that the put option is implicitly priced if the stock is traded.
14. The Black-Scholes formula is a mathematical formula for the theoretical value of so-called European put and call stock options that may be derived from the assumptions of the model.
15. The binomial tree represents different possible paths that may be followed by the stock price over the life of the option.

8.4 Summary

- The price of an option contract is that amount which is paid by the option buyer to the option seller. This is otherwise, known as option premium.
- The different factors or determinants which effect option prices are Current Stock Price, Exercise Price, Volatility, Risk free Interest Rates, Cash Dividends and Time to Expiration.
- To better understand the significance and option pricing techniques, we have to go through two important models of option valuation like Black-Scholes model and Binomial model.
- This unit also discusses at large the Put-Call parity under the 'with dividend' and 'no dividend' model.
- Put-call parity is a classic application of arbitrage-based pricing – it does not instruct us on how to price either put or call options, but it gives us an iron law linking the two prices.
- The put-call parity states that the difference in price between a call-option and a put-option with the same terms should equal the price of the underlying asset less the present discounted value of the exercise price.
- In finance, the binomial options pricing model provides a generalisable numerical method for the valuation of options.
- The binomial model was first proposed by Cox, Ross and Rubinstein (1979).
- The Black-Scholes model, often simply called Black-Scholes, is a model of the varying price over time of financial instruments, and in particular stock options.

8.5 Keywords

Notes

Intrinsic Value: The intrinsic value of a call option is that amount by which stock price exceeds the strike price, whenever the option is in-the-money.

Option Price: The price of an option contract is that amount which is paid by the option buyer to the option seller.

Put-call Parity: Put-call parity is a classic application of arbitrage-based pricing – it does not instruct us on how to price either put or call options, but it gives us an iron law linking the two prices.

Volatility: The volatility of a stock price represents the uncertainty attached to its future movement.

8.6 Review Questions

1. Briefly discuss the factors affecting option value.
2. What are the basic principles of option valuation?
3. What do you understand by Put-Call parity?
4. Discuss the effect of a dividend payable on the underlying shares on the call and put option prices.
5. What do you mean by 'binomial'? Explain with suitable example the application of Binomial model for the valuation of options.
6. State the basic feature and assumptions of Black-Scholes Option Valuation.
7. Explain the Black-Scholes model for the valuation of European call option. How is this different from valuation of put option?
8. Consider the following information with regard to a call option on the stock of XYZ company.

   Current price of the share, S_0 = ₹ 120

   Exercise price of the option, E = ₹ 115

   Time period to expiration = 3 months. Thus, t = 0.25 years.

   Standard deviation of the distribution of continuously compounded rates of return, $\sigma = 0.6$

   Continuously compounded risk-free interest rate, r = 0.10

   Calculate the value of the call option using Black-Scholes Model.
9. Using the Black-Scholes model, calculate the value of a European call option using the following data:

   Exercise price = ₹ 65, Stock price- ₹ 60, Time to Expiration = 6 months

   Continuously compounded risk-free rate of return= 15 % p.a.

   Variance of rate of return is 0.25.
10. TISCO shares is currently selling at ₹ 75. Assume that at the end of three months, it will be either ₹ 90 or ₹ 60. The risk-free rate of return with continuous compounding is 10% p.a. Calculate the value of a three-month European call option on TISCO share with exercise price of ₹ 70.

Notes

Answers: Self Assessment

1.	price	2.	option premium
3.	stock	4.	risk-free
5.	present value	6.	European
7.	arbitrage-based pricing	8.	discounted
9.	arbitrage	10.	Put-call parity
11.	True	12.	False
13.	False	14.	True
15.	True		

8.7 Further Readings

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Unit 9: Swaps

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Objectives

After studying this unit, you will be able to:

- Explain the meaning and overview of swap
- Describe interest rate and currency swaps
- Define credit risk
- Discuss the mechanics of swaps

Introduction

A swap is a method for reducing financial risks. Swap is an exchange, and in financial jargon it is an exchange of cash payment obligations, in which each party to the swap prefers the payment type or pattern of the other party. In other words, swap occurs because the counter parties prefer the terms of the other's debt contract, and the swaps enables each party to obtain a preferred payment obligation. Generally, one party in the swap deal has a fixed rate obligation and the other party in the same deal has a floating rate obligation, or one has an obligation denominated in one currency and the other in another currency.

9.1 Meaning and Overview of Swaps

A swap is any agreement to a future exchange of one asset for another, one liability for another, or more specifically, one stream of cash flows for another. A swap is a private agreement

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between two parties in which both parties are 'obligated' to exchange some specified cash flows at periodic intervals for a fixed period of time. Unlike a forward or a futures contract, a swap agreement generally involves multiple future points of exchange. The cash flows of a swap may be fixed in advance, or adjusted for each settlement date by reference to some specified interest rate, such as LIBOR, or other market yield. On the 'settlement date', a 'difference check' is paid by whichever party in the swap is obligated to pay more cash than is to be received at the settlement date.

In general, a swap may be characterized as an agreement between two parties to exchange a series of cash flows measured by different interest rates, exchange rates, or prices with payments calculated by reference to a principal base (notional amount). The most common swaps include currency swaps, in which one currency is exchanged for another at pre-specified terms on one or more pre-specified dates; and interest rate swaps, in which one type of interest payment (e.g., interest payments that float with LIBOR or any other benchmark rate) is exchanged for another (e.g. fixed interest payments) at one or more pre-specified future dates). In general, swaps can be divided into three terms i.e., short-term, medium term and long term. Short term swaps have maturity periods of less than 3 years, medium term swap matures between 3 and 5 years and long term swaps have a life extending beyond 5 years.

While swaps are used for various purposes-from hedging to speculation-their fundamental purpose is to change the character of an asset or liability without liquidating that asset or liability. For example, an investor realising returns from an equity investment can swap those returns into less risky fixed income cash flows-without having to liquidate the equities. A corporation with floating rate debt can swap that debt into a fixed rate obligation-without having to retire and reissue debt. A swap is a cash-settled OTC derivative. Except for forwards, swaps are the simplest form of OTC derivatives.

Notes **Swap Terminology**

1. ***Parties:*** Generally, there are two parties in a swap deal, and this excludes the intermediary. For example, in an interest rate swap, the first party could be a fixed rate payer/receiver and the second party could be a floating rate receiver/payer.
2. ***Swap Facilitators:*** Swap facilitators are generally referred to as 'Swap Banks' or simply 'Banks'. There are two kinds of swaps facilitators i.e., Swap Broker and Swap Dealer.
3. ***Swap Broker:*** Also known as an intermediary, a swap broker as an economic agent helps in identifying the potential counterparties in a swap deal. The swap broker only acts as a facilitator charging a commission for his services and does not take any individual position in the swap contract.
4. ***Swap Dealer:*** Swap dealer associates himself with the swap deal and often becomes an actual party to the transaction. Also known as 'market maker', the swap dealer may be actively involved as a financial intermediary for earning a profit.
5. ***Notional Principal:*** The underlying amount in a swap contract which becomes the basis for the deal between counterparties is known as the notional principal. It is called 'notional' because this amount does not vary, but the cash flows in the swap are attached to this amount. For example, in an interest rate swap, the interest is calculated on the notional principal.

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6. ***Trade Date:*** The date on which both the parties in a swap deal enter into the contract is known as trade date.
7. ***Effective Date:*** It is also known as Value Date: This is the date when the initial cash flows in a swap contract begin (e.g. initial fixed and floating payments, for interest rate swaps). The maturity of a swap contract is calculated from this date.
8. ***Reset Date:*** Reset date is that date on which the LIBOR rate is determined. The first reset date will be generally two days before the first payment date and the second reset date will be two days before the second payment date and so on.
9. ***Maturity Date:*** The date on which the outstanding cash flows stop in the swap contract is referred to as the maturity date.

9.1.1 Features of Swaps

Swap is a combination of forwards by two counterparties. It is arranged to reap the benefits arising from the fluctuations in the market – either currency market or interest rate market or any other market for that matter.

The following are the important features of a swap:

1. ***Basically a forward:*** A swap is nothing but a combination of forwards. So, it has all the properties of forward contract.
2. ***Double coincidence of wants:*** Swap requires that two parties with equal and opposite needs must come into contact with each other. i.e., rate of interest differs from market to market and within the market itself. It varies from borrowers to borrowers due to relative credit worthiness of borrowers.
3. ***Comparative Credit Advantage:*** Borrowers enjoying comparative credit advantage in floating rate debts will enter into a swap agreement to exchange floating rate interest with the borrowers enjoying comparative advantage in fixed interest rate debt, like bonds. In the bond market, lending is done at a fixed rate for a long duration, and therefore the lenders do not have the opportunity to adjust the interest rate according to the situation prevailing in the market.
4. ***Flexibility:*** In short-term market, the lenders have the flexibility to adjust the floating interest rate (short-term rate) according to the conditions prevailing in the market as well as the current financial position of the borrower. Hence, the short-term floating interest rate is cheaper to the borrower with low credit rating when compared with fixed rate of interest.
5. ***Necessity of an Intermediary:*** Swap requires the existence of two counterparties with opposite but matching needs. This has created a necessity for an intermediary to cancel both the parties. By arranging swaps, these intermediaries can earn income too. Financial companies, particularly banks, can play a key role in this innovative field by virtue of their special position in the financial market and their knowledge of the diverse needs of the customers.
6. ***Settlements:*** Through a specified principal amount is mentioned in the swap agreement; there is no exchange of principal. On the other hand, a stream of fixed rate interest is exchanged for a floating rate of interest, and thus, there are streams of cash flows rather than single payment.
7. ***Long-term agreement:*** Generally, forwards are arranged for short period only. Long dated forward rate contracts are not preferred because they involve more risks like risk of

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default, risk of interest rate fluctuations etc. But, swaps are in the nature of long-term agreement and they are just like long dated forward rate contracts. The exchange of a fixed rate for a floating rate requires a comparatively longer period.

9.1.2 Uses of Swaps

Treasurers use swaps to hedge against rising interest rates and to reduce borrowing costs. Among other applications, swaps give financial managers the ability to:

1. convert floating rate debt to fixed or fixed rate to floating rate
2. lock in an attractive interest rate in advance of a future debt issue
3. position fixed rate liabilities in anticipation of a decline in interest rates
4. arbitrage debt price differentials in the capital markets.

Financial institutions, pension managers and insurers use swaps to balance asset and liability positions without leveraging up the balance sheet and to lock-in higher investment returns for a given risk level.

Did u know? **What are the different types of swaps?**

The two major types are:

1. Interest rate swaps (also known as coupon swaps)
2. Currency swaps

Self Assessment

Fill in the blanks:

1. A swap is a method for reducing ……. risks.
2. A swap is a private agreement between two parties in which both parties are ……to exchange some specified cash flows at periodic intervals for a fixed period of time.
3. The date on which both the parties in a swap deal enter into the contract is known as …… .
4. Reset date is that date on which the …….. rate is determined.
5. A swap is nothing but a combination of ……... .

9.2 Interest Rate Swaps

A standard fixed-to-floating interest rate swap, known in the market jargon as a Plain Vanilla Coupon Swap (exchange borrowings) is an agreement between two parties in which each contracts to make payments to the other on particular dates in the future till a specified termination date. One party, known as the fixed rate payer, makes fixed payments all of which are determined at the outset. The other party known as the floating rate payer will make payments the size of which depends upon the future evolution of a specified interest rate index (6-month LIBOR).

An interest rate swap is an agreement between two parties to exchange U.S dollar interest payments for a specific maturity on an agreed upon notional amount. The term notional refers to the theoretical principal underlying the swap. Thus, the notional principal is simply a reference

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amount against which the interest is calculated. No principal ever changes hands. Maturities range from less than a year to more than 15 years; however, most transactions fall within a 2-year to 10-year period.

Example: Companies A & B have been offered the following rates per annum on a $20 million five-year plan.

	Fixed Rate	Floating Rate
Company A	5%	LIBOR+0.5%
Company B	6.5%	LIBOR+1.0%

Company A requires a floating rate loan; Company B requires a fixed rate loan. Design a swap that will net a bank; acting as intermediary, 40 basis points per annum and that will appear equally attractive to both companies.

Solution:

Company 'A' requires floating rate loan. Where as Company 'B' requires fixed rate loan.

But in reality;

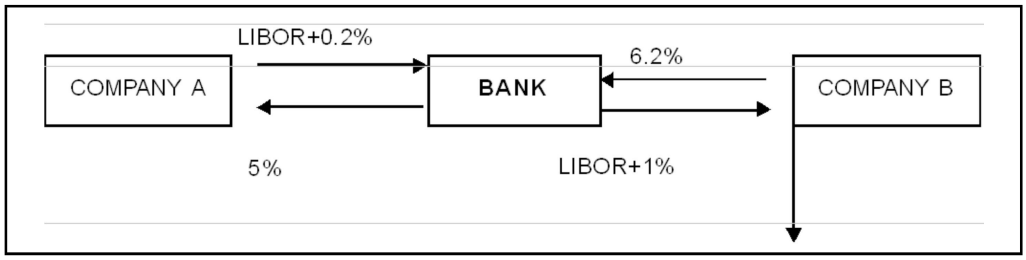
Company A has an advantage in fixed rate as well as in floating rate.

But in fixed rate advantage =(6.5 – 5)%=1.5%

In floating rate advantage= (LIBOR + 1 – LIBOR – 0.5)% = 0.5%

So, Company A has comparative advantage in fixed rate.

For this, "A" searches for a counter party, who has a comparative advantage in floating rate, that is only possible through an intermediary (banks) than only swap deal occurs.



Before the deal, Company "A" paid floating rate interest LIBOR+0.5%

But after the deal, paid by company LIBOR+0.2%

So, total gain =>LIBOR+0.5% - LIBOR - 0.2%=0.3%

Before the deal Company B paid fixed rate interest 6.5%

But after the deal, interest paid by company 6.2%

So, total gain =>6.5% - 6.2%=0.3%

For the bank, gain in fixed rate=>(6.2 - 5)%=1.2%

Gain in floating rate=>LIBOR+0.2% - LIBOR - 1%=(-)0.8%

Total Gain of Bank=1.2% - 0.8%=0.4%

Notes

9.2.1 Types of Interest Rate Swaps

Two main types of Interest Rate Swaps are: Coupon swap and Basis swaps.

1. ***Coupon swap:*** In a Coupon swap, one party pays a fixed rate calculate at the time of trade as a spread to a particular Treasury bond, and the other side pays a floating rate that resets periodically throughout the life of the deal against a designated index.
2. ***Basis swap:*** In a Basis swap, two parties exchange floating interest payments based on different reference rates. Using this relative straightforward mechanism, interest rate swaps transform debt issues, assets, liabilities, or any cash flow from type to type and-with some variation in the transaction structure-from currency to currency.

Example: X promises to pay Y and Y promises to pay X, 3 months LIBOR to 3 months T-Bills.

The most important reference rate in swap and other financial transactions is the London Inter-Bank Offered Rate (LIBOR). LIBOR is the average interest rate offered by a specific group of multinational banks in London for U.S dollar deposits of a stated maturity and is used as a based index for setting rates of many floating rate financial instruments, especially in the Eurocurrency and the Eurobond markets.

9.2.2 Other Types of Interest Rate Swaps

1. ***Forward Swaps:*** This is also known as deferred swaps, in which the commencement date is delayed to a future date. This is mostly useful for those investors who do not need funds immediately but would like to benefit from the existing rate of interest.
2. ***Callable Swap:*** A swap is said to be callable when it gives its holder (the fixed rate payer) the right to terminate the swap at any time before its maturity. This is exercised when the interest rates fall and then the fixed rate payer terminates the swap since the funds will be available in the market a lower rate.
3. ***Puttable Swap:*** A Puttable swap provides the seller of the swap (the floating rate payer) to cease the swap at any time before it maturity. If the interest rate rises, the floating rate payer will terminate the swap.
4. ***Deferred Rate Swap:*** This allows the fixed rate payer to enter into a swap contract at any time up to a specified future date. This is particularly attractive to those investors who need funds immediately but do not consider the current rates of interest.
5. ***Rate capped Swaps:*** An interest rate swap incorporating the cap feature is called a rate caped swap. For example, if a floating rate payer anticipates a rise in interest rate then he can purchase a cap at a fee payable upfront to the fixed rate payer so that the floating rate payable cannot exceed the capped rate.
6. ***Zero Coupon Swap:*** This is a variation of the plain vanilla swap in which the fixed rate payer makes a single fixed payer at the maturity of the swap. The interest is calculated on a discount basis, while the floating rate payer made periodic payments.
7. ***Extendable Swap:*** The extendable swap is constructed on the same principle as the double-up swap, except that instead of doubling the swap, the provider has the right to extend the swap, at the end of the agreed period, for a further predetermined period.
8. ***Forward Swap:*** A swap agreement created through the synthesis of two swaps differing in duration for the purpose of fulfilling the specific time-frame needs of an investor. Also referred to as a "forward start swap," "delayed start swap," and a "deferred start swap."

Notes

For example, if an investor wants to hedge for a five-year duration beginning one year from today, this investor can enter into both a one-year and six-year swap, creating the forward swap that meets the needs of his or her portfolio. Sometimes swaps don't perfectly match the needs of investors wishing to hedge certain risks.

9. ***Roller-Coaster Swap:*** In this swap, interest rate risk can be shifted by converting floating rate liability to fixed rate liability or vice-versa. A roller-coaster swap is a seasonal swap providing flexibility of payments at predetermined periods in order to best meet cyclical financing needs or other requirements of the counterparty. For example, an international company that sells lawn mowers might have a keen interest in a roller-coaster swap, because it can match swap payments with the seasonal demand for lawn mowers.

10. ***Amortising Swap:*** An amortising swap is usually an interest rate swap in which the notional principal for the interest payments declines during the life of the swap, perhaps at a rate tied to the prepayment of a mortgage, or to an interest rate benchmark such as the London Interbank Offer Rate (LIBOR).

11. ***Forex swap:*** A Forex swap is an over the counter short-term interest rate derivative instrument. A forex swap consists of a spot foreign exchange transaction entered into at exactly the same time and for the same quantity, has a forward foreign exchange transaction. The forward portion is the reverse of the spot transaction, where the spot purchase is offset by a forward selling. In this reason, surplus funds in one currency are for a while swapped into another currency for better use of liquidity. Protects against adverse movements in the forex rate, but favourable moves are renounced. It should not be confused with a currency swap, which is a much rarer, long term transaction, governed by a slightly different set of rules. In emerging money markets, Forex swaps are usually the first derivative instrument to be traded, ahead of forward rate agreements.

12. ***Constant maturity swap:*** A constant maturity swap, also known as a CMS, is a swap that allows the purchaser to fix the duration (see bond duration) of received flows on a swap. The floating leg of an interest rate swap typically resets against a published index. The floating leg of a constant maturity swap fixes against a point on the swap curve on a periodic basis. For example, a customer believes that the difference between the 6mth LIBOR rate will fall relative to the five-year swap rate for a given currency. To take advantage of this they buy a constant maturity swap paying the 6mth libor rate and receiving the three-year swap rate.

13. ***Credit default swap:*** The Credit Default Swap (CDS) is a swap designed to transfer the credit exposure of fixed income products between parties. It is the most widely used credit derivative. It is an agreement between a protection buyer and a protection seller whereby the buyer pays a periodic fee in return for a contingent payment by the seller upon a credit event (such as a certain default) happening in the reference entity. A CDS is often used like an insurance policy, or hedge for the holder of a corporate bond. The typical term of a CDS contract is five years, although being an over-the-counter derivative almost any maturity is possible.

Case Study

SBI-HUDCO Enter into Yen-swap Deal

State Bank of India has entered into a long-term Rupee-Yen swap deal with Housing and Urban Development Corporation (HUDCO).

Contd...

Notes

According to a press release, HUDCO has swapped its foreign currency liability of Yen 2.89 billions for equivalent Rupee resources with SBI for a tenor of 10 years. Under the arrangement, HUDCO will deposit its Yen with SBI on the day of transaction, and SBI in return will pay the equivalent Rupee resources to HUDCO.

According to officials, the swap will be done at the prevailing exchange rate on the day of the transaction. And HUDCO will use the rupee resources for the purpose of lending to their projects in India. The overseas branches of SBI in Japan will use Yen to fund their own assets. As per the swap agreement, SBI would provide the long-term hedge to HUDCO for a period of 10 years to cover the exchange risk of the foreign liability.

As a result of this, the swap will neutralize both the exchange rate risk and interest risk of HUDCO on Yen loan by converting the Yen flows into risk neutral-fixed interest rate Rupee flows for the company. At the end of 10 years, HUDCO will take back the Yen by giving the Rupee equivalent to SBI.

Earlier SBI had struck a Rupee-Dollar swap of sizable transaction with ICICI. At present, the bank is considering similar deals with companies, which do not have international presence to manage the foreign currency risk effectively.

The bank is actively involved in developing the derivative market in India by facilitating the use of hedging instruments such as currency swaps. This has been possible after the permission was granted by the Reserve Bank of India to enable corporates to obtain suitable hedge for their exposures arising out of their foreign currency loans.

Self Assessment

State the following are true or false:

6. In a Basic swap, one party pays a fixed rate calculate at the time of trade as a spread to a particular.
7. Coupon swaps are also known as deferred swaps.
8. A Puttable swap provides the seller of the swap (the floating rate payer) to cease the swap at any time before it maturity.
9. The Credit Default Swap (CDS) is a swap designed to transfer the credit exposure of fixed income products between parties.

9.3 Currency Swaps

Swap contracts also can be arranged across currencies. Such contracts are known as currency swaps and can help to manage both interest rate and exchange rate risk.

Currency swaps are derivative products that help to manage exchange rate and interest rate exposure on long-term liabilities. A currency swap involves exchange of interest payments denominated in two different currencies for a specified term, along with exchange of principals. The rate of interest in each leg could either be a fixed rate, or a floating rate indexed to some reference rate, like the LIBOR.

In a typical currency swap, counterparties will perform the following:

1. Exchange equal initial principal amounts of two currencies at the spot exchange rate,

Notes

2. Exchange a stream of fixed or floating interest rate payments in their swapped currencies for the agreed period of the swap, and then

3. Re-exchange the principal amount at maturity at the initial spot exchange rate.

The currency swap provides a mechanism for shifting a loan from one currency to another, or shifting the currency of an asset. It can be used, for example, to enable a company to borrow in a currency different from the currency it needs for its operations, and to receive protection from exchange rate changes with respect to the loan.

A currency swap is an agreement between two parties to exchange a given amount in one currency for another, and to repay these currencies with interest in the future" (Kester & Backstrand, 1995). A currency swap is a foreign exchange agreement between two parties to exchange a given amount of one currency for another and, after a specified period of time, to give back the original amounts swapped. Currency swaps can be negotiated for a variety of maturities up to at least 10 years.

Currency swaps contain the right of offset, which gives each party the right to offset any non-payment of principal or interest with a comparable non-payment. Absent a right of offset, default by one party would not release the other from making its contractually obligated payments. Moreover, because a currency swap is not a loan, it does not appear as a liability on the parties balance sheets.

Example: Company ABC Limited has borrowed 200 million Swiss francs at 6% and wishes to transform this liability into dollars. At the same time, company XYZ Limited wishes to convert a $ 100 million obligation bearing 8% interest rate into a Swiss franc liability. Both companies' obligations have a four-year maturity and are rated AAA. The prevailing spot exchange rate between the Swiss franc and the US dollar is SF 2.00/ $1.

Considering the matching hedging needs, a mutually satisfactory swap could be arranged in which ABC agrees to pay 8% dollar interest to XYZ for 4 years plus $ 100 million at maturity, and XYZ agrees to pay ABC 6% Swiss franc interest for 4 years plus SF 200 million at maturity. This way, both borrowers have their debt service to their respective lender exactly covered, and would be left with a payment stream in the currency of their choice.

A currency swap is an exchange of debt-service obligations denominated in one currency for the service on an agreed upon principal amount of debt denominated in another currency. By swapping their future cash flow obligations, the counterparties are able to replace cash flows denominated in one currency with cash flows in a more desired currency. In this way, Company A, which has borrowed, say, Japanese yen at a fixed interest rate, can transform its yen debt into a fully hedged dollar liability by exchanging cash flows with counterparty B. The two loans that comprise the Currency swap have parallel interest and principal repayment schedules. At each payment date, company A will pay a fixed interest rate in dollars and receive a fixed rate in yen. The counterparties also exchange principal amounts at the start and the end of the swap arrangement.

The counterparties to a currency swap will be concerned about their all-in cost- that is, the effective interest rate on the money they have raised. This interest rate is calculated as the discount rate that equates the present value of the future interest and principal payments to the net proceeds received by the issuer.

Currency swaps contain the right of offset, which gives each party the right to offset any non-payment of principal or interest with a comparable non-payment. Absent a right of offset, default by one party would not release the other from making its contractually obligated

Notes

payments. Moreover, because a currency swap is not a loan, it does not appear as a liability on the parties balance sheets.

Example: Company A, a British manufacturer, wishes to borrow US dollars at a fixed rate of interest. Company B, a US multinational, wishes to borrow sterling at a fixed rate of interest. They have been quoted the following rates per annum (adjusted for differential tax effects).

	Sterling	US dollars
Company A	11.0%	7.0%
Company B	10.6%	6.2%

Design a swap that will net a bank, acting as intermediary, 10 basis points per annum and that will produce equally gain per annum for each of the two companies.

Solution:

Company "A" wishes to borrow US dollars

Company "B" wishes to borrow Sterling

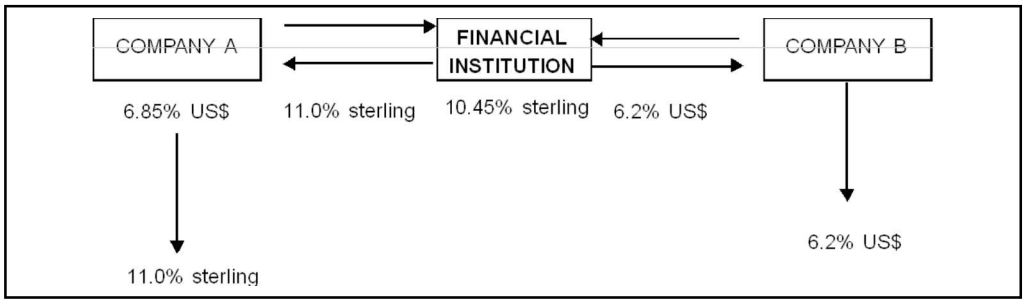
But Company B has competitive advantage in both (Sterling & US dollars).

In Sterling advantage is = (11.0 – 10.6) % = 0.4%

In US dollars advantage is = (7.0 – 6.2) % = 0.8%

So, Company B has competitive advantage in US$, but he wants to borrow Sterling.

Therefore B wants a counter party who has competitive advantage in sterling, but really wants US dollars. So he gets Company A, both go for swap deal with the help of a financial institution.



For Company A:

Before the deal Company A gives 7% US $

But after the swap deal he gives 6.85% US $

So Gain for A=>(7 – 6.85)%=0.15% US $

For Company B:

Before the deal, company B gives 10.6% sterling

But after swap deal he gives 10.45% sterling

So Gain for B = (10.6 – 10.45) % = 0.15% sterling

For Financial Institution:

In US dollar gain = (6.85 – 6.2)%=0.65%

Notes

In sterling gain = (10.45 – 11.0)% = (–) 0.55% sterling

Net Gain = (0.65 – 0.55)% = 0.10%

In practice, many currency swaps are arranged with a global bank as the counterparty. Banks make intermediation profits by charging a fee and/or spread for dealer services. The intermediated approach reduces the default risk and lowers the search costs that would be present if two corporations, generally of different nationalities, tried to structure a currency swap directly between them. The intermediation of currency swaps by global bankers has played a crucial role in the globalization of the world's financial marketplace.

Notes **Interest rate Swaps vs Currency Swaps**

The currency swap is closely related to the interest rate swap. There are, however, major differences in the two instruments. An interest rate swap is an exchange of interest payment streams of differing character (e.g., fixed rate interest for floating), but in the same currency, and involves no exchange of principal. The currency swap is in concept an interest rate swap in more than one currency, and has existed since the 1960s. The interest rate swap became popular in the early 1980s; it subsequently has become an almost indispensable instrument in the financial tool box.

Currency swaps come in various forms. One variant is the fixed-for-fixed currency swap, in which the interest rates on the periodic interest payments of the two currencies are fixed at the outset for the life of the swap. Another variant is the fixed-for-floating swap, also called cross currency swap, or currency coupon swap, in which the interest rate in one currency is floating (e.g., based on LIBOR) and the interest rate in the other is fixed. It is also possible to arrange floating-for floating currency swaps, in which both interest rates are floating.

The major difference is that with a currency swap, there is always an exchange of principal amounts at maturity at a predetermined exchange rate. Thus, the swap contract behaves like a long-dated forward foreign exchange contract, where the forward rate is the current spot rate.

According to interest rate parity theory, forward rates are a direct function of the interest rate differential for the two currencies involved. As a result, a currency with lower interest rate has a correspondingly higher forward exchange value. It follows that future exchange of currencies at the present spot exchange rate would offset the current difference in interest rates. This exchange of principals is what occurs in every currency swap at maturity based on the original amounts of each currency and, by implication, done at the original spot exchange rate.

Currency swaps are often combined with interest rate swaps. For example, one company would seek to swap a cash flow for their fixed rate debt denominated in US dollars for a floating-rate debt denominated in Euro. This is especially common in Europe where companies "shop" for the cheapest debt regardless of its denomination and then seek to exchange it for the debt in desired currency.

Self Assessment

Fill in the blanks:

10. Currency swaps are derivative products that help to manage exchange rate and ……exposure on long-term liabilities.

Notes

11. The rate of interest in each leg could either be a fixed rate, or a floating rate indexed to some ……., like the LIBOR.

9.4 Credit Risk

This risk takes place when any of the counter party to the swap deal defaults on their payment obligations thereby forcing the intermediary to pay the other party. This risk along with market risk is known as default risks of the intermediary (swap bank).

Credit risk or default risk may be defined as the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with the agreed terms. Sources of credit risk exist throughout the activities of the bank. These are:

1. ***Loans:*** Which are the largest and most important source of credit risk. Loans and advances constitute nearly 55% of the total assets of the scheduled commercial banks in India at the end of any normal financial year.
2. ***Investment (in non-SLR instruments):*** Including certificate of deposits, commercial paper, equity shares of PSUs and private corporate sector, bonds /debentures/ preference shares issued by PSUs and private corporate sector etc. The exposure to such investments in respect of the scheduled commercial banks of India is 7-9% of the total assets as at the end of March of any normal financial year.
3. ***Off balance sheet activities /items:*** These items are not booked on the balance sheets and are of a contingent nature, and hence carry a definite element of risk although they generate a fee income for the banks. Indian banks are presently exposed to the off-balance sheet items such as foreign exchange contracts, guarantees, acceptances etc. These, put together, constitute 6-7% of the total assets in respect of the scheduled commercial banks in India at the end of the March of any normal year. With further liberalization, banks are taking up new types of off-balance sheet exposures such as future, swaps, options, etc.
4. ***The remaining 25 to 30% of demand and time liabilities of the banks is locked*** up by way of Cash Reserve Ratio (CRR) on Saturday Liquidity Ratio (SLR). Credit risk is generally made up of transaction risk or default risk and portfolio risk. Transaction risk arises from individual credit transactions of the bank at a micro-level and is evaluated through technical, financial and economic analyses of individual borrowers, Project. Whereas, portfolio risk arises out of the total credit exposures of the bank at a macro-level. Portfolio risk may be intrinsic, e.g. a particular group or type of customers or industry may have a higher risk profile as compared to the other groups or types. Portfolio risk may also arise out of undue concentration of credits to single borrowers or counterparties, a group of connected borrowers or counterparties, particular industries/sectors, borrowers in a particular geographic location, etc. In the event that a particular group or industry experiences a downturn, the entire portfolio may turn into non-performing assets, at least at that point of time.

Self Assessment

Fill in the Blanks:

12. Credit risk or ……may be defined as the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with the agreed terms.
13. Credit risk along with ….....……is known as default risks of the intermediary (swap bank).

9.5 Mechanics of Swaps

Notes

The price of the swap is the difference between the values of two cash flows. Swaps can be priced by determining the values of each stream of cash flows. The value of each stream of cash flow is nothing but the present value of cash flow in the stream. If the cash flow is in different currencies, the present values are converted into a single currency at the prevailing exchange rate.

Swaps can be valued on the similar ways as bonds as they constitute a series of cash flows at various points of time. The cash inflows are first discounted at an appropriate rate to find the present value. This process is continued for cash outflows too. The difference between the present value of inflows and outflows is simply the value of swap. Normally, the prevailing LIBOR rate (in India, we use PLR rate) is used for discounting the cash flows of floating rate and market quoted rate is used for fixed rate.

There are two approaches of swap valuation that are as follows:

1. Swap may be considered as long-term forward contract
2. Swap may be considered as portfolio of two bonds.

Swap Valuation Models

1. ***Valuation of Interest Rate Swaps:*** Let us assume that at maturity the fixed rate party and the floating rate party provide each other equal amount of cash, then the value of swap is nothing but the value of fixed coupon bond minus the floating rate note.

   Symbolically,

   $$P_i = V_b - V_f$$

   Where P_i denotes the price or value of the swap; V_b denotes the value of fixed coupon bond; and V_f denotes the value of floating rate note.

   At times when the market rate varies, the value of both the fixed and floating rate side will be different. It is to be noted that the cash flows on the fixed leg do not change but discount factor changes. On the floating side, both cash flows and discounting factor change.

2. ***Valuation of Currency Swap:*** In case of currency swaps, the valuation can be determined by considering the swap as a portfolio of two bonds. So, the price of swap will be the difference between the current value of both the bonds, one denominated in the foreign currency and another in the local currency.

   Symbolically,

   $$P_c = V_f - V_l$$

   Where P_c denotes the price or value of the currency swap; V_f denotes the value of foreign currency bond; and V_l denotes the value of local currency bond.

Example: Let us consider a flat rate of interest in India and the USA. The US rate is 3% per annum and Indian rate is 8% per annum, both the rates being compounded continuously. The ICICI Bank has entered into a currency swap where it receives 7.5 % per anum in Indian currency and 4 % per annum in US dollars. The principal amount in both the currencies are ₹ 5 lakhs and US $ 75 lakhs. The swap period is for two years and current exchange rate is 1 US$= ₹ 45.00.

The price of the currency swap is as given below:

$P_c = V_f - V_l$

Notes

$V_f = 0.375e^{-.08} + 5.375\ e^{-.08x2} = \$\ 0.3461 + \$\ 4.5802 = \$\ 4.9263 = ₹\ 221.6835$

$V_l = 3e^{-0.03} + 78e^{-0.03x2} = ₹\ 2.9113 + ₹\ 73.4576 = ₹\ 76.3689$

Therefore, $P_c = ₹\ 221.6835 - ₹\ 76.3689 = ₹\ 145.3146$

If ICICI Bank were to pay US$ and receive Indian Rupees, the value of the currency swap would have been ₹ 145.3146.

Task Review the annual report of an MNC of your choice. Did the MNC enter into a swap deal in the recent past? Explain how the MNC benefited from the swap deal. Also perform a forecasted scenario analysis to show how the MNCs would fare in the coming years.

Self Assessment

Fill in the blanks:

14. The price of the swap is the difference between the values of two …….
15. Normally, the prevailing LIBOR rate (in India, we use PLR rate) is used for ……. the cash flows of floating rate and market quoted rate is used for fixed rate.

9.6 Summary

- Swaps are over-the-counter derivative products involving cash payment transfer between two counter parties with an intermediary bank in between.
- There are primarily two types of financial swaps namely, interest rate swap and currency swap. Interest rate swap, known in the market jargon as a Plain Vanilla Coupon Swap (exchange borrowings) is an agreement between two parties in which each contracts to make payments to the other on particular dates in the future till a specified termination date.
- The first Interest Swap deal was struck in the year 1981 when Salamon Brothers acted as the swap intermediary between IBM and World Bank.
- The swaps on currency were initially in the form of back-to-back/parallel loans.
- Unlike futures and option contracts, swaps have longer maturity period. The price of the swap is the difference between the values of two cash flows.
- Swaps can be priced by determining the values of each stream of cash flows.
- Credit risk or default risk may be defined as the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with the agreed terms

9.7 Keywords

Basis Swaps: Basis swaps involve an exchange of floating rate payments calculated on different basis.

Callable Swaps: A callable swap gives the holder, i.e. the fixed-rate payer, the right to terminate the swap at any time before its maturity.

Commodity Swaps: Innovations in the swap market have enabled users to link the transactions to various floating indices.

Notes

Credit Default Swap: A swap designed to transfer the credit exposure of fixed income products between parties.

Extendible Swaps: In an extendible swap, the fixed rate payer gets the right to extend the swap maturity date.

LIBOR: An interest rate at which banks can borrow funds, in marketable size, from other banks in the London interbank market.

Maturity Date: The date on which the outstanding cash flows stop in the swap contract is referred to as the maturity date.

Notional Principal: The underlying amount in a swap contract which becomes the basis for the deal between counterparties is known as the notional principal.

Putable Swaps: A putable swap gives the seller of the swap (the floating rate payer) the chance to terminate the swap at any time before its maturity.

9.8 Review Questions

1. Define the term 'Swap Contract". Who are the parties involved in a swap?
2. "Swap is a private agreement between two parties in which both parties are 'obligated' to exchange some specified cash flows at periodic intervals". Explain.
3. Briefly elaborate on the evolution of swap dealings.
4. What is a financial swap? List and explain the salient features of a swap.
5. Discuss the various types of swaps and their features.
6. Define an Interest Rate Swap contract and provide a suitable example.
7. Write a note on types of interest rate swaps.
8. Distinguish between coupon swap and basis swap.
9. Explain the trading mechanism of swap contracts.
10. What is a Currency Swap?
11. Explain the comparison between options, futures and swap contracts.

Answers: Self Assessment

1. financial
2. 'obligated'
3. trade date
4. LIBOR
5. forwards
6. False
7. False
8. True
9. True
10. interest rate
11. reference rate
12. default risk
13. market risk
14. cash flows
15. discounting

Notes

9.9 Further Readings

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Unit 10: Interest Rate Derivatives and Euro-Dollar Derivatives

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10.1.1 T-Bill Futures

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10.3 Forward Rate Agreement

10.4 Duration

10.5 Convexity

10.6 Summary

10.7 Keywords

10.8 Review Questions

10.9 Further Readings

Objectives

After studying this unit, you will be able to:

- Define Interest rate futures
- Describe T-bill and T-bond futures
- Illustrate Euro-dollar derivatives
- State the meaning of forward rate agreements
- Define duration and convexity

Introduction

According to RBI guidelines, interest rates derivatives have been launched in India on National Stock Exchange (NSE) and Bombay Stock Exchange (BSE) on June 24, 2003. This has enabled the Scheduled Commercial Banks (SCBs) (excluding Regional Rural Banks and Local Area Banks), Primary dealers and specified All India Financial Institutions, to hedge the interest rate risk in their underlying government securities portfolio by booking a future transaction on payment of a small premium to insure the unexpected liability that may arise in future.

To begin with, it has been decided by RBI to start trading in only two kinds of interest rate futures contracts on the following underlying securities

1. Notional Treasury Bills
2. Notional 10 year bonds (coupon bearing and non-coupon bearing)

Notes

10.1 T-Bill and T-Bond Futures

Interest-rate futures are contracts of the future delivery of interest-bearing securities (debt). Interest-rate futures allow speculators and hedgers to buy and sell these contracts through the locking prices of these securities for future delivery.

Interest-rate futures include the following securities:

1. Treasury bonds
2. Treasury notes
3. Treasury bills
4. 10-year agency notes
5. 10-year Muni note Index
6. 30-day federal funds
7. Eurodollar deposits
8. Selected foreign government bonds

Changes in interest rates affect bond prices. Speculators buy or sell interest-rate futures based on their future projections about which direction will the future interest-rates take in an attempt to get greater returns.

Investors with large bond portfolios can reduce their loss risk due to the changes in the rates of interest by hedging their positions using interest-rate futures. Let´s pretend that a speculator is expecting interest rates to decline in the near future. The speculator would take a long position by buying a futures contract for delivery of Treasury bonds. If rates of interest fall, the price of Treasury bonds would go up, and the value of Treasury bonds futures contract would also be increased. The speculator then can benefit from the sales of Treasury bond futures contract at a higher price.

But, if rates of interest raise, the speculator will lose money, because Treasury bond prices would fall resulting in a decline in the price of bond futures contract.

The opposite occurs when the speculator is able to anticipate a raise in interest rates. The speculator would sell in short Treasury bond futures contract, and if the rates of interest increase the value of Treasury bond futures contract will fall. Then the speculator would buy the return of the contract at a normal price, closing out his position with a profit for him.

The bond portfolios managers and individuals with large bond portfolios can hedge against raises in interest rates by selling short Treasury bonds and other bond Index futures that resemble the markup of the kind of bonds that are in the portfolio. The difference between speculators and hedgers is that the hedgers are really the owners of the financial securities and negotiate with them.

Notes In June 2003 IRF was launched with the following three types of contracts for maturities up to 1 year on the NSE.

1. Futures on 10-year notional GoI security with 6% coupon rate
2. Futures on 10-year notional zero-coupon GoI security
3. Futures on 91-day Treasury bill.

Notes

10.1.1 T-Bill Futures

A T-bill future is traded on the International Monetary Market (IMM) in Chicago. This market requires the physical delivery of the underlying T-bill. Physical delivery means that at the delivery date, the short (seller of the contract) must give the long the T-bill. This is in contrast to cash settlement, where the short simply pays the long the cash value of the underlying instrument.

Did u know? **What are Treasury-Bills?**

T-bills are money market instruments to finance the short-term requirements of the Government of India.

Treasury bill includes 3 month T-bills, 6 month T-bills, and 1 year T-bills. These bills are auctioned at regular intervals, and the delivery dates of the futures contracts are set so that on a delivery date, there are three possible underlying bonds: the new 3 month T-bill, the "seasoned" 6 month T-bill, and the "seasoned" 1 year T-bill. The seasoned 6 month bill is that which was issued three months ago and has three months left to maturity. The seasoned one year bill was issued nine months ago and also has three months left. Three months can mean 90, 91, or 92 days, depending on the month in which the contract was issued.

T-bill Futures prices are quoted relative to an index value. This time, however, they are quoted at 100 minus an annualized percentage discount rate. The annualized discount rate is expressed to two decimal places. Even though it looks like a price, what is quoted is not the price. The actual price is computed from the quotation as follows:

$$\text{Price} = \$1{,}000{,}000 - \$1{,}000{,}000\left(\frac{100-\text{QP}}{100}\right)\left(\frac{90}{360}\right)$$

Thus the quoted price, QP, is an annualized discount yield for a future that requires the delivery of a 3 month T-bill with a face value of $1,000,000. Since it is quoted to two decimal places, the smallest price change (or "tick") is one basis point, 0.01%.

10.1.2 T-Bond Futures

The most active Treasury futures are the Treasury bond and Treasury note futures traded at the Chicago Board of Trade. Both futures contracts trade in units of $100,000 and expire in May, June, September, and December.

Caution One measure of activity in these contracts is called "open interest." This is the number of contracts outstanding.

Example: At the close of trading on Friday, September 16, 1994, the reported open interest for Treasury bond futures was 264,993. The open interest for T-note futures was 269,745 and 188,736 for the 10- and 5-year notes, respectively. At this same time, there were 17,238 contracts outstanding for T-bill futures.

The quoted price for a T-bond or T-note future is the same as the price for T-bonds and T-notes (which is different from T-bill futures). The quoted price is given in thirty-seconds not - decimals.

T-bond futures can be settled with any T-bond that has 15 or more years to first call or maturity (whichever comes first). To add to the settlement complexity, this flexibility is combined with a number of settlement options that the seller of the future can choose to exercise. In this section,

Notes

the settlement procedure is described in general. Readers interested in the exact contractual details should contact the exchange.

Did u know? **What is invoice price?**

Invoice price is the price paid out by the buyer of the futures to the seller of futures for taking physical delivery of the bond.

Invoice Price = (Futures Settlement Price × Conversion Factor) + Accrued Interest

Self Assessment

Fill in the blanks:

1. ……. futures are contracts of the future delivery of interest-bearing securities (debt).
2. A T-bill future is traded on the ……..in Chicago.
3. T-bill Futures prices are quoted relative to an ……..value.
4. The ….....……price for a T-bond or T-note future is the same as the price for T-bonds and T-notes.
5. The speculator then can benefit from the sales of Treasury bond futures contract at a ……price.

10.2 Euro-Dollar Derivatives

The origin of the Eurodollar market is rather obscure. However, it is generally agreed, that it originated in the early 1950s by the desire of the Soviet Union and Eastern European countries to place their dollar holdings in European banks to avoid the risk of such balances being blocked if deposited in US banks.

Basically the Eurocurrency market has thrived on one basic reason, i.e., government regulation. By operating in Eurocurrencies, banks, suppliers of funds are able to avoid certain regulatory costs that would otherwise be imposed.

Briefly, the fast growth of the Eurodollar market in the 1965-1980 period has been attributed mainly to the following four major factors:

1. Large deficits in the US balance of payments, particularly during the 1960s, which resulted in the accumulation of substantial dollars held by foreign financial institutions and individuals.
2. The restrictive environment which prevailed in the United States during the 1963-1974 period to stem capital outflows. These restrictions, which took the form of both voluntary and mandatory controls, encouraged US and foreign multinational companies to borrow dollars abroad.
3. The massive balance of payments surpluses realised by OPEC countries due to sharp increases in oil prices in 1973-1974 and again in 1978. A good proportion of these "petrodollars" was deposited in financial institutions outside the United States.
4. The efficiency and lower cost base of the Eurodollar market. Being a wholesale funds market, operating free of restrictions at a substantially lower cost than its counterpart in the United States, it has been able to attract dollar deposits by offering higher interest rates, as well as making dollar loans available to borrowers at lower interest rates.

Notes

The International Monetary Market (IMM) a division of the Chicago Mercantile Exchange, trades Eurodollar futures. Other exchanges, including London, Tokyo and Singapore, also trade Eurodollar futures. This makes the market for this contract a virtually continuous market.

The face value for a futures contract is $1,000,000 and it is traded for settlement in March, June, September and December. The contract is defined on the spot 3 month Eurodollar deposit rate. Contrary to T-bill futures, the Eurodollar futures are settled for cash and are the most actively traded short term interest contract.

Example: At the close of trading on February 13, 1995 the open interest (i.e., the number of futures contracts currently open) reported by The Wall Street Journal for the March Eurodollar future's contract was 398,971. In contrast, the open interest at this time on the March T-bill futures contract was only 9,524.

As part of this settlement procedure, on the last trading day, the IMM samples twelve dealing banks for the 3 month Eurodollar quotations. After eliminating the top two and the lowest two, the settlement price is computed as an average rate, and convergence is forced between the futures price and the spot price at this time.

The Eurodollar future is quoted on an index basis 100 minus the LIBOR on the corresponding Eurodollar contract. The day count for futures contracts is actual days over a 360 day year.

Example: In The Wall Street Journal, April 19,1994, the June Eurodollar futures had a settlement price of 100 - 0.0466 = 95.34 and therefore the settlement yield was 4.66%. One basis point change in this 3 month contract equals $25 ($25 = 0.0001 × 1,000,000 × 0.25).

This contract provides investors with an alternative method for locking in a forward rate. Under the assumption that the future's price equals the forward price, the relationship between futures prices and forward Euro prices implied from the current Euro-yield curve can be contrasted.

Notes **Features of Euro-dollar Derivatives**

Eurodollar futures work the same as T-bill contracts except the rate is based on LIBOR. The following are the key features of Euro-Dollar derivatives:

1. Price quotes and actual price is determined the in the same way as for T-bills
2. Settles in cash
3. One of most active contracts in the markets
4. Instead of add-on interest, (for example a 100 @ 10% for a year and the bank would owe $110 dollars), the rate is subtracted from 100, just as it is with T-bills
5. With T-bills the investor would receive $1 million per contract, while in the Eurodollar futures market the firm would pay 1 million euros.

Self Assessment

Fill in the blanks:

6. The Eurodollar future is quoted on an index basis 100 minus the ..... on the corresponding Eurodollar contract.

Notes

7. Eurodollar futures work the same as T-bill contracts except the rate is based on …….
8. Eurodollar futures are settled in ……..
9. The day count for futures contracts is actual days over a …….. day year.

10.3 Forward Rate Agreement

A Forward Rate Agreement (FRA) is a widely used financial derivative by various participants in the money and securities market to manage interest rate risk. In recent years, FRA has become a very useful hedging instrument to manage interest rate risk in a deregulated interest rate environment. A FRA is a forward contract between two parties to exchange interest payments for a notional principal amount for a specified future period. On the settlement date, the parties to a FRA agree to exchange interest payments. Banks, all-India financial institutions, primary dealers are allowed to undertake FRA and can also offer these products to corporate and mutual funds for hedging their balance sheet exposures. To undertake FRA, no specific permission is required from the RBI.

The various elements of a FRA are:

1. Notional principal
2. Fixed rate
3. Floating rate
4. Tenor
5. Payment dates and Connections
6. Documentation

The prudential and accounting norms which have been issued by the RBI with reference to FRA are as mentioned below:

1. A sound internal control system should be set up by the participants that should provide for a clear functional separation of front and back offices relating to hedging and market making activities.
2. Banks, Financial institutions, primary dealers and corporates are required to maintain capital for FRA transaction, according to the guidelines issued by the RBI.
3. Transactions relating to hedging and market making activities need to be recorded separately. For valuation purposes, the respective boards should lay down an appropriate policy to reflect the fair value of the outstanding contracts.
4. The FRA position undertaken by banks, financial institutions and primary dealers should be within the prudential limits, as identified in each maturity bucket and should also have the approval of their respective boards.

Self Assessment

Fill in the blanks:

10. A FRA is a forward contract between two parties to exchange interest payments for a ……. amount for a specified future period.
11. On the settlement date, the parties to a FRA agree to exchange ……. payments.

10.4 Duration

Notes

The term duration has a special meaning in the context of bonds. It is a measurement of how long, in years, it takes for an investment in a bond to be repaid by its internal cash flows. It is also an important measure because bonds with higher durations carry more price risk and have higher price volatility than bonds with lower durations. In other words, for the same change in yield, the price of a bond with higher duration changes by a larger amount than that of a bond with smaller duration.

Fredrick Macaulay, in 1938, first propounded the idea of duration, and we call his measure Macaulay's duration.

Did u know? **What is the meaning of Macaulay duration?**

Macaulay duration in years is the weighted average of time periods at which the cash flows (coupon amounts as well as principal) are received.

So, for a two-year bond with 4 coupon payments every six months, the Macaulay duration is the weighted average of 0.5, 1, 1.5 and 2 years. The weight assigned to any time period is the present value of the cash flow at that time period as a share of present value of all cash flows put together; the discount factor for arriving at the present value being the yield of the bond. In very simple terms, Macaulay Duration signifies the time it takes for a bond to pay itself out to the investor. The other measure of Duration is Modified Duration.

Did u know? **What is Modified duration?**

Modified Duration is a measure of the sensitivity of a bond's value to the absolute change in its yield.

More specifically, it is the percentage change in value of a bond for a 100 basis point change in yield. Modified duration is, therefore, a direct measure of the interest rate sensitivity of a bond. The higher the modified duration of a bond, greater the percentage change in price for a given change in yield. Modified Duration of a bond is estimated as follows:

$$\frac{\text{Percentage Change in Bond Price}}{\text{Change n Yield in Basis Points}} \times 100$$

Note that 1 basis point is equal to one -hundredth of 1 percent. Thus, 25 basis points are equal to 0.25 percent and 50 basis points are equal to 0.5 percent and so on.

Example: Suppose the yield of a bond changes from 5 % to 4.5 % and as a result, the bond price rises from 100 to 105. Thus, with 50 basis points decline in yield, the price of the bond rises by 5 percent. The Duration of the bond would therefore be 10, using the formula given above.

Self Assessment

Fill in the blanks:

12. …… duration in years is the weighted average of time periods at which the cash flows (coupon amounts as well as principal) are received.
13. …….Duration is a measure of the sensitivity of a bond's value to the absolute change in its yield.

Notes

10.5 Convexity

The duration measure can be supplemented with an additional measure to capture the curvature or convexity of a bond portfolio. For all option free bonds, a standard result is that as yield increases (decreases), duration decreases (increases). When yields decrease, the estimated price change will be less than the actual price change, thereby underestimating the actual price. On the other hand, when yields increase, the estimated price change will be greater than the actual price change, resulting in an underestimate of the actual price. For small changes in yield, the duration does a good job in estimating the actual price. The accuracy of the approximation depends on the convexity of the price-yield relationship for the bond. The second derivative of the price function is used as a proxy measure to correct for the convexity of the price-yield relationship. The second derivative divided by price is a measure of the percentage change in the price of the bond due to convexity and is referred to as the convexity measure. The Fisher-Weil version of convexity is,

$$\text{Convexity} = \frac{\sum_{i=n}^{n} CF_i \times t_i^2 \times v^{t_i}}{P}$$

Task During the settlement month on a particular day, futures settlement price is ₹ 101.3. For the deliverable bond and conversion factor is 0.854 and the accrued interest is ₹ 3.33. What is the invoice price?

Self Assessment

Fill in the blanks:

14. The accuracy of the approximation depends on the convexity of the ……relationship for the bond.

15. The …….. derivative of the price function is used as a proxy measure to correct for the convexity of the price-yield relationship.

10.6 Summary

- According to RBI guidelines, interest rates derivatives have been launched in India on National Stock Exchange (NSE) and Bombay Stock Exchange (BSE) on June 24, 2003.
- Interest-rate futures are contracts of the future delivery of interest-bearing securities (debt).
- Interest-rate futures allow speculators and hedgers to buy and sell these contracts through the locking prices of these securities for future delivery.
- Eurodollar futures work the same as T-bill contracts except the rate is based on LIBOR.
- A Forward Rate Agreement (FRA) is a widely used financial derivative by various participants in the money and securities market to manage interest rate risk.
- The term duration has a special meaning in the context of bonds. It is a measurement of how long, in years, it takes for an investment in a bond to be repaid by its internal cash flows.
- The duration measure can be supplemented with an additional measure to capture the curvature or convexity of a bond portfolio.

10.7 Keywords

Notes

Duration: Duration is a measurement of how long, in years, it takes for an investment in a bond to be repaid by its internal cash flows.

Interest-rate Futures: Interest-rate futures are contracts of the future delivery of interest-bearing securities (debt).

Invoice Price: Invoice price is the price paid out by the buyer of the futures to the seller of futures for taking physical delivery of the bond.

Modified Duration: Modified Duration is a measure of the sensitivity of a bond's value to the absolute change in its yield.

T-bills: T-bills are money market instruments to finance the short term requirements of the Government of India.

10.8 Review Questions

1. Discuss the evolution of interest rate derivatives in India.
2. Eurodollar futures work the same as T-bill contracts except the rate is based on LIBOR. Discuss.
3. A FRA is a forward contract between two parties to exchange interest payments for a notional principal amount for a specified future period. Discuss.
4. Illustrate the computation of duration with a suitable example.
5. Discuss the meaning and role of convexity.
6. T-bill Futures prices are quoted relative to an index value. Explain with suitable example.
7. Illustrate the concept of Euro-dollar derivatives with suitable example.
8. State the difference between Macaulay duration and Modified duration.
9. What is the duration of a bond for which 4.92% change in the bond price corresponds to 1.20% change in the bond's yield?
10. What is the duration of a bond for which 5.50% change in the bond price corresponds to 1.10% change in the bond's yield.

Answers: Self Assessment

1. Interest-rate
2. International Monetary Market (IMM)
3. index
4. quoted
5. higher
6. LIBOR
7. LIBOR
8. cash
9. 360
10. notional principal
11. interest
12. Macaulay
13. Modified
14. price-yield
15. second

Notes

10.9 Further Readings

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Company Limited, New Delhi, 1997.

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"Derivatives Market" NCFM Module, NSE India Publications

FRB, "Overview of Derivative Disclosures by Major US Banks," Federal Reserve

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Unit 11: Credit Derivatives

Notes

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Objectives

After studying this unit, you will be able to:

- Explain the types of credit derivatives
- Describe colleteralised debt obligations
- Discuss credit derivatives in Indian scenario
- State the strategies for credit risk mitigation
- Describe weather and energy derivatives

Notes

Introduction

Credit derivatives is an instrument that emerged around 1993-94, is a part of the market for financial derivatives. Since credit derivatives are presently not traded on any of the organised exchanges, they are a part of the over-the-counter (OTC) derivatives market.

Though still a relatively small part of the huge market for OTC derivatives, credit derivatives are growing faster than any other OTC derivative, the reasons for which are not difficult to understand.

Credit derivatives are derivative contracts that seek to transfer defined credit risks in a credit product or bunch of credit products to the counterparty to the derivative contract. The counterparty to the derivative contract could either be a market participant, or could be the capital market through the process of securitisation. The credit product might either be exposure inherent in a credit asset such as a loan, or might be generic credit risk such as bankruptcy risk of an entity. As the risks, and rewards commensurate with the risks, are transferred to the counterparty, the counterparty assumes the position of a *virtual* or *synthetic* holder of the credit asset. The counterparty to a credit derivative product that acquires exposure to the risk synthetically acquires exposure to the entity whose risk is being traded by the credit derivative product. Thus, the credit derivative trade allows people to trade in the generic credit risk of the entity, without having to trade in a credit asset such as a loan or a bond.

Given the fact that the synthetic market does not have several of the limitations or constraints of the market for cash bonds or loans, credit derivatives have become an alternative parallel trading instrument that is linked to the value of a firm – similar to equities and bonds. Coupled with the device of securitisation, credit derivatives have been rendered into investment products. Thus, investors may invest in credit linked notes and gain credit exposure to an entity, or a bunch of entities. Securitisation linked with credit derivatives has led to the commoditization of credit risk.

11.1 Types of Credit Derivatives

The easiest and the most traditional form of a credit derivative is a guarantee. Financial guarantees have existed for thousands of years. However, the present day concept of credit derivatives has traveled much farther than a simple financial guarantee, and has obviously been found much more robust in affording protection than the traditional guarantees. The following is a quick introduction to the various types of credit derivatives.

11.1.1 Credit Default Swap

Credit default swap can literally be defined as an option to swap a credit asset for cash, should it default. A credit default swap is essentially an option, and option bought by the protection buyer, and written by the protection seller. The strike price of the option is the par value of the reference asset. Unlike a capital market option, the option under a credit default swap can be exercised only when a credit event takes place. Credit Default risk corresponds to the debtor's incapacity or refusal to meet his contractual financial undertakings towards his creditor, whether by payment of the interest or the principal of the loan contracted. In a credit default swap, if a credit event takes place, the protection buyer at his option may swap the reference asset or any other deliverable obligation of the reference obligor, either for cash equal to the par value of the reference asset, or get compensated to the extent of the difference between the par value and market value of the reference asset. Credit default swaps are the most important type of credit derivative in use in the market. Moody's Investors Service gives the following definition of default: 'Any failure or delay in paying the principal and/or the interest.' In this case,

creditors are likely to suffer a loss if they cannot recover the total amount due to them under the contract.

Notes

Did u know? **What is creditworthiness risk?**

Creditworthiness risk is defined as the risk that the perceived creditworthiness of the borrower or the counterparty might deteriorate, without default being a certainty. In practice, deteriorated creditworthiness in financial markets leads to an increase in the risk premium, also called credit spread of the borrower. Moreover, where this borrower has a credit rating from a rating agency, it might be downgraded. The risks of creditworthiness deterioration and default may be correlated insofar as creditworthiness deterioration may be the precursor of default.

11.1.2 Total Return Swaps

A Total Rate of Return Swap ("Total Return Swap" or "TR Swap") is also a bilateral financial contract designed to transfer credit risk between parties, but a TR Swap is importantly distinct from a Credit Swap in that it exchanges the total economic performance of a specified asset for another cash flow. That is, payments between the parties to a TR Swap are based upon changes in the market valuation of a specific credit instrument, irrespective of whether a Credit Event has occurred. As the name implies, a total return swap is a swap of the total return out of a credit asset swapped against a contracted prefixed return. The total return out of a credit asset is reflected by the actual stream of cash flows from the reference asset as also the actual appreciation/ depreciation in its price over time, and can be affected by various factors, some of which may be quite extraneous to the asset in question, such as interest rate movements. Nevertheless, the protection seller here guarantees a prefixed spread to the protection buyer, who in turn, agrees to pass on the actual collections and actual variations in prices on the credit asset to the protection seller.

So periodically, the protection buyer swaps (the actual return on a notional value of the reference asset), in lieu of (a certain spread on a reference rate, LIBOR + 60 bps). The swapping of principal flows is usually avoided as the interest will anyway compensate for any deviations in the principal flows.

11.1.3 Credit Linked Notes

Credit Linked notes (CLNs) are a securitized form of credit derivatives which converts a credit derivative into a funded form. Here, the protection buyer issues notes or bonds which implicitly carries a credit derivative. The buyer of the CLN sells protection and pre-funds the protection sold by way of subscribing to the CLN. Should there be a credit event payment due from the protection seller, the amounts due on the notes/bonds on account of credit events will be appropriated against the same and the net, if any, will be paid to the CLN holder. The CLNs carry a coupon which represents both the interest on the funding, as also the credit risk premium on protection sold. Obviously the maximum amount of protection that the CLN holder provides is the amount receivable on account of the CLN, that is, the interest and the principal.

11.1.4 Credit Spread Options

These are basically call or put options on an asset exercisable based on a certain spread. The call or put is an option with the holder, who is the protection buyer. Let us say a protection buyer

Notes

agrees with the protection buyer that should the spread of a particular bond exceed a particular spread over LIBOR (strike spread), then the protection buyer will have the option, as usual, of either a physical settlement of the reference obligation at the strike spread, or net settlement.

The option to put the asset can be said to be the option to call a pre-determined spread. In other words, the protection buyer intends to protect a particular spread over a base rate and indicates a negative view on the reference obligation. On the contrary, if the protection buyer holds a positive view on the reference obligation, he may enter into an option to call the asset, or put the spread. Credit spread options are not related to events of default as understandably, the movement in spreads can be related to various factors besides credit events.

11.1.5 Repackaged Notes

Repackaged notes are also known as a repack note. It is a structured finance instrument being a debt security in the form of an issued by a bankruptcy remote. A repack note is backed, that is funded, by the cash flows arising from an existing security (such as an asset-backed security). The cash flows from the existing security are channeled through a swap counterparty to change one or more of their characteristics, such as coupon or currency. Certain other features of the repack note may be structured differently to those of the underlying security including, among other things, its term to maturity, interest payment frequency or credit rating.

Self Assessment

Fill in the blanks:

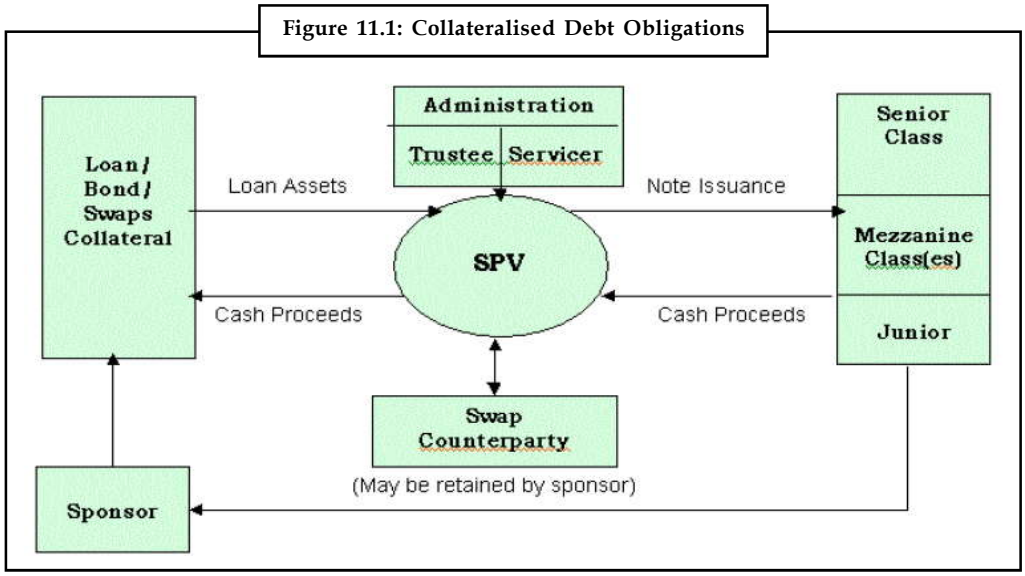
1. Credit derivatives is an instrument that emerged around ……, is a part of the market for financial derivatives.
2. Credit derivatives are derivative contracts that seek to transfer defined …….....….. in a credit product or bunch of credit products to the counterparty to the derivative contract.
3. A credit default swap is essentially an …….. .
4. Credit Linked Notes (CLNs) are a securitized form of credit derivatives which converts a credit derivative into a ……..
5. Repackaged notes are also known as a …….. note.

11.2 Collateralized Debt Obligations

CDOs are specialized repackaged offerings that typically involve a large portfolio of credits. Both involve issuance of debt by a SPV based on collateral of underlying credit(s). The essential difference between a repackaging programme and a CDO is that while a simple repackaging usually delivers the entire risk inherent in the underlying collateral (securities and derivatives) to the investor, a CDO involves a horizontal splitting of that risk and categorizing investors into senior class debt, mezzanine classes and a junior debt. CDO may be subject to local debt registration/regulatory requirements. The transactions under a CDO are shown in Figure 11.1.

Notes

Figure 11.1: Collateralised Debt Obligations



Source: www.rbi.org.in

Explanation of Related Terms

Sponsor: The entity that places the portfolio in the SPV.

Senior Debt: That portion of funding, which has the lowest risk weight, or the highest rated debt.

Mezzanine Debt: That portion of funding, which has debt in ascending order of risk weights, or in descending order of ratings.

Equity: The balance funding, which has the highest risk weight or the lowest rated debt.

CDOs may be further categorized, based on the structure with which funding is raised. The funding could be raised by issuing bonds, which are called Collateralised Bond Obligations (CBOs) or by raising loans, which are called Collateralised Loan Obligations (CLOs). Since the underlying credit is not a single asset but a portfolio of assets, the risk that it carries is a composite risk. To elucidate, some assets may have greater credit risk than others and there is a degree of correlation that each asset has with other assets in the portfolio. This means that the probability and timing of default/ downgrade could vary. Also, the cash flows from each of the assets are not uniform. This presents with a new risk, which is reinvestment. To put it differently, it is possible to issue debt with different risk weights, which means that it is possible to sell senior and mezzanine levels of debt. Also, there is an equity component, which may be sold off or retained by the sponsor.

Self Assessment

State the following are true or false:

6. CDOs are specialized repackaged offerings that typically involve a large portfolio of credits.
7. Senior debt is that portion of funding, which has debt in ascending order of risk weights, or in descending order of ratings.
8. Mazzine debt is that portion of funding, which has the lowest risk weight, or the highest rated debt.

Notes

11.3 The Indian Scenario

One of the more successful products introduced in India in the recent past has been the Interest Rate Derivative product. Currently, there has been an increase in the use of this product with a number of hedging benchmarks and the entry of a large number of market players. The success of this product is due to the fact that it has helped the market to transmit the interest rate risk from one participant to another. This transmission of the interest rate risk allows for the risk to be hedged away by the risk averse players and reside in players who are risk takers and/or those who are able to bear the risk.

Similarly, credit risk also requires an effective transmission mechanism. It is now imperative that a mechanism be developed that will allow for an efficient and cost effective transmission of credit risk amongst market participants. The current architecture of the financial market is either characterized by lumpiness in credit risk with the banks and Development Financial Institutions (DFIs) or lack of access to credit market by mutual funds, insurance companies, etc.

The major hedging mechanism now available with banks and DFIs to hedge credit risk is to sell the loan asset or the debentures it holds. Banks and Development Financial Institutions require a mechanism that would allow them to provide long term financing without taking the credit risk if they so desire. They could also like to assume credit risk in certain sectors/obligors.

Credit derivatives will give substantial benefits to all kinds of participants, including the financial system as a whole, such as:

1. Banks would stand to benefit from credit derivatives mainly due to two reasons – efficient utilisation of capital and flexibility in developing/managing a target risk portfolio. Currently, banks in India face two broad sets of issues on the credit leg of their asset – blockage of capital and loss of opportunities,
   (a) Banks generally retain assets - and hence, credit risk - till maturity. This results in a blocking up of bank's capital and impairs growth through churning of assets.
   (b) Due to exposure norms that restrict concentration of credit risk on their books, banks are forced to forego attractive opportunities on existing relationships.
2. Asset portfolio of banks is largely constrained by distribution system and sales relationships. New banks possess capital but have to overcome high costs in building an asset portfolio. Similarly, existing banks may want to diversify portfolio but may be unable to do so because of stickiness of client relationships and switching costs.

Self Assessment

Fill in the blanks:

9. One of the more successful products introduced in India in the recent past has been the ……..product.
10. Asset portfolio of banks is largely constrained by …….. system and sales relationships.

11.4 Credit Risk Mitigation

Credit risk management encompasses a hot of techniques, which help the banks in mitigating the adverse impacts of credit risk.

Notes

11.4.1 Credit Approving Authority

Commercial bank usually adopts either a committee or sequential process of credit approval. The former requires ultimate approval of a loan or credit facility by a committee that customarily consists of members of senior management and the heads of the credit departments. The sequential process involves an approval chain of individual loan officers with ascending levels of authority to sanction credit. Most of the Indian banks, especially in the public sector, have adopted the sequential system of loan sanction.

The proponents of the committee system believe that:

1. The committee has better decision making capabilities, by virtue of the combined experience of its members and
2. There is greater transparency in the decision making process.

Advocates of the sequential system, however, argue that:

1. Majority of members may follow preferences of senior members of the committee.
2. The system may not always help in speedy decision making.
3. It may be difficult to fix accountability to generate more responsible decision-making.
4. Committee may hence be more risk-prone.

Ultimately, the size of the bank, scope of its operations and most important – its credit culture will determine the type of credit approval process to be adopted by it. It may be mentioned that RBI in its recent guidelines has reiterated its, earlier instruction to the banks to consider establishment of the 'Committee' system of loan approval at the earliest.

11.4.2 Prudential Limits

In order to limit the magnitude of credit risk, banks may fix prudential limits on various aspects of credit. The banks may establish:

1. Benchmark financial ratios, such as current ratio, debt equity ratio, profitability ratios, debt service coverage ratio, etc. with flexibility for deviations (These will serve as minimum entry level qualifications for a borrower to be eligible for credit granting).
2. Single/group borrower limits,
3. Substantial exposure limits i.e. sum total of exposures assumed in respect of those single borrowers or group borrowers enjoying credit facilities in excess of a threshold limit,
4. Maximum exposure limits to industry, sector, geographic location etc.

The primary objective of fixing these limits is to avoid undue risk concentration, in any industry, trade, group, business house, etc.

11.4.3 Risk Rating

An important tool in monitoring the quality of individual credits as well as the total portfolio, is the use of an internal risk rating system. A well structured internal risk rating system is a good means of differentiating the degree of credit risk indifferent credit exposures of a bank. This will allow more accurate determination of the overall characteristics of the credit portfolio, concentrations, problem credits and the adequacy of loan loss provisions, etc.

Notes

Typically, an internal risk rating system categorises credits into various classes designed to take into account the gradations in risk. The risk rating system should be drawn in a structured manner, incorporating, inter-alia, financial analysis, projections and sensitivity, industrial and management risks. Banks may use the following parametres for developing a risk rating system suited for the bank:

Financial Aspects

1. ***Quantitative parametres***
   (a) Financial indicators - viz. net worth, sales turnover, profits, and ratios such as liquidity, profitability, gearing, turnover, etc.
   (b) Historical comparison of the indicators of the firm.
   (c) Inter-firm comparisons.
2. ***Operational parametres*** – conduct of account, turnover in the account, etc.

Qualitative Aspects

Qualitative analysis of financial risks that could impact the borrowing company's bottom-line such as:

1. Accounting policies
2. Auditor's qualifying remarks

Management Aspects

Evaluation of the management of the borrowing company, such as:

1. Structure & systems,
2. Its track record,
3. Honesty and integrity,
4. The promoters – their expertise, competence and commitment,
5. Market perception of the company and its promoters.

Industry Aspects

1. Industry and its trends
2. Trade cycle
3. Regulatory aspects such as Government policies and controls
4. Competition faced from peers and the market for the products
5. Technology levels of the unit vis-à-vis developments in the country and abroad
6. Input profile – raw materials and infrastructure and their pricing
7. Products/user characteristics, alternatives/substitutes available.

Once the risk rating systems are put in place, the ratings assigned to the borrowers can be used as critical inputs for setting pricing and non-price terms of loans as also present meaningful

Notes

information for review and management of loan portfolio. Within the rating framework, banks can proscribe certain level of standards or critical arameters, beyond which no proposals should be entertained. A separate rating framework may also be developed for large corporates, small borrowers, and traders, that exhibit varying nature and degree for risk.

Internal risk rating systems are thus pivotal to credit risk management. These ratings serve as important tools in monitoring and controlling credit risk. The rating assigned to individual borrowers or counterparties at the time the credit is granted must be reviewed on a periodic basis and individual credits should be assigned a new rating when conditions improve or deteriorate. The bank's risk rating system should be responsive to the indicators of potential or actual deterioration in credit quality. Advances with deteriorating ratings should be subject to continuously evaluating the credit portfolio and determining the necessary changes to be introduced in the credit strategy of the bank.

11.4.4 Risk Pricing

Risk-return pricing of loans is a fundamental tenet of risk management. Returns on loans must be measured by a degree of risk. In a deregulated environment, competition will force banks to accept more risk but the returns may not always be commensurate. If loans are not priced right, banks run the risk of either underpricing their loans or losing their business to other competitors in case of overpricing . In a risk-return setting, a borrower with a lower rating will be placed in a high risk category and hence priced higher and vice versa.

The systems to price credit risk should be scientific and take into account the expected probability of default. The pricing of loans is normally linked to risk rating or credit quality. Hence, risk rating, especially in the case of commercial loans, will be the anchor for pricing loans. However, this may be duly supplemented and supported by other factors, such as:

1. Market forces and competition
2. Portfolio/industry exposure
3. Value of collateral
4. Value of account, both short-term and long-term
5. Strategic reasons such as additional business potential or threat of loss of business, past conduct of account, etc.

11.4.5 Portfolio Management

Banks, in general focus on oversight of individual credits in managing their overall credit risk. While this focus is important, banks also need to have in place a system for overall composition and quality of the various credit portfolios.

A continuing source of credit related problems in banks in concentration within the credit portfolio. Concentration of risk can take many forms and can arise whenever a significant number of credits have similar risk characteristics. Concentration occurs when, among other things, a bank's portfolio contains a high level of direct or indirect credits to

1. A single counterparty
2. A group of connected counterparties
3. A particular industry
4. A geographic region

Notes

5. A foreign country or a group of countries whose economies are strongly interrelated
6. A type of credit facility or security with the same maturity.

Concentrations can stem from more complex or subtle linkages among credits in the portfolio. The concentration of risk does not only apply to the granting of loans but to the whole range of banking activities that, by their nature, involve counterparty risk. A high level of concentration in a few firms or industries or areas can expose the bank to avoidable risk in the area in which the credits are concentrated.

Portfolio management balances and contains overall portfolio risk by anticipating, constantly assessing and controlling exposure to each of the areas listed above. Portfolio management is particularly relevant as banks diversify their operations. It is closely linked with a bank's strategic planning process. Banks should, therefore, establish acceptable risk exposure limits based on the expected returns in its various business activities.

Risk concentration limits may vary among banks and regions. In many instances, avoiding or reducing concentrations may be extremely difficult. In addition, banks may want to capitalize on their expertise in a particular industry or economic sector. A bank may also decide that it is being adequately compensated for incurring certain concentrations of risk. Consequently, banks may not necessarily stop financing in such areas solely on the basis of concentration. In such cases, banks may adopt measures such as:

1. Pricing for additional risk
2. Increased holdings of capital to compensate for additional risks and
3. Making use of loan participation in order to reduce dependency on a particular sector of the economy or group of related borrowers.

Now possibilities to manage credit concentrations and other portfolio issues viz. loan sales, credit derivatives, securitisation, secondary loan markets etc., are still to evolve in the Indian context.

With regard to portfolio management, RBI, in its risk management guidelines. has recommended appointment of Portfolio Managers to watch the loan portfolio concentrations and exposure to counterparties. It has also advised banks to consider appointment of Relationship Managers to ensure that overall exposure to a single borrower is monitored, captured and controlled. The Relationship Managers may service high value loans so that a substantial share of the loan portfolio, which can alter the risk profile of the bank, would be under constant surveillance.

11.4.6 Loan Review Mechanism/Credit Review Function

Loan Review Mechanism (LRM) is an effective tool for constantly evaluating the quality of loan book and to bring about qualitative improvements in credit administration. Because individuals throughout the bank have the authority to grant credit, the bank should have an effective and efficient internal review and reporting system in order to manage effectively the bank's loan portfolio. Internal credit reviews conducted by individuals independent from the business function provide an important assessment of individual credits and the overall quality of the credit portfolio.

The main objectives of LRM as envisaged in the RBI document are to:

1. Assess adequacy of and adherence to loan policies and procedures, and to monitor compliance with relevant laws and regulation;
2. Provide top management with information on credit administration, including credit sanction process, risk evaluation and post-sanction follow-up;

Notes

3. Identify problem loans which develop credit weaknesses and initiate timely corrective action;
4. Evaluate portfolio quality and isolate problem areas; and
5. Provide information for determining adequacy of loan provision.

One main reason for establishing a systematic credit review process is to identify problems at the incipient stage when there may be core options available with the bank for improving the health of loan accounts at an early stage or initiating any other action, at the earliest.

Effective programmes for management of problem loans (workouts) are critical to managing risk in the portfolio. The workout division or sick problem accounts Division of the bank should be segregate from the credit administration division. It can help develop an effective strategy to rehabilitate a troubled unit or to increase the amount of repayment. An experienced workout section can also provide valuable input to any credit restructuring organised by the Credit Administration division. Presently the Indian public sector banks have "Industrial Rehabilitation Division", "Protested Division" and "Recovery Teams" to handle such functions.

Caselet

Credit Derivatives for Banks only to manage Risks: Panel

Banks will be initially permitted to use credit derivatives only for the purpose of managing their credit risk, according to the recommendations made by the RBI working group on Credit Derivatives.

Credit derivatives are over-the-counter financial contracts, usually defined as `off-balance sheet financial instruments that permit one party to transfer credit risk of a reference asset, which it owns, to another party without actually selling the asset.'

It, therefore, `unbundles' credit risk from the credit instrument and trades it separately.

According to the recommendations of the working group, banks may use credit derivatives for buying protection on loans and investments for reduction of credit risk, selling protection for the purpose of diversifying their credit risk and reducing credit concentrations and taking exposure in high quality assets.

Market making activities by banks in credit derivatives are not envisaged for the present.

For the present, banks will not be permitted to take long or short credit derivative positions with a trading intent. It means that banks may hold the derivatives in their banking books and not in the trading books except in case of Credit-Linked Notes, which can be held as investments in the trading book if the bank so desires.

To start with, RBI proposes to restrict banks to use simple credit derivative structures like credit default swaps and credit-linked notes described in paragraph 2.2 (a) (i), (ii) and (iii) only, involving single reference entities, in the initial phase. The credit default options will be treated as credit default swaps for regulatory purposes. RBI intends to develop the credit derivatives as a domestic product for the domestic loan and investments market, initially.

As under the present exchange control regulations, there are certain restrictions on non-residents to acquire, hold and dispose of immovable property in India, non-resident entities cannot be parties to credit derivative transactions in the domestic market for the present.

Contd...

Notes

The underlying assets on which credit derivatives can be written could be either the rupee-denominated assets or foreign currency-denominated assets originated by domestic entities and having resident entities as the obligors. In case of foreign currency assets, the premiums and the credit event payments can be denominated in foreign currency.

In such cases, the participants in the transactions can only be such banks and financial institutions who are authorised to deal in foreign exchange.

The credit derivative should conform to the following minimum criteria, i.e., it should be direct, explicit, irrevocable and unconditional.

The credit protection must represent a direct claim on the protection provider and must be linked to specific exposures, so that the extent of the cover is clearly defined and incontrovertible.

Other than a protection purchaser's non-payment of money due in respect of the credit protection contract, there must be no clause in the contract that would allow the protection provider unilaterally to cancel the credit cover.

There should be no clause in the protection contract that could prevent the protection provider from being obliged to pay out in a timely manner in the event that the original obligor fails to make the payments due.

Source: http://www.thehindubusinessline.in

Self Assessment

Fill in the blanks:

11. ……pricing of loans is a fundamental tenet of risk management.
12. ……is an effective tool for constantly evaluating the quality of loan book and to bring about qualitative improvements in credit administration.
13. The pricing of loans is normally linked to risk rating or …….. .

11.5 Weather and Energy Derivatives

Weather derivatives are financial instruments that can be used by organisations or individuals as part of a risk management strategy to reduce risk associated with adverse or unexpected weather conditions. The difference from other derivatives is that the underlying asset (rain/ temperature/snow) has no direct value to price the weather derivative. Farmers can use weather derivatives to hedge against poor harvests caused by drought or frost, theme parks may want to insure against rainy weekends during peak summer seasons, and gas and power companies may use Heating Degree Days (HDD) or Cooling Degree Days (CDD) contracts to smooth earnings.

Heating degree days are one of the most common types of weather derivative. Typical terms for an HDD contract would be like: for the November to March period, for each day where the temperature falls below 18 degrees Celsius keep a cumulative count. Depending upon whether the option is a put option or a call option, pay out a set amount per heating degree day that the actual count differs from the strike.

The first weather derivative deal was in July 1996 when Aquila Energy structured a dual-commodity hedge for Consolidated Edison Co. The transaction involved ConEd's purchase of electric power from Aquila for the month of August. The price of the power was agreed to, but a weather clause was imbedded into the contract. This clause stipulated that Aquila would pay

Notes

ConEd a rebate if August turned out to be cooler than expected. The measurement of this was referenced to Cooling Degree Days measured at New York City's Central Park weather station. If total CDDs were from 0 to 10% below the expected 320, the company received no discount to the power price, but if total CDDs were 11 to 20% below normal, ConEd would receive a $16,000 discount. Other discounted levels were worked in for even greater departures from normal.

After that humble beginning, weather derivatives slowly began trading over-the-counter in 1997. As the market for these products grew, the Chicago Mercantile Exchange introduced the first exchange-traded weather futures contracts (and corresponding options), in 1999. The CME currently trades weather derivative contracts for 18 U.S. cities, 9 European cities, and 2 cities in Japan. Most of these contracts track cooling degree days or heating degree days, but recent additions track frost days in the Netherlands and monthly/seasonal snowfall in Boston and New York.

Task Make an analysis on credit derivatives trading in NSE for the year 2009-10.

Self Assessment

Fill in the blanks:

14. ……..are one of the most common types of weather derivative.

15. The first weather derivative deal was in July ……..when Aquila Energy structured a dual-commodity hedge for Consolidated Edison Co.

11.6 Summary

- Credit derivatives, an instrument that emerged around 1993-94, is a part of the market for financial derivatives.
- Since credit derivatives are presently not traded on any of the organised exchanges, they are a part of the over-the-counter (OTC) derivatives market.
- Credit derivatives can be defined as arrangements that allow one party (protection buyer or originator) to transfer, for a premium, the defined credit risk, or all the credit risk, computed with reference to a notional value, of a reference asset or assets, which it may or may not own, to one or more other parties (the protection sellers).
- Credit risk may be defined overall as the risk of loss arising from nonpayment of installments due by a debtor to a creditor under a contract.
- Formally, credit derivatives are bilateral financial contracts that isolate specific aspects of credit risk from an underlying instrument and transfer that risk between two parties.
- A credit asset is the extension of credit in some form: normally a loan, accounts receivable, installment credit or financial lease contract.
- Like all financial innovations, credit derivatives meet a basic need for traders in the financial markets, which is to be capable of identifying credit risk, trading it easily via simple market instruments, and hedging it.
- Even today, we cannot yet argue that credit risk is, on the whole, "actively" managed. Indeed, even in the largest banks, credit risk management is often little more than a process of setting and adhering to notional exposure limits and pursuing limited opportunities for portfolio diversification.

Notes

- In recent years, stiff competition among lenders, a tendency by some banks to treat lending as a loss-leading cost of relationship development, and a benign credit cycle have combined to subject bank loan credit spreads to relentless downward pressure, both on an absolute basis and relative to other asset classes.

11.7 Keywords

Collateralized Debt Obligations: CDOs are specialized repackaged offerings that typically involve a large portfolio of credits.

Credit Derivatives: Credit derivatives are derivative contracts that seek to transfer defined credit risks in a credit product or bunch of credit products to the counterparty to the derivative contract.

Creditworthiness Risk: Creditworthiness risk is defined as the risk that the perceived creditworthiness of the borrower or the counterparty might deteriorate, without default being a certainty.

Mezzanine Debt: That portion of funding, which has debt in ascending order of risk weights, or in descending order of ratings.

Securitization: The process through which an issuer creates a financial instrument by combining other financial assets and then marketing different tiers of the repackaged instruments to investors.

Senior Debt: That portion of funding, which has the lowest risk weight, or the highest rated debt.

11.8 Review Questions

1. Credit derivatives are derivative contracts that seek to transfer defined credit risks in a credit product or bunch of credit products to the counterparty to the derivative contract. Discuss.
2. The easiest and the most traditional form of a credit derivative is a guarantee. What are the other types of credit derivatives?
3. Write a note on credit default swaps.
4. Discuss the functioning of CDOs with suitable examples.
5. Analyse the scope and growth of credit derivatives in India.
6. Make a strategy for credit risk mitigation in banks.
7. What is weather derivative? Give some examples of weather hedging.
8. Discuss the mechanics of Total Return Swaps.
9. Define creditworthiness risk.
10. State the difference between credit derivatives and financial derivatives.

Answers: Self Assessment

1. 1993-94
2. credit risks
3. option
4. funded form
5. repack
6. True
7. False
8. False

9. Interest Rate Derivative
10. distribution
11. Risk-return
12. Loan Review Mechanism (LRM)
13. credit quality
14. Heating degree days
15. 1996

Notes

11.9 Further Readings

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Company Limited, New Delhi, 1997.

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Unit 12: Risk Management with Derivatives I

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Objectives

After studying this unit, you will be able to:

- Describe hedging using Greeks (Delta-Gamma hedging)
- Explain hedging with futures
- Describe strategies of hedging
- State the benefits of speculation and arbitrage in futures

Introduction

The dictionary meaning of risk is the possibility of loss or injury; the degree or probability of such loss. In risk, the probable outcomes of all the possible events are listed. Once the events are listed subjectively, the derived probabilities can be assigned to the entire possible events. For example, the investor can analyse and find out the possible range of returns from his investments. He can assign some subjective probability to his returns, such as 50% of the time there is a likelihood of getting ₹ 2 per share as dividend and 50 % of the time the possible dividend may be ₹ 3 per share. Often risk is inter-changeably used with uncertainty. In uncertainty, the possible events and probabilities of their occurrence are not known. Hence, risk and uncertainty are different from each other.

12.1 Hedging using Greeks (Delta-Gamma Hedging)

Notes

The sensitivity analysis of option premium deals with the measurement of changes in option price due to the change in the underlying parameters that determine the option prices. These parameters include stock price, time period, interest rate and volatility. As the price of the underlying asset rises or falls, options are more or less likely to finish in-the-money and their values rise or fall accordingly. As volatility rises, the extreme outcomes are more likely to increase an option's value. As volatility falls or as expiration date approaches, the extreme outcomes are less likely to occur and the option value decreases.

There are five sensitivity measures. They are:

1. Delta
2. Gamma
3. Theta
4. Rho
5. Vega

12.1.1 Delta of an Option

Delta is a measure of the sensitivity the calculated option value has to small changes in the share price. The delta of an option tells you by how much the premium of the option would increase or decrease for a unit change in the price of the underlying. This can help the buyer of an option as to which call/put option should be bought.

Delta is positive for a bullish position (long call and short put) as the value of the position increases with rise in the price of the underlying. Delta is negative for a bearish position (short call and long put) as the value of the position decreases with rise in the price of the underlying.

Caution Delta varies from 0 to 1 for call options and from –1 to 0 for put options. Some people refer to delta as 0 to 100 numbers.

Symbolically, option delta is given as N (d_1).

Example: An option with delta of 0.4, the premium of the option would change by 40 paise for a Re 1 change in the price of the underlying. Delta is about 0.4 for near/at the money options. As the option becomes in the money, the value of delta increases. Conversely as the option becomes out of the money, the value of delta decreases.

12.1.2 Option Gamma

Gamma is a measure of the calculated delta's sensitivity to small changes in share price. The gamma of an option tells you how much the delta of an option would increase or decrease for a unit change in the price of the underlying.

If we were to explain in very simple terms: if delta is velocity, then gamma is acceleration. Delta tells you how much the premium would change; gamma changes delta and tells you how much the next premium change would be for a unit price change in the price of the underlying. Gamma is positive for long positions (long call and long put) and negative for short positions (short call and short put). Gamma does not matter much for options with long maturity. However

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for options with short maturity, gamma is high and the value of the options changes very fast with swings in the underlying prices.

Example: Assume the gamma of an option is 0.03 and its delta is 0.4. For a unit change in the price of the underlying, the delta of the option would change to 0.4 + 0.03 = 0.43. The new delta of the option at changed underlying price is 0.43; so the rate of change in the premium has increased.

$$\text{Gama} = \frac{d^2C}{dS^2} = \frac{e^{(-d^2/2)}}{S\sigma\sqrt{2\pi T}}$$

12.1.3 Option Vega

Vega measures the calculated option value's sensitivity to small changes in volatility. In other words, option Vega indicates how much the option premium would change for a unit change in annual volatility of the underlying. Vega is positive for a long position (long call and long put) and negative for a short position (short call and short put). Simply put, for the buyer it is advantageous if the volatility increases after he has bought the option. On the other hand, for the seller any increase in volatility is dangerous as the probability of his option getting in the money increases with any rise in volatility.

Example: Suppose the vega of an option is 0.6 and its premium is ₹ 15, when volatility of the underlying is 35%. As the volatility increases to 36%, the premium of the option would change upward to ₹ 15.6.

$$\text{Vega} = \frac{e^{\frac{S\sqrt{T}}{(d^2/2)}}}{\sqrt{2\pi}}$$

12.1.4 Rho and Phi

The rho may be defined as the rate of change in the value of option premium to the domestic interest.

Rho = Δ option premium/Δ domestic interest rate

Phi is defined as the change in option value (premium) to the change in foreign interest rate.

Phi = Δ option premium /Δ foreign interest rate

$$\text{Rho} = \frac{TE}{e^{rt}}\ N(d - \sigma\sqrt{T})$$

Self Assessment

Fill in the blanks:

1. As the price of the underlying asset rises or falls, options are more or less likely to finish ……. and their values rise or fall accordingly.
2. As …….. rises, the extreme outcomes are more likely to increase an option's value.
3. The delta of an option tells you by how much the ……. of the option would increase or decrease for a unit change in the price of the underlying.

Notes

4. ……..measures the calculated option value's sensitivity to small changes in volatility.

5. Gamma is a measure of the calculated …….to small changes in share price.

12.2 Hedging with Futures

Future contracts can be used to hedge a company's exposure to a price of a commodity. A position in the futures markets is taken to offset the effect of the price of the commodity on the rest of the company business. It is important to recognize that futures' hedging does not necessarily improve the overall financial outcome.

There are a number of reasons why hedging using futures contracts works less than perfectly in practice.

1. The asset whose price is to be hedged may not be exactly the same as the asset underlying the futures contract.
2. The hedger may be uncertain as to the exact date when the asset will be bought or sold.
3. The hedge may require the futures contracts to be closed out well before its expiration date.

Notes **Issues in Hedging Using Futures**

The three basic issues in deciding a suitable hedging strategy using futures contracts are as described below.

(a) When to use a long futures and when to use a short futures?

(b) Which futures contract to use?

(c) What is the appropriate optimal size of the futures position?

Self Assessment

Fill in the blanks:

6. A position in the futures markets is taken to offset the effect of the price of the ……on the rest of the company business.
7. The asset whose price is to be hedged may not be exactly the same as the asset underlying the ……..

12.3 Strategies of Hedging

Essentially, futures contracts try to predict what the value of an index or commodity will be at some date in the future. Speculators in the futures market can use different strategies to take advantage of rising and declining prices. The most common are known as "going long," and "going short", also referred to as Long Hedge and Short Hedge respectively.

1. ***Going Long – Buy Futures:*** When an investor goes long – that is, enters a contract by agreeing to buy and receive delivery of the underlying at a pre-determined price – it means that he or she is trying to get profit from an anticipated increase in future price. The pay-off profile of 'going long' is depicted in Figure 12.1.

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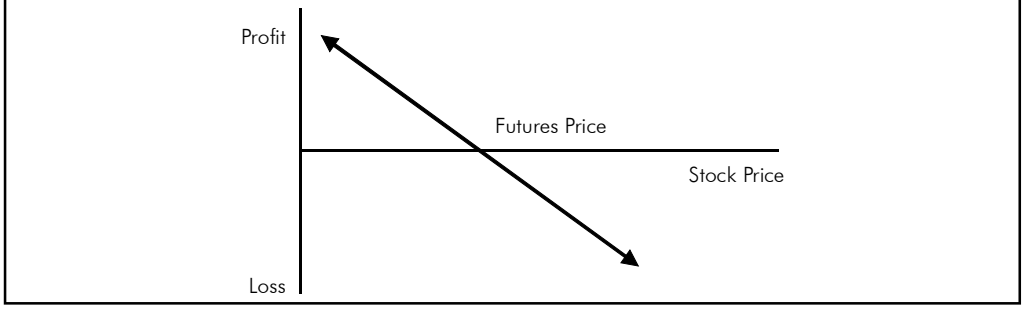
Example: Let's say that, with an initial margin of ₹ 2,000 in June, Ramesh, the speculator buys one September contract of gold at ₹ 350 per gram, for a total of 1,000 grams or ₹ 3,50,000. By buying in June, Ramesh is 'going long', with the expectation that the price of gold will rise by the time the contract expires in September. By August, the price of gold increases by ₹ 2 to ₹ 352 per grams and Ramesh decides to sell the contract in order to realize a profit. The 1,000 gram contract would now be worth ₹ 3,52,000 and the profit would be ₹ 2,000. Given the very high leverage (remember the initial margin was ₹ 2, 000), by going long, Ramesh made a 100% profit. Of course, the opposite would be true if the price of gold per gram had fallen by ₹ 2. The speculator would have realized a 100% loss. It's also important to remember that throughout the time the contract was held by Ramesh, the margin may have dropped below the maintenance margin level. He would have thus had to respond to several margin calls, resulting in an even bigger loss or smaller profit.

Figure 12.1: Pay-off profile of 'Going Long'



The salient features of going long strategy are:

(a) *Situation:* Bullish outlook for the market. Price of the underlying expected to increase.

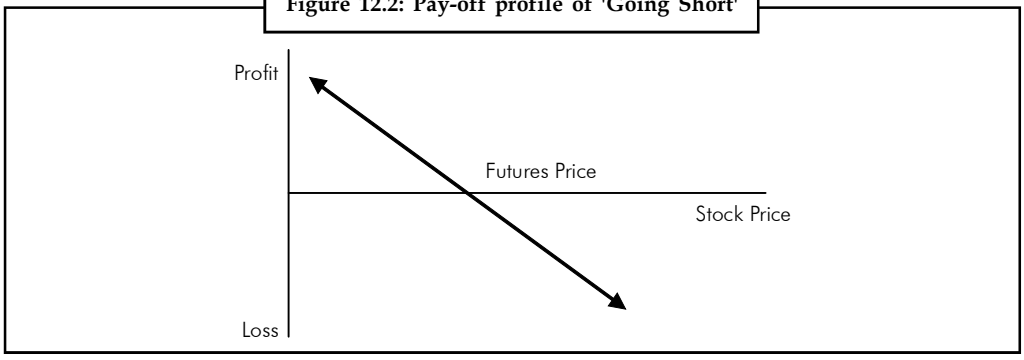
(b) *Risk:* Unlimited as the price of the underlying, and hence of futures, falls, until it reaches zero.

(c) *Profit:* Unlimited. Depends on the upward price movement.

(d) *Break-even:* The price of the underlying (on maturity) equal to the futures price contracted.

2. ***Going Short – Sell Futures:*** A speculator who goes short – that is, enters into a futures contract by agreeing to sell and deliver the underlying at a set price – is looking to make a profit from declining price levels. By selling high now, the contract can be repurchased in the future at a lower price, thus generating a profit for the speculator. The pay-off profile of 'going short' is depicted in Figure 12.2.

Figure 12.2: Pay-off profile of 'Going Short'



Notes

The salient features of going short strategy are:

(a) *Situation:* Bearish outlook for the market. Price of the underlying expected to fall.

(b) *Risk:* Unlimited as the price of the underlying, and hence of futures, increase.

(c) *Profit:* Unlimited. Depends on the downward price movement until the price of the underlying reaches zero.

(d) *Break-even:* The price of the underlying (on maturity) equal to the futures price contracted.

Example: Let's say that Sonali did some research and came to the conclusion that the price of oil was going to decline over the next six months. She could sell a contract today, in November, at the current higher price, and buy it back within the next six months after the price has declined. This strategy is called going short and is used when speculators take advantage of a declining market. Suppose that, with an initial margin deposit of ₹ 3,000, Sonali sold one May crude oil contract (one contract is equivalent to 1,000 barrels) at ₹ 25 per barrel, for a total value of ₹ 25,000. By March, the price of oil had reached ₹ 20 per barrel and Sonali felt it was time to cash in on her profits. As such, she bought back the contract which was valued at ₹ 20,000. By going short, Sonali made a profit of ₹ 5,000! But again, if Sonali's research had not been thorough, and she had made a different decision, her strategy could have ended in a big loss.

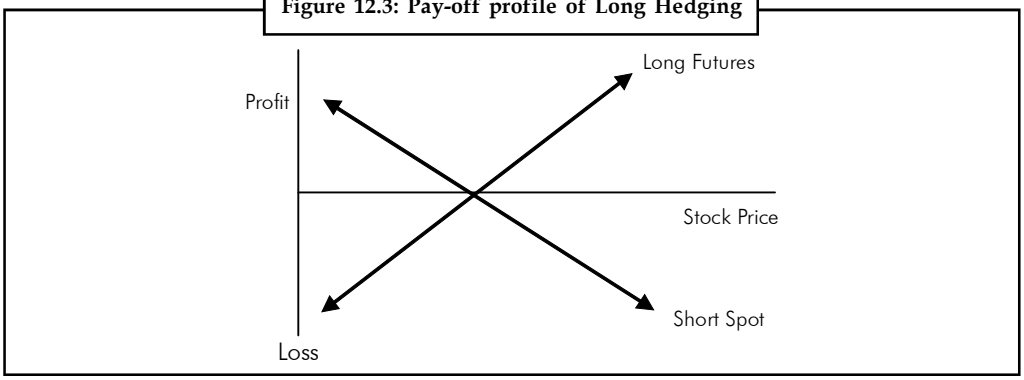
3. ***Long Hedging – Short Spot and Long Futures:*** Hedges where long position is taken in a futures contract are known as long hedges. A long hedge is appropriate when a company knows it will have to purchase a certain asset in the future and wants to lock in a price now. A company that knows that it is due to buy an asset in the future can hedge by taking a long futures position. This is known as long hedge. A long hedge is initiated when a futures contract is purchased in order to reduce the price variability of an anticipated future long position. Equivalently a long hedge locks in the interest rate of price of a cash security that will be purchased in the future subject to small adjustment due to the basis risk.

Did u know? **Why long hedge is known as anticipatory hedge?**

A long hedge is also known as an anticipatory hedge, because it is effectively a substitute position for a future cash transaction.

The pay-off profile of long hedging is depicted in Figure 12.3.

Figure 12.3: Pay-off profile of Long Hedging



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The salient features of Long Hedging strategy in futures are:

(a) *Situation:* Bullish outlook. Prices expected to rise.

(b) *Risk:* No upside risk. Strategy meant to protect against rising markets.

(c) *Profit:* No profits, no loss. In case of price increase, loss on the spot position offset by gain on futures position. In case of price fall, gain on the spot position offset by loss on futures position.

Example: Suppose that a tyre manufacturing company knows it will require 1,000 quintals of rubber on May 15. It is, say, January 15 today. The spot price of rubber is ₹ 5350 per quintal and the May futures price is ₹ 5210 per quintal. The company can hedge its position by taking a long position in 10 May futures contracts and closing its position on May 15. The strategy has the effect of locking in the price of the rubber that is required at close to ₹ 5,210 per quintal.

Suppose the price of rubber on May 15 proves to be ₹ 5,260 per quintal. Since May is the delivery month for the futures contract, this should be very close to the futures price. The company gains on the futures contracts = 1000 × (₹ 5,260 – 5,210) = ₹ 50,000. It pays 1,000 × ₹ 5,260 = ₹ 52,60,000 for the rubber. The total cost is therefore ₹ 52,60,000 – ₹ 50,000 = ₹ 52,10,000 or ₹ 5,210 per quintal.

For an alternative outcome, suppose the futures price is ₹ 5,050 per quintal on May 15. The company loses approximately: 1,000 (₹ 5,210 – ₹ 5,050)= ₹ 1,60,000 on the futures contract and pays ₹ 1,000 × ₹ 5,050 = ₹ 50,50,000 for the rubber. Again the total cost is ₹ 52,10,000 or ₹ 5,210 per quintal.

Let us take another example. A greeting card company anticipated a large inflow of funds at the end of January when retail outlets pay for the stock of cards sold during the holiday's season in December. The management intends to puts ₹ 1 crore of these funds into a long-term bond because of the high yields on these investments. The current date is November 1 significantly by the time the firm receives the funds on February 1. Thus, unless a long hedge is initiated now, the financial manager believes that the return on investment will be significantly lower (the cost of the bonds significantly higher) than is currently available via the futures market.

Caution The primary objective of the long hedge is to benefit from the high long term interest rates, even though funds are not currently available for investment.

The disadvantages of a long hedge are as follows:

(a) If the financial manager incorrectly forecasts the direction of future interest rates and a long hedge is initiated, then the firm still locks in the futures yield rather than fully participating in the higher returns available because of the higher interest rates.

(b) If rates increase instead, to fall then bond prices will fall causing an immediate cash outflow due to margin calls. This cash outflow will be offset only over the life of the bond via a higher yield on investment. Thus the net investment is the same but the timing of the accounting profits differs from the investment decision.

(c) If the futures market already anticipates a fall in interest rates similar to the decrease forecasted by financial manager, then the futures price reflects this lower rate, negating any return benefit from the long hedge. Specifically, one hedges only against unanticipated changes that the futures market has not yet forecasted. Hence, if the eventual cash price increases only to a level below the current futures rice, then a loss occurs on the long hedge. Consequently, an increase in return from a

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long hedge in comparison to the future cash market investment occurs only if the financial manager is a superior forecaster of future interest rates. However, long hedge does lock-in the currently available long-term futures rate, thereby reducing the risk of unanticipated changes in this rate.

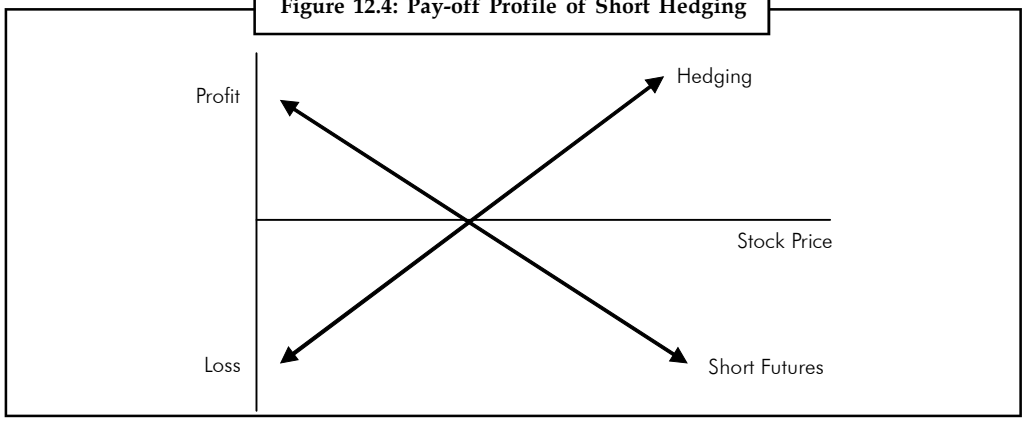
(d) Financial institutions are prohibited from employing long hedges, since their regulatory agencies believe that long hedges are similar to speculation, and these agencies do not want financial institutions to be tempted into affecting the institution's return with highly leveraged "speculative" futures positions.

Stock futures can be used as an effective risk-management tool. Take the case of an investor who holds the shares of a company and gets uncomfortable with market movements in the short run. He sees the value of his security falling from ` 450 to ` 390. In the absence of stock futures, he would either suffer the discomfort of a price fall or sell the security in anticipation of a market upheaval. With security futures, he can minimize his price risk. All he needs do is enter into an offsetting stock futures position; in this case, take on a short futures position. Assume that the spot price of the security he holds is ` 390. Two-month futures cost him ` 402. For this he pays an initial margin. Now if the price of the security falls any further, he will suffer losses on the security he holds. However, the losses he suffers on the security, will be offset by the profits he makes on his short futures position. Take for instance that the price of his security falls to ` 350. The fall in the price of the security will result in a fall in the price of futures.

Caution Futures will now trade at a price lower than the price at which he entered into a short futures position. Hence his short futures position will start making profits. The loss of ₹ 40 incurred on the security he holds, will be made up by the profits made on his short futures position.

4. ***Short Hedging – Long Spot and Short Futures:*** A short hedge is one that involves a short position in futures contracts. A short hedge is appropriate when a hedger already owns an asset and expects to sell it at some time in future. It can also be used when a hedger does not own an asset right now, but knows that the asset will be owned at some time in the future. A hedger who holds the commodity and is concerned about a decrease in its price might consider hedging it with a short position in futures. If the spot price and futures price move together, the hedge will reduce some of the risk. This is called short hedge because the hedger has a short position. A company that knows it is due to sell an asset at a particular time in the future can hedge by taking short futures position. This is known as a short hedge. The pay-off profile of long hedging is depicted in Figure 12.4.

Figure 12.4: Pay-off Profile of Short Hedging



Notes

The salient features of short hedging strategy in futures are:

(a) *Situation:* Bearish outlook. Prices expected to fall. Protection needed against risk of falling prices.

(b) *Risk:* No downside risk. Strategy meant to protect against falling markets.

(c) *Profit:* No profits, no loss. In case of price increase, loss on the spot position is offset by gain on futures position. In case of price increase, gain on the spot position is offset by loss on futures position.

Example: Consider for example, an exporter knows that he will receive U.S. dollars in two months. The exporter will realize a gain if the U.S. dollar increases in value relative to the rupee and loss if the dollar decreases in value to the rupee. A short futures position leads to a loss if dollar appreciates and a gain if it depreciates in value. It has the effect of offsetting the exporter's risk.

If the spot price decreases, the futures price also will decrease since the hedger is short the futures contract. The futures transaction produces a profit that at least partially offsets the loss on the spot position. This is called a short hedge. Another type of short hedge can be used in anticipation of the future sale of an asset. It is taken out in anticipation of a future transaction in the spot market. This type of hedge is known as an anticipatory hedge.

Self Assessment

State the following are true or false:

8. A short hedge is appropriate when a company knows it will have to purchase a certain asset in the future and wants to lock in a price now.

9. A short hedge is also known as an anticipatory hedge, because it is effectively a substitute position for a future cash transaction.

10. The primary objective of the long hedge is to benefit from the high long term interest rates, even though funds are not currently available for investment.

11. A hedger who holds the commodity and is concerned about a decrease in its price might consider hedging it with a short position in futures.

12. Futures will now trade at a price lower than the price at which he entered into a short futures position.

12.4 Speculation and Arbitrage

The following are the key benefits of speculation and arbitrage in future contracts:

12.4.1 Speculation using Future Contracts

Speculators can also benefit from trading in futures contracts. When the underlying asset is expected to be bullish (rising prices), the speculator opts for buying futures; whereas when the underlying asset is expected to be bearish (falling prices), the speculator opts for selling futures. Both of these are described below using suitable illustrations.

Case 1: Bullish Sentiment and Buying of Futures

Take the case of a speculator who has a view on the direction of the market. He would like to trade based on this view. He believes that a particular security that trades at ₹ 1,000 is undervalued

Notes

and expects its price to go up in the next two-three months. How can he trade based on this belief? In the absence of a deferral product, he would have to buy the security and hold on to it.

Assume he buys a 100 shares which cost him one lakh rupees. His hunch proves correct and two months later the security closes at ₹ 1,010. He makes a profit of ₹ 1,000 on an investment of ₹ 1,00,000 for a period of two months. This works out to an annual return of 6%.

Today, a speculator can take exactly the same position on the security by using futures contracts. Let us see how this works. The security trades at ₹ 1,000 and the two-month futures trades at 1006. Just for the sake of comparison, assume that the minimum contract value is 1,00,000. He buys 100 security futures for which he pays a margin of ₹ 20,000. Two months later, the security closes at 1,010. On the day of expiration, the futures price converges to the spot price and he makes a profit of ₹ 400 on an investment of ₹ 20,000. This works out to an annual return of 12%. Because of the leverage they provide, security futures form an attractive option for speculators.

Case 2: Bearish sentiment and Buying of Futures

Stock futures can be used by a speculator who believes that a particular security is over-valued and is likely to see a fall in price. How can he trade based on his opinion? In the absence of a deferral product, there wasn't much he could do to profit from his opinion. Today all he needs to do is sell stock futures.

Let us understand how this works. Simple arbitrage ensures that futures on an individual security move correspondingly with the underlying security, as long as there is sufficient liquidity in the market for the security. If the security price rises, so will the futures price. If the security price falls, so will the futures price.

Now take the case of the trader who expects to see a fall in the price of SBI. He sells one two-month contract of futures on SBI at ₹ 240. (each contact for 100 underlying shares). He pays a small margin on the same. Two months later, when the futures contract expires, SBI closes at 220. On the day of expiration, the spot and the futures price converge. He has made a clean profit of ₹ 20 per share. For the one contract that he bought, this works out to be ₹ 2,000.

12.4.2 Arbitrage using Futures

Arbitrage refers to riskless profit earned by taking positions in spot/futures markets. Following are two of the primary benefits that an arbitrageur can obtain using futures contracts.

1. ***Arbitrage: Overpriced futures: Buy spot, Sell futures:*** As we discussed earlier in pricing of futures, the cost-of-carry ensures that the futures price stay in tune with the spot price. Whenever the futures price deviates substantially from its fair value, arbitrage opportunities arise.

   If you notice that futures on a security that you have been observing seem overpriced, we would illustrate as to how to obtain riskless arbitrage profits.

Example: Say for instance, SBI trades at ₹ 1,000. One-month SBI futures trade at ₹ 1,025 and seem overpriced. As an arbitrageur, you can make riskless profit by entering into the following set of transactions:

1. On day one, borrow funds; buy the security on the cash/spot market at 1,000.
2. Simultaneously, sell the futures on the security at ` 1,025.
3. Take delivery of the security purchased and hold the security for a month.
4. On the futures expiration date, the spot and the futures price converge. Now unwind the position.

Notes

5. Say the security closes at ` 1015. Sell the security.
6. Futures position expires with profit of ` 10.
7. The result is a riskless profit of ` 15 on the spot position and ` 10 on the futures position.
8. Return the borrowed funds.

Did u know? **When does it make sense to enter into this arbitrage?**

If your cost of borrowing funds to buy the security is less than the arbitrage profit possible, it makes sense for you to arbitrage. This is termed as cash-and-carry arbitrage. Remember however, that exploiting an arbitrage opportunity involves trading on the spot and futures market. In the real world, one has to build in the transactions costs into the arbitrage strategy.

2. ***Arbitrage: Under priced futures: Buy futures, Sell spot:*** Whenever the futures price deviates substantially from its fair value, arbitrage opportunities arise. It could be the case that you notice the futures on a security you hold seem underpriced. How can you cash in on this opportunity to earn riskless profits? Say for instance, ABB trades at ₹ 1,000. One-month ABB futures trade at ₹ 965 and seem underpriced. As an arbitrageur, you can make riskless profit by entering into the following set of transactions.
    1. On day one, sell the security in the cash/spot market at ₹ 1,000.
    2. Make delivery of the security.
    3. Simultaneously, buy the futures on the security at ₹ 965.
    4. On the futures expiration date, the spot and the futures price converge. Now unwind the position.
    5. Say the security closes at ₹ 975. Buy back the security.
    6. The futures position expires with a profit of ₹ 10.
    7. The result is a riskless profit of ₹ 25 on the spot position and ₹ 10 on the futures position.

If the returns you get by investing in riskless instruments are lesser than the return from the arbitrage trades, it makes sense for you to arbitrage. This is termed as reverse-cash-and-carry arbitrage. It is this arbitrage activity that ensures that the spot and futures prices stay in line with the cost-of-carry. As we can see, exploiting arbitrage involves trading on the spot market. As more and more players in the market develop the knowledge and skills to do cash-and-carry and reverse cash-and-carry, we will see increased volumes and lower spreads in both the cash as well as the derivatives market.

Task Consider a call option on a stock with following parameters:

Strike Price	= ₹ 70
Risk-free rate of interest	= ₹ 6%
Time to expiration	= 90 days

Contd...

Notes

Standard deviation of returns on a stock	= 0.4
Spot price of the stock	= ₹ 60

Compute

(i) Price of the call option

(ii) Its delta

(iii) Gamma

Self Assessment

Fill in the blanks:

13. …….. refers to riskless profit earned by taking positions in spot/futures markets.
14. When the underlying asset is expected to be bullish (rising prices), the speculator opts for ……. futures.
15. When the underlying asset is expected to be bearish (falling prices), the speculator opts for …… futures.

12.5 Summary

- The sensitivity analysis of option premium deals with the measurement of changes in option price due to the change in the underlying parameters that determine the option prices.
- Delta is a measure of the sensitivity the calculated option value has to small changes in the share price.
- Delta is positive for a bullish position (long call and short put) as the value of the position increases with rise in the price of the underlying.
- Delta is negative for a bearish position (short call and long put) as the value of the position decreases with rise in the price of the underlying.
- Gamma is a measure of the calculated delta's sensitivity to small changes in share price.
- The gamma of an option tells you how much the delta of an option would increase or decrease for a unit change in the price of the underlying.
- Vega measures the calculated option value's sensitivity to small changes in volatility.
- The rho may be defined as the rate of change in the value of option premium to the domestic interest.
- A position in the futures markets is taken to offset the effect of the price of the commodity on the rest of the company business.
- The most common hedging strategies are known as "going long," and "going short", also referred to as Long Hedge and Short Hedge respectively.
- When the underlying asset is expected to be bullish (rising prices), the speculator opts for buying futures; whereas when the underlying asset is expected to be bearish (falling prices), the speculator opts for buying futures.
- Arbitrage refers to riskless profit earned by taking positions in spot/futures markets.

Notes

12.6 Keywords

Arbitrage: Arbitrage refers to riskless profit earned by taking positions in spot/futures markets.

Delta: Delta is a measure of the sensitivity the calculated option value has to small changes in the share price.

Gamma: Gamma is a measure of the calculated delta's sensitivity to small changes in share price.

Sensitivity analysis: The sensitivity analysis of option premium deals with the measurement of changes in option price due to the change in the underlying parameters that determine the option prices.

Vega: Vega measures the calculated option value's sensitivity to small changes in volatility.

12.7 Review Questions

1. List and explain the various option Greeks. Discuss their significance in relation to option valuation.
2. The delta of an option tells you by how much the premium of the option would increase or decrease for a unit change in the price of the underlying. How?
3. Define Theta. How is it calculated? Discuss the variations of theta of a European call option.
4. Identify the three main issues involved in hedging using futures contracts.
5. What do you mean by 'going short'? Take a numerical example to illustrate the usage of 'going short' in futures contracts for hedging purpose.
6. What is a short hedge? List its features and present its profit-loss pattern, by taking an example.
7. Explain in detail the basic steps involved in the hedging strategy using futures contracts.
8. Can futures contracts be used for speculation benefits? Support your answer with suitable numerical illustrations.
9. What do understand by 'arbitrage?' How can futures be useful for arbitrage gains?
10. Speculators can also benefit from trading in futures contracts. When the underlying asset is expected to be bullish (rising prices), the speculator opts for buying futures; whereas when the underlying asset is expected to be bearish (falling prices), the speculator opts for buying futures. Discuss.

Answers: Self Assessment

1. in-the-money
2. volatility
3. premium
4. Vega
5. delta's sensitivity
6. commodity
7. futures contract
8. False
9. False
10. True
11. True
12. True
13. Arbitrage
14. buying
15. selling

12.8 Further Readings

12.8 Further Readings

Notes

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Unit 13: Risk Management with Derivatives II

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Objectives

After studying this unit, you will be able to:

- Define index options and futures
- Describe VaR and historical simulation
- Discuss risk management structure and policies in India

Introduction

Traditionally used tools for assessing and optimizing market risk assume that the portfolio return is normally distributed. In this way, the two statistical measures mean and standard deviation can be used to balance return and risk.

However, often, as in the case of credit losses, the distributions of losses are far from normal; they are heavily skewed, with a long fat tail. In the case of credit losses, the distribution is a result of the fact that an obligor rarely defaults or changes credit rating, but when default occurs losses are generally substantial.

Caution Value-at-Risk (VaR) is by far the most popular and most accepted risk measure among financial institutions. VaR is an estimate of the maximum potential loss with a certain confidence level, which a dealer or an end-user of financial instruments would experience during a standardized period (e.g. day, week, or year). In other words, with a certain probability, losses will not exceed VaR.

13.1 Index Options and Futures

Notes

Index options and futures are discussed as below:

13.1.1 Index Options

Like equity options, index options offer the investor an opportunity to either capitalize on an expected market move or to protect holdings in the underlying instruments. The difference is that the underlying instruments are indexes. These indexes can reflect the characteristics of either the broad equity market as a whole or specific industry sectors within the marketplace. In the US, stock index options traded on SP100 and NYSE composite index are very popular. SP100 is an index of many individual stocks that pay different dividends throughout the year but the index itself exhibits discontinuous leakage as most stock dividends are paid out during certain months/days. These options have the index as the underlying. In India, they have a European style settlement. Eg. Nifty options, Mini Nifty options etc.

13.1.2 Index Futures

These futures contract without actual delivery were introduced only in 1982 and are the most recent major futures contract to emerge. In the United States, these contracts trade on several market indices like Standard and Poor's 500, a major market index, the NYSE Index and the Value Line Index. Numerous contracts on industry indices are now trading as well.

A stock index futures contract is a contract to buy or sell the face value of the underlying stock index where the face value is defined as being the value of index multiplied by the specified monetary amount.

This device makes it possible to equate the value of the stock index with that of a specific basket of shares with the following specifications.

1. The total value of shares must match the monetary value of the index.
2. The shares selected must correspond to the set of shares used to create the index.
3. The amount of each holding must be in proportion to the market capitalisation of the companies.

The profit or loss from a futures contract that is settled at delivery is the difference between the value of the index at delivery and the value when originally purchased or sold. It is important to emphasise that the delivery at settlement cannot be in the underlying stocks but must be in cash.

Caution The futures index at expiration is set equal to the cash index on that day.

Index futures are futures markets where the underlying commodity is a stock index, such as the Dow Jones, or the FTSE100. Stock indexes cannot be traded directly, so futures based upon stock indexes are the primary way of trading stock indexes. Index futures are essentially the same as all other futures markets (currency and commodity futures markets), and are traded in exactly the same way. Stock index futures are traded in terms of number of contracts. Each contract is to buy or sell a fixed value of the index. The value of the index is defined as the value of the index multiplied by the specified monetary amount. In the S&P 500 futures contract traded at the Chicago Mercantile Exchange (CME), the contract specification states:

$$1 \text{ Contract} = \$250 \times \text{Value of the S\&P 500}$$

Notes

If we assume that the S&P 500 is quoting at 1,000, the value of one contract will be equal to $250,000 (250 × 1,000). The monetary value $250 in this case is fixed by the exchange where the contract is traded.

Advantages of using Stock Index Futures

The various advantages of using stock index futures are:

1. ***Actual purchases are not involved:*** Stock index futures permit investment in the stock market without the trouble and expense involved in buying the shares themselves.
2. ***There is high leverage due to margin system:*** Operating under a margin system, stock index allows for full participation in market moves without significant commitment of capital. The margin levels may allow leverage of up to 30-40 times.
3. ***Lower transaction costs:*** The transaction costs are typically many times lower than those for share transactions.
4. ***Hedging of share portfolio:*** Portfolio managers for large share portfolios can hedge the value of their investment against bear moves without having to sell the shares themselves.

Thus, the changing nature of the future market has meant new types of market participants. Today, the largest and most prestigious financial institutions like banks, pension funds, insurance companies, mutual funds all around the world use futures and futures markets have become an integral part of how these institutions manage their risks and portfolio of assets.

Pricing of Index Future Contracts

Unlike an options contract, pricing of a futures contract is easy to understand. The price of the stock index futures is given as:

$$FB = IB + (Rf - D),$$

where

FB = Current futures price

IB = Current index price

Rf = Risk free rate of interest

D = Dividends

(Rf – D) above indicates the cost of carrying an index in future. Thus, if the annualised risk free rate of interest is 13% and the annualised dividend yield is 6%, a futures contract on the index for one year should sell at an annualised 7% (13 – 6) premium to index, independent of expectations for the market.

Self Assessment

Fill in the blanks:

1. Index options offer the investor an opportunity to either capitalize on an expected market move or to protect holdings in the …….. instruments.
2. In India, index options have a …… style settlement.
3. A stock index futures contract is a contract to buy or sell the ……..of the underlying stock index.

Notes

4. Index futures contract without actual delivery were introduced only in ……..and are the most recent major futures contract to emerge.

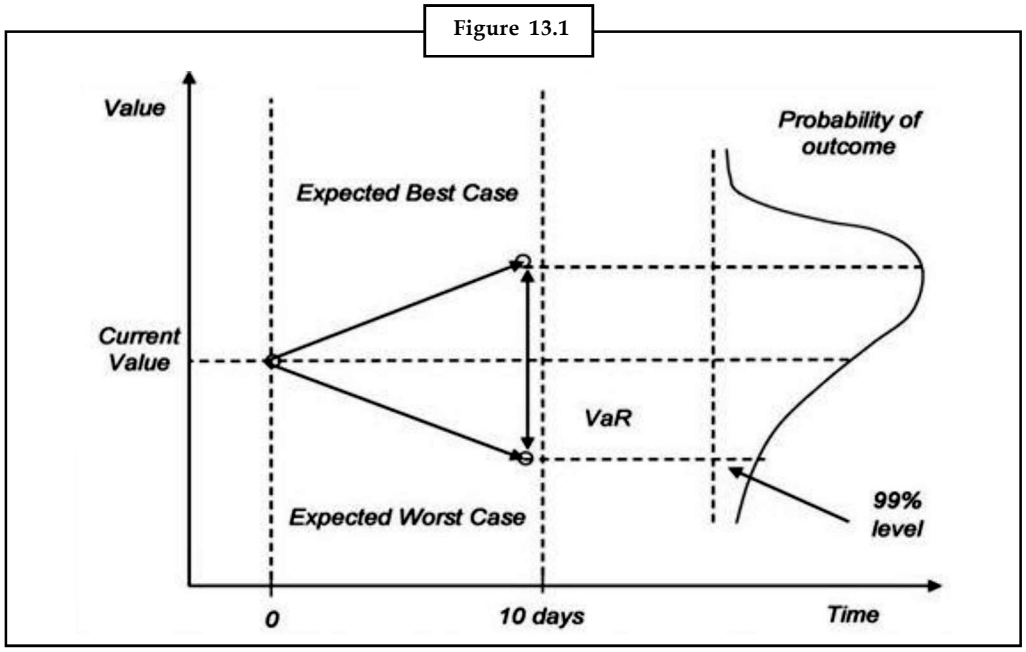
5. The value of the index is defined as the value of the index multiplied by the specified …….amount.

13.2 VaR

Value at Risk (VaR) is a market risk measurement approach that uses historical market trends and volatilities to estimate the likelihood that a given portfolio's losses will exceed a certain amount.

In one sense it is an extension (or even a simplification, depending on who you ask) of the probability of shortfall calculations model used in early 80 by pension fund managers to estimate the probability that they will eat into surplus as well as the probability of ruin models used by insurance companies for the last 200 years.

Figure 13.1

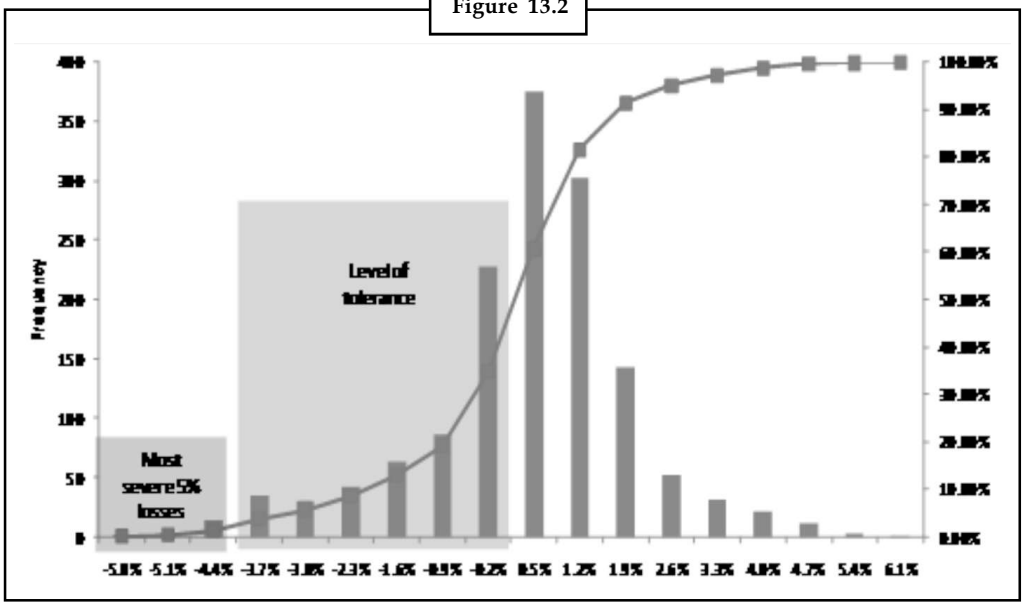


Risk management is concerned with extreme events or large deviations from what is expected. The most common tool used for measuring the above is variance, an average (of sorts) of all the deviations from the mean. Although it is the key tool used in calculating VaR, it is not the most appropriate. Higher order factors that measure symmetry or length & thickness of tails would be more accurate. VAR is a statistical methodology that helps risk managers to aggregate risk numbers across business and product lines in a meaningful way. This helps financial institutions to impose risk limits on market risk exposure, and it helps them to manage and optimize risk a cross their various portfolios – at a corporate level as opposed to a trading desk level.

VaR measures the largest loss likely to be suffered on a portfolio or a position over a holding period (usually 1 to 10 days) with a given probability (confidence level). As an example, assuming a 99% confidence level, a VaR of 1 million US dollars means that the there is only a one percent chance that losses will exceed the 1 million US dollar figure over the next ten days. It is also "fashionable" to refer to this loss as the one day in 100 days loss.

Notes

Figure 13.2



Self Assessment

Fill in the blanks:

6. Value at Risk (VaR) is a market risk measurement approach that uses …….. market trends.
7. ……. is a statistical methodology that helps risk managers to aggregate risk numbers across business and product lines in a meaningful way.
8. VaR measures the largest loss likely to be suffered on a portfolio or a position over a holding period (usually 1 to 10 days) with a given …….. (confidence level).

13.3 Historical Simulation

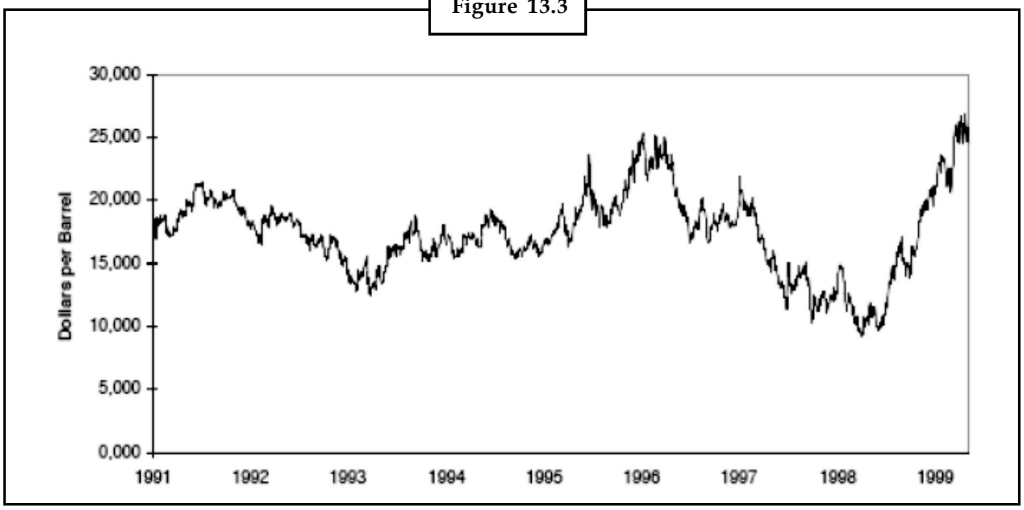
Historical simulations represent the simplest way of estimating the Value at Risk for many portfolios. In this approach, the VaR for a portfolio is estimated by creating a hypothetical time series of returns on that portfolio, obtained by running the portfolio through actual historical data and computing the changes that would have occurred in each period.

To run a historical simulation, we begin with time series data on each market risk factor, just as we would for the variance-covariance approach. However, we do not use the data to estimate variances and covariances looking forward, since the changes in the portfolio over time yield all the information you need to compute the Value at Risk. Cabedo and Moya provide a simple example of the application of historical simulation to measure the Value at Risk in oil prices. Using historical data from 1992 to 1998, they obtained the daily prices in Brent Crude Oil and graphed out the prices in Figure 13.3.

They separated the daily price changes into positive and negative numbers, and analyzed each group. With a 99% confidence interval, the positive VaR was defined as the price change in the 99th percentile of the positive price changes and the negative VaR as the price change at the 99th percentile of the negative price changes. For the period they studied, the daily Value at Risk at the 99th percentile was about 1% in both directions.

Notes

Figure 13.3



The implicit assumptions of the historical simulation approach are visible in this simple example.

1. The first is that the approach is agnostic when it comes to distributional assumptions, and the VaR is determined by the actual price movements. In other words, there are no underlying assumptions of normality driving the conclusion.
2. The second is that each day in the time series carries an equal weight when it comes to measuring the VaR, a potential problem if there is a trend in the variability – lower in the earlier periods and higher in the later periods, for instance.
3. The third is that the approach is based on the assumption of history repeating itself, with the period used providing a full and complete snapshot of the risks that the oil market is exposed to in other periods.

Self Assessment

Fill in the blanks:

9. ……represent the simplest way of estimating the Value at Risk for many portfolios.
10. Under historical simulation the VaR for a portfolio is estimated by creating a hypothetical ……of returns on that portfolio, obtained by running the portfolio through actual historical data and computing the changes that would have occurred in each period.

13.4 Risk Management Structure and Policies on India

Risk management is a discipline for dealing with the possibility that some future event will cause harm. It provides strategies, techniques, and an approach to recognizing and confronting any threat faced by an organization in fulfilling its mission. Risk management may be as uncomplicated as asking and answering three basic questions:

1. What can go wrong?
2. What will we do (both to prevent the harm from occurring and in the aftermath of an "incident")?
3. If something happens, how will we pay for it?

Notes

The management of risk data and information is the key to success of any risk management effort regardless of an organization's size or industry sector. Risk Management Information Systems/Services (RMIS) are used to support expert advice and cost-effective information management solutions around key processes such as:

1. Risk identification and assessment
2. Risk control
3. Risk financing

Typically, RMIS facilitates the consolidation of insurance related information, such as claims from multiple sources, property values, policy information, and exposure information, into one system. Often, Risk Management Information Services/Systems (RMIS) applies primarily to "casualty" claims/loss data systems. Such casualty coverage's include Auto Liability, Auto Physical Damage, Workers' Compensation, General Liability and Products Liability.

RMIS products are designed to provide their insured organizations and their brokers with basic policy and claim information via electronic access, and most recently, via the Internet. This information is essential for managing individual claims, identifying trends, marketing an insurance program, loss forecasting, actuarial studies and internal loss data communication within a client organization. They may also provide the tracking and management reporting capabilities to enable one to monitor and control overall cost of risk in an efficient and cost-effective manner.

In the context of the acronym RMIS, the word "risk" pertains to an insured or self-insured organization. This is important because prior to the advent of RMIS, insurance company loss information reporting typically organized loss data around insurance policy numbers. The historical focus on insurance policies detracted from a clear, coherent and consolidated picture of a single customer's loss experience. The advent of RMIS in the 1980s was a breakthrough step in the insurance industry's evolution toward persistent and focused understanding of their end-customer needs. Typically, the best solution for your organization depends on whether it is enhancing an existing RMIS system, ensuring the highest level of data quality, or designing and implementing a new system while maintaining a focus on state-of-the-art technology.

13.4.1 Risk Governance Structure

Risk governance can be defined as a system for directing and controlling the management of risk within and across an enterprise. Sound principles for risk governance warrant three key roles.

1. Businesses that originate, manage as per the laid down policy and procedures and monitor risk.
2. Risk management department that develops policies and procedures, manage risks such as through independent risk rating confirmations or completion for corporate exposures and conducts analytics with the objective of improving risk management through pricing, credit strategy, capital provided.
3. Internal audit that provides independent assurance.

In additional good risk governance practices comprise the following features:

1. Board is ultimately accountable for the risk management practice at a bank including the setting of risk appetite and senior management is responsible for implementing risk management practices.
2. Senior management understands all bank activities and the bank's risk management activities including rating systems and associated management reports.

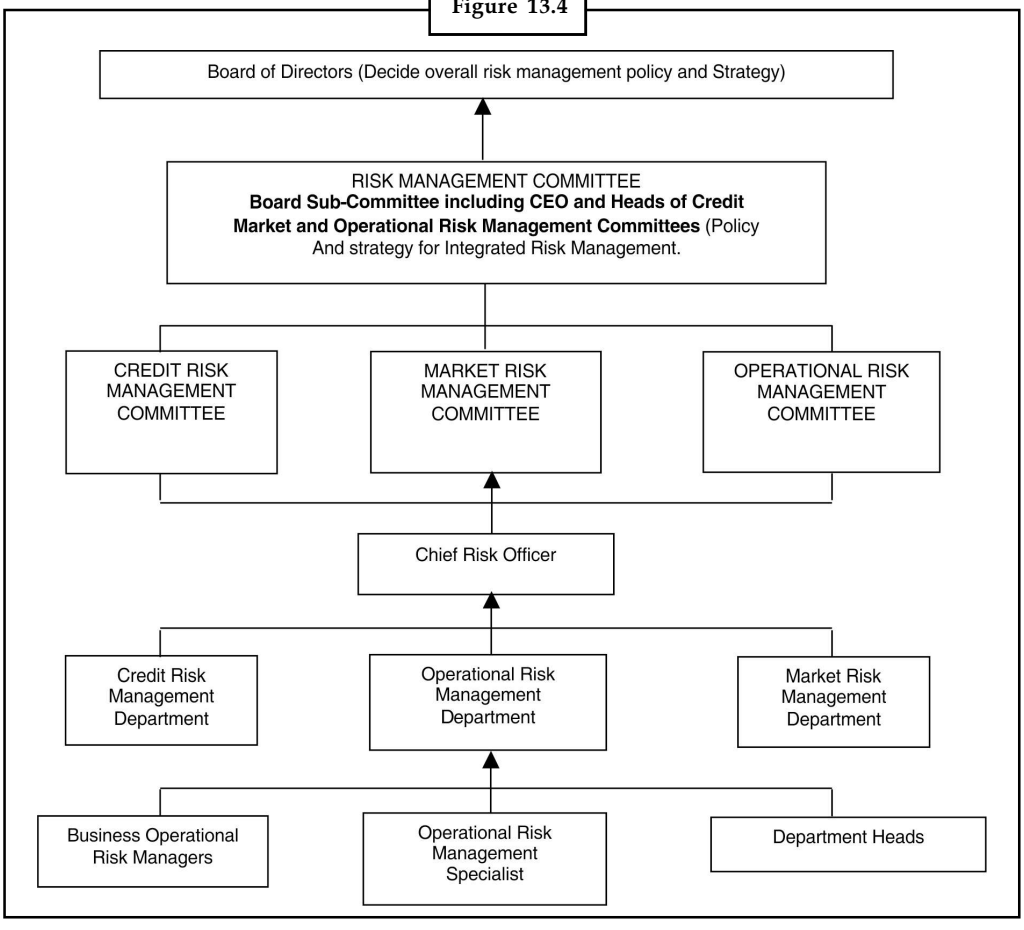
Notes

3. Senior management understands the nature and level of risk being taken by the bank and how it relates to adequate capital levels.
4. Authority, responsibility and ownership in respect of risk management should be clearly defined.
5. The risk management function should be functionally and otherwise (such as in terms of reporting and hence performance evaluation) independent of the business units originating exposures.
6. Risk reporting procedures should allow the board and senior management to monitor adherence to laid down risk management policy and procedures as well as assess the performance of risk estimates, particularly in the context of setting credit/business strategy.

Basel II guidelines mention the following in respect of risk governance:

1. Senior management is responsible for understanding the nature and level of risk being taken by the bank and how this risk relates to adequate capital levels.
2. Senior management is responsible for ensuring that the formality and sophistication of the risk management processes are appropriate in light of the risk profile and business plan.
3. Senior management and board should view capital planning (i.e. current and future capital requirements in relation to the bank's current and future business strategy) as a crucial element of strategy planning.

Figure 13.4



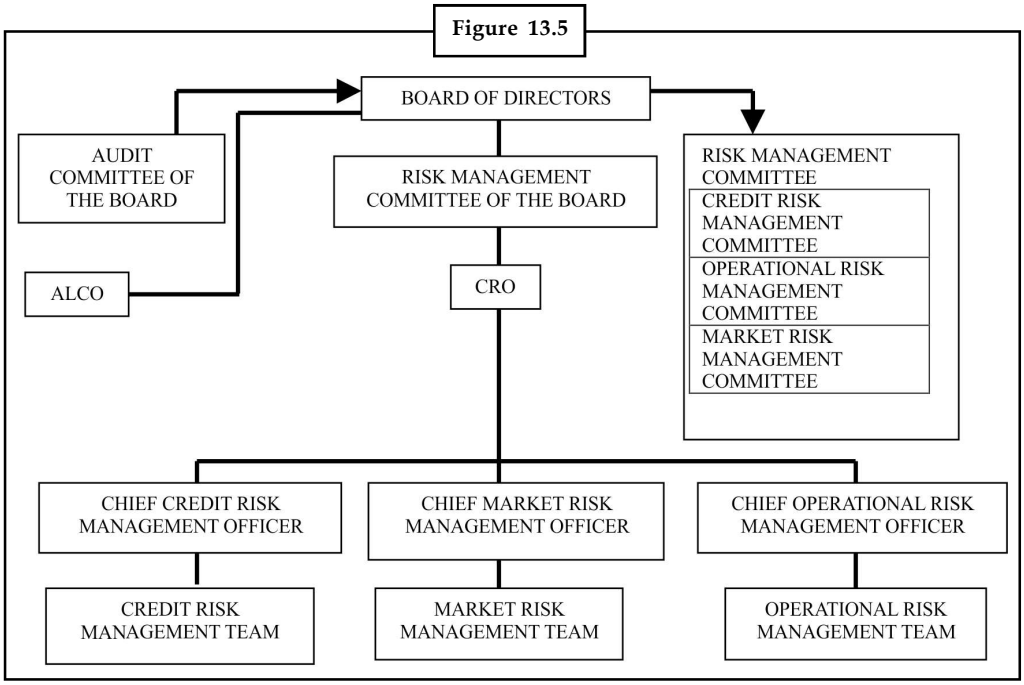
Notes

4. The board of directors has responsibility for setting the bank's tolerance for risks.
5. Board should ensure that the management establishes a framework for assessing the various risks, develops a system to relate risk to the bank's capital levels, and establishes a method for monitoring compliance with internal policies.
6. All material aspects of the rating and estimation process must be approved by the bank's board of directors or a designated committee thereof and senior management.
7. The above-mentioned parties must possess a good understanding of the rating system's design and operations and must approve material differences between established procedures and actual practice.
8. Senior management should ensure on an on-going basis that the rating system is operating properly.

In addition, the RBI guidance note says in respect of the risk governance structure that each type of risk function i.e. credit market and operational risk, be managed as an independent function and accordingly have corresponding risk management committees and risk management departments.

An illustration of a risk governance structure for a bank in keeping with the above guidelines is given below:

Figure 13.5



13.4.2 Risk Management Policy

As illustrated in the implementation roadmap, let us begin with the integrated risk management policy. This policy document should be developed to serve the following objectives:

1. Adhere to guidelines/policies concerning risk management specified by the Reserve Bank of India, Government of India and other binding regulatory authorities.
2. Adhere to Basel II guidelines in respect of risk management (RBI's version of Basel II adopted for implementation by Indian Banks or in absence of RBI's directions, a version which is not in conflict with extant binding regulations)

Notes

3. Adhere to International "good practices" in respect of risk management.
4. Communicate uniform and consistent definitions for measuring risk.
5. Assist in anticipating risk, thereby minimising cost and effort of reactive risk management and improving value to shareholders.
6. Address risk management in a manner, which allows optimisation of risk-return profile and hence contribute to improved risk-adjusted returns and optimal use of capital.
7. Improve the understanding and interrelationships between different risks and incorporate results in active risk management including providing economic capital for unexpected loss (just the way credit or market portfolio risk management considers interrelationships between constituents of the credit or market portfolio or attempts are made towards capturing the correlations between different operational risk types) allocating economic capital, setting risk-based limits based on risk/economic capital and controlling risk by monitoring compliance with these limits.
8. Provide an objective mechanism for evaluating risk against business objectives, strategies and risk tolerances.

If a bank does not take an integrated view of identifying, assessing, measuring and mitigating risks, it could be potentially exposed to risks such as making sub-optimal business strategies and decisions in risk-return terms or misreading the risks associated with its business strategies and arising from its existing business composition.

Self Assessment

Fill in the blanks:

11. ……is a discipline for dealing with the possibility that some future event will cause harm.
12. The management of risk ……is the key to success of any risk management effort regardless of an organization's size or industry sector.
13. ……. products are designed to provide their insured organizations and their brokers with basic policy and claim information via electronic access, and most recently, via the Internet.
14. ……..can be defined as a system for directing and controlling the management of risk within and across an enterprise.
15. ……understands all bank activities and the bank's risk management activities including rating systems and associated management reports.

13.5 Summary

- Like equity options, index options offer the investor an opportunity to either capitalize on an expected market move or to protect holdings in the underlying instruments.
- A stock index futures contract is a contract to buy or sell the face value of the underlying stock index where the face value is defined as being the value of index multiplied by the specified monetary amount.

Notes

- Value at Risk (VaR) is a market risk measurement approach that uses historical market trends and volatilities to estimate the likelihood that a given portfolio's losses will exceed a certain amount.
- VAR is a statistical methodology that helps risk managers to aggregate risk numbers across business and product lines in a meaningful way.
- Historical simulations represent the simplest way of estimating the Value at Risk for many portfolios.
- In this approach, the VaR for a portfolio is estimated by creating a hypothetical time series of returns on that portfolio, obtained by running the portfolio through actual historical data and computing the changes that would have occurred in each period.
- Variability in a security's total returns that is directly associated with overall movements in the general market or economy is called systematic (market) risk.
- The variability in a security's total returns not related to overall market variability is called the non-systematic (non-market) risk.

13.6 Keywords

Historical Simulations: Historical simulations represent the simplest way of estimating the Value at Risk for many portfolios.

Non-systematic (non-market) Risk: The variability in a security's total returns not related to overall market variability is called the non-systematic (non-market) risk.

Stock Index Futures: A stock index futures contract is a contract to buy or sell the face value of the underlying stock index where the face value is defined as being the value of index multiplied by the specified monetary amount.

Systematic (Market) Risk: Variability in a security's total returns that is directly associated with overall movements in the general market or economy is called systematic (market) risk.

Value at Risk (VaR): Value at Risk (VaR) is a market risk measurement approach that uses historical market trends and volatilities to estimate the likelihood that a given portfolio's losses will exceed a certain amount.

13.7 Review Questions

1. Define index options. How index options are different from equity options?
2. Discuss the evolution of index futures.
3. How will you price a index future.
4. "Value at Risk (VaR) is a market risk measurement approach that uses historical market trends and volatilities to estimate the likelihood that a given portfolio's losses will exceed a certain amount." Discuss.
5. Historical simulations represent the simplest way of estimating the Value at Risk for many portfolios. Discuss.
6. Distinguish between systematic and non-systematic risk.

Notes

Answers: Self Assessment

1.	Underlying	2.	European
3.	face value	4.	1982
5.	monetary	6.	historical
7.	VaR	8.	probability
9.	Historical simulations	10.	time series
11.	Risk management	12.	data and information
13.	RMIS	14.	Risk governance
15.	Senior management		

13.8 Further Readings

Books

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Avadhani, V.A. : *Securities Analysis and Portfolio Management*.

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Chance, Don M: *An Introduction to Derivatives*, Dryden Press, International Edition

Chew, Lilian: *Managing Derivative Risk*, John Wiley, New Jersey.

Company Limited, New Delhi, 1997.

Das, Satyajit: *Swap & Derivative Financing*, Probus.

"Derivatives Market" NCFM Module, NSE India Publications

FRB, "Overview of Derivative Disclosures by Major US Banks," Federal Reserve

Online links

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www.ncfm-india.com

http://www.nseindia.com/content/ncfm/ncfm_modules.htm

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Unit 14: Management of Derivatives Exposure

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Objectives

After studying this unit, you will be able to:

- State the nature of derivative trading
- Discus the setting of risk vision
- Describe the reasons for managing derivative risk
- Identify the types of risks in derivative trading
- Describe future and options trading system
- State the basis of trading

Introduction

A future trading is an important economic activity for the development of an economy. Being the first form of derivatives trading, it is a specialized field which requires professional expertise and adequate knowledge in this area. To be a successful market operator (as a speculator, arbitrageur, trader, investor or hedger) one must have adequate information and proper

Notes

understanding of the functioning of the futures markets. These are essential to make evaluation of derivatives products in terms of their prices and values so that the market participants can select them as per their objectives.

Futures are useful to the market participants only if futures prices reflect information about the prices of the underlying assets. That is why it is essential to understand how futures markets work and how the prices of futures contracts relate to the spot prices. In this section, we will examine the factors that affect futures prices in general. The futures prices of different assets like commodities, foreign exchanges and securities are influenced by various factors which are not common for all such assets. For example, futures prices of foreign currencies may be determined by different factors as different for determination of futures prices of food grains and vegetables. Further, we will discuss the terms Basis and Spreads used in trading in futures markets along with the different theories of futures pricing with their applications.

14.1 Nature of Derivative Trading

According to L C Gupta Committee Report on Derivatives, at the time of introduction of Derivatives Contracts on any underlying the value of the contract should be at least ₹ 2 lakhs. This value of ₹ 2 lakhs is divided by the market price of the individual stock to arrive at the initial 'market lot' for it. It may be mentioned here that the only exception to this rule is the **'*mini*' contract on the Sensex (both futures and Options)**. The market lots are reviewed twice a year and changes are made as per SEBI guidelines to re-align the market lots in cases where the value has increased/decreased drastically from the value at the time of introduction/previous review.

Quantity Freeze

The Relevant Authority may, from time to time, decide various parameters like price, quantity, value or such other parameters for the purpose of applying price, quantity or value freeze to any order placed by any trading member and such order shall be allowed to be processed for execution only after ascertaining from the trading member about the genuineness of the order and about adequacy of capital with the Clearing Agency. The Exchange or Clearing Agency shall, on best endeavor basis, proceed to ascertain and complete this process. The Exchange or Clearing Agency shall, however, in no way, be liable for any delay in completing the process for execution and attendant consequences, if any.

Charges

The maximum brokerage chargeable by a trading member in relation to trades affected in the contracts admitted to dealing on the F&O segment of NSE is fixed at 2.5%of the contract value in case of index futures and stock futures. In case of index options and stock options it is 2.5% of the notional value of the contract [(strike price + premium) × quantity)], exclusive of statutory levels. The transaction charges payable to the exchange by the trading member for the trades executed by him on the F&O segment are fixed at the rate of ₹ 2. per lack of turnover (0.002%) subject to a minimum of ₹ 1, 00,000 per year. However for the transactions in the options sub-segment the transaction charges are levied on the premium value at the rate of 0.05 %(each side) instead on this strike price as levied earlier. Further to this trading members have been advised to charge brokerage from their clients on the premium price (traded price) rather than strike price. The trading members contribute to investor protection fund of F&O segments at the rate of ₹ 10 per corer of turnover (0.0001%).

Notes

Self Assessment

State the following are true or false:

1. Futures are useful to the market participants only if futures prices reflect information about the prices of the underlying assets.
2. According to L C Gupta Committee Report on Derivatives, at the time of introduction of Derivatives Contracts on any underlying the value of the contract should be at least ₹ 1 lakhs.
3. The maximum brokerage chargeable by a trading member in relation to trades affected in the contracts admitted to dealing on the F&O segment of NSE is fixed at 1.5%of the contract value in case of index futures and stock futures.
4. The transaction charges payable to the exchange by the trading member for the trades executed by him on the F&O segment are fixed at the rate of ₹ 2. per lack of turnover (0.002%) subject to a minimum of ₹ 1, 00,000 per year.
5. The trading members contribute to investor protection fund of F&O segments at the rate of ₹ 10 per corer of turnover (0.0001%).

14.2 Setting of Risk Vision

Risk Vision is central to a financial institutions risk management function providing a consolidated view of risk exposures across multiple systems, incorporating both the trading and banking book. Risk Vision delivers:

1. Real-time trade approval to maximise market opportunity with pre-deal checks in 0.100 seconds
2. Accurate analysis of exposure across multiple scenarios in real-time
3. Ease & low cost integration due to open & flexible API
4. Single view of exposure across operations to support efficient & accurate capital allocation
5. Data Warehouse for aggregating data from multiple systems for a central store in a consistent format.

Risk Vision supports accurate pricing of numerous trade types, accurate exposure measurement and risk management measures like Value at Risk and Economic Capital. Risk Vision also has various decision support tools like 'what-if' analysis, scenario stress testing and sensitivity analysis.

Risk Vision uses state of the art risk estimation techniques like Monte Carlo, historical simulations and parametric approaches. The Risk Vision suite also includes a highly flexible and advanced 'Exposure and Limit Management' module which is fully integrated with the risk calculation engine. A uniquely flexible solution, Risk Vision is focused on supporting value management and regulatory compliance within a global financial institution through accurate, real time identification, measurement and control of exposure and capital.

Self Assessment

Fill in the blanks:

6. ……is central to a financial institutions risk management function providing a consolidated view of risk exposures across multiple systems, incorporating both the trading and banking book.

Notes

7. Risk Vision supports accurate ……. of numerous trade types, accurate exposure measurement and risk management measures like Value at Risk and Economic Capital.

14.3 Reasons for Managing Derivatives Risk

Objective of risk management is to lessen the effect of various kinds of threats to a certain level which is accepted by the society. The various kinds of threat include threats caused by the environment, threat caused by technology and also threat caused by the human beings. Various kinds of threat also include threats caused by different organizations and also by politics. Risk management can be accomplished by the skillful maneuvering of different kinds of resources available for risk management like person, staff and also the organization.

In an ideal model of risk management, first of all the risk which may do the highest loss or has got the highest probability to happen is first identified. The risks which have got more power to do harm or have the more chance to occur are handled first and after that the risks which have got less power to do harm and have got less chance to occur are handled.

This process of risk management may be very difficult in the actual field. A proper balance between the risks which have got more possibility to happen and the risks which have got less possibility to happen is very difficult to make. Handling of different types of risks among a basket of risks may become very difficult to the risk management group engaged in risk management but there is no other way to handle the risks properly.

Derivatives instruments have become increasingly important to the overall risk profile and profitability of banking organisations throughout the world. Broadly defined, a derivatives instrument is a financial contract whose value depends on the values of one or more underlying assets or indexes.

Did u know? **What is the scope of derivative products?**

Derivatives transactions include a wide assortment of financial contracts, including forwards, futures, swaps and options.

In addition, other traded instruments incorporate derivatives characteristics, such as those with imbedded options. While some derivatives instruments may have very complex structures, all of them can be divided into the basic building blocks of options, forward contracts or some combination thereof. The use of these basic building blocks in structuring derivatives instruments allows the transfer of various financial risks to parties who are more willing or better suited, to take or manage them.

Derivatives are used by banking organisations both as risk management tools and as a source of revenue. From a risk management perspective, they allow financial institutions and other participants to identify, isolate and manage separately the market risks in financial instruments and commodities. When used prudently, derivatives can offer managers efficient and effective methods for reducing certain risks through hedging. Derivatives may also be used to reduce financing costs and to increase the yield of certain assets. For a growing number of banking organisations, derivatives activities are becoming a direct source of revenue through "market-making" functions, position taking and risk arbitrage:

1. "Market-making" functions involve entering into derivatives transactions with customers and with other market-makers while maintaining a generally balanced portfolio with the expectation of earning fees generated by a bid/offer spread

2. Position-taking, on the other hand, represents efforts to profit by accepting the risk that stems from taking outright positions in anticipation of price movements

Notes

3. Arbitrageurs also attempt to take advantage of price movements, but focus their efforts on trying to profit from small discrepancies in price among similar instruments in different markets.

Self Assessment

Fill in the blanks:

8. A …… instrument is a financial contract whose value depends on the values of one or more underlying assets or indexes.
9. Derivatives are used by banking organisations both as risk management tools and as a source of ……... .
10. …….functions involve entering into derivatives transactions with customers and with other market-makers while maintaining a generally balanced portfolio with the expectation of earning fees generated by a bid/offer spread.

14.4 Types of Risks in Derivative Trading

Non-financial firms need to watch out for three main risks when using derivatives. The following are the key risks associated with the derivative trading:

1. Market risk
2. Basic risk
3. Credit or Counterparty risk

The given below is the explanation of key risks:

1. ***Market risk:*** The possibility that the value of the derivative will change. This is essentially no different from the risk involved in buying an equity or bond, or holding a currency–except that the market risk may be magnified many times if the derivative is leveraged; indeed some of the most famous disasters, including Procter & Gamble's losses, were associated with leveraged products. The other difference compared with equities, bonds and so on is that the value of an option changes increasingly quickly as it becomes more likely to be exercised.
2. ***Basic Risk:*** The derivative used may not be a perfect match with whatever it is intended to hedge so that when the value of the underlying asset falls, the value of the derivative may not rise by the expected amount.
3. ***Credit or "counterparty" risk:*** That the institution concerned will get into trouble and be unable to pay up. Bear in mind, however, that the credit risk on buying a derivative is less than that on, say, making a loan, as the cost of replacing a derivative contract is only the amount to which the market has moved against the buyer since the original contract was drawn up, whereas for the loan it is the entire amount lent. Derivatives bought from banks are exposed to bigger credit risks than those bought from exchanges. This is because exchanges guarantee contracts, and, unlike banks, ensure they can cover them by requiring traders to stump up cash ("post-margin") to cover potential losses in advance. However, this increases the possibility that a firm might face liquidity problems.

Notes

Notes **Exchanges the Mechanics' of Derivative Markets**

The important currency derivatives exchange is as listed below:

1. Singapore International Monetary Exchange (SIMEX)
2. London Financial and Futures Exchange (LIFFE)
3. Chicago Mercantile Exchange (CME)
4. New York Mercantile Exchange (NYMEX)
5. Chicago Board Option Exchange (CBOE)
6. Hong Kong Futures Exchange
7. Philadelphia Board of Trade
8. Tokyo International Financial Futures Exchange
9. Sydney Futures Exchange (SFE)

Self Assessment

State the following are true or false:

11. Basic risk is the possibility that the value of the derivative will change.
12. Derivatives bought from banks are exposed to bigger credit risks than those bought from exchanges.

14.5 Futures and Options Trading Systems

The futures & options trading system of NSE, called NEAT-F&O trading system, provides a fully automated screen-based trading for Nifty futures & options and stock futures & options on a nationwide basis as well as an online monitoring and surveillance mechanism. It supports an order driven market and provides complete transparency of trading operations. It is similar to that of trading of equities in the cash market segment.

The software for the F&O market has been developed to facilitate efficient and transparent trading in futures and options instruments. Keeping in view the familiarity of trading members with the current capital market trading system, modifications have been performed in the existing capital market trading system so as to make it suitable for trading futures and options.

The following are the eligible scripts for trading in futures market in BSE along with their script code.

Scrip Code in Cash Segment	Underlying Stock	Underlying Stock Details
523204	Aban Offshore Ltd	ABO
500002	Abb Ltd	ABB
532399	Adlabs Films Ltd	ADF
532309	Alstom Projects India Ltd	API
500425	Ambuja Cement Limited	ACL

Contd...

Notes

532475	Aptech Ltd	APT
522275	Areva T & D India Ltd	ATD
500101	Arvind Mills Ltd.	ARVML
500477	Ashok Leyland Ltd.	ASHOK
500410	Associated Cement Companies Limited	ACC
532215	Axis Bank Ltd.	AXSBK
500032	Bajaj Hindusthan Ltd	BHL
500490	Bajaj Holdings & Investments Ltd	BHI
532134	Bank of Baroda	BOB
532149	Bank of India	BOI
500103	Bharat Heavy Electricals Limited	BHEL
500547	Bharat Petroleum Corporation Limited	BPCL
532454	Bharti Tele-Ventures Ltd.	BTLE
532792	Cairn India Limited	CNL
532483	Canara Bank	CNBNK
532885	Central Bank Of India	CBI
500040	Century Textiles & Industries Ltd.	CEN
500087	Cipla Limited	CIPLA
532488	Divis Laboratories Ltd	DIV
532868	Dlf	DLF
500124	Dr.Reddys Laboratories Limited	DRREDDY
532922	Edelweiss Capital Ltd	EDL
532696	Educomp Solutions Ltd	EDU
526881	Financial Technologies India Ltd	FTL
532155	Gail India Ltd	GAIL
532754	Gmr Infrastructure	GMR
500300	Grasim Industries Limited	GRSIM
500620	Great Eastern Shipping Company Ltd	GESHIP
532281	Hcl Technologies Limited	HCLTECH
500180	Hdfc Bank Ltd.	HDBK
500182	Hero Honda Motors Limited	HEROHON
500440	Hindalco Industries Limited	HNDALCO
500104	Hindustan Petroleum Corporation Limited	HPCL
500696	Hindustan Unilever Limited	HUL
500188	Hindustan Zinc Ltd	HZN
532873	Housing Dev. & Infra. Ltd	HDIL
500010	Housing Development Finance Corporation Limited	HDFCLTD
532174	Icici Bank Ltd	ICICIBA
532822	Idea Cellular Ltd	IDEA
500106	Ifci Ltd	IFC
532466	I-Flex Solutions Ltd	IFLXSL
530005	India Cements Ltd.	INCEM
532636	India Infoline Ltd	IIL

Contd...

Notes

532814	Indian Bank	INDNBK
530965	Indian Oil Corporation Ltd	IOCL
532187	Indusind Bank Ltd.	INBK
500116	Industrial Development Bank Of India Ltd.	IDBI
500209	Infosys Technologies Limited	INFOSYS
532659	Infrastructure Development Finance Company Limited.	IDFC
532947	Irb Infrastructure Developers Ltd	IRB
500305	Ispat Industries Ltd	ISP
500875	Itc Limited	ITC
530773	Ivrcl Infrastructures & Projects Ltd	IVL
532532	Jaiprakash Associates Ltd	JAI
532617	Jet Airways Limited	JET
500228	Jsw Steel Ltd	JSW
500247	Kotak Mahindra Bank Ltd	KMB
532997	Ksk Energy Ventures Ltd	KSK
532778	Lanco Infratech Ltd	LNC
500510	Lnt	LNT
500108	Mahanagar Telephone Nigam Limited	MTNL
500520	Mahindra & Mahindra Limited	MAHMAH
532500	Maruti Suzuki India Ltd	MSL
500075	Nagarjuna Fertilizers & Chemicals Ltd	NFC
532555	National Thermal Power Corporation Limited	NTPC
513683	Neyveli Lignite Corporation Ltd	NLC
500312	Oil And Natural Gas Corporation Limited	ONGC
524372	Orchid Chemicals & Pharmaceuticals Ltd	ORC
532780	Parsvnath Developers Ltd	PSN
532522	Petronet Lng Ltd	PTR
532254	Polaris Software Limited	POLARIS
532810	Power Finance Corporation Ltd	PFC
532898	Power Grid Corp.	PGC
522205	Praj Industries Ltd	PRJ
532693	Punj Lloyd Ltd	PNJ
532461	Punjab National Bank	PNBNK
500359	Ranbaxy Laboratories Limited	RBXY
500111	Reliance Capital Limited	RCAP
532712	Reliance Comm. Ltd	RCOM
500325	Reliance Industries Limited	RIL
500390	Reliance Infrastructure Ltd.	RNF
532709	Reliance Natural Resources Ltd	RNL
532743	Reliance Petroleum Limited	RPLETR
532939	Reliance Power Ltd	RPW
500366	Rolta India Ltd	ROL
532955	Rural Electrification Corporation Ltd	REC

Contd...

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500113	Sail	SAIL
500376	Satyam Computer Serivices Limited	SATYAM
500295	Sesa Goa Ltd	SES
532670	Shree Renuka Sugars Ltd	REU
500550	Siemens Ltd.	SIEMN
532784	Sobha Developers Ltd	SDL
532863	Spice Communications Ltd	SPCN
500285	Spicejet Ltd	SPJ
500112	State Bank of India	SBI
500900	Sterlite Industries (India) Ltd	STER
532667	Suzlon Energy Ltd	SUZ
500770	Tata Chemicals Ltd	TCHEM
500483	Tata Communications Ltd.	TCL
532540	Tata Consultancy Services Ltd	TCS
500470	Tata Iron & Steel Company Limited	TISCO
500570	Tata Motors Ltd.	TELCO
500400	Tata Power Company Limited	TPWR
500800	Tata Tea Limited	TTEA
532371	Tata Teleservices Maharashtra Ltd	TTL
532755	Tech Mahindra Ltd	TEM
500114	Titan Industries Ltd	TIL
532477	Union Bank Of India	UBI
507878	Unitech Ltd	UNI
532432	United Spirits Ltd	USL
500575	Voltas Ltd	VOL
532144	Welspun-Gujarat Stahl Rohren Ltd	WGS
507685	Wipro Limited	WIPRO
505537	Zee Entertainment Enterprises Ltd	ZEE

14.6 Basics of Trading

The following are the key concepts of a trading system:

14.6.1 Parties of a Trading System

There are four parties/entities in the trading system. They are Trading members, clearing members, professional clearing members and participants.

1. ***Trading members:*** Trading members are members of NSE. They can trade either on their own account or on behalf of their clients including participants. The exchange assigns a trading member ID to each trading member. Each trading member can have more than one user. The number of users allowed for each trading member is notified by the exchange from time to time. Each user of a trading member must be registered with the exchange and is assigned a unique user ID. The unique trading member ID functions as a reference for all orders/traders of different users. This ID is common for all users of a particular trading member.

Notes

Caution It is responsibility of the trading member to maintain adequate control over persons having access to the firm's User IDs.

2. ***Clearing members:*** Clearing members are members of NSCCL. They carry out risk management activities and confirmation/inquiry of trades through the trading system.
3. ***Professional clearing members:*** A professional clearing members is a clearing member who is not a trading member. Typically, banks and custodians become professional clearing members and clear and settle for their trading members.
4. ***Participants:*** A participants is a client of trading members like it financial institutions. These clients may trade through multiple trading members but settle through a single clearing member.

14.6.2 The Market Watch Window

The following windows are displayed on the trader workstation screen.

1. Title bar
2. Ticker window of futures and options market
3. Ticker window of underlying (capital) market
4. Tool bar
5. Market watch window
6. Inquiry window
7. Snap quote
8. Orders/trade window
9. System message window

As mentioned earlier, the next best way to familiarize oneself with the screen and its various segments is to actually spend some time studying a live screen. In this section we shall restrict ourselves to understanding just two segments of the workstation screen, the market watch window and the inquiry window.

The market watch window is the third window from the top of the screen which is always visible to the user. The purpose of market watch is to allow continuous monitoring of contracts or securities that are of specific interest to the user. It displays trading information for contracts selected by the user. The user also gets broadcast of all the cash market securities on the screen. This function also will be available if the user selects the relevant securities for display on the market watch screen. Display of trading information related to cash market securities will be on "Read only" format, i.e. the dealer can only view the information on cash market but, cannot trade in them through the system.

Caution This is the main window from the dealer's perspective.

14.6.3 Inquiry Window

The inquiry window enables the user to view information such as Market by Price (MBP), Previous Trades (PT), Outstanding Orders (OO), Activity log (AL), Snap Quote (SQ), Order

Notes

Status (OS), Market Movement (MM), Market Inquiry (MI), Net Position, On line backup, Multiple index inquiry, Most active security and so on. Relevant information for the selected contract/ security can be viewed. We shall look in demand at eh Market by Price (MBP) and the Market Inquiry (MI) screens.

1. ***Market by Price (MBP):*** The purpose of the MBP is to enable the user to view passive orders in the market aggregated at each price and are displayed in order of best prices. The window can be invoked by pressing the [F6] key. If a particular contract or security is selected f, the details of the selected contract or security can be seen on this screen

2. ***Market Inquiry (MI):*** The market inquiry screen can be invoked by using the [F11] key. If a particular contract or security is selected, the details of the selected contract or selected security defaults in the selection screen or else the current position in the market watch defaults. The first line for the screen gives the Instrument type, symbol, expiry, contract status, total traded quantity, life time high and life time low. The second line displays the closing price, open price, high price, low price, last traded price and indicator for net change from closing price. The third line displays the last traded quantity, last traded time and the last traded date. The fourth line displays the closing open interest, the opening open interest, day high open interest, day low open interest, current open interest, life time high open interest, life time low open interest and net change from closing open interest. The fifth line display very important information, namely the carrying cost in percentage terms.

14.6.4 Placing Orders on the Trading System

For both the futures and the options market, while entering orders on the trading system, members are required to identify orders as being proprietary or client order. Proprietary orders should be identified as 'Pro, and those of clients should be identified as 'Cli'. Apart from this, in the case of 'Cli' trades, the client account number should also be provided.

The futures market is a zero sum game i.e. the total number of long in any contract always equals the total number of short in any contract. The total number of outstanding contracts (long/sight) at any point in time is called the "Open interest". This Open interest figure is a good indicator of the liquidity in every contract. Based on studies carried out in international exchanges, it is found that open interest is maximum in near month expiry contracts.

14.6.5 Market Spread/Combination Order Entry

The NEAT F&O trading system also enables to enter spread/combination trades. This enables the user to input two or three orders simultaneously into the market. These orders will have the condition attached to it that unless and until the whole batch of orders finds a countermatch, they shall not be traded. This facilitates spread and combination trading strategies with minimum price risk.

14.6.6 Basket Trading

In order to provide a facility for easy arbitrage between futures and cash markets. NSE introduced basket-trading facility. This enables the generation of portfolio offline order files in the derivatives trading system and its execution in the cash segment. A trading member can buy or sell a portfolio through a single order, one he determines its size. The system automatically works out the quantity of each security to be bought or sold in proportion to their weights in the portfolio.

Notes

Task Make a report on trading mechanism of futures and options under NSE.

Self Assessment

Fill in the blanks:

13. The futures & options trading system of NSE, called ……..trading system.
14. Trading members are members of ……...
15. The ……is the third window from the top of the screen which is always visible to the user.
16. …….enables the generation of portfolio offline order files in the derivatives trading system and its execution in the cash segment.

14.7 Summary

- The futures prices of different assets like commodities, foreign exchanges and securities are influenced by various factors which are not common for all such assets. For example, futures prices of foreign currencies may be determined by different factors as different for determination of futures prices of food grains and vegetables.
- According to L C Gupta Committee Report on Derivatives, at the time of introduction of Derivatives Contracts on any underlying the value of the contract should be at least ₹ 2 lakhs.
- The maximum brokerage chargeable by a trading member in relation to trades affected in the contracts admitted to dealing on the F&O segment of NSE is fixed at 2.5% of the contract value in case of index futures and stock futures.
- Risk Vision is central to a financial institutions risk management function providing a consolidated view of risk exposures across multiple systems, incorporating both the trading and banking book.
- Non-financial firms need to watch out for three main risks when using derivatives. The following are the key risks associated with the derivative trading:
  (a) Market risk
  (b) Basic risk
  (c) Credit or Counterparty risk
- Market risk is the possibility that the value of the derivative will change.
- The futures & options trading system of NSE, called NEAT-F&O trading system, provides a fully automated screen-based trading for Nifty futures & options and stock futures & options on a nationwide basis as well as an online monitoring and surveillance mechanism.
- There are four parties/entities in the trading system. They are Trading members, clearing members, professional clearing members and participants.
- The market watch window is the third window from the top of the screen which is always visible to the user.

Notes

- The inquiry window enables the user to view information such as Market by Price (MBP), Previous Trades (PT), Outstanding Orders (OO), Activity log (AL), Snap Quote (SQ), Order Status (OS), Market Movement (MM), Market Inquiry (MI), Net Position, On line backup, Multiple index inquiry, Most active security and so on. Relevant information for the selected contract/security can be viewed.

14.8 Keywords

Basic Risk: The derivative used may not be a perfect match with whatever it is intended to hedge so that when the value of the underlying asset falls, the value of the derivative may not rise by the expected amount.

Inquiry Window: The inquiry window enables the user to view information such as Market by Price (MBP), Previous Trades (PT), Outstanding Orders (OO), Activity log (AL), Snap Quote (SQ), Order Status (OS), Market Movement (MM), Market Inquiry (MI), Net Position, On line backup, Multiple index inquiry, Most active security and so on. Relevant information for the selected contract/security can be viewed.

Market Risk: Market risk is the possibility that the value of the derivative will change.

Market Watch Window: The market watch window is the third window from the top of the screen which is always visible to the user.

Risk Vision: Risk Vision is central to a financial institutions risk management function providing a consolidated view of risk exposures across multiple systems, incorporating both the trading and banking book.

14.9 Review Questions

1. What are the key guidelines issued under L C Gupta Committee Report?
2. Discuss the concept of risk vision.
3. Non-financial firms need to watch out for three main risks when using derivatives. What are those risks?
4. Write a note on NEAT-F&O trading system.
5. Clearing members carry out risk management activities and confirmation /inquiry of trades through the trading system. What are the other parties of trading system?
6. State the difference between market watch window and inquiry window.
7. Discuss the role and functions of basket trading.
8. Derivatives bought from banks are exposed to bigger credit risks than those bought from exchanges. Why?
9. Discuss the MPB.
10. What are the key reasons for managing derivative risks?

Answers: Self Assessment

1. True
2. False
3. False
4. True
5. True
6. Risk Vision

7.	Pricing	8.	Derivatives	**Notes**
9.	Revenue	10.	"Market-making"	
11.	False	12.	True	
13.	NEAT-F&O	14.	NSE	
15.	Market watch window	16.	Basket trading	

14.10 Further Readings

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