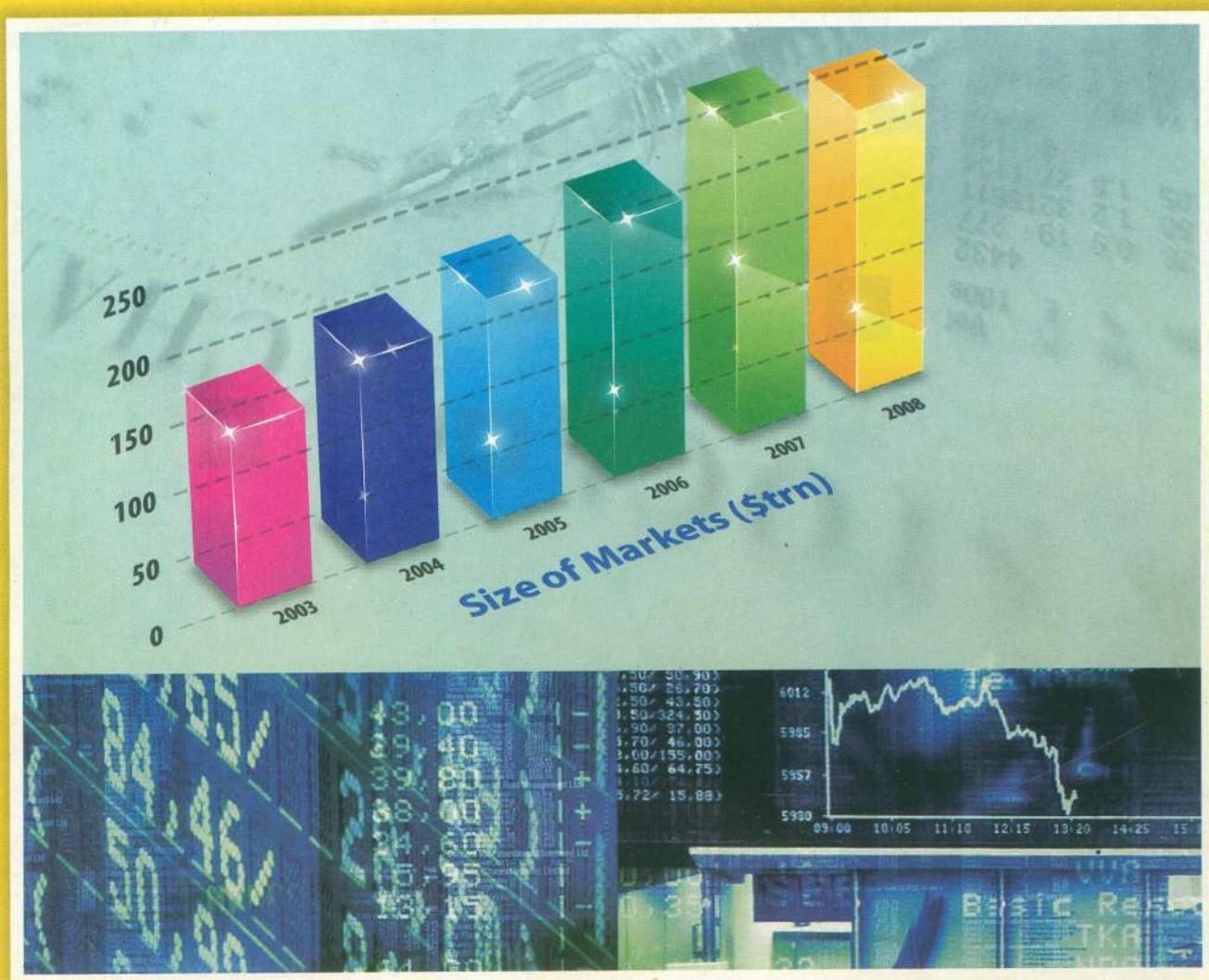




INDIRA GANDHI NATIONAL OPEN UNIVERSITY  
School of Management Studies

**FTKMC**  
FINANCIAL TECHNOLOGIES KNOWLEDGE MANAGEMENT CO.

## MFP-2 EQUITY DERIVATIVES



Trading, Risk Management &  
Support Systems

4

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“शिक्षा मानव को बन्धनों से मुक्त करती है और आज के युग में तो यह लोकतंत्र की भावना का आधार भी है। जन्म तथा अन्य कारणों से उत्पन्न जाति, एवं वर्गगत विषमताओं को दूर करते हुए मनुष्य को इन सबसे ऊपर उठाती है।”

— इन्दिरा गांधी

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*“Education is a liberating force, and in our age it is also a democratising force, cutting across the barriers of caste and class, smoothing out inequalities imposed by birth and other circumstances.”*

— Indira Gandhi

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Block

# 4

## **TRADING, RISK MANAGEMENT & SUPPORT SYSTEMS**

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## **BLOCK 4 TRADING, RISK MANAGEMENT & SUPPORT SYSTEMS**

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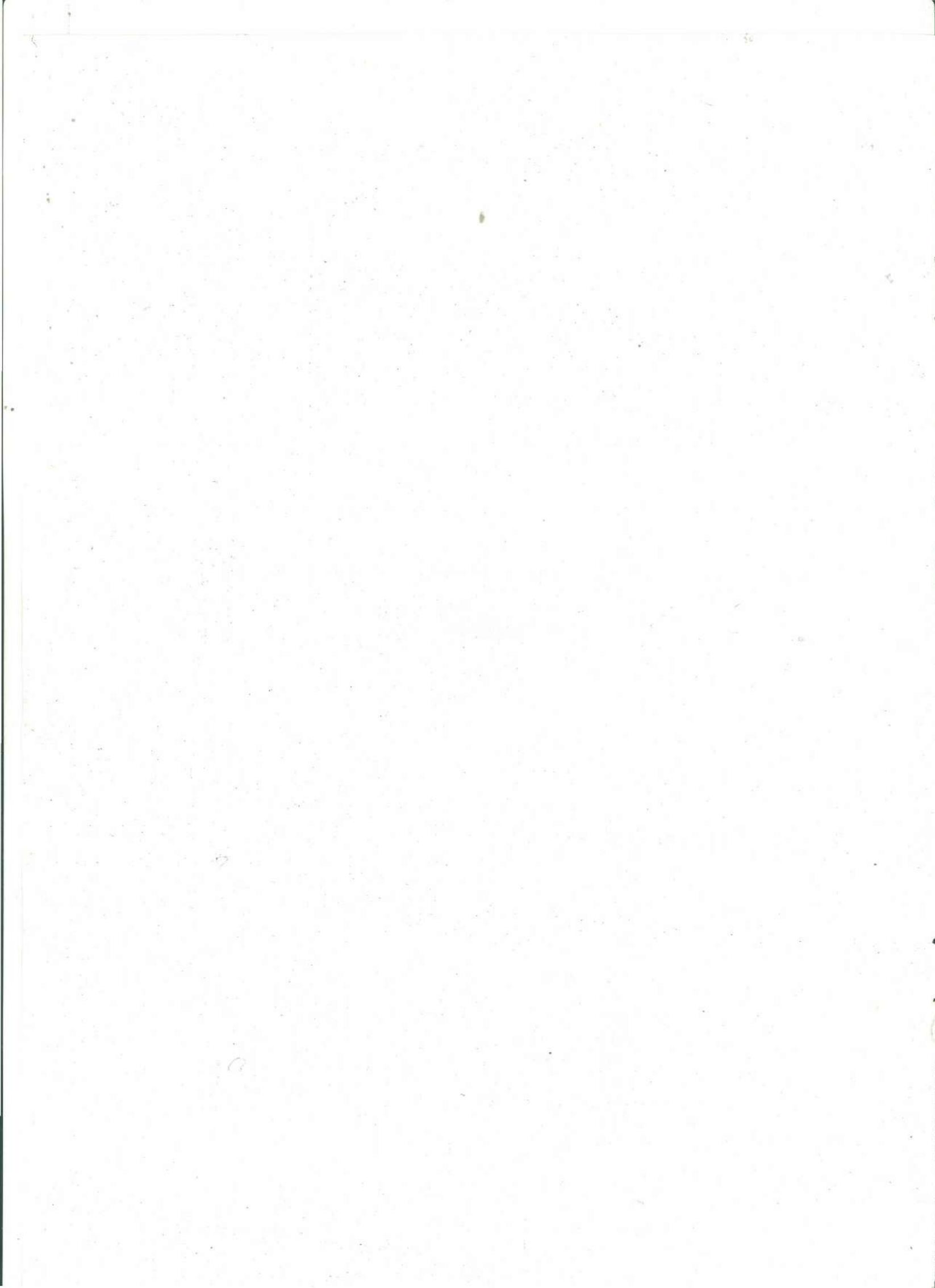
This Block explains the trading and risk management parameters and support systems laid down for trading in equity derivatives

**Unit 12** explains the significance and use of open interest, cost of carry, implied volatility, put call ratio and option Greeks. The unit further focuses on the non-linear derivatives like delta, gamma, theta and vega; explaining their significance, usage and practical applicability.

**Unit 13** explains the basics of risk management. Risk management is very crucial for any organization. The unit further explains the computation of volatility and how it can be used effectively to manage risk. The concept of VaR (Value at Risk) its computation and applicability is explained using examples. The unit also covers the concept of margins and its different types.

**Unit 14** explains the clearing function in detail mentioning the role of various players including the exchange, the Clearing house/corporation, Clearing members, Trading members, clients. The unit also explains the settlement process for a futures contract covering all risk management measures applicable to equity derivatives and people trading using them with focus on networth and capital base criterias.

**Unit 15** elaborates on the accounting guidelines for equity derivatives in Indian as well as International markets. It further explains the tax regulations on gains or losses generated by trading in equity derivatives.



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## **UNIT 12 MARKET INDICATORS, CHALLENGES IN DERIVATIVE TRADING AND OPTION GREEKS**

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### **Objectives**

After studying this unit, you should be able to:

- understand the meaning and significance of Open Interest, Cost of Carry, Implied Volatility and Put Call Ratio;
- discuss the meaning and significance of Option Greeks; and
- appreciate the meaning of delta, gamma and portfolio gamma.

### **Structure**

- 12.1 Introduction
- 12.2 Option Greeks
- 12.3 Delta
- 12.4 Delta and Hedging
- 12.5 Gamma
- 12.6 Vega
- 12.7 Theta
- 12.8 Rho
- 12.9 Summary
- 12.10 Self Assessment Questions
- 12.11 Further Readings

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### **12.1 INTRODUCTION**

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Derivative markets create their own specialized market indicators which serve to help traders to understand how market players are behaving. This behaviour further strengthens their insight on possible future developments in the short term. We will discuss four basic indicators in this section:

- Open Interest
- Cost of Carry
- Implied Volatility
- Put Call Ratio

You should always bear in mind that indicators are merely indicators and not assurances. Even if the indicators are read correctly by an expert, there is always a possibility that the market on the next day may not behave as predicted. Our Indian markets close at 3.30 pm Indian time while the world is always open. Post closing, there are developments through our night in the West, the US and in the early morning in Japan, China, Hong Kong and Singapore. Our markets open after these markets have closed / opened and react to developments from the world around. Thus, the indicators which relate to 3.30 pm of the earlier day may no longer remain valid.

### Open Internet

Open Interest is the number of contracts open in the market. At any point of time, the total longs will be equal to the total shorts and open interest is counted only once. For example, if you buy 10 contracts of Reliance Futures, then your counterparty would have sold those 10 contracts. If this was the only transaction in the market till date on Reliance, the open interest will be considered to be 10 contracts (which comprises of 10 longs from your side and 10 shorts from your counterparty).

If new participants enter the market, the open interest will increase. If one party is new while the counterparty is squaring up, open interest will remain constant. If both parties are squaring up, open interest will fall.

High open interest levels indicate overheating or excessive speculation and regulatory authorities get concerned. Hence, maximum possible open interest is pre-defined by regulations as 20% of the free float of any stock. Thus, if the paid up capital of a company is 1 cr shares of which 51% is held by promoters, the free float will be 49 lakh shares. The maximum open interest allowed in this stock will be 20% of 49 lakh shares that is 9.80 lakh shares.

Trading systems are programmed to warn participants when open interest levels increase beyond 70% of the maximum permissible position at frequent intervals. Traders who take fresh positions after the open interest level has increased beyond 95% of the maximum permissible position are penalized by the exchange.

Open interest can be expressed in number of units, in number of contracts or in Rs cr. If you desire to understand the total open interest in the derivative market, the rupee figure is the best indicator as adding up heterogeneous contracts or units is logically incorrect. Open interest levels can be studied to identify possible excessive speculation. For example, market experts say that if the open interest of the market as a whole exceeds Rs. 1 lakh crores, there is a possibility of overheating. However, this limit is not sacrosanct and will vary from time to time depending on the level of the index itself apart from other conditions.

Some experts combine the price trend with open interest and come up with the following possibilities:

- Rising prices, rising open interest – Bullish trend.
- Rising prices, falling open interest – Longs are squaring up and bull trend may not continue.
- Falling prices, rising open interest – Bearish trend.
- Falling prices, falling open interest – Shorts are squaring up and bear trend may not continue.

### Cost of Carry

We have discussed Futures pricing and cost of carry principles in Block 2. Cost of carry represents the difference between Futures prices and Spot prices. Day to day markets are governed by emotion apart from theoretical principles. Experts therefore believe that if the cost of carry moves up above the risk free rate, the implication is that traders are willing to pay an extra price for Futures. This will be justified only if traders are bullish on the stock. For example, if Reliance equity is quoting at Rs. 2,100 and theoretical price of Futures based on a 7% risk free rate should be Rs. 2,111 with 28 days to expiry but the actual Futures price is Rs. 2,115, this indicates that traders are willing to pay an extra Rs. 4 for Futures and there is a possibility that traders are bullish on the stock.

On the other hand, if these Futures are trading below Rs. 2,111, then traders could be bearish as they are not even willing to pay a risk free rate for the cost of carry. In disastrous situations, the Futures price may quote below Spot, i.e., below Rs. 2,100. This

situation could indicate that the market is bearish or that traders are heavily bearish on Reliance and are heavily shorting Reliance Futures. It is found that on all those disastrous days when the index itself falls by more than 5%, cost of carry of most stocks turns negative.

Some experts combine the Cost of Carry and Open Interest indicators and believe as follows:

- Rising Cost of Carry, Rising Open Interest – Strong bullish trend, new players are taking fresh positions and willing to pay a strong price.
- Rising Cost of Carry, Falling Open Interest – Shorts could be squaring up to cut their losses as price has moved up, the trend may not sustain once short covering is over.
- Falling Cost of Carry, Rising Open Interest – Strong bearish trend, new players are taking fresh short positions.
- Falling Cost of Carry, Falling Open Interest – Longs may be squaring up to cut their losses as price has moved down, the trend may not sustain once long covering is over.

### **Implied Volatility**

We will discuss option Greeks shortly in this unit and you will understand that volatility is one of the important inputs that determines the option price. Let us say that historically over the last 15 days, the volatility of your stock was 35% (we will discuss how to compute volatility in the Unit on Risk Management later). If you input 35% as the volatility level in your option calculator, the price of the option comes to say Rs. 50. However, the actual market price is Rs. 57. If you back calculate the volatility level which would yield a price of Rs. 57 on your option calculator, that volatility comes to say 41%. This 41% level is called as the “implied volatility” or in other words, the volatility level that is implied in the quoted market price.

The Chicago Stock Exchange and NSE in India have coined an index called VIX which is based on the implied volatility levels of options quoted on these exchanges. The VIX level broadly represents the volatility implied in the market prices of options.

When you compare the implied volatility with the historical volatility and find that the implied volatility levels are much higher, most experts would tell you that market traders are nervous and the probability of the market falling is quite high. This phenomenon has been observed in the Chicago markets for many years including the recent fall in the S&P post the subprime crisis in the US. In India, we are yet to observe significant adverse correlation between the VIX and the Nifty, but it is possible that our history is not long enough to reach clear conclusions.

### **Put Call Ratio**

The put call ratio is computed in two ways: (1) the number of puts traded in particular period of time (day, week, month) divided by the number of calls traded in the same period, (2) the number of puts open at any point of time divided by the number of calls open at the same point of time. In India the second ratio is more popular.

In general, higher the number of puts, the more bearish the sentiment in the market as puts are bearish products. Experts have their own levels (based on past historical trends in this ratio) of the level at which markets have become bearish or bullish. Many experts also believe that once the put call ratio reaches its historical peak or trough, it tends to reverse and so does the market. Some experts therefore view the put call ratio as a contrarian indicator as it could provide useful signals of when the market trends could reverse.

Many experts however point out that the statistical correlation between this ratio and the market movement is poor and hence this ratio does not merit a serious consideration.

## 12.2 OPTION GREEKS

In the last section, we saw that the six basic factors which drive option prices are:

- Stock price
- Strike price
- Volatility
- Time to expiry
- Interest rates
- Dividends

We also discussed mathematical models that compute option prices if these inputs are provided. We did not get into the mathematical derivation of the relevant equations, as we are of the view that practitioners do not require to do so.

In the framework of differential equations in calculus, if there are multiple factors driving an output (in this case, the option value), one could isolate the impact of each of those factors using partial differentiation techniques. In simpler terms, one could identify exactly how much the value of the option will change if the stock price were to change, exactly how much the value of the option will change if the volatility were to change and so on. Each of these impacts is technically referred to as an Option Greek (named after Greek alphabets). Various Greeks like delta, gamma, vega and theta have been designed by derivatives experts.

In section 12.3, we will discuss the meaning, definition; significance and practical utility of these option Greeks.

## 12.3 DELTA

Option models provide delta for each option. This is a number between -1 to +1. The delta indicates the responsiveness of the price of the option to changes in the price of the underlying. Conventionally, the change in the price of the underlying is defined as an upward movement of rupee one and the delta therefore provides an estimate of the extent of change in the price of the option given an upward movement in the price of the underlying by rupee one.

In our example of the Reliance 2250 June Call which was trading at Rs. 80.50 (given the Reliance equity price at Rs. 2,142.70), let us input the following data into a Black Scholes model. The relevant inputs are:

- Stock price : 2,142.70
- Strike price : 2,250.00
- Volatility : 57.50%
- Time to expiry : 22 days
- Interest rate : 7%
- Dividends : zero

The delta as shown by the model is 0.4030. You could browse the Net and use a Black Scholes model from any website (list of relevant websites provided in the Appendix to this Block) and experience the computed delta yourself.

### Interpretation of Delta

Let us now understand the meaning of this number thrown up by the model 0.4030. This is the responsiveness of the option price to changes in the price of the underlying (in this case Reliance equity). If Reliance equity were to move up by Re. 1.00, the option price is estimated to move up by Rs. 0.4030. Thus, if Reliance equity price were to move up to Rs. 2,143.70 (Rs. 2,142.70 plus Re. 1.00), the price of the option would most likely move up to Rs. 80.90 (Rs. 80.50 plus Rs. 0.40).

The delta can also be understood as an equivalent equity position. In other words, holding one Reliance 2250 June Call is equivalent to holding 0.4030 units of Reliance equity. The gain that you would obtain (or loss) from 1 Reliance 2250 June Call is the same as that you would obtain from holding 0.4030 units of Reliance equity.

All Greeks option are defined from the point of view of the buyer (holder). For the seller (writer), the Greek number will be the same, but the sign will become inverse. In our example, for the buyer of the Reliance 2250 June Call, the delta is 0.4030 positive, while the same delta from the point of view of the seller will become 0.4030 negative.

### Portfolio Delta

In market practice, this change of sign is carried out in a simpler manner (without having to think in opposite ways for each counterparty). Long positions are indicated with a positive sign and short positions with a negative sign. When you multiply the same delta with the positive sign (+0.4030), the position delta is automatically derived correctly.

For example, you have bought 200 calls. What is your position delta (also called portfolio delta)? It is  $200 \times 0.4030 = \text{Rs. } 80.60$ . What does this mean? It means if Reliance equity moves up by Re. 1.00, your position or portfolio will move up by Rs. 80.60.

Your counterparty has sold 200 calls. What is his position delta? It is  $-200 \times 0.4030 = \text{negative Rs. } 80.60$ . What does this mean? It means if Reliance equity moves up by Rs. 1.00, his position will show a loss of Rs. 80.60.

### Delta of Various Strikes of Calls

How would the deltas of various strikes of calls get designed mathematically? We already know that the delta of the 2250 Call is 0.4030. So what would the delta of the 2280 call be? And what would be the delta of the 2010 call? Would there necessarily be a mathematical logic to these delta levels?

The answer is yes. Higher strike calls are less responsive to changes in the prices of the underlying. For example, a 2400 call is so far away from the current price of Rs. 2,142.70, and then it will hardly react to a one rupee change in the price of Reliance equity. Remember, the 2400 call will be in the money only when Reliance arrives at Rs. 2,400 (it will then carry some intrinsic value). A small movement from Rs. 2,142.70 to Rs. 2,143.70 has not much impact on this 2400 Call. Hence, its delta will be quite low (the model shows 0.2411), while the responsiveness of the 2010 Call will be quite different.

Remember the 2010 Call is already in the money (as the equity price of Rs. 2,142.70 is more than this strike). The Intrinsic value of this 2010 Call will increase in step with increases in the price of Reliance equity (i.e., a one rupee rise in the Intrinsic value of the call for a one rupee rise in the price of Reliance equity). The model shows the delta of this Call at 0.7101. To summarize,

- Deltas of calls will be positive
- The range of values of deltas will lie between zero and +1.00.
- Deltas of out of the money calls (higher strikes in the case of calls as we have discussed earlier) will be low and will tend towards zero.

- The range of deltas of out of the money calls will lie between zero and +0.50.
- Deltas of in the money calls (lower strikes in the case of calls) will be high (indicating a higher responsiveness level) and will tend towards +1.00.
- The range of deltas of in the money calls will lie between +0.50 and +1.00.
- Deltas of at the money calls will be around 0.50.

### Range of Validity of Delta

Option prices can be scientifically estimated applying delta for small price movements in the price of Reliance in this manner. What is small is a big question, which we will attempt to answer in a crude manner. But you need to understand that the delta computation will not be valid for large movements. For example, if the price of Reliance equity were to move up by Rs.1,000, would the option price move up by Rs. 403.00 (applying the delta of 0.4030 on Rs.1,000)? The answer is no, because the price movement is too large. Very roughly, the writer believes that delta arithmetic stands valid for movements in the price of underlying equity of around 1% plus or minus from the current price. Beyond this level, the delta itself starts changing and therefore application of the old delta does not prove very accurate.

### Exercises

You need to familiarize yourself with this area which is best done through some exercises. Please fill up the blanks in the following table.

#### Estimation of Call values at various prices of Reliance equity

Reliance Price	Estimated value of 2250 Call	Estimated value of 2400 Call	Estimated value of 2010 Call	Remarks if any
2,142.70				
2150.00				
2140.00				
2160.00				
2300.00				

#### Estimation of ranges of delta values

Fill in the ranges within which delta values of the following strikes will fall (continuing our above example). Assume Reliance equity price stays at Rs. 2,142.70 for this purpose.

Call strike	Delta will be more than	Delta will be less than	Delta will be (known)	Remarks, if any
1980				
2010	Known	Known		
2040				
2100				
2160				
2250	Known	Known		
2280				
2370				
2400	Known	Known		
2430				

### Delta of Puts

We know that a long Put is a bearish position. The price of the Put varies inversely with movements in the underlying, i.e., if the price of the underlying were to rise, the price of the Put will fall and *vice versa*. So the delta of Puts is negative by definition. Deltas of Puts range between zero and minus 1.00.

In our earlier units, we had taken the example of Bharti Airtel to explain Put. In this Unit, we will continue to use Reliance as the underlying for examples of Puts (rather than choosing a different underlying), as a single underlying will be helpful in understanding Portfolio delta examples which are to be developed further in this unit. Applying the same Black Scholes model which was used to derive Call deltas, the following Put deltas can be determined.

Input data:

- Stock price : 2,142.70
- Strike price : 2,250.00
- Volatility : 57.50%
- Time to expiry : 22 days
- Interest rate : 7%
- Dividends : zero

The price of the Put (as per the model) is Rs. 178.34. The Put Delta comes to -0.5970. If you observe carefully, you can figure out that this is the complement of the Call Delta (which was 0.4030). The sum of the absolutes of the two deltas is 1.00 (i.e., 0.4030 + 0.5970 = 1.0000).

If the price of Reliance equity were to move up by Re.1.00 (to Rs. 2,143.70), the price of the Put is estimated to fall by Rs. 0.5970 and should become Rs. 177.74. Conversely if the price of Reliance equity were to fall by Re 1.00 (to Rs. 2,141.70), the price of the Put is estimated to rise by Rs. 0.5970 and should become Rs. 178.94.

All option Greeks are defined from the point of view of the buyer (holder). For the seller (writer), the Greek number will be the same, but the sign will become inverse. In our example, for the buyer of the Reliance 2250 June Put, the delta is 0.5970 negative, while the same delta from the point of view of the seller will become 0.4030 positive.

### Portfolio Delta

In market practice, this change of sign is carried out in a simpler manner (without having to think in opposite ways for each counterparty). Long positions are indicated with a positive sign and short positions with a negative sign. When you multiply the same delta with the negative sign (-0.5970), the position delta is automatically derived correctly.

For example, you have bought 300 Puts. What is your position delta (also called portfolio delta)? It is  $300 \times -0.5970$  = negative Rs.179.11. What does this mean? It means if Reliance equity moves up by Re.1.00, your position or portfolio will lose Rs.179.11.

Your counterparty has sold 300 Puts. What is his position delta? It is  $-300 \times -0.5970$  = positive Rs.179.11. What does this mean? It means if Reliance equity moves up by Rs.1.00, his position will show a gain of Rs.179.11.

### Delta of Various Strikes of Puts

How would the deltas of various strikes of calls get designed mathematically? We already know that the delta of the 2250 Put is -0.5970. So what would the delta of the 2280 Put be? And what would be the delta of the 2010 Put? Would there necessarily be a mathematical logic to these delta levels?

The answer is yes. Lower strike Puts are less responsive to changes in the prices of the underlying. For example, a 2010 Put is so far away from the current price of Rs. 2,142.70, and then it will hardly react to a one rupee change in the price of Reliance equity. Remember, the 2010 Put will come into the money only when Reliance arrives at Rs. 2,010 (it will then carry some intrinsic value). A small movement from Rs. 2,142.70 to Rs. 2,141.70 has not much impact on this 2010 Put. Hence, its delta will be quite low (the model shows -0.2901), while the responsiveness of the 2400 Put will be quite different.

Remember the 2400 Put is already in the money (as the equity price of Rs. 2,142.70 is less than this strike). The Intrinsic value of this 2400 Put will increase in step with increases in the price of Reliance equity (i.e., a one rupee rise in the intrinsic value of the Put for a one rupee fall in the price of Reliance equity). The model shows the delta of this Put at -0.7589.

To summarize:

- Deltas of Puts will be negative.
- The range of values of deltas will lie between zero and -1.00.
- Deltas of out of the money Puts (lower strikes in the case of Puts as we have discussed earlier) will be low and will tend towards zero.
- The range of deltas of out of the money Puts will lie between zero and -0.50.
- Deltas of in the money Puts (higher strikes in the case of Puts) will be high (indicating a higher responsiveness level) and will tend towards -1.00.
- The range of deltas of in the money Puts will lie between -0.50 and -1.00.
- Deltas of at the money Puts will be around -0.50.

### Exercises

You need to familiarize yourself with this area which is best done through some exercises. Please fill up the blanks in the following table.

### Estimation of Put values at various prices of Reliance equity

Reliance Price	Estimated value of 2250 Put	Estimated value of 2400 Put	Estimated value of 2010 Put	Remarks if any
2,142.70				
2150.00				
2140.00				
2160.00				
2300.00				

### Estimation of ranges of delta values

Fill in the ranges within which delta values of the following strikes will fall (continuing our above example). Assume Reliance equity price stays at Rs. 2,142.70 for this purpose.

Call strike	Delta will be more than	Delta will be less than	Delta will be (known)	Remarks, if any
1980				
2010	Known	Known		
2040				
2100				
2160				
2250	Known	Known		
2280				
2370				
2400	Known	Known		
2430				

## 12.4 DELTA AND HEDGING

In the context of hedging and portfolio management, the concept of delta holds great solutions. If you are holding 500 Reliance shares and you wish to hedge this holding by using an opposite position in Reliance Calls, you could sell Reliance 2250 Calls and create an opposite position. Please note that Reliance equity is a bullish position and selling Reliance Calls (or shorting Calls) is a bearish position. Equity shares (and associated Futures) carry a delta of +1 by basic definition (indicating that an upward movement of the equity price by Re.1.00 will prompt an upward movement of Re.1.00 in these products).

Your delta is +500 for the Reliance shares that you hold. To hedge perfectly (in simple words to create an opposite position), you need to create negative delta of 500. As each option has a delta of 0.4030, you should sell  $500/0.4030 = 1,241$  Calls so that this negative delta can be generated. Thus, if you hold 500 shares and sell 1,241 Calls, your net position is equal to zero Delta. If your delta is zero, you are hedged (it is almost equivalent to your having no position in the stock) and any movements in price of Reliance will neither generate a profit for you nor any loss.

Let us first summarize the delta signs and position deltas for various positions:

Position	View	Position Sign	Delta Sign	Position Delta
Long Equity	Bullish	+	+	+
Short Equity	Bearish	-	+	-
Long Futures	Bullish	+	+	+
Short Futures	Bearish	-	+	-
Long Calls	Bullish	+	+	+
Short Calls	Bearish	-	+	-
Long Puts	Bearish	+	-	-
Short Puts	Bullish	-	-	+

Notes to the above table:

- A long position is indicated with a positive position sign.
- A short position carries a negative position sign.
- Deltas of equity, futures and calls are positive.
- Deltas of puts are negative.
- Position delta is computed by multiplying position sign and delta sign.
- Bullish views will create positive Position Deltas.
- Bearish views will create negative Position Deltas.

### Exercises

- 1) Assume that you have a position of 300 Long Futures in Reliance, 600 Long 2250 Calls and 300 Short 2400 Calls. What is your position delta?
  - If Reliance price moves upwards by Rs. 5, how much will you gain or lose?
  - If Reliance price moves downwards by Rs. 10, how much will you gain or lose?
  - If you wish to convert your position to +100 Delta by using Reliance 2250 calls, how many calls should you buy or sell?
- 2) You have a position of 300 Long Futures and 300 Long 2010 Puts. What is your position delta?
  - If Reliance price moves upwards by Rs. 5, how much will you gain or lose?
  - If Reliance price moves downwards by Rs. 10, how much will you gain or lose?
  - If you wish to convert your position to +100 Delta by using Reliance 2250 Puts, how many Putss should you buy or sell?

### Implications of Portfolio Delta

Portfolio delta can be computed only on one underlying at a time. This is the sum of all the deltas of the individual products (equity, futures, calls and puts) held on that underlying and includes both long and short positions and all options of all strikes. Portfolio delta is a number (not a percentage). If your portfolio delta on Reliance is say -2,381, it means you are bearish. Positive deltas indicate bullishness and negative deltas indicate bearishness. Secondly, it implies that for every one rupee fall in the price of Reliance equity, your portfolio will show a gain of Rs. 2,381.

Professional traders manage their positions by monitoring portfolio delta constantly. If your position delta is -2,381, you are in effect quantifying your bearishness. If you believe that you want to be bearish to the tune of -2,000 delta (or equivalent to 2,000 short equity), your next assignment would be to build a positive delta of 381 units in your portfolio. You can build positive delta by taking the following actions:

- a) Buy equity
- b) Buy futures
- c) Buy calls
- d) Sell puts

The number of units to be bought will depend on the individual deltas of each of these products. Equity and futures carry a delta of +1.00. If you buy 381 shares or 381 futures, your objective is achieved. On the other hand, if you decide to use calls or puts, you will first need to decide the relevant strike. If you decide to use 2250 calls where the delta is known to be +0.4030, you will buy  $381 / 0.4030 = 945$  calls to fullfil your portfolio objective.

## 12.5 GAMMA

Gamma is a second derivative which seeks to quantify the responsiveness of the delta itself to changes in prices of the underlying. We know that the delta of the Reliance 2250 June Call is 0.4030 when the price of Reliance equity is Rs. 2,142.70. We have understood that the price of this Call will rise by Rs. 0.4030 for every one rupee rise in the price of Reliance equity. Now the question is – if the price of Reliance equity increases by one rupee to Rs. 2,143.70, what will happen to the delta? This expected change in the delta is given by ‘gamma’. The gamma as per the Black Scholes model is 0.0013. The gamma tells us that the delta will change from 0.4030 to 0.4043.

Conversely, if the price of Reliance equity were to fall by one rupee, the delta of 0.4030 will fall by 0.0013 and become 0.4017. Gamma is numerically, a small number and is always positive (for both Calls and Puts). A rising price trend will increase deltas of all strikes of Calls. As prices of underlying equity increases, deltas will rise. How much these deltas will rise depends on the Gamma at each price level. A falling price trend will decrease deltas of all strikes of Calls. How much these deltas will fall depends on the Gamma of each strike at each price level.

Gammas of at the money calls are high and gammas of in the money and out of the money calls are relatively lower. The following sensitivity table illustrates how the deltas and gammas of the 2250 call would react given various levels of Reliance equity prices.

	Deltas	Gammas
2250 Call	0.4030	0.00128
1,642.70	0.0167	0.00018
1,742.70	0.0437	0.00038
1,842.70	0.0944	0.00065
1,942.70	0.1737	0.00094
2,042.70	0.2795	0.00117
2,142.70	0.4030	0.00128
2,242.70	0.5309	0.00126
2,342.70	0.6504	0.00112
2,442.70	0.7526	0.00092
2,542.70	0.8332	0.00070
2,642.70	0.8925	0.00050
2,742.70	0.9336	0.00033

As the price of Reliance equity moves downwards (say to Rs. 1,642.70), the 2250 Call will become out of the money. The delta has shrunk from the present level of 0.4030 to a much lower level of 0.0167. The change in the delta (i.e., the gamma) has also shrunk from the present level of 0.00128 to 0.00018.

As the price of Reliance equity moves upwards (say to Rs. 2,742.70), the 2250 Call will become quite in the money. The delta has increased from the present level of 0.4030 to a much higher level of 0.9336. The change in the delta (i.e., the gamma) has reduced from the present level of 0.00128 to 0.00033 indicating that for further rise in the price of Reliance, the delta will not respond rapidly. The response in the delta's movements taper off on both sides of Reliance movements.

### Interpretation of Gamma

Gamma is a good measure of risk. A high gamma indicates that the portfolio's gains and losses could quickly change. Consider the following portfolios:

Portfolio	Delta	Gamma
A	Zero	20
B	Zero	200

As delta of both portfolios is zero, the portfolios are delta neutral. In other words any small price movement in the underlying will not affect the portfolio's gains or losses. However, as the gamma levels are different, the impact of further price movements (after the initial price movement) will vary quite substantially in the two portfolios. After a one rupee movement, the delta of the first portfolio will be 20 and the second will be 200. So, if the underlying moves again by one rupee (a second time), the gain or loss on the Portfolio A will be Rs. 20, while the impact on Portfolio B will be Rs. 200.

With a high gamma, your portfolio delta is shaky, unstable and unreliable. As a trader, you will require a very active watch on the portfolio, its delta, its gains and losses and its gamma. Small changes in underlying prices can change your gains and losses substantially.

### Gamma of Puts

We know that the delta of the Reliance 2250 June Put is -0.5970 when the price of Reliance equity is Rs. 2,142.70. We have understood that the price of this Put fall by Rs 0.5970 for every one rupee rise in the price of Reliance equity. Now the question is - if the price of Reliance equity increases by one rupee to Rs 2,143.70, what will happen to the delta? This expected change in the delta is given by 'gamma'. The gamma as per the Black Scholes model is 0.0013 (you may note that the gamma of the Call and Put are the same – both are always positive and equal). The gamma tells us that the delta will change from -0.5970 to -0.5957.

Conversely, if the price of Reliance equity were to fall by one rupee, the delta of -0.5970 will fall (in an arithmetical sense) by 0.0013 and become more negative at -0.5983. Gamma is numerically a small number and is always positive (for both Calls and Puts). A rising price trend will increase deltas (in an arithmetical sense that negative deltas will become less negative) of all strikes of Puts. As prices of underlying equity increases, deltas will rise in the arithmetical sense. How much these deltas will rise depends on the Gamma at each price level. A falling price trend will decrease deltas of all strikes of Puts in an arithmetical sense that negative deltas will become more negative. How much these deltas will fall depends on the Gamma of each strike at each price level.

Gammas of at the money calls are high and gammas of in the money and out of the money calls are relatively lower. The following sensitivity table illustrates how the deltas and gammas of the 2250 call would react given various levels of Reliance equity prices.

	Deltas	Gammas
2250 Put	- 0.5983	0.00128
1,642.70	- 0.9833	0.00018
1,742.70	- 0.9563	0.00038
1,842.70	- 0.9056	0.00065
1,942.70	- 0.8263	0.00094
2,042.70	- 0.7205	0.00117
2,142.70	- 0.5970	0.00128
2,242.70	- 0.4691	0.00126
2,342.70	- 0.3496	0.00112
2,442.70	- 0.2474	0.00092
2,542.70	- 0.1668	0.00070
2,642.70	- 0.1075	0.00050
2,742.70	- 0.0664	0.00033

As the price of Reliance equity moves downwards (say to Rs. 1,642.70), the 2250 Put will become in of the money. The delta has decreased (become more negative) from the present level of -0.5970 to a much lower level of -0.9833. The change in the delta (i.e., the gamma) has also shrunk from the present level of 0.00128 to 0.00018.

As the price of Reliance equity moves upwards (say to Rs. 2,742.70), the 2250 Put will become out of the money. The delta has increased (become less negative) from the present level of -0.5970 to a much lower negative level of -0.0664. The change in the delta (i.e., the gamma) has reduced from the present level of 0.00128 to 0.00033 indicating that for further rise in the price of Reliance, the delta will not respond rapidly. The response in the delta's movements taper off on both sides of Reliance movements.

## 12.6 VEGA

Vega seeks to quantify the relationship between changes in volatility and the response of the option value. We have already understood that higher volatility will cause both Call and Put prices to move upwards and *vice versa*. The Vega quantifies the extent of the rise.

The Vega of the Reliance 2250 June Call (based on the same inputs as above) is 2.0362. We know that the current volatility input is 57.50% and the current price is Rs. 80.50. The Vega signifies that if this volatility were to increase by 1% (to 58.50%), the price of the Call is estimated to increase by Rs. 2.0362 and would become Rs. 82.5362.

Conversely a fall in the volatility by 1% (to 56.50%) would decrease the option price by Rs. 2.0362, which would now be estimated to become Rs. 78.4638. Incidentally, the Vega of Calls and Puts is the same. Therefore the 2250 Put will increase in value by the same Rs 2.0362 for a 1% increase in volatility and *vice versa*.

Professional traders in options bet on volatility. If they see a rise in volatility, they may buy options and a prospective fall in volatility may see them go short on options. Such traders are immensely guided by the portfolio Vega which helps them to quantify their prospective gains and losses which are likely to accrue as a result of volatility movements.

The sensitivity of the Vega at various price levels is provided below:

	Call Vega	Put Vega
2250 strike	2.03625	2.03625
1,642.70	0.16718	0.16718
1,742.70	0.39599	0.39599
1,842.70	0.76105	0.76105
1,942.70	1.22347	1.22347
2,042.70	1.68679	1.68679
2,142.70	2.03625	2.03625
2,242.70	2.19000	2.19000
2,342.70	2.12941	2.12941
2,442.70	1.89528	1.89528
2,542.70	1.56064	1.56064
2,642.70	1.19980	1.19980
2,742.70	0.86799	0.86799

## 12.7 THETA

Theta seeks to quantify the relationship between passage of time and the response of the option value. We have already understood that passage of time will cause both Call and Put prices to decay. The theta quantifies the extent of the fall in option prices. The theta is the only Greek which is negative for the option buyer (and hence has a negative sign before it for the long position).

The theta of the Reliance 2250 June Call (based on the same inputs as above) is negative 2.8112. We know that the current number of days to expiry is 22 days and the current price is Rs 80.50. The theta signifies that if these days were to reduce by one day (to 21 days), the price of the Call is estimated to fall by Rs. 2.8112 and would become Rs. 77.6888.

Conversely if we were to calculate these numbers yesterday (when 23 trading days were available for expiry), the price of the call would have been higher by Rs. 2.8112, i.e., Rs. 83.3112.

The theta of the Put is negative Rs. 2.3815. Thus passage of one day would reduce the value of the 2250 Put by Rs. 2.3815. Option buyers are unhappy with passage of time as time value of the option decays. The loss on their portfolio due to passage of one day is provided by the portfolio theta. Option writers are delighted if time passes and the underlying stays at the same level. The option decay accrues to them as their gain. The quantum of gain is given by their portfolio theta.

The sensitivity of the theta at various price levels is provided below:

	Call Theta	Put Theta
2250 strike	- 2.81116	- 2.38147
1,642.70	- 0.22347	0.20622
1,742.70	- 0.53128	- 0.10159
1,842.70	- 1.02584	- 0.59615
1,942.70	- 1.65894	- 1.22925
2,042.70	- 2.30492	- 1.87523
2,142.70	- 2.81116	- 2.38147
2,242.70	- 3.06586	- 2.63617
2,342.70	- 3.03922	- 2.60953
2,442.70	- 2.78010	- 2.35041
2,542.70	- 2.38129	- 1.95160
2,642.70	- 1.93921	- 1.50952
2,742.70	- 1.52678	- 1.09709

## 12.8 RHO

Rho is an option Greek which seeks to quantify the responsiveness of the option price to changes in the risk free interest rate. The impact of changes in interest rates on short dated options (like one month) is not significant. In Indian equity markets, the more popular options are short dated ones. Hence, rho is not very popular among the practitioners in India. Application of rho would work on the same lines as Vega and theta above.

## 12.9 SUMMARY

The unit discusses the various Option Greeks in details with examples. For instance the option Greek Delta explains the various strategies which help in mitigating risk. Similarly, the unit has also discussed the other option Greeks like Vega, gamma, theta and Rho:

In this unit, you have learnt:

- Meaning and significance of Open Interest, Cost of Carry, Implied Volatility and Put Call Ratio.
- Meaning and significance of Option Greeks.
- What delta and portfolio delta means and how this can be applied in practice.
- What gamma, theta and Vega mean and how this can be applied in practice in managing a derivatives portfolio.

## 12.10 SELF ASSESSMENT QUESTIONS

- 1) What is the maximum open interest allowed for a company with a paid up capital of 5 crore shares with promoter holding of 30%?
- 2) If open interest is rising along with fall in prices, what does that possibly indicate?
- 3) If open interest is rising along with rising cost of carry, what does that possibly indicate?
- 4) If implied volatility is significantly above historical volatility, what does that show?

- 5) Delta of an in the money call will be in what range?
- 6) Delta of an in the money put will be in what range?
- 7) How is the portfolio delta calculated?
- 8) What does a Vega of 0.15 mean?
- 9) What does a theta of -0.25 mean? Has this position gone long or short?
- 10) What does a theta of +0.35 mean? Has this position gone long or short?

**Market Indicators,  
Challenges in  
Derivative Trading  
and Option Greeks**

## **12.11 FURTHER READINGS**

- Nick Battley, Fitzroy Dearborn, 2003, *Directory of the World's Futures and Options Markets*, Routledge publishers.
- Donald Spence, 1999, *Futures and Options: A Guide for Traders and Investors*, Routledge Publishers.
- Todd E. Petzal, *Financial Futures and Options: A Guide to Markets, Applications and Strategies*, Greenwood Press.
- Noble Drakoln, 2003, *Futures for Small Speculators: Companion Guide*, Enlightened Financial Press.
- Michael Himick, 2000, *Option Strategies: A Portfolio Approach*, Amacom.
- Mark Powers, 2000, *Starting Out in Futures Trading*, Marketplace Books.

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## **UNIT 13 - MARGINING AND VALUE AT RISK**

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### **Objectives**

After studying this unit, you should be able to:

- understand risk management basics;
- understand the definition, meaning of volatility;
- understand computation of volatility;
- appreciate what VaR is and its practical application;
- understand the range of prices within a defined time horizon for any equity scrip at a certain statistical confidence level;
- understand margining concepts and background;
- compute Initial Margin for a given position; and
- compute Mark to Market Margin for a given position.

### **Structure**

- 13.1 Risk Management: An Overview
- 13.2 Measurement of Risk
- 13.3 Value at Risk (VaR)
- 13.4 Margining
- 13.5 Summary
- 13.6 Self Assessment Questions
- 13.7 Further Readings

### **APPENDIX**

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### **13.1 RISK MANAGEMENT: AN OVERVIEW**

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Risk Management is crucial to all organizations. The recent global meltdown could be primarily attributed to bad risk management. Risk management includes risk assessment, risk measurement and quantification, risk controls, risk monitoring systems, pre-emptive and post facto actions, systems and processes associated with each step and finally an efficient ongoing implementation of such systems and processes.

It is remarkable that stock exchanges which are at the center of the financial world in all its complex forms and ferocity have remained untouched by the meltdown and have not resorted to any kind of bail-out packages in any country of the world. This goes to show the level of sophistication that stock exchanges have achieved to set an example for other constituents of the financial world to emulate and if possible, follow.

Derivatives are inherently high risk instruments and stock exchanges are perhaps institutions with the largest exposure to derivatives in terms of nearness to the derivatives world as well as trading volumes and open interest levels. Risk management of derivatives segments is quite challenging and onerous. This Unit seeks to help you to understand risk management systems and particularly focuses on margining and quantification of risk through measures such as value at risk. Indian systems in risk management are on par with best practices in the world and we should be proud that our exchanges have performed extremely well in times of great stress during the last nine years of operations, particularly in the last 18 months beginning December, 2007.

Various pieces of the risk management framework in the derivatives segment of stock exchanges contribute to the overall efficacy of the system. Some of the important ones could be identified as under:

- Stringent mathematically defined stock selection criteria for derivatives segment.
- Availability of both futures and options for all qualifying underlyings.
- Position limits at market wide level, trading member level, FII and mutual fund level and finally individual client level.
- Measurement of risk using scientific methodologies.
- Initial Margins on scientifically derived mathematical formulae.
- Mark to market margins on daily basis leading to substantial reduction of risk on a day to day basis.
- Minimum net worth levels for clearing and trading members assuring basic financial strength of market intermediaries.
- Strong financial base of the exchanges.
- Strong software systems to monitor positions on real time basis.
- Measures relating to trading halts in case of huge volatility on major indices.
- Strong implementation of systems, ongoing detection of penalties through online monitoring, inspection and audits.
- Severe penalties for violations.

In unit 4 on Policy and Regulation, we already discussed: (a) stock selection criteria for qualifying securities for the derivatives segment, (b) futures and options being made available on all qualifying securities, and (c) position limits at various levels in the derivatives segment.

Stocks are carefully selected on the basis of trading volumes and liquidity (measured through the quarter-sigma mechanism). The principle behind liquidity being that once the trader takes a position in the derivative segment, he/she should be able to exit smoothly without significant impact costs. Unless this confidence is seen in the market by traders, they will not be incentivized to execute large orders in this segment. The availability of options on the same scrips along with futures helps to hedge positions in both futures and equity in a better manner through execution of complex combination strategies. Further, availability of puts helps in gaining downside protection which many investors are keen to avail of. Position limits keep a check on over-extending exposures by any section of the investing community.

In this unit, we will cover the provisions relating to Margining and Value at Risk. In the next Unit 14, we will cover provisions relating to Clearing and Settlement. Here, we will discuss the framework relating to Liquid Net Worth requirements of brokers as well as maximum positions that member brokers can enter into at any point in time.

## **13.2 MEASUREMENT OF RISK**

In equity markets, risk is commonly referred to as volatility, sigma, standard deviation and represents probable variations in return in a mathematical sense. For example, if the return from a portfolio of stocks can be mathematically calculated to range between positive 10% to negative 10% over the next three day horizon, this 10% return represents the risk inherent in the portfolio. The positive side of the return indicates reward while the negative possible fluctuation indicates risk. One should also note that upward movements may carry equal risks similar to downward movements because portfolios in derivative markets can be bullish or bearish. For example, if your position comprises of short futures, then upward movements cause losses and downward movements would be profitable.

A negative return of over 100% can destroy the trader's entire capital and lead to possible bankruptcy. Thus, risk computations encompass such possibilities of bankruptcy and are well within the definition of risk being understood as 'variability in returns'. Portfolios whose returns do not vary much are therefore described as low risk portfolios. For example, if you invest in Public Provident Fund where the return is assured at 8%, then under all circumstances, you are expected to earn 8%. The variation in return is zero and mathematically a low variation in return defines a low risk portfolio and a zero variation in return defines a risk free portfolio.

### Standard Deviation

Let us understand how standard deviation is computed, on what base numbers and what is the interpretation of the result. Let us consider quoted market prices of Reliance for the month of May, 2009 and work out the standard deviation of this scrip. Please note that the methodology suggested here to begin with is a very simple one and we can improvise and refine it as we go further in the discussion.

Date	Close Price
04-May-09	1,887.10
05-May-09	1,883.65
06-May-09	1,881.50
07-May-09	1,915.55
08-May-09	1,900.30
11-May-09	1,861.60
12-May-09	1,959.90
13-May-09	1,933.00
14-May-09	1,908.95
15-May-09	1,950.70
18-May-09	2,367.55
19-May-09	2,230.90
20-May-09	2,152.45
21-May-09	2,160.00
21-May-09	2,115.45
22-May-09	2,185.75
25-May-09	2,194.75
26-May-09	2,142.70
27-May-09	2,186.35
28-May-09	2,220.55
29-May-09	2,271.90

We calculate from the daily closing prices above the daily change in prices. For example, on May 5, 2009 the price change (over the closing price of May 4, 2009) was negative Rs 3.45 (and so on for each day). We then express this daily change in terms of a percentage over the previous closing price. Thus, May 5, 2009, the percentage would be computed as negative 0.18% ( $-3.45 / 1887.10$ ), which is then repeated for each day thereafter.

The data table would then appear as under:

Date	Close Price	Daily Change	Daily Return
04-May-09	1,887.10		
05-May-09	1,883.65	-3.45	-0.18%
06-May-09	1,881.50	-2.15	-0.11%
07-May-09	1,915.55	34.05	1.81%
08-May-09	1,900.30	-15.25	-0.80%
11-May-09	1,861.60	-38.70	-2.04%
12-May-09	1,959.90	98.30	5.28%
13-May-09	1,933.00	-26.90	-1.37%
14-May-09	1,908.95	-24.05	-1.24%
15-May-09	1,950.70	41.75	2.19%
18-May-09	2,367.55	416.85	21.37%
19-May-09	2,230.90	-136.65	-5.77%
20-May-09	2,152.45	-78.45	-3.52%
21-May-09	2,160.00	7.55	0.35%
21-May-09	2,115.45	-44.55	-2.06%
22-May-09	2,185.75	70.30	3.32%
25-May-09	2,194.75	9.00	0.41%
26-May-09	2,142.70	-52.05	-2.37%
27-May-09	2,186.35	43.65	2.04%
28-May-09	2,220.55	34.20	1.56%
29-May-09	2,271.90	51.35	2.31%

We then calculate the standard deviation of the last column above, i.e., the daily return. In Excel you could use the formula STDEV() for this purpose. Please refer to a statistics text book for a detailed understanding of the computation of standard deviation. When we work out the Standard Deviation for the above data sample, we get 5.42%. This figure of 5.42% represents the daily standard deviation (or risk or sigma or volatility).

### Basic Concepts of Normal Distribution

As per the concepts of normal distribution in statistics, a normally distributed set of numbers would have many observations around the average and few observations at the extremes. You will have observed a Normal Curve in statistics with a peak in the middle and the two sides tapering downwards.

The normal curve is conceptualized in such a manner that the area under the curve can be theoretically computed in a precise manner for each 'number of standard deviations'. For the purpose of this discussion, we assume that daily returns of stock market prices indeed follow a normal distribution pattern (subject to further refinements which we will discuss later in this Unit) and that the average of daily returns converges to zero. If this assumption be indeed true, then the area under the curve for one standard deviation plus or minus will be 68% approximately. For financial markets, we generally define this as 66% on a more conservative reckoning. Similarly, the area under the curve at the two standard deviation level is defined as 95% and three standard deviations is defined at 99%.

Let us understand the implications of the above rather technical paragraph by continuing the Reliance example. We have computed the standard deviation to be 5.42% and we

know that the closing price on May 29, 2009 was Rs. 2,271.90. Now, what is the expected range of closing prices for the next trading day? The answer is that we can predict the range by applying the above concept of normal distribution to the numbers we have computed.

The one standard deviation movement will be computed as Rs. 123.04 (Rs 2,271.90  $\times$  5.42%). The one standard deviation range of movement in the price of Reliance can therefore be worked out as last closing price plus / minus the one standard deviation range, which comes to a minimum of Rs. 2,148.86 and a maximum of Rs. 2,394.94. This range now represents the possible closing price range of Reliance after one day at a 66% confidence level. The following table summarizes the price movement possibilities of Reliance at other confidence levels:

Sigma	Sigma Rs	Min Price	Max Price	Confidence	Sigma %
1	123.04	2,148.86	2,394.94	66%	5.42%
2	246.08	2,025.82	2,517.98	95%	10.83%
3	369.12	1,902.78	2,641.02	99%	16.25%

### 13.3 VALUE AT RISK

The above table leads us to the understanding of Value at Risk. As the term itself suggests, VaR helps in computing the value that is at risk – or in other words, the amount that your portfolio could possibly lose. The concept of VaR carries with it the following attributes:

- a) The amount the portfolio could lose.
- b) Over what horizon of time.
- c) At what confidence level is the computation being effected (or in other words, how many times out of 100 attempts will the computed figure go wrong).

Thus in the above example, we could state that the VaR of the Reliance scrip is Rs. 369.12 over a one day horizon at 99% confidence. The holder of a position in Reliance could lose upto Rs. 369.12 over one more trading day and that this computation may go wrong once in 100 days (and that it is likely to be correct 99 times out of 100).

You can understand that the computation of VaR is linked to volatility of the underlying. If Reliance were to become more volatile, the sigma would shoot up and so would the VaR.

How do we know that this is a one-day VaR? We know because the data on which the computation was based was daily closing prices. If we had considered weekly closing prices or monthly closing prices, the result would have been a weekly VaR or a monthly VaR.

#### VaR for longer horizons

Way back, more than 85 years ago, a French physicist Louis Bachelier helped establish an important theorem called Root Square Mean Theorem which even today sits at the heart of many mathematical calculations in financial markets. After researching stock price movements for over a decade he concluded that stock prices movements can be correlated to square root of time and not time itself. In simple words, if Reliance price moved by Rs 10 in one day, how much will it move in 5 days? The answer is not a simple Rs. 50.

But if we know that the standard deviation of the daily returns in Reliance was 5.42% computed over daily price data, then the one sigma number for a 2 day period will be

5.42% multiplied by square root of 2 and the one sigma number for a 20 day period will be 5.42% multiplied by square root of 20 and so on.

Thus, if you are interested in volatility of Reliance over the month of June which comprises of 22 trading days, you can compute the VaR for June as 5.42% multiplied by square root of 22, i.e., 25.40%. So, if you are asked to predict the price range within which Reliance should quote by end of June, you could produce the following table with statistical backing.

Sigma	Sigma Rs	Min Price	Max Price	Confidence	Sigma %
1	577.10	1,694.80	2,849.00	66%	25.40%
2	1,154.20	1,117.70	3,426.10	95%	50.80%
3	1,731.31	540.59	4,003.21	99%	76.21%

You may be a little amazed at the finding that Reliance could close anywhere between Rs. 540 to Rs. 4,003 by end of June (hardly one month away) given the volatility data that you have computed for the month of May.

Practitioners often argue whether one should consider total days for the purposes of longer duration VaR or trading days. For example, June may have 30 total days and 22 trading days. Both practices are found in the world. The exchanges in India use total days as the basis, while many practitioners swear by trading day logic.

### Refinements in VaR computations

The standard deviation that we have calculated above follows a very simple methodology. Practitioners argue that the computation of a percentage in simple arithmetic is flawed. For example, if 50 becomes 100, i.e., considered to be a 100% rise. Now, if this 100 becomes 50 next day, i.e., considered to be a 50% fall. Finally, the 50 has come back to 50, but the rise was 100% and the fall merely 50%.

To overcome this problem with basic arithmetic, a logarithmic approach is followed where logarithmic returns are computed. 50 becoming 100 and 100 becoming 50 are both 66.66% (rise and fall respectively) in the logarithmic world.

Some practitioners argue that recent data should be given more importance compared to past data. For example, if we consider 2 year data of Reliance, the price movement of yesterday is much more significant than the price movement of June 2007. These practitioners then follow a weighted methodology whereby recent data attracts a higher weightage than past data.

As these VaR computations are refreshed every day, they are also called Moving Averages.

The Indian stock exchanges follow a methodology incorporating all the above refinements. This methodology is called EWMA (Exponential Weighted Moving Average) model and is used for margining at the exchange level. As per SEBI regulations, Indian exchanges use a 3.5 sigma VaR for individual scrips.

The volatility and VaR are continuously computed by the exchanges on a real time basis. This computation of daily volatility and annual volatility for all derivative scrips as at May 29, 2009 is provided below for your ready reference. You will observe that unlike the 5.42% one sigma computed by us based on May data, the more complex and real time computation of one sigma is 4.49% in the Table.

Date	Scrip	Equity Daily Volatility	Equity Annual Volatility
29-May-09	3IINFOTECH	6.02%	115.11%
29-May-09	ABAN	7.62%	145.66%
29-May-09	ABB	4.58%	87.58%
29-May-09	ABIRLANUVO	5.74%	109.69%
29-May-09	ACC	3.74%	71.48%
29-May-09	ADLABSFILM	5.70%	108.92%
29-May-09	ALBK	5.42%	103.61%
29-May-09	ALOKTEXT	5.89%	112.45%
29-May-09	AMBUJACEM	3.75%	71.59%
29-May-09	AMTEKAUTO	3.65%	69.68%
29-May-09	ANDHRABANK	4.52%	86.37%
29-May-09	APIL	4.90%	93.53%
29-May-09	APTECHT	5.54%	105.93%
29-May-09	ARVIND	7.49%	143.06%
29-May-09	ASHOKLEY	5.90%	112.81%
29-May-09	ASIANPAINT	2.68%	51.19%
29-May-09	AUROPHARMA	4.39%	83.80%
29-May-09	AXISBANK	5.15%	98.34%
29-May-09	BAJAJ-AUTO	4.13%	78.93%
29-May-09	BAJAJHIND	6.07%	116.04%
29-May-09	BAJAJHLDNG	3.80%	72.58%
29-May-09	BALAJITELE	6.67%	127.37%
29-May-09	BALLARPUR	5.88%	112.30%
29-May-09	BALRAMCHIN	4.30%	82.09%
29-May-09	BANKBARODA	4.68%	89.34%
29-May-09	BANKINDIA	4.56%	87.20%
29-May-09	BANKNIFTY	4.53%	86.64%
29-May-09	BATAINDIA	4.94%	94.39%
29-May-09	BEL	3.60%	68.85%
29-May-09	BEML	5.09%	97.32%
29-May-09	BHARATFORG	5.81%	110.92%
29-May-09	BHARTIARTL	5.59%	106.79%
29-May-09	BHEL	4.46%	85.15%
29-May-09	BHUSANSTL	6.86%	131.14%
29-May-09	BIOCON	4.67%	89.30%
29-May-09	BIRLACORPN	3.06%	58.45%
29-May-09	BOMDYEING	6.81%	130.19%
29-May-09	BOSCHLTD	2.15%	41.06%
29-May-09	BPCL	3.99%	76.32%
29-May-09	BRFL	4.58%	87.48%
29-May-09	CAIRN	4.00%	76.51%
29-May-09	CANBK	3.91%	74.67%
29-May-09	CENTRALBK	5.73%	109.40%
29-May-09	CENTURYTEX	6.36%	121.42%
29-May-09	CESC	4.83%	92.24%
29-May-09	CHAMBLFERT	4.39%	83.93%
29-May-09	CHENNPETRO	4.89%	93.35%
29-May-09	CIPLA	3.38%	64.63%
29-May-09	CNX100	3.63%	69.32%
29-May-09	CNXIT	3.75%	71.65%
29-May-09	COLPAL	1.94%	37.04%

			Margining and Value at Risk
29-May-09	CONCOR	2.67%	50.99%
29-May-09	CORPBANK	3.76%	71.78%
29-May-09	CROMPGREAV	5.50%	104.99%
29-May-09	CUMMINSIND	4.24%	80.98%
29-May-09	DABUR	2.38%	45.39%
29-May-09	DCB	5.90%	112.70%
29-May-09	DCHL	6.58%	125.64%
29-May-09	DEFTY	4.32%	82.61%
29-May-09	DENABANK	4.30%	82.17%
29-May-09	DISHTV	5.23%	99.88%
29-May-09	DIVISLAB	3.55%	67.84%
29-May-09	DLF	7.39%	141.25%
29-May-09	DRREDDY	3.07%	58.61%
29-May-09	EDELWEISS	5.66%	108.04%
29-May-09	EDUCOMP	4.47%	85.42%
29-May-09	EKC	4.46%	85.24%
29-May-09	ESCORTS	5.91%	112.92%
29-May-09	ESSAROIL	6.34%	121.15%
29-May-09	EVERONN	7.52%	143.59%
29-May-09	FEDERALBNK	4.66%	89.07%
29-May-09	FINANTECH	6.25%	119.46%
29-May-09	FSL	7.03%	134.38%
29-May-09	GAIL	3.41%	65.20%
29-May-09	GDL	6.03%	115.28%
29-May-09	GESHIP	4.98%	95.10%
29-May-09	GITANJALI	6.37%	121.61%
29-May-09	GLAXO	1.76%	33.58%
29-May-09	GMRINFRA	5.31%	101.39%
29-May-09	GNFC	4.01%	76.52%
29-May-09	GRASIM	4.14%	79.07%
29-May-09	GSPL	5.53%	105.71%
29-May-09	GTL	2.69%	51.31%
29-May-09	GTLINFRA	4.55%	86.86%
29-May-09	GTOFFSHORE	4.33%	82.68%
29-May-09	GUJALKALI	4.84%	92.40%
29-May-09	GVKPIL	6.42%	122.75%
29-May-09	HAVELLS	6.09%	116.27%
29-May-09	HCC	7.88%	150.58%
29-May-09	HCL-INSYS	3.77%	72.07%
29-May-09	HCLTECH	5.05%	96.53%
29-May-09	HDFC	5.55%	106.10%
29-May-09	HDFCBANK	3.82%	72.89%
29-May-09	HDIL	8.15%	155.78%
29-May-09	HEROHONDA	4.57%	87.39%
29-May-09	HINDALCO	4.75%	90.69%
29-May-09	HINDOILEXP	6.45%	123.25%
29-May-09	HINDPETRO	5.22%	99.82%
29-May-09	HINDUNILVR	7.11%	40.38%
29-May-09	HINDZINC	4.40%	84.11%
29-May-09	HOTELEELA	4.29%	82.03%
29-May-09	IBREAEST	6.89%	131.55%
29-May-09	ICICIBANK	6.28%	120.03%
29-May-09	ICSA	5.80%	110.84%

29-May-09	IDBI	5.44%	103.93%
29-May-09	IDEA	5.36%	102.44%
29-May-09	IDFC	6.31%	120.63%
29-May-09	IFCI	7.27%	138.81%
29-May-09	INDHOTEL	4.52%	86.44%
29-May-09	INDIACEM	4.30%	82.16%
29-May-09	INDIAINFO	7.98%	152.54%
29-May-09	INDIANB	4.77%	91.16%
29-May-09	INDUSINDBK	5.78%	110.52%
29-May-09	INFOSYSTCH	4.25%	81.17%
29-May-09	IOB	5.23%	99.95%
29-May-09	IOC	5.40%	103.08%
29-May-09	IRB	4.25%	81.22%
29-May-09	ISPATIND	6.10%	116.45%
29-May-09	ITC	3.33%	63.59%
29-May-09	IVRCLINFRA	8.21%	156.85%
29-May-09	JETAIRWAYS	6.15%	117.51%
29-May-09	JINDALSAW	5.03%	96.07%
29-May-09	JINDALSTEL	4.67%	89.17%
29-May-09	JPASSOCIAT	5.77%	110.32%
29-May-09	JPHYDRO	6.74%	128.69%
29-May-09	JSL	5.78%	110.37%
29-May-09	JSWSTEEL	5.61%	107.11%
29-May-09	JUNIOR	3.49%	66.60%
29-May-09	KESORAMIND	5.69%	108.78%
29-May-09	KFA	7.21%	137.67%
29-May-09	KOTAKBANK	6.25%	119.31%
29-May-09	KKSK	4.16%	79.43%
29-May-09	KSOILS	3.56%	67.99%
29-May-09	KTKBANK	5.08%	97.06%
29-May-09	LAXMIMACH	5.77%	110.16%
29-May-09	LICHSGFIN	4.66%	89.02%
29-May-09	LITL	6.85%	130.91%
29-May-09	LT	5.84%	111.53%
29-May-09	LUPIN	2.48%	47.42%
29-May-09	M&M	5.43%	103.75%
29-May-09	MAHLIFE	5.86%	111.96%
29-May-09	MAHSEAMLES	5.47%	104.59%
29-May-09	MARUTI	3.53%	67.51%
29-May-09	MCDOWELL-N	4.77%	91.04%
29-May-09	MINDTREE	4.67%	89.18%
29-May-09	MINIFTY	3.71%	70.87%
29-May-09	MLL	6.29%	120.08%
29-May-09	MONNETISPA	6.39%	122.06%
29-May-09	MOSERBAER	5.35%	102.20%
29-May-09	MPHASIS	5.08%	97.13%
29-May-09	MRF	5.14%	98.20%
29-May-09	MRPL	5.81%	111.09%
29-May-09	MTNL	4.84%	92.49%
29-May-09	NAGARCONST	6.87%	131.21%
29-May-09	NAGARFERT	6.48%	123.88%
29-May-09	NATIONALUM	4.66%	89.02%
29-May-09	NBVENTURES	6.21%	118.64%

				Margining and Value at Risk
29-May-09	NDTV	5.65%	107.97%	
29-May-09	NETWORK18	6.40%	122.26%	
29-May-09	NEYVELILIG	4.73%	90.37%	
29-May-09	NFTYMCAP50	3.80%	72.55%	
29-May-09	NIFTY	3.71%	70.87%	
29-May-09	NIITLTD	8.13%	155.33%	
29-May-09	NOIDATOLL	5.57%	106.36%	
29-May-09	NSE10Y06	1.47%	28.01%	
29-May-09	NSE10YZC	2.62%	50.06%	
29-May-09	NSETB91D	2.58%	49.31%	
29-May-09	NTPC	2.84%	54.18%	
29-May-09	OFSS	4.43%	84.65%	
29-May-09	ONGC	4.47%	85.38%	
29-May-09	OPTOCIRCUI	5.46%	104.23%	
29-May-09	ORCHIDCHEM	4.94%	94.41%	
29-May-09	ORIENTBANK	4.68%	89.49%	
29-May-09	PANTALOONR	5.78%	110.46%	
29-May-09	PATELENG	6.61%	126.19%	
29-May-09	PATNI	5.84%	111.67%	
29-May-09	PENINLAND	7.30%	139.50%	
29-May-09	PETRONET	4.24%	80.96%	
29-May-09	PFC	4.38%	83.60%	
29-May-09	PIRHEALTH	4.24%	80.94%	
29-May-09	PNB	4.00%	76.45%	
29-May-09	POLARIS	5.78%	110.48%	
29-May-09	POWERGRID	3.84%	73.40%	
29-May-09	PRAJIND	6.09%	116.37%	
29-May-09	PTC	3.74%	71.45%	
29-May-09	PUNJLLOYD	6.38%	121.85%	
29-May-09	RAJESHEXPO	5.47%	104.43%	
29-May-09	RANBAXY	6.47%	123.55%	
29-May-09	RCOM	6.07%	116.04%	
29-May-09	RECLTD	5.02%	95.89%	
29-May-09	REL CAPITAL	7.47%	142.76%	
29-May-09	RELIANCE	4.49%	85.72%	
29-May-09	RELINFRA	6.13%	117.11%	
29-May-09	RENUKA	4.57%	87.33%	
29-May-09	RIIL	8.73%	166.81%	
29-May-09	RNRL	5.52%	105.46%	
29-May-09	ROLTA	6.76%	129.06%	
29-May-09	RPL	3.92%	74.91%	
29-May-09	RPOWER	5.23%	99.93%	
29-May-09	SAIL	5.49%	104.92%	
29-May-09	SBIN	5.06%	96.66%	
29-May-09	SCI	5.21%	99.50%	
29-May-09	SESAGOA	4.87%	92.96%	
29-May-09	SIEMENS	4.91%	93.86%	
29-May-09	SINTEX	6.61%	126.24%	
29-May-09	SKUMARSYNF	6.34%	121.09%	
29-May-09	SREINTFIN	8.10%	154.83%	
29-May-09	SRF	4.43%	84.64%	
29-May-09	STAR	4.50%	85.91%	
29-May-09	STER	6.03%	115.15%	

29-May-09	STERLINBIO	1.36%	25.99%
29-May-09	SUNPHARMA	5.48%	104.63%
29-May-09	SUNTV	4.85%	92.73%
29-May-09	SUZLON	6.18%	118.02%
29-May-09	SYNDIBANK	3.83%	73.09%
29-May-09	TATACHEM	4.82%	92.01%
29-May-09	TATACOMM	4.32%	82.52%
29-May-09	TATAMOTORS	5.95%	113.65%
29-May-09	TATAPOWER	3.44%	65.74%
29-May-09	TATASTEEL	5.78%	110.37%
29-May-09	TATATEA	2.19%	41.77%
29-May-09	TCS	4.55%	87.00%
29-May-09	TECHM	5.57%	106.44%
29-May-09	THERMAX	4.69%	89.64%
29-May-09	TITAN	4.20%	80.29%
29-May-09	TORNTPOWER	4.76%	90.92%
29-May-09	TRIVENI	6.06%	115.71%
29-May-09	TTML	4.99%	95.25%
29-May-09	TULIP	6.77%	129.37%
29-May-09	TV-18	6.37%	121.77%
29-May-09	TVSMOTOR	5.88%	112.28%
29-May-09	UCOBANK	4.06%	77.60%
29-May-09	ULTRACEMCO	3.51%	67.02%
29-May-09	UNIONBANK	3.82%	73.02%
29-May-09	UNIPHOS	4.79%	91.61%
29-May-09	UNITECH	7.27%	138.88%
29-May-09	UTVSOF	5.32%	101.70%
29-May-09	VIJAYABANK	5.55%	106.06%
29-May-09	VOLTAS	5.94%	113.43%
29-May-09	WELGUJ	5.99%	114.41%
29-May-09	WIPRO	4.34%	82.90%
29-May-09	WOCKPHARMA	5.32%	101.68%
29-May-09	YESBANK	6.48%	123.88%
29-May-09	ZEEL	4.99%	95.27%

### 13.4 MARGINING

The VaR computations above form the heart for deciding margins applicable to exposures taken by investors. The daily VaR provides a good estimate of how much the position could lose in one day's time. If Reliance VaR as per the above table is computed at 4.49% (representing one sigma), the 3.5 sigma level would work out to 15.70%. As discussed above, Indian stock exchanges apply a 3.5 sigma on individual scrips for computing margins as per SEBI regulations.

Let us now understand how margining works in practice.

#### Margins on Futures

Imagine that you have taken a long position in Reliance Futures. You bought one lot of 300 Futures at a price of Rs. 2,286.05 (closing price of May 29, 2009). The notional value (or exposure) of your position works out to Rs. 685,815. You will be required to pay a margin of 15.70% of this notional value, which would work out to Rs. 107,673. This margin is called 'Initial Margin'.

- A similar margin would be collected by the exchange from the other counterparty, the party who sold Reliance Futures that you bought. Thus the exchange has collected 15.70% from each side.

- The margin would change day to day depending on EWMA volatility. Any incremental margin would be collected from you and any decrease would be refunded back to you. For example, if the closing price of Reliance June Futures on the next trading day is Rs. 2,300 and the margin increases to 16%, your Initial Margin will work out to  $Rs. 2,300 \times 16\% \times 300 = Rs. 110,400$ . Thus, an incremental demand of Rs. 2,727 would be raised on you on account of Initial Margin.

The Initial Margin is retained by the exchange till the position is held by you. It will be released / refunded on the day you exit your position. If you do not exit the position, then the position will be automatically squared up on the last Thursday of June (June 25, 2009) on which day the margin will be released.

This Initial Margin is like a security deposit that the exchange needs to collect to remain solvent. In a futures contract, one of the parties believes that Reliance will move up (the long futures position), while the other party believes that Reliance will move downwards (the short futures position). One of these parties will gain and the other will lose. The exchange is legally bound to pay the gaining party the amount of gains that accrue and therefore will make all attempts to ensure that the amount of loss of the counterparty is indeed collected.

As one of the parties is bound to suffer a loss (and nobody knows which party that is), the exchange decides to collect upfront Initial Margins from both parties. The potential of loss continues to exist as long as the position itself remains open and hence the requirement of maintaining the Initial Margin as long as the position remains.

The computation of VaR assured us that the 3.5 sigma level will make it a little more than 99.5% assured that the amount of loss over a one day horizon will not exceed the margin percentage computed. Thus, the exchange is reasonably assured that the amount of loss that it may have to incur (should the losing party vanish) will be well within statistical potential loss limits.

### **Mark to Market Margins on Futures**

Clients are required to pay two kinds of margins on Futures positions to the exchange: (a) Initial Margin which was discussed above, and (b) Mark to Market margins. Unlike Initial Margins which are always paid by the client to the exchange, Mark to Market Margins (MTMs) could swing both ways in the sense that on some days client would be required to exchanges and on some others, the exchange would pay clients. Let us now examine this area in detail:

- You have taken a long position of 300 units (one lot) in Reliance June Futures at a price of Rs. 2,286.05. The next day, the closing price of Reliance June Futures comes to Rs. 2,300.00. Your position will be marked to market, i.e. revalued at current price. You would have hypothetically generated a gain of Rs. 13.95 per unit, i.e., Rs. 4,185 on one contract. This is your MTM gain.
- Your counterparty (who sold Reliance June Futures at Rs. 2,286.05) would have an equal and opposite loss of Rs. 4,185. We are assuming that he has also kept his position open till the close of the next day.
- Your counterparty will pay the exchange a sum of Rs. 4,185 which the exchange will promptly hand over to you on the next day ( $t + 1$ ).

This process ensures that all losses which players have incurred on a daily basis are collected on the next day by the exchange. The exchange does not retain these funds with itself, but merely pays them back to the gaining parties. In this manner, settlement

of gains and losses is effected on a daily basis. In commercial parlance, this could be understood as a one day credit period granted by the exchange to all loss making parties.

As the exchange has already collected all losses till yesterday evening, its only risk left (to manage and measure and control) is one day risk of price movements in its derivative securities in the futures market. If Reliance June Futures open on the third trading day morning (in our example) at Rs. 2,305, the only risk the exchange now faces is how far this could go by the evening. To protect against this fluctuation, the exchange has already collected Initial Margin at a 3.5 sigma level as discussed in the earlier section in this Unit.

Thus, this simple combination of Initial Margin at a high statistical confidence level and Mark to Market Margins on a daily basis ensures a high level of risk management ability.

### Exercises

The computation of Initial Margins and Mark to Market Margins and understanding implications thereof requires a player to actually compute these margins on a day to day basis. You may sometimes find (as a speculator or market participant) that your views about the scrip may well be right, but you may not have adequate cash to manage your position. This happens in many cases because market participants are not well aware of the intricacies of margin requirements and hence are forced to square up their interesting positions in some situations. Let us therefore do some exercises in this area.

#### One

Assume that you have taken a long position of one contract (300 units) in Reliance May Futures. For the limited purpose of this exercise, let us assume that Reliance Equity prices as per the above table are the same as prices of Reliance May Futures. Let us also assume that the Initial Margin percentage was 15% on the first five trading days, 14% on the next five trading days and 17% on the balance trading days.

Work out the Initial Margin on day one, the increment or reduction in Initial Margin on each day thereafter.

Work out the Mark to Market Margin from day two till the last Thursday of May.

Work out the net cash flow (outflow or inflow) for each day from day one till the last Thursday of May.

Work out the final profit or loss on the position taken

#### Two

Assume that you had taken a short position of two contracts (600 units) in Reliance May Futures. Other data remaining the same as One above.

Work out the Initial Margin on day one, the increment or reduction in Initial Margin on each day thereafter.

Work out the Mark to Market Margin from day two till the last Thursday of May.

Work out the net cash flow (outflow or inflow) for each day from day one till the last Thursday of May.

Work out the final profit or loss on the position taken.

#### Three

Assume that you have taken a long position of three contracts (900 units) on May 4, 2009 at closing price. You have squared up one contract on May 6, 2009 at closing

price. You have squared up the second contract on May 8, 2009 at closing price. You have then sold four contracts (1,200 units) on May 14, 2009. On May 15, 2009 you bought enough contracts to make your position five contracts long (1,500 units). This position was then continued till expiry.

Work out the Initial Margin on day one, the increment or reduction in Initial Margin on each day thereafter.

Work out the Mark to Market Margin from day two till the last Thursday of May.

Work out the net cash flow (outflow or inflow) for each day from day one till the last Thursday of May.

Work out the final profit or loss on the position taken.

### Margins on Options

We have seen in the Units on Options that the option buyer faces a comfortable payoff profile of limited losses and unlimited gains, while the Option writer faces a rather uncomfortable payoff of limited gains and unlimited losses. This is quite unlike Futures payoffs where both parties face unlimited gains and losses. Thus, the exchange has to protect itself from both parties in the case of Futures (as any one of them could run up unlimited losses), while in the case of Options, the exchange needs to protect itself only from one party, i.e., the Option writer who is exposed to unlimited losses. Therefore, option margins are collected only from the writer community. The buy side in Options pays the Option Premiums in advance and cannot suffer any more losses than such premiums and are exempted from margining.

The computation of Option margins is complicated as the quantum of loss that the option writer could suffer depends on the movement and direction of movement of the underlying. This is further complicated by the fact that different option strikes would carry different deltas and hence the loss may not be proportional to the movement in the underlying. A special software called SPAN (Standard Portfolio Analysis of Risk) has been developed by CME (Chicago Mercantile Exchange) which Indian exchanges have adopted to compute option margins.

This software foresees sixteen possible scenarios of where the underlying could move in the next one day and quantifies the option value for each of these scenarios. The worst scenario is then identified and option margins levied on the basis that if this worst scenario were to indeed unfold, what is the quantum of loss the option writer would face. The option margin computation is considered to be a black box in the market as market players are unable to comprehend the rather complex statistical algorithm that goes into the computation. The amount of margin as thrown up by the software is accepted by market participants as correct and margins are collected / paid on this basis. The option margin amount would vary every day due to changes in the price of the underlying, passage of time, changes in volatility and consequential changes in the sixteen scenarios conceptualized by SPAN.

If you have bought one contract (300 units) of Reliance 2250 call option on May 4, 2009 for Rs. 80.50, what is the margin payable by you?

Answer is zero margin as long positions in options are not subject to margins.

If you had sold this contract, what would be the margin payable?

Answer is that the margin payable as per SPAN would be applicable to the position. Let us assume this margin comes to Rs. 50,000. Let us also assume that you have indeed paid this margin to your broker.

On the next trading day, the SPAN margin as computed based on the refreshed closing price (and background volatility) comes to Rs. 52,000. You will be required to pay an

additional Rs. 2,000 as SPAN margin has increased. On the other hand, if this margin had reduced to Rs. 47,000, the broker would credit you with Rs 3,000 which you could withdraw anytime.

For readers interested in an advance reading, extracts of SPAN methodology from the NSE website are provided in the Appendix to this unit.

### Other Margins

Exchanges are authorized to levy other margins like exposure margins, concentration margins from time to time. These are levied on member-brokers who may or may not collect such margins from ultimate clients. These margins are discussed in unit 14 on Clearing and Settlement.

### Cross Margining between Equity and Derivative Segments

Recent developments in margining include relief to member brokers and clients in offsetting margins between positions in equity and derivative markets. These developments are discussed in unit 14 on Clearing and Settlement.

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## 13.5 SUMMARY

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This entire unit discussed about basics of risk management. Risk management is very crucial for any organization. We divided the whole risk management process into four important segments:

- Risk Assessment
- Risk measurement and quantification
- Risk controls
- Risk monitoring systems

In this unit, we discussed about various measure of risk. First we discussed about volatility. In equity markets, risk is commonly referred to as volatility, sigma, standard deviation and represents probable variations in return in a mathematical sense. Then we covered VaR (Value at Risk). VaR helps in computing the value that is at risk - or in other words, the amount that your portfolio could possibly lose with 99% confidence.

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## 13.6 SELF ASSESSMENT QUESTIONS

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- 1) How to calculate volatility? Explain with example.
- 2) What do you mean by Value at Risk (VaR)?
- 3) What is Mark to Market margin? Explain with example.
- 4) You have taken a long position in stock future contract. The lot size and price of this future contract is 400 and Rs.1500 respectively. Suppose initial margin on this contract is 12%. How much margin amount you have to pay for 2 lot?

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## 13.7 FURTHER READINGS

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- John C Hull, Sankarshan Basu, 2009, *Options, Futures, and Other Derivatives*, 7/E, Pearson Education, India.
- Parasuraman, 2008, *Fundamentals of Financial Derivatives*, Wiley, India.
- Francesca Taylor, 2008, *Mastering Derivatives Markets: A Step-By-Step Guide to the Products, Applications and Risks*, 3/E, Pearson Education, India.
- Elton & Grubber, 2008, *Modern Portfolio Theory and Investment Analysis*, 7/E, Wiley, India.
- Aswath Damodaran, 2007, *Corporate Finance Theory and Practice*, 2/E, Wiley India.

**EXTRACTS FROM SPAN METHODOLOGY (NSE website)****Risk Arrays**

The SPAN risk array represents how a specific derivative instrument (for example, an option on NIFTY index at a specific strike price) will gain or lose value, from the current point in time to a specific point in time in the near future (typically it calculates risk over a one day period called the ‘look ahead time’), for a specific set of market conditions which may occur over this time duration.

The specific set of market conditions evaluated, are called the risk scenarios, and these are defined in terms of :

- how much the price of the underlying instrument is expected to change over one trading day, and
- how much the volatility of that underlying price is expected to change over one trading day.

The results of the calculation for each risk scenario – i.e., the amount by which the futures and options contracts will gain or lose value over the lookahead time under that risk scenario – is called the risk array value for that scenario. The set of risk array values for each futures and options contract under the full set of risk scenarios, constitutes the Risk Array for that contract.

In the Risk Array, losses are represented as positive values, and gains as negative values. Risk array values are typically represented in the currency (Indian Rupees) in which the futures or options contract is denominated.

SPAN further uses a standardized definition of the risk scenarios, defined in terms of

- the underlying ‘price scan range’ or probable price change over a one day period,
- and the underlying price ‘volatility scan range’ or probable volatility change of the underlying over a one day period.

These two values are often simply referred to as the ‘price scan range’ and the ‘volatility scan range’. There are sixteen risk scenarios in the standard definition. These scenarios are listed as under:

- Underlying unchanged; volatility up
- Underlying unchanged; volatility down
- Underlying up by 1/3 of price scanning range; volatility up
- Underlying up by 1/3 of price scanning range; volatility down
- Underlying down by 1/3 of price scanning range; volatility up
- Underlying down by 1/3 of price scanning range; volatility down
- Underlying up by 2/3 of price scanning range; volatility up
- Underlying up by 2/3 of price scanning range; volatility down
- Underlying down by 2/3 of price scanning range; volatility up
- Underlying down by 2/3 of price scanning range; volatility down
- Underlying up by 3/3 of price scanning range; volatility up
- Underlying up by 3/3 of price scanning range; volatility down
- Underlying down by 3/3 of price scanning range; volatility up
- Underlying down by 3/3 of price scanning range; volatility down

- 15) Underlying up extreme move, double the price scanning range (cover 35% of loss).
- 16) Underlying down extreme move, double the price scanning range (cover 35% of loss).

SPAN uses the risk arrays to scan probable underlying market price changes and probable volatility changes for all contracts in a portfolio, in order to determine value gains and losses at the portfolio level. This is the single most important calculation executed by the system.

As shown above in the sixteen standard risk scenarios, SPAN starts at the last underlying market settlement price and scans up and down three even intervals of price changes ('price scan range').

At each 'price scan point', the program also scans up and down a range of probable volatility from the underlying market's current volatility ('volatility scan range'). SPAN calculates the probable premium value at each price scan point for volatility up and volatility down scenario. It then compares this probable premium value to the theoretical premium value (based on last closing value of the underlying) to determine profit or loss.

Deep-out-of-the-money short options positions pose a special risk identification problem. As they move towards expiration, they may not be significantly exposed to "normal" price moves in the underlying. However, unusually large underlying price changes may cause these options to move into-the-money, thus creating large losses to the holders of short option positions. In order to account for this possibility, two of the standard risk scenarios in the Risk Array (sr. no. 15 and 16) reflect an "extreme" underlying price movement, currently defined as double the maximum price scan range for a given underlying. However, because price changes of these magnitudes are rare, the system only covers 35% of the resulting losses.

After SPAN has scanned the 16 different scenarios of underlying market price and volatility changes, it selects the largest loss from among these 16 observations. This "largest reasonable loss" is the 'Scanning Risk Charge' for the portfolio - in other words, for all futures and options contracts.

### Composite Delta

SPAN uses delta information to form spreads between futures and options contracts. Delta values measure the manner in which a future's or option's value will change in relation to changes in the value of the underlying instrument. Futures deltas are always 1.0; options deltas range from -1.0 to +1.0. Moreover, options deltas are dynamic: a change in value of the underlying instrument will affect not only the option's price, but also its delta.

In the interest of simplicity, SPAN employs only one delta value per contract, called the "Composite Delta." It is the weighted average of the deltas associated with each underlying 'price scan point'. The weights associated with each 'price scan point' are based upon the probability of the associated price movement, with more likely price changes receiving higher weights and less likely price changes receiving lower weights. Please note that Composite Delta for an options contract is an estimate of the contract's delta after the lookahead in other words, after one trading day has passed.

### Calendar Spread or Intra-commodity or Inter-month Risk Charge

As SPAN scans futures prices within a single underlying instrument, it assumes that price moves correlate perfectly across contract months. Since price moves across contract months do not generally exhibit perfect correlation, SPAN adds an Calendar Spread Charge (also called the Inter-month Spread Charge) to the Scanning Risk Charge

associated with each futures and options contract. To put it in a different way, the Calendar Spread Charge covers the calendar (inter-month etc.) basis risk that may exist for portfolios containing futures and options with different expirations.

For each futures and options contract, SPAN identifies the delta associated each futures and option position, for a contract month. It then forms spreads using these deltas across contract months. For each spread formed, SPAN assesses a specific charge per spread which constitutes the Calendar Spread Charge.

The margin for calendar spread shall be calculated on the basis of delta of the portfolio in each month. Thus, a portfolio consisting of a near month option with a delta of 100 and a far month option with a delta of 100 would bear a spread charge equivalent to the calendar spread charge for a portfolio which is long 100 near month futures contract and short 100 far month futures contract.

A calendar spread would be treated as a naked position in the far month contract three trading days before the near month contract expires.

### **Short Option Minimum Charge**

Short options positions in extremely deep-out-of-the-money strikes may appear to have little or no risk across the entire scanning range. However, in the event that underlying market conditions change sufficiently, these options may move into-the-money, thereby generating large losses for the short positions in these options. To cover the risks associated with deep-out-of-the-money short options positions, SPAN assesses a minimum margin for each short option position in the portfolio called the Short Option Minimum charge, which is set by the Clearing Corporation. The Short Option Minimum charge serves as a minimum charge towards margin requirements for each short position in an option contract.

For example, suppose that the Short Option Minimum charge is Rs. 50 per short position. A portfolio containing 20 short options will have a margin requirement of at least Rs. 1,000, even if the scanning risk charge plus the inter month spread charge on the position is only Rs. 500.

### **Net Buy Premium (only for option contracts)**

In the above scenario only sell positions are margined and offsetting benefits for buy positions are given to the extent of long positions in the portfolio by computing the net option value.

To cover the one day risk on long option positions (for which premium shall be payable on T+1 day), net buy premium to the extent of the net long options position value is deducted from the Liquid Networth of the member on a real time basis. This would be applicable only for trades done on a given day. The Net Buy Premium margin shall be released towards the Liquid Networth of the member on T+1 day after the completion of pay-in towards premium settlement.

## **UNIT 14    CLEARING AND SETTLEMENT**

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### **Objectives**

After studying this unit, you should be able to:

- understand the meaning and role of clearing function;
- identify the role of various players including the exchange, the Clearing house/corporation, Clearing members, Trading members, clients;
- explain concept of settlement;
- discuss risk management measures in this area;
- explain need for liquid net worth and capital base of members;
- understand cross margining; and
- discuss other margins imposable by exchanges from time to time

### **Structure**

- 14.1 Introduction
- 14.2 Organization Structure
- 14.3 Clearing Function
- 14.4 Clearing and Settlement Mechanism
- 14.5 Cross Margining
- 14.6 Summary
- 14.7 Self Assessment Questions
- 14.8 Further Readings

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### **14.1    INTRODUCTION**

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Any trade on the stock exchange will have two parties for executing the trade, one buyer and one seller. At the end of the day it is important to determine the obligations outstanding against each of the parties to the trade.

The process of ascertaining the obligations is known as clearing and the process of meeting or discharging these obligations is known as settlement. In other words, clearing is the process of determination of obligations and settlement is the process of discharging these obligations by the respective parties to the trade.

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### **14.2    ORGANIZATION STRUCTURE**

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Let us understand the organization structure operating in the areas of Trading, Clearing and Settlement functions. We have used the structure of the National Stock Exchange for illustrating these areas in this Study Note. The various players involved in the structure are:

- The Exchange
- The Clearing Corporation
- Clearing Members
- Trading Members
- Clients

The exchange provides the trading platform where brokers are authorized to trade on behalf of clients as well as on their own account. Brokers who are allowed to provide such trading services are technically termed as 'Trading Members' Any broker who

wishes to offer trading services on the derivatives segment is first required to empanel himself as a Trading Member. This process is subject to various requirements of net worth and liquidity.

Trading members may either clear their trades themselves or effect clearing through other members who are authorized to clear trades. Members who are eligible to clear traders are referred to as Clearing Members. Clearing in effect means ability to offset receivables and payables and receive or pay the net amount from / to the exchange. Clearing and settlement functions are generally housed in a different entity (the clearing Corporation) which is focused entirely on this function. The Clearing Corporation is the entity that provides the ‘settlement guarantee’ and takes responsibility for payment of dues to participating parties.

Trading members (or individual clients) cannot transact with the exchange or its Clearing Corporation directly. They need to access the exchange or the Clearing Corporation through the Clearing Member fraternity.

### **14.3 CLEARING FUNCTION**

#### **Trading Member**

Let us assume that you are working in a broker’s office which offers equity derivatives trading as one of its services. You will have several clients who buy and sell futures and options. On an ongoing basis, you will have to keep track of client wise buy trades, sell trades and open positions. At the end of each day, you will have to track the net open positions on which initial margins will be computed. Further, mark to market margins will be computed for the gains and losses of the day. These amounts will have to be collected / paid from/to clients on a day today basis.

First you need to identify whether the broker that you are working for is a Trading Member or also a Clearing Member. Let us assume that he/she is a Trading Member for the moment (in other words, he/she does not have clearing rights). In such a situation, your broker will be required to clear his/her trades through a Clearing Member. Your broker cannot receive/pay to/from the Clearing Corporation of the exchange directly.

Every time you enter into a trade, you need to identify whether the trade is on your own account (proprietary trading) or on behalf of clients. All client trades have to be identified through a unique client code in the trading system. You need to execute a Know Your Customer document before you can enlist clients. Clients are also required to be aware of the risks that they carry in the derivatives segment and a Risk Disclosure Document is required to be executed by clients before they can trade in the derivatives segment. Appendix A to this Study Note provides a sample of a Risk Disclosure Document from the NSE website.

#### **Example**

You opened your broking office on May 4, 2009. You have traded on your own account, your client A and your client B and the following transactions have been entered into on May 4, 2009.

Account	Scrip	Product	Price Rs	Transaction	Units
Proprietary	Reliance	May Futures	1885.00	Long	300
Client A	Bharti Airtel	May Futures	760.00	Short	-500
Client B	Reliance	May Futures	1886.00	Short	-600
Proprietary	Bharti	May Futures	765.00	Long	1500
Proprietary	Reliance	May Futures	1890.00	Short	-600

Let us assume that Initial Margin on Reliance is 15% and Bharti Airtel 14%. Let us work out the amounts payable to the Clearing Member for these transactions. Closing prices were Reliance Rs. 1,887.10 and Bharti Airtel Rs. 753.00.

Please note that we will compute two margins – Initial Margins and Mark to Market Margins.

We first need to understand positions of each client separately (your own proprietary positions can be conceptualized as one client). If there are offsetting positions within the same client, then these would get squared off and the net open position will attract margining. However, if Client A has a long position and Client B has a short position (in the same scrip), then these will be treated as separate positions and both legs will attract margins – no offset is possible here.

### **Proprietary Account**

#### **Reliance**

In the above example, in the Proprietary account, you have first bought Reliance 300 units and then sold Reliance 600 units. These will be offset and the net closing position will be 300 units short. Such an offset is allowed as the offsetting transactions have occurred in the same client code in the same product (Reliance May Futures).

As the long trade was at Rs. 1,885 and the square up at Rs. 1,890, you have a realized gain of Rs 5 on 300 units, which will become receivable from the Clearing Member (Rs. 1,500).

Thus, on the closing net short position of 300 units at closing price of Rs. 1,887.10 at 15%, the Initial Margin comes to Rs. 84,920.

The open short position of 300 units was entered into at a price of Rs. 1,890 and the closing price is Rs. 1,887.10. So you have a mark to market gain of Rs. 2.90 per unit, i.e., Rs. 870.

#### **Bharti Airtel**

You have a closing long position of 1,500 units, which at the closing price of Rs. 753 carries a notional value of Rs. 1,129,500. At 14%, the Initial Margin on this position would work out to Rs. 158,130.

Further, this position was entered into at a price of Rs. 765, while the closing price is Rs. 753. So there is a mark to market loss of Rs 12 per unit, i.e., Rs. 1,800 on the long position of 1,500 units.

### **Client positions**

In a similar manner client positions related Initial Margins and Mark to Market Margins can be computed. The Table summarizes the margin computations for the day

Your broking office will be responsible to pay to the Clearing Member a sum of Rs. 478,389 for today's transactions and open position. It is quite likely (as we will discover in the further sections in this Unit), that your broker would have already paid some amounts upfront. In that case, the balance amount will be due and payable. For example, if you have already paid Rs. 4.60 lakhs, you will now be required to pay Rs. 18,389.

You will now appreciate the amount of effort and work required in these computations. Please remember that these computations are required for each client, for each position, for each trading day. Even if a client has no transactions for today but has some open positions, both initial margins and mark to market margin computations will be triggered. In view of the heavy duty computational challenges, specialized software programs are necessary to handle daily transactions. The back office of brokers' offices specializes in these computations and spins out a variety of reports on exposures, initial margins, mark to market margins, overdue amounts, client profits and losses so that brokers are able to keep track of their clients' fortunes and their own.

Initial Margin						
Client	Scrip	Net Open	Cls Price	Exposure	Margin %	Initial Margin Rs
Proprietary	Reliance	(300)	1,887.10	566,130	15%	84,920
Proprietary	Bharti	1,500	753.00	1,129,500.	14%	158,130
Client A	Bharti	(500)	753.00	376,500	14%	52,710
Client B	Reliance	(600)	1,887.10	1,102,260	15%	169,839
<b>Total Initial Margin</b>						<b>465,599</b>
Mark to Market Margin						
Client	Scrip	Net Open	Cls Price	Transaction Price	MTM per Unit	MTM Rs
Proprietary	Reliance	(300)	1,887.10	1,890.00	(2.90)	870
Proprietary	Bharti	1,500	753.00	765.00	(12.00)	(18,000)
Client A	Bharti	(500)	753.00	760.00	(7.00)	3,500
Client B	Reliance	(600)	1,887.10	1,886.00	1.10	(660)
<b>Total MTM Margin</b>						<b>(14,290)</b>
Realized Profit						
Client	Scrip	Units	Entry Price	Exit Price	MTM per Unit	MTM Rs
Proprietary	Reliance	300	1,885.00	1,890.00	5.00	1,500
<b>Total Realized Profit</b>						<b>1,500</b>

Brokers' fortunes are necessarily linked to that of their clients the fear being if they are unable to collect their dues, then their clients' misadventures may become their own. Risk management is crucial in an industry where brokerage rates are plummeting over the years and a couple of major client defaults could put in jeopardy the economics of the entire office.

### Exercise for Day Two

Please continue the above computations for day two (May 5, 2009). The following transactions were executed. Initial margins were 16% for Reliance and 12.5% for Bharti Airtel and closing prices were Rs. 1,875.25 and Rs. 743.90 respectively.

Account	Scrip	Product	Price Rs	Transaction	Units
Proprietary	Reliance	May Futures	1871.00	Long	900
Client A	Bharti Airtel	May Futures	740.00	Long	1,500
Client B	Reliance	May Futures	1875.00	Long	3,60
Proprietary	Bharti	May Futures	755.00	Short	1,500
Proprietary	Bharti	May Futures	751.00	Long	600

### Clearing Members

A Clearing Member is responsible for clearing and settlement of all deals executed by Trading Members, who clear and settle such deals through them. Primarily, the Clearing Member performs the following functions:

- 1) Clearing – Computing obligations of all his Trading Members i.e. determining positions to settle.
- 2) Settlement – Performing actual settlement.
- 3) Risk Management – Setting position limits based on upfront deposits/margins for each Trading Member and monitoring positions on a continuous basis.

### Types of Clearing Members

- **Trading Member Clearing Member (TM-CM)** A Clearing Member who is also a Trading Member. Such Clearing Members may clear and settle their own proprietary trades, their clients' trades as well as trades of other Trading Members.
- **Professional Clearing Member (PCM)** A Clearing Member who is not a Trading Member. Typically banks or custodians act as Professional Clearing Members and clear and settle for Trading Members
- **Self Clearing Member (SCM):** A Clearing Member who is also a Trading Member. Such Clearing Members may clear and settle only their own proprietary trades and their clients' trades but cannot clear and settle trades of other Trading Member.

## **14.3 CLEARING AND SETTLEMENT MECHANISM**

Exchanges have empanelled specified banks as clearing banks with whom clearing members are required to maintain clearing accounts at designated branches. This clearing account is used only for clearing and settlement operations, i.e., for settling dues payable and receivable from the clearing corporation for margins and other payments including penalties.

A Clearing Member in the Futures and Options Segment, who is also Clearing Member in the Capital Market Segment is required to maintain a separate clearing bank account for the Futures and Options Segment distinct from the capital market clearing account.

Clearing Members are required to authorise the Clearing Bank to access their clearing account for debiting and crediting their accounts, reporting of balances and other information. The Clearing Bank will debit/credit the clearing account of clearing members as per instructions received from the Clearing Corporation.

A Clearing member can deposit funds into this account in any form, but can withdraw funds from this account only in self-name.

### **Clearing Mechanism**

A Clearing Member's open position calculation is arrived by aggregating the open position of all the Trading Members (TM) and all custodial participants clearing through him. The logic followed for the computation is similar to that of the Trading Member's example we discussed above (except that a Clearing Member's ambit is wider and he may have his own proprietary positions, that of several Trading Members operating through him, his own clients as well as clients of those Trading Members).

### **Custodial Participants**

In the retail segment, you would trade through one member and he will also clear your trades. If he is himself a Clearing Member, he will clear the trades himself and if he is purely a Trading Member, he will make arrangements to clear your trade through some other Clearing Member. However, large institutions may prefer to clear their trades through their own designated Clearing Member. They may however require trade execution through some other brokers. Some brokers are good at execution of orders which demand a specialized set of skills. Clearing and settlement is a risky function in the sense that the institution will be paying and receiving from the Clearing Member and if some funds to get into delicate hands, then recovery could be a challenge.

Large institutions therefore require that trading orders be executed through a Trading Member and these trades be then transferred to their Clearing Member. Such Clearing Members are referred to as Custodial Participants.

All trades executed by Custodial Participants through any Trading Member are required to have the Custodial Participant code in the relevant field on the F&O trading system at the time of order entry. Such trades executed on behalf of a Custodial Participant are required to be confirmed by their Clearing Member, within a specified time.

Till such time the trade is confirmed by the Clearing Member of the Custodial Participant, the same is considered as a trade of the Trading Member and the responsibility of settlement of such trade vests with the Clearing Member of the Trading Member. Once the trades have been confirmed by the Clearing Member of the Custodial Participant, they form part of the obligations of the Clearing Member of the Custodial Participant and they shall be responsible for all obligations arising out of such trades including the payment of margins and settlement of obligations.

### **Settlement Mechanism of Futures Contracts on Index or Individual Securities**

#### **Daily Mark-to-Market Settlement**

The positions in the futures contracts for each member is marked-to-market to the daily settlement price of the futures contracts at the end of each trade day.

The profits/ losses are computed as the difference between the trade price or the previous day's settlement price, as the case may be, and the current day's settlement price. The Clearing Members who have suffered a loss are required to pay the mark-to-market loss amount to the clearing corporation which is in turn passed on to the members who have made a profit. This is known as daily mark-to-market settlement.

Theoretical daily settlement price for unexpired futures contracts, which are not traded during the last half an hour on a day, is currently the price computed as per the formula detailed below:

$$F = S * e^{rt}$$

where :

F = theoretical futures price

S = value of the underlying index

r = rate of interest

t = time to expiration

Rate of interest may be the relevant MIBOR rate in the case of the NSE or such other rate as may be specified.

After daily settlement, all the open positions are reset to the daily settlement price.

Clearing Members are responsible to collect and settle the daily mark to market profits / losses incurred by the Trading Members and their clients clearing and settling through them. The pay-in and pay-out of the mark-to-market settlement is on T+1 days (T = Trade day). The mark to market losses or profits are directly debited or credited to the Clearing Members clearing bank account.

#### **Final Settlement**

On the expiry of the futures contracts, NSCCL marks all positions of a Clearing Member to the final settlement price and the resulting profit / loss is settled in cash.

The final settlement of the futures contracts is similar to the daily settlement process except for the method of computation of final settlement price. The final settlement profit / loss is computed as the difference between trade price or the previous day's settlement price, as the case may be, and the final settlement price of the relevant futures contract.

Final settlement loss/ profit amount is debited/ credited to the relevant CMs clearing bank account on T+1 day (T= expiry day). Open positions in futures contracts cease to exist after their expiration day.

## Settlement Mechanism of Options Contracts on Index or Individual Securities

### Daily Premium Settlement

Premium settlement is cash settled and settlement style is premium style. The premium payable position and premium receivable positions are netted across all option contracts for each Clearing Member at the client level to determine the net premium payable or receivable amount, at the end of each day.

The Clearing Members who have a premium payable position are required to pay the premium amount to the clearing corporation which is in turn passed on to the members who have a premium receivable position. This is known as daily premium settlement.

Clearing Members are responsible to collect and settle for the premium amounts from the Trading Members and their clients clearing and settling through them.

The pay-in and pay-out of the premium settlement is on T+1 days (T = Trade day). The premium payable amount and premium receivable amount are directly debited or credited to the Clearing Members clearing bank account.

### Interim Exercise Settlement for Options on Individual Securities

Interim exercise settlement for Option contracts on Individual Securities is effected for valid exercised option positions at in-the-money strike prices, at the close of the trading hours, on the day of exercise. Valid exercised option contracts are assigned to short positions in option contracts with the same series, on a random basis. The interim exercise settlement value is the difference between the strike price and the settlement price of the relevant option contract.

Exercise settlement value is debited/ credited to the relevant Clearing Members clearing bank account on T+1 day (T= exercise date).

### Final Exercise Settlement

Final Exercise settlement is effected for option positions at in-the-money strike prices existing at the close of trading hours, on the expiration day of an option contract. Long positions at in-the money strike prices are automatically assigned to short positions in option contracts with the same series, on a random basis.

For index options contracts, exercise style is European style, while for options contracts on individual securities, exercise style is American style. Final Exercise is Automatic on expiry of the option contracts.

Option contracts, which have been exercised, shall be assigned and allocated to Clearing Members at the client level.

Exercise settlement is cash settled by debiting/ crediting of the clearing accounts of the relevant Clearing Members with the respective Clearing Bank.

Final settlement loss/ profit amount for option contracts on Index is debited/ credited to the relevant Clearing Members clearing bank account on T+1 day (T = expiry day).

Final settlement loss/ profit amount for option contracts on Individual Securities is debited/ credited to the relevant Clearing Members clearing bank account on T+1 day (T = expiry day).

Open positions, in option contracts, cease to exist after their expiration day. The pay-in/ pay-out of funds for a Clearing Member on a day is the net amount across settlements and all TMs/clients, in F&O Segment.

### Minimum Base Capital

A Clearing Member is required to meet with the Base Minimum Capital requirements prescribed by exchanges before he can start operating as a Clearing Member. The regulations of the NSE in this regard are discussed in this Section.

Every Clearing Member is required to maintain Base Minimum Capital of Rs.50 lakhs with the clearing corporation in the following manner:

- 1) Rs.25 lakhs in the form of cash.
- 2) Rs.25 lakhs in any one form or combination of the below forms:
  - Cash.
  - Fixed Deposit Receipts issued by approved banks.
  - Bank Guarantee in favour of the clearing corporation from approved banks.
  - Approved securities in demat form deposited with approved Custodians.

Further, every Clearing Member is required to maintain Base Minimum Capital of Rs.10 lakhs, in respect of every trading member whose deals such Clearing Member undertakes to clear and settle, in the following manner:

- 1) Rs.2 lakhs in the form of cash.
- 2) Rs.8 lakhs in a one form or combination of the following:
  - Cash.
  - Fixed Deposit Receipts issued by approved banks.
  - Bank Guarantee in favour of the clearing corporation from approved banks.
  - Approved securities in demat form deposited with approved Custodians.

### **Additional Base Capital**

Clearing members may provide additional margin/collateral deposit (additional base capital) to the clearing corporation and/or may wish to retain deposits and/or such amounts which are receivable from the clearing corporation, over and above their minimum deposit requirements, towards initial margin and/ or other obligations.

Clearing members may submit such deposits in any one form or combination of the above forms.

### **Effective Deposits / Liquid Networth**

#### **Effective deposits**

All collateral deposits made by Clearing Members are segregated into cash component and non-cash component.

For Additional Base Capital, cash component means cash, bank guarantee, fixed deposit receipts, T-bills and dated government securities. Non-cash component shall mean all other forms of collateral deposits like deposit of approved demat securities.

At least 50% of the Effective Deposits should be in the form of cash.

#### **Liquid Networth**

Liquid Networth is computed by reducing the initial margin payable at any point in time from the effective deposits.

The Liquid Networth maintained by Clearing Members at any point in time should not be less than Rs.50 lakhs (referred to as Minimum Liquid Net Worth).

#### **Payment of Margins**

The initial margin is payable upfront by Clearing Members. Initial margins can be paid by members in the form of Cash, Bank Guarantee, Fixed Deposit Receipts and approved securities.

Non-fulfillment of either the whole or part of the margin obligations is treated as a violation by the NSE and attracts penal charges of 0.07% per day of the amount not paid.

## 14.5 CROSS MARGINING

Margins are imposed by the equity segment of Indian exchanges for exposures in that segment. Margins are also imposed by the derivatives segment of these exchange for derivative open positions. Thus, the client ends up paying multiple margins making the trade more expensive. Clients have been asking for reduction or relief in margins by taking a holistic view of positions across both segments. In particular, if there are offsetting positions, there could be, in reality a risk lower than that perceived by margining systems operating in silos.

SEBI has recently taken some measures for such margin relief. The relevant circular of Dec 2008 is discussed below.

### Positions eligible for cross margining benefit

The positions of clients in both the cash and derivatives segments to the extent they offset each other shall be considered for the purpose of cross margining as per the following priority:

- Index futures position and constituent stock futures position in derivatives segment.
- Index futures position in derivatives segment and constituent stock position in cash segment.
- Stock futures position in derivatives segment and the position in the corresponding underlying in cash segment.

A basket of positions in index constituent stock/stock futures, which is a complete replica of the index in the ratio specified by the Exchange/Clearing Corporation, shall be eligible for cross margining benefit.

The positions in the derivatives segment for the stock futures and index futures shall be in the same expiry month to be eligible for cross margining benefit.

### Computation of cross margin

To begin with, a spread margin of 25% of the total applicable margin on the eligible offsetting positions, as mentioned in para 1 (a) above, shall be levied in the respective cash and derivative segments.

Cross margining benefit shall be computed at client level on an online real time basis and provided to the trading member/clearing member/custodian, as the case may be, who, in turn, shall pass on the benefit to the client. For institutional investors, however, the cross margining benefit shall be provided after confirmation of trades.

## 14.6 SUMMARY

This unit discussed about the entire clearing and settlement process of equity derivative market. There are five major entities, which are involved in this clearing and settlement process. They are: the Exchange, Clearing corporation, Clearing member, Trading member and Client.

Exchange not directly participate in clearing and settlement process. Exchange has its own clearinghouse, which is entirely focused on this function.

The exchange provides the trading platform where brokers are authorized to trade on behalf of clients as well as on their own account. If they trade on their own account then

it is known as proprietary account trading and if they trade on behalf of their client then it is known as client account trading. Trading members (or individual clients) cannot transact with the exchange or its Clearing Corporation directly. They need to access the exchange or the Clearing Corporation through the Clearing Member fraternity. If trading member is also clearing member then they are authorized to clear their trades directly with the exchange clearing corporation.

There are types of clearing member: Trading member Clearing member (TM CM), Professional clearing member (PCM) and Self clearing member (SCM).

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#### 14.7 SELF ASSESSMENT QUESTIONS

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- 1) What do you mean by Initial margin?
  - 2) What is the difference between Proprietary account trading and Client account trading?
  - 3) Explain the various function of Clearing member?
  - 4) Discuss the settlement mechanism of future contract?
  - 5) Discuss the settlement mechanism of option contract?
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#### 14.8 FURTHER READINGS

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- 1) John C Hull, 2005, *Futures, Options and other derivatives*, Fifth Edition, Prentice Hall Publications.
- 2) Paul Davidson, 2002, *Financial Markets, Money and the Real world*, Edward Elgar Publishing Limited.
- 3) John C Hull, 2005, *Fundamentals of Futures and options markets*, fourth edition, Prentice Hall Publications.
- 4) Indian Securities Markets Review, 2007, National Stock Exchange Publication, Mumbai.

**As used by the NSE**

**RISK DISCLOSURE DOCUMENT**

(THIS DOCUMENT SHOULD BE READ BY EACH AND EVERY PROSPECTIVE CONSTITUENT BEFORE ENTERING INTO DERIVATIVES TRADING AND SHOULD BE READ IN CONJUNCTION WITH CLAUSE 4.3.3 OF THE NSE (FUTURES & OPTIONS) TRADING REGULATIONS OF THE NATIONAL STOCK EXCHANGE OF INDIA LIMITED (NSEIL)

NSEIL has not passed the merits of participating in this trading segment nor has NSEIL passed the adequacy or accuracy of this disclosure document. This brief statement does not disclose all of the risks and other significant aspects of trading. In light of the risks, you should undertake such transactions only if you understand the nature of the contracts (and contractual relationships) into which you are entering and the extent of your exposure to risk. Risk of loss in trading in derivatives can be substantial. You should carefully consider whether trading is appropriate for you in light of your experience, objectives, financial resources and other relevant circumstances. Derivatives trading thus requires not only the necessary financial resources but also the financial and emotional temperament. In case of any consequences or loss in the Futures & Options segment, the constituent shall be solely responsible for such loss and the Exchange or SEBI shall not be responsible for the same and it will not be open for any client to take the plea that no adequate disclosure was made or he was not explained the full risk involved by the member. The client will be solely responsible for the consequences and no contract can be rescinded on that account.

**RISKS INVOLVED IN TRADING IN DERIVATIVES CONTRACTS**

**Effect of "Leverage" or "Gearing"**

The amount of margin is small relative to the value of the derivatives contract so the transactions are 'leveraged' or 'geared'.

Derivatives trading, which is conducted with a relatively small amount of margin, provides the possibility of great profit or loss in comparison with the principal investment amount. But transactions in derivatives carry a high degree of risk.

You should therefore completely understand the following statements before actually trading in derivatives trading and also trade with caution while taking into account one's circumstances, financial resources, etc. If the prices move against you, you may lose a part of or whole margin equivalent to the principal investment amount in a relatively short period of time. Moreover, the loss may exceed the original margin amount.

- a) Futures trading involves daily settlement of all positions. Every day the open positions are marked to market based on the closing level of the index. If the index has moved against you, you will be required to deposit the amount of loss (notional) resulting from such movement. This margin will have to be paid within a stipulated time frame, generally before commencement of trading next day.
- b) If you fail to deposit the additional margin by the deadline or if an outstanding debt occurs in your account, the broker/member may liquidate a part of or the whole position or substitute securities. In this case, you will be liable for any losses incurred due to such close-outs.
- c) Under certain market conditions, an investor may find it difficult or impossible to execute transactions. For example, this situation can occur due to factors such as illiquidity i.e., when there are insufficient bids or offers or suspension of trading due to price limit or circuit breakers etc.

- d) In order to maintain market stability, the following steps may be adopted: changes in the margin rate, increases in the cash margin rate or others. These new measures may be applied to the existing open interests. In such conditions, you will be required to put up additional margins or reduce your positions.
- e) You must ask your broker to provide the full details of the derivatives contracts you plan to trade i.e., the contract specifications and the associated obligations.

#### **Risk-reducing orders or strategies**

The placing of certain orders (e.g., "stop-loss" orders, or "stop-limit" orders) which are intended to limit losses to certain amounts may not be effective because market conditions may make it impossible to execute such orders. Strategies using combinations of positions, such as "spread" positions, may be as risky as taking simple "long" or "short" positions.

#### **Suspension or restriction of trading and pricing relationships**

Market conditions (e.g., illiquidity) and/or the operation of the rules of certain markets (e.g., the suspension of trading in any contract or contact month because of price limits or "circuit breakers") may increase the risk of loss due to inability to liquidate/offset positions.

#### **Deposited cash and property**

You should familiarise yourself with the protections accorded to the money or other property you deposit particularly in the event of a firm insolvency or bankruptcy. The extent to which you may recover your money or property may be governed by specific legislation or local rules. In some jurisdictions, property which has been specifically identifiable as your own will be pro-rated in the same manner as cash for purposes of distribution in the event of a shortfall. In case of any dispute with the member, the same shall be subject to arbitration as per the byelaws/regulations of the Exchange.

#### **Risk of Option holders**

- 1) An option holder runs the risk of losing the entire amount paid for the option in a relatively short period of time. This risk reflects the nature of an option as a wasting asset which becomes worthless when it expires. An option holder who neither sells his option in the secondary market nor exercises it prior to its expiration will necessarily lose his entire investment in the option. If the price of the underlying does not change in the anticipated direction before the option expires to an extent sufficient to cover the cost of the option, the investor may lose all or a significant part of his investment in the option.
- 2) The Exchange may impose exercise restrictions and have authority to restrict the exercise of options at certain times in specified circumstances.

#### **Risks of Option Writers**

- 1) If the price movement of the underlying is not in the anticipated direction the option writer runs the risks of losing substantial amount.
- 2) The risk of being an option writer may be reduced by the purchase of other options on the same underlying interest-and thereby assuming a spread position-or by acquiring other types of hedging positions in the options markets or other markets. However, even where the writer has assumed a spread or other hedging position, the risks may still be significant. A spread position is not necessarily less risky than a simple 'long' or 'short' position.
- 3) Transactions that involve buying and writing multiple options in combination, or buying or writing options in combination with buying or selling short the underlying

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## **UNIT 15 ACCOUNTING AND TAXATION**

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### **Objectives**

After reading this unit, you should be able to:

- understand accounting guidelines as per Indian practices for Derivatives;
- understand accounting guidelines as per International practices for Derivatives; and
- understand tax regulations on gains and losses generated from Derivatives.

### **Structure**

- 15.1 Introduction
- 15.2 Accounting of Futures
- 15.3 Accounting of Options
- 15.4 Tax Regulations on Futures and Options
- 15.5 Key Words
- 15.6 Summary
- 15.7 Self Assessment Questions
- 15.8 Further Readings

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### **15.1 INTRODUCTION**

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Indian Accounting Guidelines are published from time to time by The Institute of Chartered Accountants of India (ICAI). The ICAI issues Accounting Standards on areas requiring wide applicability. It also issues Guidance Notes on areas which have relatively narrow applicability. The ICAI has issued a Guidance Note on Accounting for Futures and Options which currently provides guidance on how these instruments are recognized, de-recognized and measured in the financial statements. This Guidance Note will be applicable upto March 31, 2011 in India.

In order to extend the scope of accounting and follow international practices in this area, the ICAI has issued Accounting Standards 30, 31 and 32 which govern accounting of derivatives and other financial instruments. This is a much more detailed set of guidelines which will be applicable from April 1, 2011 onwards.

Internationally, most countries are currently governed by International Financial Reporting Standards (IFRS), which is framed by the International Accounting Standards Board (IASB). The IAS has issued detailed accounting standards on accounting for derivatives and financial instruments. In particular, IAS 39, IAS 32 and IFRS 7 deal with this area. These standards are revised from time to time in order to keep abreast of latest developments in the derivatives world as well as to reflect current thoughts of the accounting regulators in this area. The proposed Indian accounting standards 30, 31 and 32 almost reflect the latest international thought in accounting for derivatives. Post March 2011, we can claim that Indian accounting is almost on par with international accounting in the areas of derivatives and financial instruments.

A detailed discussion of accounting is beyond the scope of this text. However a brief summarized understanding is sought to be discussed in the succeeding chapters.

## 15.2 ACCOUNTING OF FUTURES

The current Indian Accounting guidelines are simple and apply to individuals as well as institutions. The same guidelines apply irrespective of the purpose of the transaction, viz. speculation, hedging or arbitrage, are applicable for all derivative instruments in all the asset classes.

### Regular Accounting – Indian guidelines

Let us understand Accounting of Futures using a practical example. You have bought Infosys Futures (1 unit) for Rs. 2,425. You have paid an Initial Margin of Rs.. 350. What is the accounting implication of this transaction?

The contract value of Rs. 2,425 is referred to as the Notional Value and is also referred to as Exposure. There is no accounting recognition of Notional Value or Exposure in the financial statements. You will record the payment of Margin, which will appear as a Current Asset in your Balance Sheet today evening.

From time to time, you may receive mark to market gains from your broker or you may pay mark to market losses to your broker. These gains and losses are recorded in the Balance Sheet as receipts or payments. These are not required to be reported as gains/losses in the Profit & Loss Account unless the Futures transaction is squared up. For example, if you received Rs. 500 from your broker towards gains and you paid Rs 300 to your broker towards losses, your net receipt of Rs. 200 will have an impact of increasing your cash balance and reduce the balance shown against Margin. Thus, the Margin account will show a net balance of Rs. 150 (Rs. 350 paid initially minus Rs. 200 received against mark to market net gains).

Let us assume that you squared up at this point, when your net mark to market gains were Rs. 200. At that point, Infosys Futures would have run up to Rs. 2,445 (Rs. 200 higher than your entry price). Your broker would now return back to you the Rs. 350 of Initial Margin as no margin is required to be maintained once your position in the market is zero.

Your ledger therefore now reflects an additional receipt of Rs 200 from your broker - against the balance of Rs. 150 receivable (as above), you have received Rs. 350, which represents the gain of Rs. 200 on the position. This Rs. 200 will be reflected in the Profit & Loss Account as a gain on Infosys Futures.

In reality, a day or two may elapse between booking the exit on Futures and actually collecting the cheque from the broker. These nuances are not considered for understanding basic accounting principles in this simplistic example.

### Period End Accounting – Indian guidelines

In simple words, gains and losses are recognized only on squaring up of Futures transactions and not on mark to market basis for day to day accounting. You will appreciate that listed companies need to publish their financial results every quarter while other entities and companies need to publish their results every year. At the time of quarter end or year end (period ends), these entities need to consider their open positions on Futures carefully. If these positions reflect a mark to market loss, such positions need to be reflected as losses in their Profit & Loss Account. However, if these positions reflect gains, such gains are to be ignored. Ignoring gains and recognizing losses is a time tested old principle of conservatism in the old fashioned world of accounting.

If you have a long position in Infosys Futures at Rs. 2,425 and these Futures closed at Rs. 2,501 at the year end, you have an unrealized gain of Rs. 76. This gain will be ignored for the purpose of financial accounting. If you have a long position in Reliance Futures which you acquired for Rs. 2,100 and the closing price at year end is Rs. 2,075,

you have a mark to market loss of Rs. 25. This loss will be recognized in the financial books of account.

The next question that arises is whether you can offset gains and losses within Futures positions. For example, if you have an unrealized gain of Rs. 76 in Infosys Futures and a loss of Rs. 25 in Reliance Futures, your net result is a gain of Rs. 51. Are you therefore required to ignore the net gain of Rs. 51 or recognize the unrealized loss of Rs. 25 in Reliance Futures? The answer is as per our Indian accounting guidelines, you cannot offset gains and losses. You are required to recognize the unrealized loss of Rs. 25 in Reliance Futures and ignore the unrealized gain of Rs. 76 in Infosys Futures.

### **International Accounting – Futures**

Notional value of Futures positions are not to be recognized internationally (same position as in India). If you go long on Infosys Futures at Rs. 2,425 and pay a margin of Rs. 350, you will recognize the margin of Rs. 350 as an Asset. The Notional value will be disclosed in the Notes to Accounts.

Regular daily accounting will happen in practice on the same lines as discussed in the Indian accounting section above. However, recognition of gains or losses and the period ends will differ significantly from Indian guidelines.

International GAAP requires you to specify the purpose of the transaction. The possible purposes are: (a) speculation or trading, and (b) hedging. If you are speculating, the mark to market gains as well as losses are recognized in the Profit & Loss Account. You will observe that under Indian accounting guidelines, losses are recognized while gains are ignored applying old fashioned principles of conservatism. However, under International GAAP, both gains and losses are required to be recognized.

Thus, in the above example where Infosys Futures have generated a mark to market gain of Rs. 76 while Reliance Futures have generated a mark to market loss of Rs. 25, you will recognize both the gains as well as losses and the net gain of Rs. 51 will therefore be recognized as a gain in your Profit and Loss Account. In contrast, we saw that under Indian guidelines, you will recognize a loss of Rs. 25 in your Profit and Loss Account.

This is a significant departure from conservatism and many Indian corporate profits are likely to be impacted once these guidelines become applicable from April, 2011 onwards.

### **International Accounting – Hedging**

Two types of hedges are primarily defined in International GAAP: (a) fair value hedging, and (b) cash flow hedging. If your hedge is intended to protect the fair value of any of your existing assets or liabilities, that hedge is a fair value hedge. On the other hand, if your future cash flows are uncertain which you are seeking to protect, then that is a cash flow hedge.

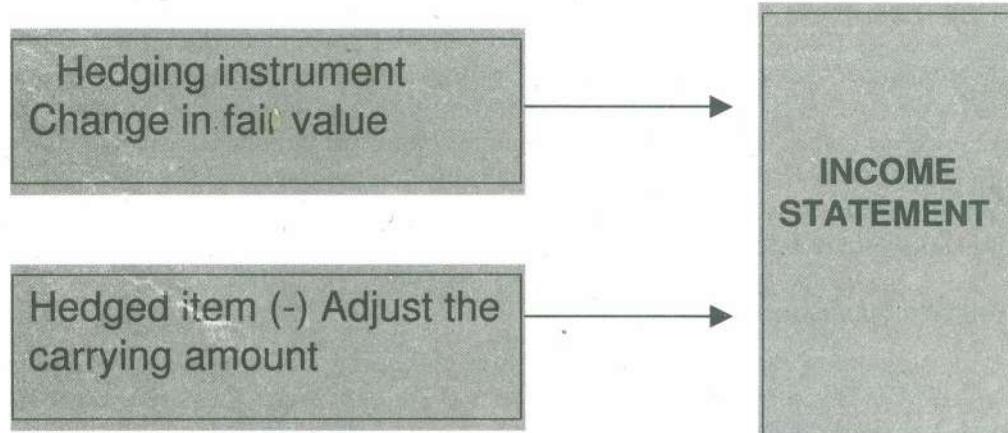
### **Example One**

You own 100 shares of Infosys which you have acquired many years ago at a cost of Rs. 500 per share. The current market price is Rs. 2,401. You are nervous that the share price may fall and you have sold Infosys Futures (100 units) at Rs. 2,425 to protect yourself.

### **What type of hedge is this?**

This is a fair value hedge because the objective of the Futures position is to protect the value of an existing asset, viz Infosys shares.

Illustration: Risk hedged is the change in the 'fair value' of or identified portion of an asset or liability.



### Example Two

You have a floating rate loan from State Bank of India of Rs. 5 crores which carries interest at MIBOR plus 3%. This loan is repayable after 5 years. You face a risk of MIBOR rising in the future, in which case your interest cost will also rise. You seek to protect yourself by entering into an Interest Rate Swap in the derivatives market. In this Interest Rate Swap, you will pay the derivative counterparty 7% fixed and receive MIBOR. Thus, you have neutralized the risk of MIBOR rising in future. In effect, your interest cost is now fixed at 10%. This is the result of the following three cash flows:

- Pay MIBOR plus 3% to State Bank of India.
- Receive MIBOR from derivatives counterparty.
- Pay 7% to derivatives counterparty.

This Interest Rate Swap will be priced in such a manner that the value of the swap on the day of entering into the Swap will be zero. As time passes, the Swap will have either a favourable value or an adverse value depending on interest rate movements in the future. For example, if Interest rates rise, the Swap will work in your favour (as you will receive more interest cash flows in future from the derivatives counterparty) and *vice versa*.

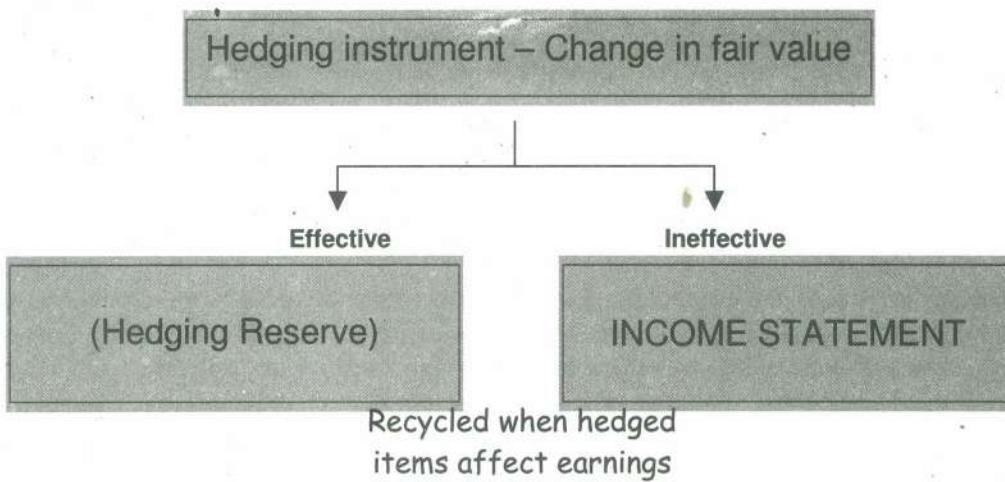
### What type of hedge is this?

This is a cash flow hedge as it seeks to protect you from uncertainty in future cash flows of interest. The interest that you will pay to State Bank of India over the next five years is neither an existing asset nor an existing liability. It will arise over the next five years from time to time. As the amount is uncertain, there is a risk attached which this Interest Rate Swap seeks to hedge.

Illustration: Risk being hedged is exposure to variability in 'cash flows' of an asset or liability.

### Example Three

The management of a British company (the Company) enters into an agreement with an American supplier on 30 September 20XX to purchase an item of equipment for USD 1 million. The equipment is to be delivered in March of the following year and the payment is to be made in June. In order to hedge the foreign exchange risk, (fluctuation in exchange rates) the Company enters into a forward exchange contract on 30 September 200X to purchase USD 1 million in June of the following year at a fixed exchange rate.



### What type of hedge is this?

The management designates the forward contract as a fair value hedge of the foreign currency exposure of a firm commitment.

### Accounting of Hedges

Derivative instruments used for hedging are marked to market. These gains and losses are recognized in the Profit and Loss Account where they relate to Fair Value hedging. These gains and losses are recognized in Shareholders Equity (or Reserves) where they relate to Cash Flow Hedging.

In the above examples, Infosys Futures position is a Fair Value hedge. You have shorted Futures at Rs. 2,425. Suppose the closing price is Rs 2,350 and you have a mark to market gain of Rs. 75. This gain will be recognized in the Profit and Loss Account.

Suppose the Interest Rate Swap has a mark to market gain of Rs. 20 lakhs at the period end. This gain will be recognized in Shareholders Equity. The second impact will be the recognition of Receivables from the Derivatives Counterparty (Asset). The idea is that if you square up the Swap today, you will be entitled to receive Rs. 20 lakhs, which is recognized on the one hand as an Asset (Receivable) and on the other hand as an increment in your Shareholders Equity or Reserves.

Hedge accounting is considered to be one of the most complex areas of accounting and has several other layers of nuances which are beyond the scope of this simple text.

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## 15.3 ACCOUNTING OF OPTIONS

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### Regular Accounting – India

Let us consider going long on options where you will pay a premium for the option. You buy an Infosys Call Option (strike 2500) and pay a premium of Rs. 53. Let us assume that Infosys equity is quoting at Rs. 2,401 at this point in time. You will be aware from previous chapters that no margins are applicable for long positions on options.

No accounting will be applicable for the Infosys equity of Rs. 2,401 (because you have not bought or sold equity) nor for the strike price of Rs. 2,500 (because this strike price is not bought or sold by you and merely represents the threshold above which you will be entitled to benefits on expiry).

The option premium of Rs. 53 will be recognized as an Asset in your Balance Sheet (and your cash balance will reduce to the same extent).

If you sell this Option after 7 days when the Infosys equity price is say Rs 2,650 and the option premium is say Rs. 201, you will recognize a gain on sale. The gain will be Rs. 148, worked out as Rs. 201 minus Rs. 53. Again the equity price of Infosys is not relevant for accounting as you have not bought or sold equity. You will record a Receivable of Rs. 201 from your broker, you will offset the Asset of Rs. 53 which is currently recognized in your Balance Sheet (as that Asset is no longer owned by you) and the excess of Rs. 148 will be recognized as a gain in your Profit and Loss Account.

In regular day to day accounting, gains and losses will be recognized on realization. Realization in case of options happens on squaring up of your original position and can occur (a) through sale or purchase or (b) through exercise or assignment or (c) on expiry. Accounting guidelines do not distinguish between these modes of square up and the accounting treatment remains the same in all modes.

### **Short positions on options**

If you sell options, you will (a) receive a premium from the counterparty, and (b) pay margins to the exchange. You are bearish on the Nifty which is currently trading at 4,900. You sell a 4950 Nifty Call for Rs 43 and pay a margin of Rs. 400.

There is no accounting of the current price of the Nifty of 4,900 as you have neither bought nor sold the Nifty. There is no recognition of the strike price of 4950 as the strike price is neither bought nor sold this strike price. The strike price merely acts as the threshold above which you will be exposed to unlimited losses. You will therefore need to account for (a) the premium which you have received of Rs. 43, and (b) the margin which you have paid of Rs 400.

The premium collected will be recognized as a Liability on your Balance Sheet and the margin paid will be recognized as an Asset on your Balance Sheet. There is no impact on your profit or loss on the day of selling the option. Your net cash outflow would have been Rs. 357 (Rs. 400 margin minus Rs. 43 option premium)

If you square up this option (i.e., buy back) after 3 days when the Nifty is trading at 4825 and the option is trading at Rs. 12, you would (a) generate a gain of Rs. 31, and (b) get back your margin. In a simple scenario, your broker will pay you Rs. 388 (Rs. 400 margin refund minus cost of option Rs. 12).

You will account for this receipt of Rs. 388 by (a) offsetting the margin which appears as an Asset in your Balance Sheet – Rs. 400, (b) offsetting the Option Premium Liability of Rs. 43 in your Balance Sheet, and (c) recognize the gain of Rs. 31 in the transaction – this gain will be reflected in your Profit and Loss Account.

### **Period End Accounting**

Indian guidelines follow the principles of conservatism, wherein unrealized gains will be ignored and unrealized losses will be recognized. Let us continue the example of the Infosys call option where you have paid a premium of Rs. 53. At the year end, if the market price of the call is Rs. 71, you would have a mark to market gain of Rs. 18. This will be ignored. On the other hand, if the market price were to be 41, you would have a mark to market loss of Rs. 12 which would be recognized as a loss in your Profit and Loss Account and as a Liability (payable to market) in your Balance Sheet.

Similarly, if you have a short position on the Nifty Call and you have collected a premium of Rs. 43 which is reflected as a Liability in your Balance Sheet and the market price of the Call falls to Rs. 25 at period end, you would have a mark to market gain of Rs 18. This gain would be ignored in the interests of conservatism. However, if the market price of the Call had appreciated to say Rs. 60, you would have generated a mark to market loss of Rs. 17, which will be recognized as a loss in your Profit and Loss Account.

Suppose you have a mark to market gain on Infosys Call of Rs. 18 and a mark to market loss on the Nifty Call of Rs. 17, how would you account for the two? Can you offset the two and argue that the net gain is Re. 1, which should be ignored?

The answer is No – you need to record the loss of Rs. 17 on the Nifty Call and ignore the gain on the Infosys Call of Rs. 18. You cannot offset the loss in one underlying with the gain in another.

### International Accounting

The principles of International Accounting for options are similar to those of Accounting for futures which have been discussed above. Regular accounting of options will follow Indian practices where realized gains or losses get recognized on square up. However, at period ends, international accounting requires that all derivative positions be marked to market and all gains and losses be recognized. Principles of conservatism are not applicable to derivatives accounting.

Suppose you have a mark to market gain on Infosys Call of Rs. 18 and a mark to market loss on the Nifty Call of Rs. 17, how would you account for the two? Can you offset the two and recognize the net gain?

The answer here is Yes – you should offset the two and recognize the net gain.

In other words, (a) offset of gains and losses is allowed unlike Indian accounting guidelines, and (b) gains are required to be recognized unlike Indian accounting.

Where will the gains be recognized? This depends on the purpose of the transaction. If the purpose is speculation, the gains or losses are recognized in the Profit and Loss Account. If the purpose is hedging, you are required to classify the hedge into either fair value hedge or cash flow hedge. Gains or losses on fair value hedges are recognized in the Profit and Loss Account. Gains or losses on cash flow hedges are recognized in Shareholders Equity or Reserves.

As mentioned above, that many Indian corporate profits are likely to be impacted once the new guidelines become applicable from April, 2011 onwards. These guidelines are in line with the International Financial Reporting Standards (IFRS)

Three standards which will be made mandatory from April 2011 are:

- AS30: Deals with recognition and measurement of financial instruments.
- AS31: Deals with the presentation and principles of reporting in the statements.
- AS32: Deals with disclosures.

### Accounting Standard 30 (AS30)

This deals with recognition and measurement of financial instruments.

#### Definitions Relating to Recognition and Measurement

The amortized cost of a financial asset or financial liability is the amount at which the financial asset or financial liability is measured at initial recognition minus principal repayments, plus or minus the cumulative amortization using the effective interest method of any difference between that initial amount and the maturity amount, and minus any reduction for impairment or un-collectibles.

**Initial Recognition:** An entity should recognize a financial asset or a financial liability on its balance sheet when, and only when, the entity becomes a party to the contractual provisions of the instrument.

**Measurement:** When a financial asset or financial liability is recognised initially, an entity should measure it as follows:

- a) A financial asset or financial liability at fair value through profit or loss should be measured at fair value on the date of acquisition or issue.
- b) Short-term receivables and payables with no stated interest rate should be measured at original invoice amount if the effect of discounting is immaterial.
- c) Other financial assets or financial liabilities should be measured at fair value plus/minus transaction costs that are directly attributable to the acquisition or issue of the financial asset or financial liability.

### **Subsequent Measurement of Financial Assets**

For the purpose of measuring a financial asset after initial recognition, this Standard classifies financial assets into the following four Categories :

- a) Financial assets at fair value through profit or loss;
- b) Held-to-maturity investments;
- c) Loans and receivables; and
- d) Available-for-sale financial assets.

**Fair Value Measurement Considerations:** The best evidence of fair value is quoted prices in an active market. If the market for a financial instrument is not active, an entity establishes fair value by using a valuation technique. The objective of using a valuation technique is to establish what the transaction price would have been on the measurement date in an arm's length exchange motivated by normal business considerations. Valuation techniques include using recent arm's length market transactions between knowledgeable, willing parties, if available, reference to the current fair value of another instrument that is substantially the same, discounted cash flow analysis and option pricing models. If there is a valuation technique commonly used by market participants to price the instrument and that technique has been demonstrated to provide reliable estimates of prices obtained in actual market transactions, the entity uses that technique. The chosen valuation technique makes maximum use of market inputs and relies as little as possible on entity-specific inputs. It incorporates all factors that market participants would consider in setting a price and is consistent with accepted economic methodologies for pricing financial instruments. Periodically, an entity calibrates the valuation technique and tests it for validity using prices from any observable current market transactions in the same instrument or based on any available observable market data.

### **Accounting Standard 31 (AS31)**

This deals with the presentation and principles of reporting in the financial statements. Derivatives have not been given a prominent position on the financial statements. They are to be stated at their fair value on the balance sheet under the head 'other assets or other liability' and gains and losses on derivative instruments are to be reflected in the Income statement under the head 'Other income or other expenditure'. However, the details, showing the break-up of the balance sheet and income statement items have to be reflected in the notes to accounts at the bottom of the statements.

### **Accounting Standard 32 (AS32)**

Standard states the following:

- Disclosure of derivative instruments in the financial statements is to be made at their fair value.
- The disclosure must state the type of risk faced and the methods and or financial instruments used by the company to mitigate the risk.
- Distinction between derivatives instruments (fair value, cash flow hedge) must be made and stated in the books of accounts.

- Objective of holding a derivative instrument must be detailed and the context for understanding the objectives must be enumerated.
- Strategies devised for achieving the objectives and the risk policy for each type of hedge instrument must be given along with the description of the hedged item.

## 15.4 TAX REGULATIONS ON FUTURES AND OPTIONS

A key question which arises from the tax point of view is whether the activity that is sought to be taxed is regular business or is it sale of capital assets (which happens rarely). For example, if you sell your house and generate a gain, that is taxed as a 'capital gain' because you are not in the business of selling houses. But if you are a furniture dealer and sell furniture, the profits from such furniture transactions are taxed under the head 'business income' because selling furniture is your regular business.

Traders in equity derivatives are likely to be operating in this activity as part of their regular business. In such a situation, the profits and gains are characterized as 'income from business'. Once it is clear that the head of income is business, the next question that arises is whether such gains or losses can be characterized as 'speculation business' and if yes, what are the implications of such a characterization.

Section 43(5) of the income tax act, defines a speculative transaction as one which is squared up without delivery of the underlying. For example, if you buy wheat for next month delivery but before delivery, you square up the contract by paying or receiving the price difference between the date of purchase and date of squaring up, that would amount to speculation under the Income Tax Act. However, there is a special carve-out for equity derivative transactions which are effected through stock exchanges recognized by SEBI. Such transactions are not speculative. As a result, regular transactions in the equity derivatives market are not speculative and would be characterized as regular business income.

The implications for speculation businesses should nevertheless be understood. Section 71 of the Income Tax Act does not allow losses from speculation business to be offset against profits from non-speculation business. For example, if you carry on a furniture business (non-speculation) and a speculation business and you generate a profit of Rs. 10 lakhs from furniture business and a loss of Rs. 7 lakhs from speculation business, you are required to pay your taxes on the profit of Rs. 10 lakhs. You are not allowed to offset the loss of Rs. 7 lakhs. You can carry forward this loss of Rs. 7 lakhs to future years (allowed for 4 years) and offset these losses only against future speculation profits.

However, if you carry on a furniture business (profit Rs. 10 lakhs) and equity derivatives business (loss Rs. 7 lakhs), you can offset the two and declare a net profit of Rs. 3 lakhs as equity derivatives are not considered to be speculative under the special carve-out in Section 43(5).

**Income Tax:** It is important to appreciate that Income Tax provisions prescribe differential treatment for loss arising out of speculative and non speculative transactions. A loss on a speculative transaction can only be allowed to be set off against income from speculative transaction.

**Corporate Tax:** Any impact of a derivative transaction on the balance sheet date, whether a concluded transaction or an open position will impact the bottom line in the income statement and a legal entity will end up paying corporate tax .

## 15.5 KEY WORDS

- **Financial Asset:** are in the form of stocks, bonds, rights, derivatives such as options, futures, as distinguished from tangible physical assets.

- **Financial Liability:** are financial obligations or cash outlay that must be made at a specific time to satisfy the contractual terms of such an obligation where the method of working out the amount has been determined.
- **Mark to Market:** The daily notional Gains or Losses made on futures positions held.
- **Hedging:** refers to assuming a position in a derivative such that it offsets any unfavorable change in the value of hedged item.
- **Hedging Instrument:** is a financial instrument whose fair value or cash flows are expected to offset changes in the fair value or cash flows of a designated hedged item.
- **Hedged item:** is an asset, liability, firm commitment, highly probable forecast transaction or net investment that exposes an entity to risk of changes in fair value or future cash flows.
- **Fair Value Hedge:** A fair value hedge is the one that safeguards changes in the value of an asset or liability.
- **Cash Flow Hedge:** A cash-flow hedge is the one that safeguards variation in a forecasted cash flow; for instance, a hedge created by an enterprise to safeguard variable commodity outflows.
- **Speculation:** means anticipating future price movements. Take a risk by buying futures contracts (long) if he anticipates an increase in the price in future and sell futures contract (short) if he anticipates a fall in the price and make profit from this calculated risk.
- **Speculation Business:** is where a person called a speculator, will make a living by making profits based on anticipated price movements.

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## 15.6 SUMMARY

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In this unit you have learnt:

- How to account for futures and options as per as per Indian guidelines.
- How to account for futures and options as per as per International guidelines.
- How equity derivative transactions are taxed in India.

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## 15.7 SELF ASSESSMENT QUESTIONS

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How will these transactions be accounted under Indian accounting guidelines:

- 1) You have bought 100 units of Nifty Futures at 4951 each and paid a margin of Rs. 400 per unit.
- 2) You squared up the above at 5053 and margin was released.
- 3) You have bought 100 units of Nifty Futures at 4800 each and paid a margin of Rs 400 per unit. The market price of these Futures at year end was 4822.
- 4) You have bought 100 units of Nifty Futures at 4800 each and paid a margin of Rs. 400 per unit. The market price of these Futures at year end was 4715.
- 5) You have sold 100 units of Nifty Futures at 4800 each and paid a margin of Rs. 400 per unit. The market price of these Futures at year end was 4822.
- 6) You have sold 100 units of Nifty Futures at 4800 each and paid a margin of Rs. 400 per unit. The market price of these Futures at year end was 4715.

- 7) You have bought 5050 Nifty Call 100 units for Rs. 61 each. You then sold these Calls for Rs. 82 each.
- 8) You have sold 4850 Nifty Call 100 units for Rs. 41 each. You then bought back these Calls for Rs. 73 each.

## 15.8 FURTHER READINGS

- *Institute Guidance Note on Accounting for Stock Futures and Options, 2003.*
- *Institute Accounting Standard 30 - Derivatives and Financial Instruments.*
- Income Tax Act – Section 43 (5)
- Hyun Song Shin, 2004, *Derivatives Accounting and Risk Management- Impact of IAS 39*, Financial Publishing Limited, UK.
- Juan Rettirez, 2007, *Accounting for Derivatives- Advanced hedging under IFRS*, Wiley Finance, London UK.

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