ZERODHA

Futures Trading

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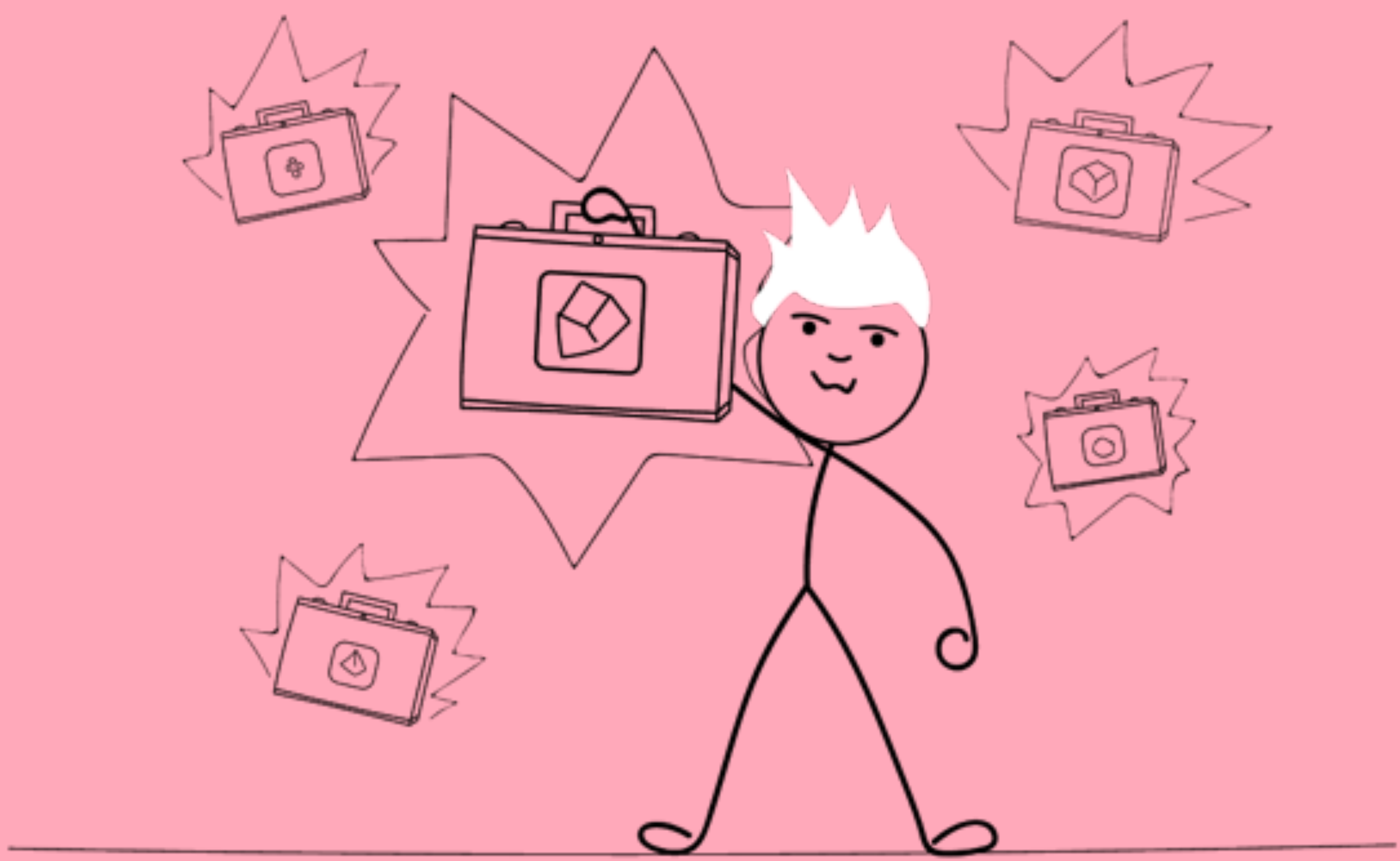

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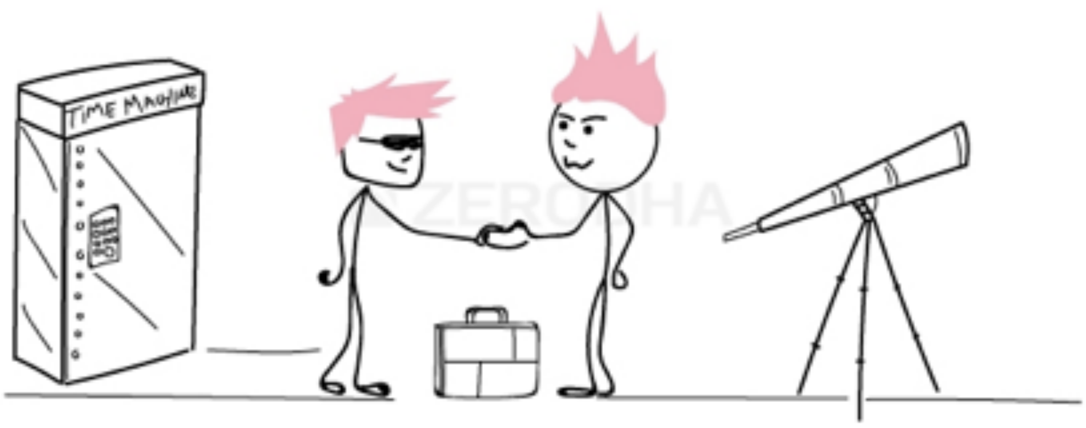
CHAPTER 1

Background – Forwards Market



1.1 Overview

The Futures market is an integral part of the Financial Derivatives world. ‘Derivatives’ as they are called is a security, whose value is derived from another financial entity referred to as an ‘Underlying Asset’. The underlying asset can be anything a stock, bond, commodity or currency. The financial derivatives have been around for a long time now. The earliest reference to the application of derivatives in India dates back to 320 BC in ‘Kautilya’s Arthashastra’. It is believed that in the ancient Arthashastra (study of Economics) script, Kautilya described the pricing mechanism of the standing crops ready to be harvested at some point in the future. Apparently he used this method to pay the farmers much in advance, thereby structuring a true ‘forwards contract’.

Given the similarities between the forwards and the futures market, I think the best possible way to introduce the futures market is by first understanding the ‘Forwards market’. The Understanding of Forwards Market would lay a strong foundation for learning the Futures Market.

The forwards contract is the simplest form of derivative. Consider the forwards contract as the older avatar of the futures contract. Both the futures and the forward contracts share a common transactional structure, except that over the years the futures contracts have become the default choice of a trader. The forward contracts are still in use, but are limited to a few participants such as the industries and banks.

1.2 – A simple Forwards example

The Forward market was primarily started to protect the interest of the farmers from adverse price movements. In a forward market, the buyer and seller enter into an agreement to exchange the goods for cash. The exchange happens at a specific price on a specific future date. The price of the goods is fixed by both the parties on the day they enter into the agreement. Similarly the date and time of the goods to be delivered is also fixed. The agreement happens face to face with no intervention of a third party. This is called "Over the Counter or OTC" agreement. Forward contracts are traded only in the OTC (Over the Counter) market, where individuals/ institutions trade through negotiations on a one to one basis.

Consider this example, there are two parties involved here.

One is a jeweler whose job is to design and manufacture jewelry. Let us call him 'ABC Jewelers'. The other is a gold importer whose job is to sell gold at a whole sale price to jewelers, let us call him' XYZ Gold Dealers'.

On 9th Dec 2014, ABC enters into an agreement with XYZ to buy 15 kilograms of gold at a certain purity (say 999 purity) in three months time (9th March 2015). They fix the price of Gold at the current market price, which is Rs.2450/- per gram or Rs.24,50,000/- per kilogram. Hence as per this agreement, on 9th March 2015, ABC is expected to pay XYZ a sum of Rs.3.675 Crs (24,50,000/ Kg*15) in return for the 15 kgs of Gold.

This is a very straightforward and typical business agreement that is prevalent in the market. An agreement of this sort is called a 'Forwards Contract' or a 'Forwards Agreement'.

Do note, the agreement is executed on 9th Dec 2014, hence irrespective of the price of gold 3 months later i.e 9th March 2015, both ABC and XYZ are obligated to honor the agreement. Before we proceed further, let us understand the thought process of each party and understand what compelled them to enter into this agreement.

Why do think ABC entered into this agreement? Well, ABC believes the price of gold would go up over the next 3 months, hence they would want to lock in today's market price for the gold. Clearly, ABC wants to insulate itself form an adverse increase in gold prices.

In a forwards contract, the party agreeing to buy the asset at some point in the future is called the "Buyer of the Forwards Contract", in this case it is ABC Jewelers.

Likewise, XYZ believes the price of gold would go down over the next 3 months and hence they want to cash in on the high price of gold which is available in the market today. In a forwards contract, the party agreeing to sell the asset at some point in the future is called the "Seller of the Forwards Contract", in this case it is XYZ Gold Dealers.

Both the parties have an opposing view on gold; hence they see this agreement to be in line with their future expectation.

1.3 – 3 possible scenarios

While both these parties have their own view on gold, there are only three possible scenarios that could pan out at the end of 3 months. Let us understand these scenarios and how it could impact both the parties.

Scenario 1 – The price of Gold goes higher

Assume on 9th March 2015, the price of gold (999 purity) is trading at Rs.2700/- per gram. Clearly, ABC Jeweler's view on the gold price has come true. At the time of the agreement the deal was valued at Rs 3.67 Crs but now with the increase in Gold prices, the deal is valued at Rs.4.05 Crs. As per the agreement, ABC Jewelers is entitled to buy Gold (999 purity) from XYZ Gold Dealers at a price they had previously agreed upon i.e Rs.2450/- per gram.

The increase in Gold price impacts both the parties in the following way –

Party	Action	Financial Impact
ABC Jewelers	Buys gold from XYZ Gold Dealers @ Rs.2450/- per gram	ABC saves Rs.38 Lakhs (4.05 Crs – 3.67 Crs) by virtue of this agreement
XYZ Gold Dealers	Obligated to sell Gold to ABC @ Rs.2450/- per gram	Incurs a financial loss of Rs.38 Lakhs.

Hence, XYZ Gold Dealers will have to buy Gold from the open market at Rs.2700/- per gram and would have to sell it to ABC Jewelers at the rate of Rs.2450/- per gram thereby facing a loss in this transaction.

Scenario 2 – The price of Gold goes down

Assume on 9th March 2015, the price of gold (999 purity) is trading at Rs.2050/- per gram. Under such circumstances, XYZ Gold Dealers view on the gold price has come true. At the time of the agreement the deal was valued at Rs 3.67 Cr but now with the decrease in gold prices, the deal is valued at Rs.3.075 Cr. However, according to the agreement, ABC Jewelers is obligated to buy

Gold (999 purity) from XYZ Gold Dealers at a price they had previously agreed upon i.e Rs.2450/- per gram.

This decrease in the gold price would impact both the parties in the following way –

Party	Action	Financial Impact
ABC Jewelers	Is obligated to buy gold from XYZ Gold Dealers @ Rs.2450/- per gram	ABC loses Rs.59.5 Lakhs (3.67 Crs – 3.075 Crs) by virtue of this agreement
XYZ Gold Dealers	Entitled to sell Gold to ABC @ Rs.2450/- per gram	XYZ enjoys a profit of Rs.59.5 Lakhs.

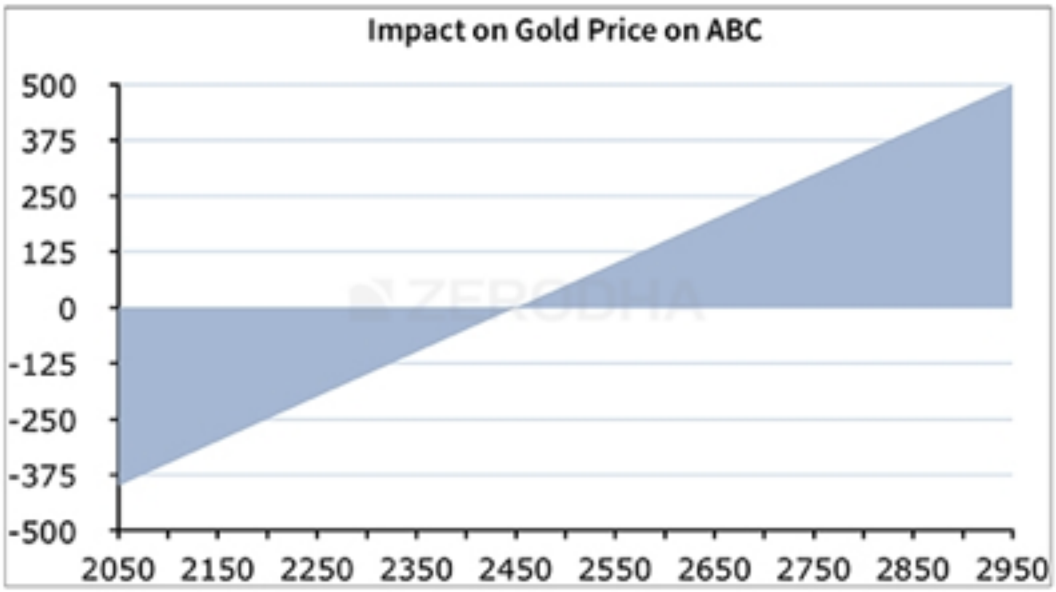
Do note, even though Gold is available at a much cheaper rate in the open market, ABC Jewelers is forced to buy gold at a higher rate from XYZ Gold Dealers hence incurring a loss.

Scenario 3 – The price of Gold stays the same

If on 9th March 2015, the price is the same as on 9th Dec 2014 then neither ABC nor XYZ would benefit from the agreement.

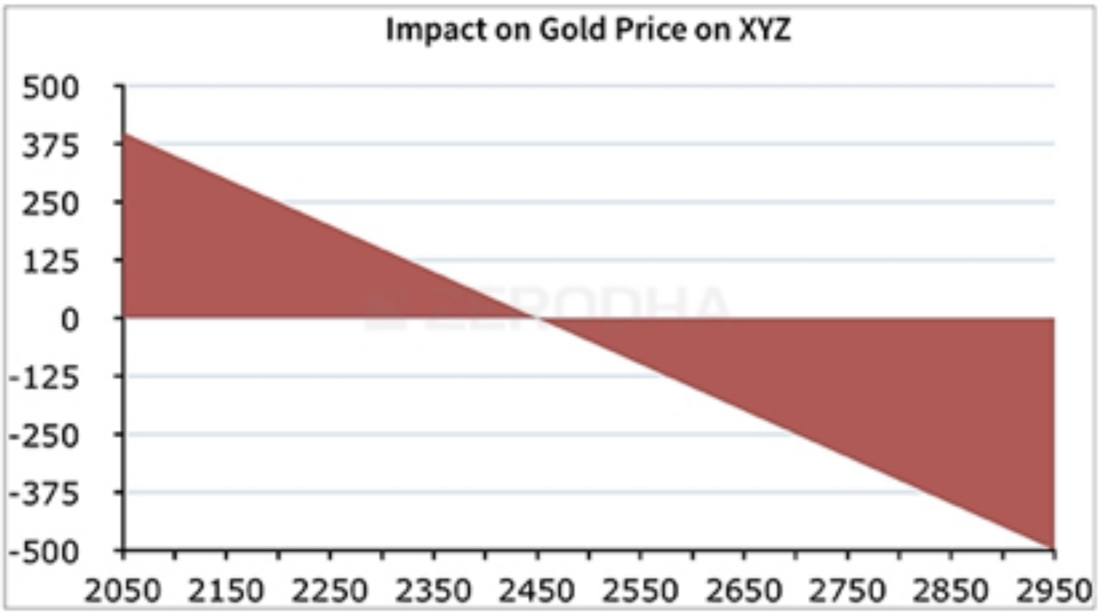
1.4 – 3 possible scenarios in one graph

Here is a visual representation of the impact of gold prices on ABC Jewelers –



As you can see from the chart above, at Rs.2450/- per gram, there is no financial impact for ABC. However, as per the graph above we can notice that ABC's financials are significantly impacted by a directional movement in the gold prices. Higher the price of gold (above Rs.2450/-), higher is ABC's savings or the potential profit. Likewise, as and when the gold price lowers (below Rs.2450/-), ABC is obligated to buy gold at a higher rate from XYZ, thereby incurring a loss.

Similar observations can be made with XYZ –



At Rs.2450/- per gram, there is no financial impact on XYZ. However as per the graph above, XYZ's financials are significantly impacted by a directional movement in the gold prices. As and when the price of gold increases (above Rs.2450/-), XYZ is forced to sell gold at a lower rate, thereby incurring a loss. However, as and when the price of gold decreases (below Rs.2450/-) XYZ would enjoy the benefit of selling gold at a higher rate, at a time when gold is available at a lower rate in the market thereby making a profit.

1.5– A quick note on settlement

Assume that on 9th March 2015, the price of Gold is Rs.2700/- per gram. Clearly as we have just understood, at Rs.2700/- per gram ABC Jewelers stands to benefit from the agreement. At the time of the agreement (9th Dec 2014) 15 Kgs gold was worth Rs. 3.67Crs, however as on 9th March 2015 15 kgs Gold is valued at Rs.4.05 Crs. Assuming at the end of 3 months i.e 9th March 2015, both the parties honor the contract, here are two options available to them for settling the agreement –

1. **Physical Settlement** – – The full purchase price is paid by the buyer of a forward contract and the actual asset is delivered by the seller. XYZ buys 15 Kgs of gold from the open market by paying Rs.4.05Crs and would deliver the same to ABC on the receipt of Rs.3.67 Crs. This is called physical settlement
2. **Cash Settlement** – In a cash settlement there is no actual delivery or receipt of a security.

In cash settlement, the buyer and the seller will simply exchange the cash difference. As per the agreement, XYZ is obligated to sell Gold at Rs.2450/- per gram to ABC. In other words, ABC pays Rs.3.67 Crs in return for the 15 Kgs of Gold which is worth Rs.4.05Cr in the open market. However, instead of making this transaction i.e ABC paying Rs.3.67 Crs in return for the gold worth Rs.4.05Crs, the two parties can agree to exchange only the **cash differential.** In this case it would be Rs.4.05 Crs – Rs.3.67 Crs = Rs.38 Lakhs. Hence XYZ would just pay Rs.38 lakhs to ABC and settle the deal. This is called a cash settlement

We will understand a lot more about settlement at a much later stage, but at this stage you need to be aware that there are basically two basic types of settlement options available in a Forwards Contract – physical and cash.

1.6 – What about the risk?

While we are clear about the structure (terms and conditions) of the agreement and the impact of the price variation on either party, what about the risk involved? Do note, the risk is not just with price movements, there are other major drawbacks in a forward contract and they are–

1. **Liquidity Risk** – In our example we have conveniently assumed that, ABC with a certain view on gold finds a party XYZ who has an exact opposite view. Hence they easily strike a deal. In the real world, this is not so easy. In a real life situation, the parties would approach an investment bank and discuss their intention. The investment bank would scout the market to find a party who has an opposite view. Of course, the investment bank does this for a fee.

2. **Default Risk/ / Counter party risk** – Consider this, assume the gold prices have reached Rs.2700/- at the end of 3 months. ABC would feel proud about the financial decision they had taken 3 months ago. They are expecting XYZ to pay up. But what if XYZ defaults?

3. **Regulatory Risk** – The Forwards contract agreement is executed by a mutual consent of the parties involved and there is no regulatory authority governing the agreement. In the absence of a regulatory authority, a sense of lawlessness creeps in, which in turn increases the incentive to default

4. **Rigidity** – Both ABC and XZY entered into this agreement on 9th Dec 2014 with a certain view on gold. However what would happen if their view would strongly change when they are half way through the agreement? The rigidity of the forward agreement is such that, they cannot foreclose the agreement half way through.

The forward contracts have a few disadvantages and hence future contracts were designed to reduce the risks of the forward agreements.

In India, the Futures Market is a part of a highly vibrant Financial Derivatives Market. During the course of this module we will learn more about the Futures and methods to efficiently trade this instrument!

So, let's hit the road!

Key takeaways from this chapter

1. The forwards contract lays down the basic foundation for a futures contract
2. A Forward is an OTC derivative, which is not traded on an exchange
3. Forward contracts are private agreements whose terms vary from one contract to the other
4. The structure of a forwards contract is fairly simple
5. In a forward agreement, the party agreeing to buy the asset is called the "Buyer of the Forwards Contract"
6. In a forward agreement the party agreeing to sell the asset is called the "Seller of the Forwards Contract"
7. A variation in the price would have an impact on both the buyer and the seller of the forwards contract
8. Settlement takes place in two ways in a forward contract – Physical and Cash settlement
9. The risk of a forward contract is reduced by a futures contract
10. The core of a forward and futures contract is the same.

CHAPTER 2

Introducing Futures Contract

2.1 – Setting the context

In the previous chapter we looked at a very simple Forwards Contract example, where in two parties agreed to exchange cash for goods at some point in the future. We inspected the structure of the transaction and understood how the variation in price impacts the parties involved. Towards the end of the chapter, we had listed down 4 key risks (or issues) with respect to the forwards contracts and we concluded that, a futures contract is structured to overcome the critical risks of a forward agreement namely –

1. Liquidity risk
2. Default Risk
3. Regulatory Risk
4. Rigidity of the transitional structure

We will continue referring to the same example in this chapter as well. Hence you may want to refresh your understanding of the example quoted in the previous chapter.

From the previous chapter one thing is quite clear – **If you have a view on the price of an asset, you can benefit significantly by entering into a forward agreement.** All one needs to do is to find a counterparty willing to take the opposite side. Needless to say, a forward agreement is limited by the inherent risks involved, all of which is overcome by a futures agreement.

The Futures contract or Futures Agreement is an improvisation of the Forwards Agreement. The Futures Contract is designed in such a way that it retains the core transactional structure of a Forwards Market and at the same time, it eliminates the risks associated with the forwards contract. A Forward Agreement would give you a financial benefit as long as you have an accurate directional view on the price of an asset, this is what I mean when I say ‘core transactional structure’.

This may seem a bit absurd but think about it – the ‘transaction structure’ of an old generation car was just to transport you from point ‘A’ to point ‘B’. However, the new generation car comes with improvisations in terms of the safety features – air bags, seat belts, ABS, power steering etc, but it still retains the core ‘transaction structure’ i.e to help you move from point ‘A’ to point ‘B’. This is the same distinction between the forwards and the futures agreement.

2.2 – A sneak peek into the Futures Agreement

As we now know that the core transactional structure of the futures and forwards is the same, I guess it makes sense to look into the features that distinguishes the Futures from the forwards. We will have a quick sneak peek into these features in this chapter, but at a later stage we will dig into each and every feature in greater detail.

Recall, in the example we had quoted in the previous chapter, ABC jeweler enters into an agreement with XYZ to buy a certain quantity of gold at a certain point in the future. Now imagine this, what if ABC found it really hard to find XYZ as a counter party to the agreement? Under such circumstances though ABC has a certain view on gold and is also willing to enter into a financial agreement, they would be left helpless simply because there is no counterparty to take the opposite side of the agreement.

Now further imagine this, what if ABC instead of spending its time and effort to scout for a counterparty, simply decides to walk into a financial supermarket where there are many counterparties willing to take the opposite view. With such a financial supermarket in place, ABC has to just announce its intention and the willing counterparties would line up to take the opposing stance. What more, a true financial supermarket of this sort would not just have people with a view on gold, but instead will also have people with a view on Silver, Copper, Crude oil, and pretty much any asset class including stocks!

In fact, this is exactly how the Futures Contracts are made available. They are available and accessible to all of us and not just available to a corporate such as ABC Jewelers. The futures contracts are available to us in the financial (super) market, often called the "Exchange". The exchange can be a stock exchange or a commodity exchange.

As we know a futures contract is structured a little differently compared to a forwards contract. This is mainly to overcome the risks involved in the forwards market. Let us look at each of these points that differentiate the futures from the forwards agreement.

Note, after reading through the following points you may still not be very clear about futures, that's alright, just keep the following points in perspective. We will shortly consider a futures example and with that you should be clear about the way in which Futures agreement works.

Futures Contract mimics the underlying – In the example of ABC jewelers and XYZ Gold Dealers the forwards agreement was based on gold (as an asset) and its price. However, when it comes to a Futures Contract, the agreement is based on the 'future price' of the asset. The futures price mimics the asset, which is also called the underlying. For example gold as an asset can have a 'Gold Futures' contract. Think of the underlying and its futures contract somewhat as twin siblings. Whatever the underlying asset does, the futures contract does the same. Therefore if the price of the underlying goes up, the price of the futures contract would also go up. Likewise if the price of the underlying goes does, the price of the futures contract also goes down.

Standardized Contracts – Again going back to the example of ABC jewelers and XYZ Gold Dealers the agreement was to deal with 15 kgs of gold of certain purity. If both the parties mutually agreed, the agreement could have been for 14.5Kgs or 15.25 Kgs or whatever they would think is convenient for them. However in the futures contract, the parameters are standardized. They are not negotiable.

Futures Contracts are tradable – The futures contract is easily tradable. Meaning if I get into an agreement with counterparty, unlike a forward contract, I need not honor the contract till the end (also called the expiry day). At any point in time if my view changes, I can just transfer the contract to someone else and get out of the agreement.

Futures Market is highly regulated – The Futures markets (or for that matter the entire financial derivatives market) is highly regulated by a regulatory authority. In India, the regulatory authority is "Securities and Exchange Board of India (SEBI)". This means, there is always someone overlooking the activities in the market and making sure things run smoothly. This also means default on a futures agreement is hardly a possibility.

Contracts are time bound – We will understand this point in detail a bit later but for now, do remember that all the futures contracts available to you have different time frames. In the example from previous chapter, ABC jewelers had a certain view on gold keeping 3 months in perspective. If ABC were to do a similar agreement in the futures market, contracts would be available to them in the 1 month, 2 month, and 3 month time frame. The time frame upto which the contract lasts is called 'The expiry' of the contract.

Cash settled – Most of the futures contracts are cash settled. This means only the cash differential is paid out. There is no worry of moving the physical asset from one place to another. More so the cash settlement is overseen by the regulatory authority ensuring total transparency in the cash settlement process.

To sum up, here is a table that quickly summarizes the difference between the "Forwards Contract" and "Futures Contract"

Forwards Contract	Futures Contract
Contracts are traded over the counter (OTC)	Futures Contract are traded in the exchange
Contracts can be customized	Future Contracts are standardized
High counter party risk	No counter party risk
Not regulated	Regulated by SEBI (in India)
Contracts are not transferable	Transferable hence easily tradable
Time bound to just 1 time frame	Multiple time frame contracts available
Settlement is flexible (physical or cash)	Cash settled

At this stage, I feel there is a need to stress upon the distinction between the **spot price** and the **future price**. The spot price is the price at which the asset trades in the 'regular' market, also called the 'spot market'. For example if we are talking about gold as an underlying, then there are two prices we are referring to – gold in the regular market also called the Spot market and gold in the Futures market called the Gold Futures. The prices in the spot market and futures market move in tandem, meaning if one goes up, the other also goes up.

With these points in perspective, let us now move our attention to few other nuances of the futures contract.

2.3 – Before your first futures trade

Before we dig deeper and understand the working of a futures contract, we need to understand a few other aspects related to futures trading. Do remember at a later stage we will revisit these points and discuss them in greater detail. But for now, a good working knowledge on the following points is what is required.

Lot size – Futures is a standardized contract where everything related to the agreement is predetermined. Lot size is one such parameter. Lot size specifies the minimum quantity that you will have to transact in a futures contract. Lot size varies from one asset to another.

Contract Value – In our example of ABC jeweler and XYZ Gold Dealers, ABC agreed to buy 15 kgs of Gold at the rate of Rs.2450/- per gram or Rs.24,50,000/- per kilogram. Since the deal was to buy 15 kgs, the whole deal was valued at Rs.24,50,000 x 15 = Rs.3.675 Crs. In this case it is said that the 'Contract Value' is Rs.3.675 Crs. Simply put, the contract value is the quantity times the price of the asset. We know the futures agreement has a standard pre-determined minimum quantity (lot size). Going by this, the contract value of a futures agreement can be generalized to **"Lot size x Price".**

Margin – Again, referring back to the example of ABC jeweler and XYZ Gold Dealers, at the time of agreement i.e on 9th Dec 2014, both the parties would have had a gentleman's word and nothing beyond that. Meaning both the parties would have just agreed to honor the contract on the agreement's expiry day i.e 9th March 2015. Do notice there is **no** exchange of money on 9th Dec 2014.

However, in a futures agreement the moment a transaction takes place, both the parties involved will have to deposit some money. Consider this as the token advance required for entering into an agreement. The money has to be deposited with the broker. Usually, the money that needs to be deposited is calculated as a % of the contract value. This is called the 'margin amount'. Margins play a very pivotal role in futures trading; we will understand this in greater detail at a later stage. For now, just remember that to enter into a futures agreement a margin amount is required, which is a certain percentage of the contract value.

Expiry – As we know, all futures contracts are time bound. The expiry or the expiry date of the futures contract is the date upto which the agreement is valid. Beyond the valid date, the contract ceases to exist. Also be aware that the day a contract expires, new contracts are introduced by the exchanges.

With these few points that we have discussed so far, I guess we are now equipped to understand a simple example of futures trading.

Key takeaways from this chapter

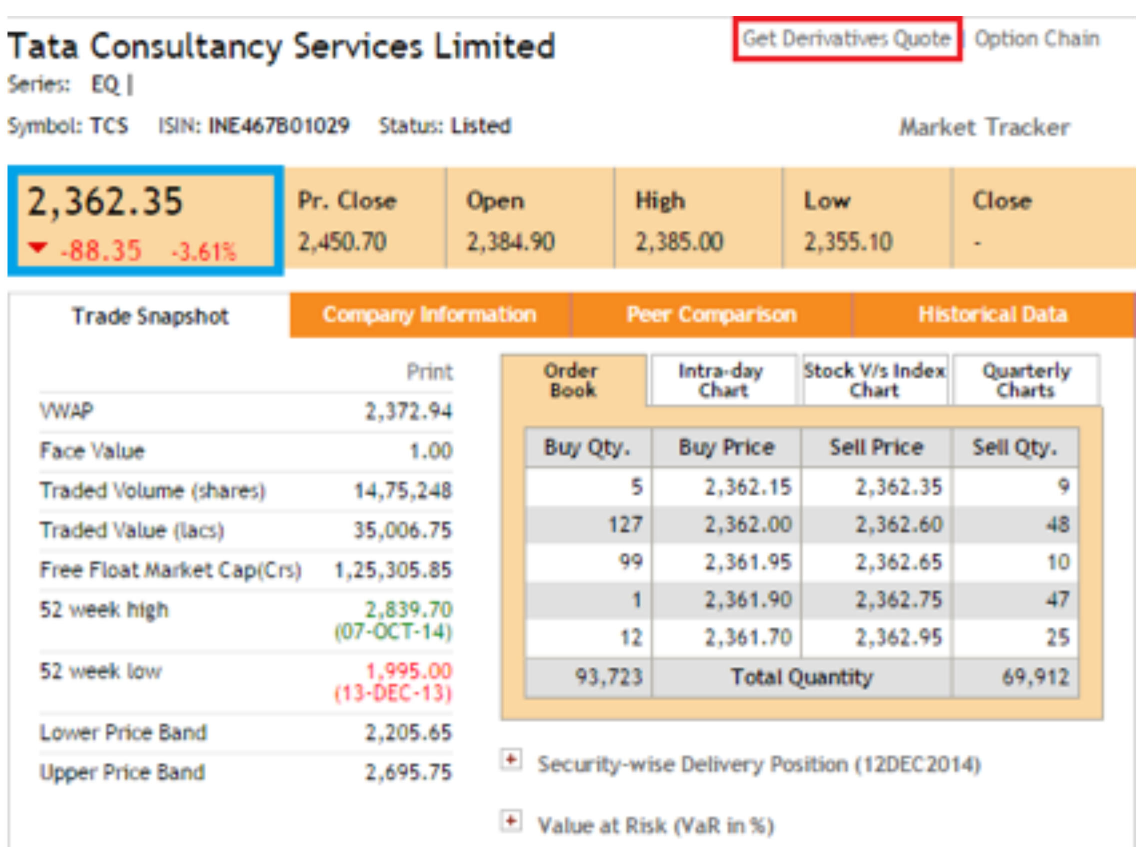
1. The forwards and futures markets gives you a financial benefit if you have an accurate directional view on the price of an asset
2. The Futures contract is an improvisation over the Forwards contract
3. The Futures price generally mimics the underlying price in the spot market
4. Unlike a forwards contract, the futures contract is tradable
5. The futures contract is a standardized contract wherein all the variables of the agreement is predetermined
6. Futures contracts are time bound and the contracts are available over different timeframes
7. Most of the futures contracts are cash settled
8. The futures market is regulated by SEBI in India
9. Lot size is the minimum quantity specified in the futures contract
10. Contract value = Lot size times the Futures price
11. To enter into a futures agreement one has to deposit a margin amount, which is a certain % of the contract value.
12. Every futures contract has an expiry date beyond which the contact would seize to exist. Upon expiry old contracts cease and new ones are created

The Futures Trade

3.1 – Before the Trade

In the last chapter, we learnt various concepts related to the futures market. **Remember, the motivation for any trader entering into a futures agreement is to benefit financially, and for which the trader needs to have a directional view on the price of the underlying asset**. Perhaps it is time we take up a practical example of a futures trade to demonstrate how this is done. Also, I guess we should move away from the Gold example and look into an example related to the stocks.

Today (15th Dec 2014) the management of Tata Consultancy Services (TCS), a leading Indian Software Company had an investors meet, wherein the TCS management announced that they are cautious about the revenue growth for the December Quarter. The markets do not like such cautious statements, especially from the company's management. After the statement, the markets reacted to it and as we can see from the TCS's spot market quote, the stock went down by over 3.6%. In the snapshot below, the price per share is highlighted in blue. Ignore the red highlight, we will discuss about it shortly.

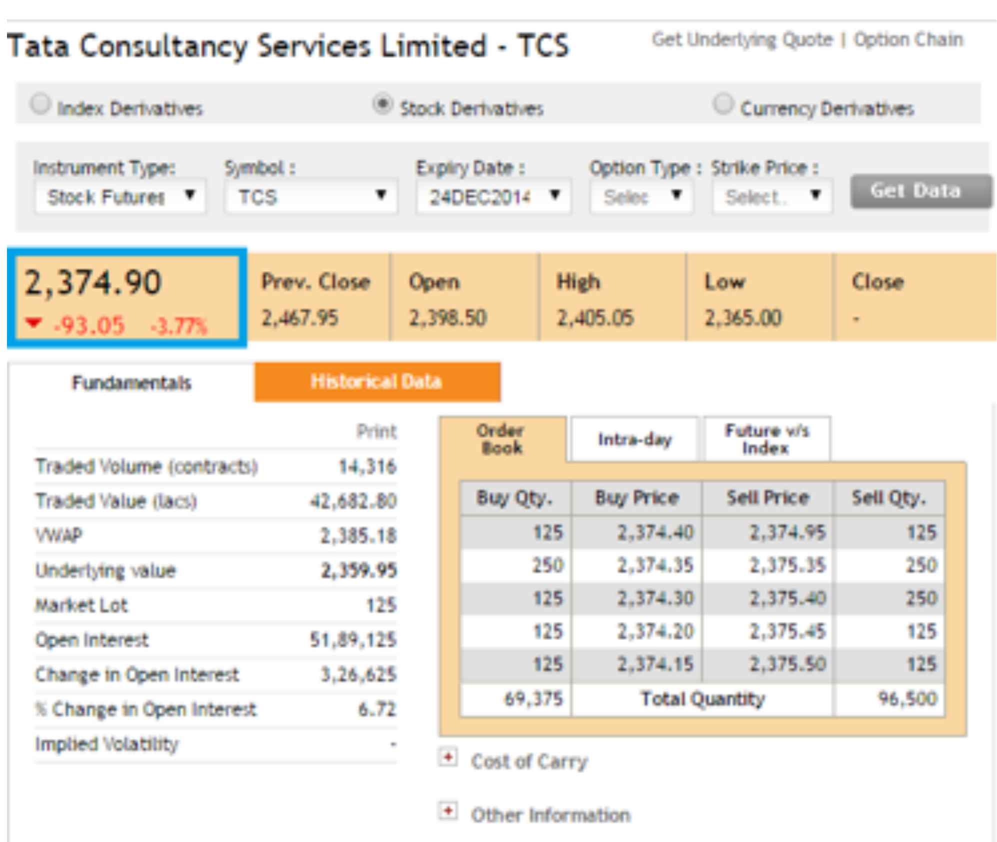


I as trader believe that, the TCS stock price reaction to the management's statement is a bit exaggerated. Here is my rational – If you follow TCS or any Indian IT sector company in general, you will know that December is usually a lackluster month for the Indian IT companies. December is the financial year end in the US (the biggest market for the Indian IT companies), and also the holiday season, hence the business moves quite slowly for such companies. This furlough has a significant impact on the IT sector revenues. This information is already known and factored in by the market. Hence, I believe the stock sinking by 3.6% is unwarranted for. I also feel this could be an opportunity to buy TCS, as I believe the stock price will eventually go up. Hence I would be a buyer in TCS after such an announcement.

Notice, based on my thoughts (which I perceive as rational) I have developed a **'directional view'** on the price of the asset (TCS). From my analysis, I believe the TCS (underlying asset) stock price will increase in due course of time. In other words, I am bullish about TCS at the current market price.

Now, instead of buying TCS shares in the spot market, I decide to buy the TCS Futures (for reasons I will discuss in the next chapter). Having decided to buy futures, all I need to see is price at which the TCS Futures is trading at. The contract details are readily available on the NSE's website. In fact, the link to get details for a TCS futures contract is available on the spot market quote. I have highlighted the same in red in the image above.

Recall, the futures price should always mimic the spot price, meaning if the spot price has gone down, the futures price should also go down. Here is a snapshot from NSE's website showing the TCS Futures price.

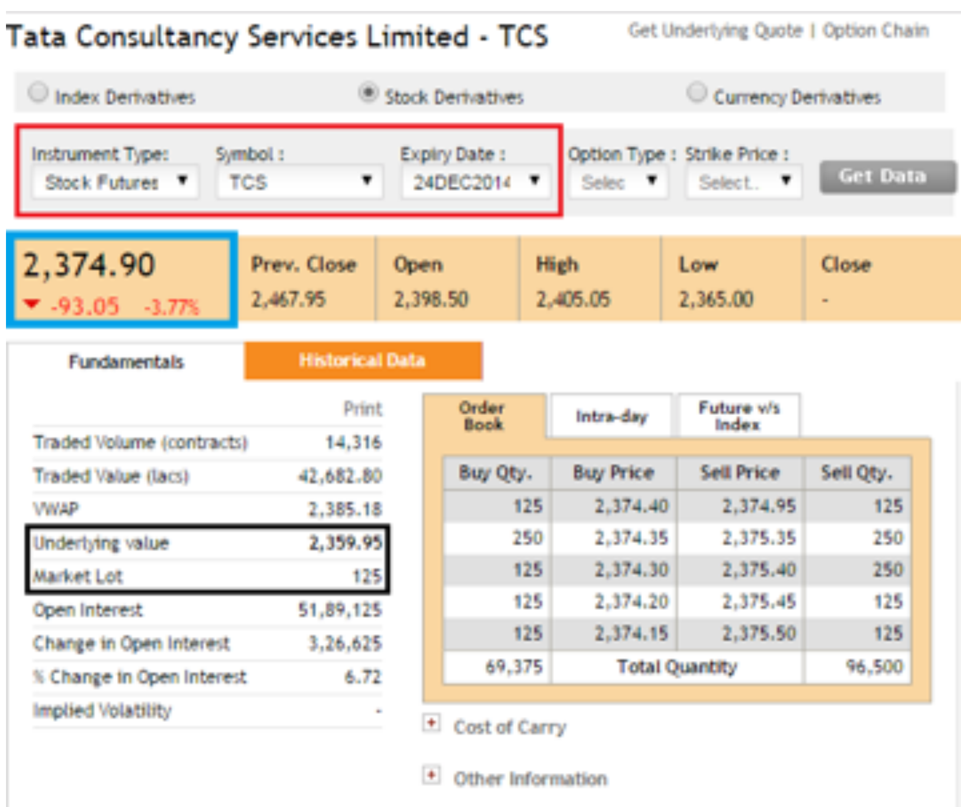


As expected, the futures price has mimicked the spot price and therefore the TCS Futures is also down by 3.77%. You may have two questions at this point –

1. TCS in the spot market is down by 3.61%, however TCS futures is down by 3.77%? Why the difference?

2. TCS spot price is at Rs.2362.35, but Futures price is at Rs.2374.90? Why the difference?

Both these are valid questions at this point, and the answer to these questions depends upon the "Futures Pricing Formula", a topic we will deal with at a later point in time. But the most important point to note at this stage is that, the futures price has moved in line with the spot price, and both of them are down for the day. Now, before we proceed any further let us relook at the futures contract and inspect a few key elements. Allow me to repost the futures contract with a few important features highlighted.



Starting from top, the box highlighted in red has three important bits of information –

1. **Instrument Type** – Remember, the underlying asset is the stock of a company and we are interested in the asset's future contract. Hence, the instrument type here is the 'stock futures'

2. **Symbol** – This highlights the name of the stock, TCS in this case

3. **Expiry Date** – This is the date on which the contract ceases to exist. As we can see, the TCS futures contract specifies 24th Dec 2014 as the expiry. You may be interested to know

that, all derivative contracts in India expire on the last Thursday of the month. We will discuss more on what happens on the expiry date at a later point

We had looked at the blue box a little earlier, it just highlights the future price.

Lastly the black box highlights two important parameters – the underlying value and the market lot.

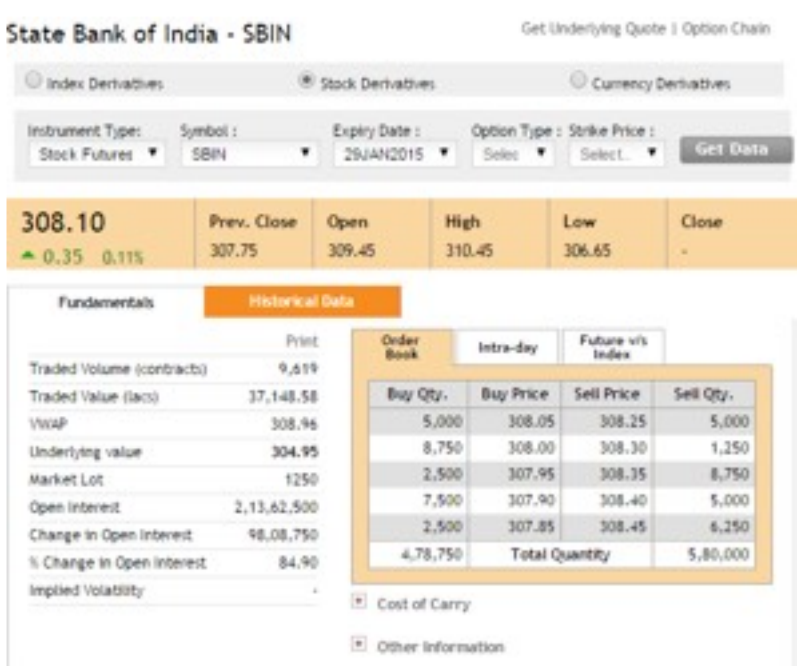
1. **Underlying Value** – This is the same as the price at which the underlying is trading in the spot market. From the earlier snapshot, we know TCS was trading at Rs.2362.35 per share, however when I took the above snapshot, TCS fell by another few points, hence the price we see here is Rs.2359.95. per share
2. **Market lot (lot size)** – Remember, a futures contract is a standardized contract. The parameters are prefixed. Lot size is the minimum number of shares that we need to buy/sell if we wish to enter into an agreement. The lot size for the TCS futures is 125, which means a minimum of 125 shares (or a multiple of 125 shares) have to be transacted while trading the TCS futures.

Recall, in the previous chapter we had discussed about the 'Contract value', which is simply 'Lot size' multiplied by the futures price. We can now calculate the contract value for TCS futures as follows–

Contract Value = Lot size x Price of futures

125 x Rs.2374.90 = **Rs. 296,862.5**

Now before we proceed to discuss about the TCS futures trade, let us quickly look at another 'Futures Contract' just to rivet our understanding so far. Here, is the snapshot of the futures contract of 'State Bank of India (SBI)'.



With the help of the above snapshot you can perhaps answer the following questions –

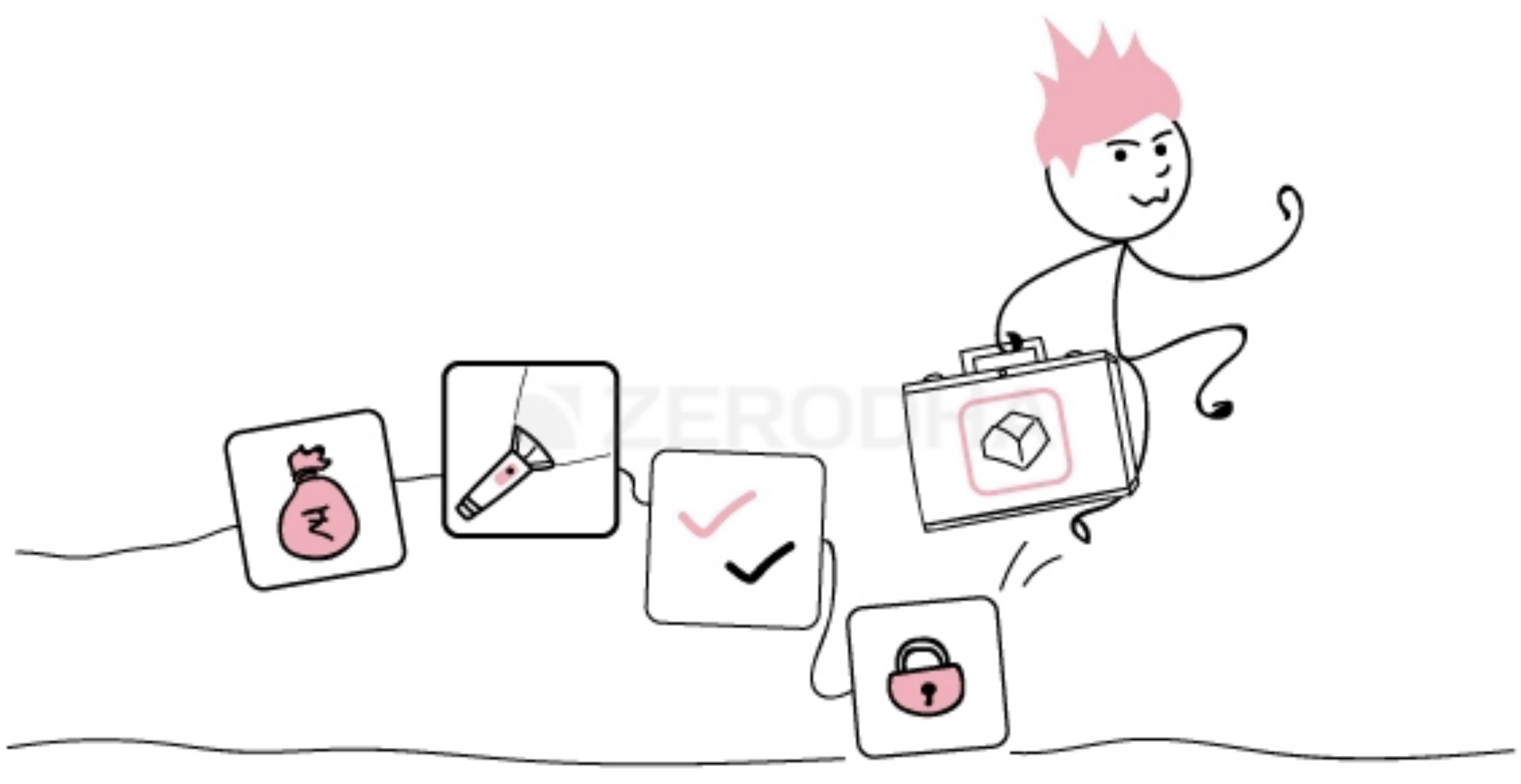
1. What is the instrument type?
2. What is SBI's futures price?
3. How does SBI's future price compare with its spot price?
4. What is the expiry date of the Futures contract?
5. What is the lot size and the contract value of SBI futures?

3.2 – The Futures Trade

Now going back to the TCS futures trade, the idea is to buy a futures contract as I expect the TCS stock price to go up. The price at which I would buy TCS Futures is Rs.2374.9/- per share. Remember the minimum number of shares that I need to buy is 125. The minimum number of shares is also colloquially called 'one lot'.

So how do we buy the 'Futures Contract'? Well, this is quite simple we can call our broker and ask him to buy 1 lot of TCS futures at Rs.2374.9/- or we can buy it ourselves through the broker's trading terminal.

I prefer to place trades myself through the trading terminal. If you are new to the trading terminal, I would suggest you read through the chapter on the **Trading terminal**. Once TCS Futures is loaded on my market watch, all I need to do is just press F1 and buy the contract.



The moment I press the F1 key (expressing my interest to buy TCS futures) on my trading terminal, a couple of things happen in the background.

1. **Margin Validation** – Remember, whenever we enter into a futures agreement we need to deposit a margin amount (sort of a token advance), which is simply a percentage of the contract value. We will discuss margins shortly. If there is insufficient margin, we cannot enter into the agreement. So as the first step, the broker's risk management system/ software checks if I have sufficient money in my trading account (to suffice the margin requirement) to enter into a futures agreement
2. **The counterparty search** – After validating the margins, the system scouts for a relevant counterparty match. The match has to be made between me – the buyer of the TCS futures and the seller of the TCS futures. Remember, the stock exchange is a 'Financial supermarket' where one can find many participants with different views on the price of an asset. The seller of TCS futures obviously thinks, TCS futures price will go further down. Just like my rational as to why the TCS stock price will go higher, the seller has his own rational for his directional view, hence he wants to be a seller.
3. **The signoff** – Once Step 1 and 2 are through i.e. the margin validation and finding the counterparty, the buyer and the seller digitally sign the futures agreement. This is mainly a symbolic process. By agreeing to buy (or sell) the futures agreement, one gives consent to the other to honor the contract specifications.
4. **The margin block** – After the signoff is done, the required margin is blocked in our trading account. We cannot use the blocked margin for any other purpose. The money will be blocked as long as we hold the futures contract.

With the completion of these 4 steps, **I now own 1 lot of TCS Futures Contract**. You may be surprised to know, in the real markets, all the above mentioned steps happen sequentially in a matter of a few seconds!

Here is a critical question – What does it mean by "I now own 1 lot of TCS Futures Contract"? Well, it simply means by purchasing TCS futures on 15th Dec 2014, I have digitally entered into an agreement with a certain counterparty agreeing to buy 125 TCS shares from me (counterparty) at Rs.2374.9/- per share. This futures agreement between me and the counterparty expires on 24th Dec 2014.

3.3 –The 3 possible scenarios post the agreement

After entering into the agreement, there are 3 possible scenarios that can pan out by 24th Dec 2014. We know what these scenarios are (we studied them in chapter 1) – the price of TCS can go up, the price of TCS can come down, or the price of TCS could stay the same. Let us just arbitrarily take up a few possible price situations and see what would be the impact of the price on both the parties involved.

Scenario 1 – TCS stock price goes up by 24th Dec

This is a case where my directional view on TCS shares has come true, therefore I stand to benefit.

Assume on 24th Dec 2014, the stock price of TCS has gone up from Rs.2374.9/- to Rs.2450/- per share, by virtue of the increase in spot price, the futures price would also increase. This means as per the agreement, I am entitled to buy the TCS shares at Rs.2374.9/- per share which is a much lower price compared to what is available in the market. My profit will be Rs.75.1/- per share (Rs.2450 – Rs.2374.9). Since the deal is for 125 shares, my overall profit will be Rs.9387.5/- (Rs.75.1/- * 125).

The seller obviously incurs a loss, as he is forced to sell TCS shares at Rs.2374.9 per share as opposed to selling it in the open market at a much higher price of Rs.2450/- per share. Clearly, the buyer's gain is the seller loss.

Scenario 2 – TCS stock price goes down by 24th Dec

This is a case where my directional view on TCS shares has gone wrong, therefore I would stand to lose.

Assume on 24th Dec 2014, the stock price of TCS goes down from Rs.2374.9/- to Rs.2300/- per share, by virtue of this decrease the futures price will also be around the same level. This means as per the agreement, I am obligated to buy the TCS shares at Rs.2374.9/- per share which is a much higher price compared to what is available in the market. My loss will be Rs.75./- per share (Rs.2374.9 – Rs.2300). Since the deal is for 125 shares my overall loss will be Rs.9375/- (Rs.75/- * 125).

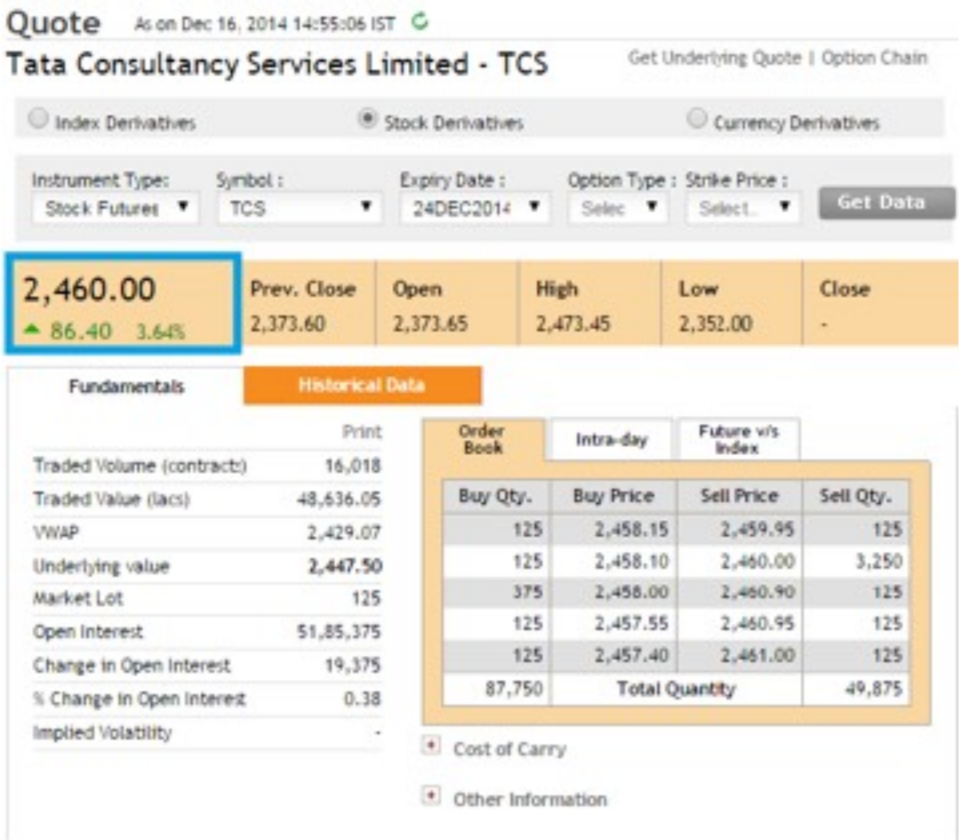
I would obviously incur a loss as I'm forced to buy the TCS shares at Rs.2374.9/- per share as opposed to buying it in the open market at a much lower price of Rs.2300/- per share. Clearly, the sellers gain is the buyer's loss.

Scenario 3 – TCS stock price remains unchanged

Under such a situation, neither the buyer nor the seller benefit, hence there is no financial impact on either party.

3.3 – Exploiting a trading opportunity

So here is a situation – after buying the TCS futures on 15th Dec 2014 at Rs.2374.9/- the very next day i.e 16th Dec 2014, TCS price shot up. It is now trading at Rs.2460/-. What do I do? Clearly with the price increase, I stand to benefit significantly. To be precise, at the time of taking the snapshot, I am sitting at a profit of Rs.85.1/- per share or Rs.10,637.5/- (Rs.85.1/- * 125) as an overall profit.



Suppose I am happy with the money that I have made overnight, can I close out the agreement? Or rather at Rs.2460 per share what if my view changes? What if I no longer feel bullish about TCS at Rs.2460? Do I really need to hold on to the agreement until the contract expiry date i.e. 24th Dec 2014, by which time if the price goes down it could lead to a loss?

Well, as I had mentioned in the previous chapter the futures agreement is tradable. Meaning, at any point after entering into a futures agreement I can easily get out of the agreement by transferring the agreement to someone else. This means I can close the existing TCS futures position and book a profit of Rs.10,637.5/-. Not bad for a 1 day job right? J

Closing an existing futures position is called "square off". By squaring off, I offset an existing open position. In case of the TCS example, initially I bought 1 lot of TCS futures and when I square off I have to sell 1 lot of TCS futures (so that my initial buy position is offset). The following table summarizes the concept of square off in general –

Serial No	Initial Leg	View at the time of initial leg	Square off leg	View at the time of squaring off
1	Buy / Long	Expect price to go higher – Bullish	Sell	No longer expect the price to go higher or one just wants to get out of the existing position (for whatever reason)
2	Sell/Short	Expect price to go lower – Bearish	Buy	No longer expect the price to go lower or one just wants to get out of the existing position (for whatever reason)

When I intend to square off a position I can either call my broker asking him to square off the open position or I can do it myself on the trading terminal. In the example we have a buy open position in TCS futures (1 lot), to offset this open position the square off position would be to "sell 1 lot of TCS futures". The following things happen when I opt to square off the TCS position –

1. The broker (via trading terminal) scouts for a counterparty that would be willing to buy the futures position from me. In simpler words "my existing buy position will simply be transferred to someone else". That 'someone else' by virtue of buying the con**tract from** me, now bears the risk of the TCS price going up or down. Hence this is simply referred to as the "Risk Transfer"

2. Note, the transfer will happen at the current futures price in the market i.e. 2460/- per share

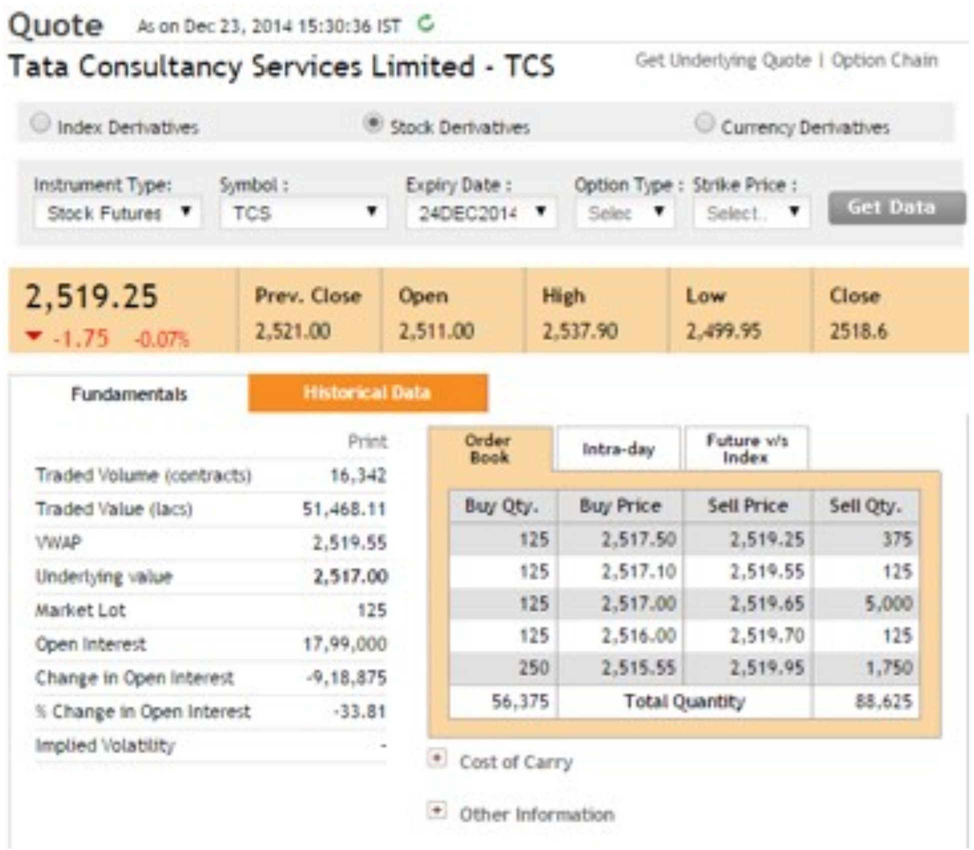
3. My position is considered offset (or squared off) after the trade is executed

4. Once the trade is executed, the margins that were initially blocked would now be unblocked. I can utilize this cash for other transactions

5. The profit or loss made on the transaction will be credited or debited to my trading account the same evening itself

And with this, the futures trade is now set to be complete.

Note, if at Rs.2460 I develop a view that the price is going to be much higher, I could continue to hold the stock futures. In fact, I can continue to hold the futures till the contract's expiry i.e. 24th Dec 2014. As long as I continue to hold the futures, I continue to hold the risk of TCS price fluctuation. In fact, here is the snapshot of TCS futures taken on 23rd Dec 2014, just 1 day before the expiry of the contract, had I opted to hold the futures till 23rd Dec my profits would have been much higher – TCS futures is trading at Rs.2519.25/- per share.



In fact on 16th Dec 2014 when I decided to book profits at Rs.2460/- , 'someone else' bought the TCS futures from me. In other words, I transferred my buy position to someone else, and even that 'someone else' (the counterparty) would also have made money on this contract by buying the contract at Rs.2460/- from me and holding it until 23rd Dec 2014. Now here are two simple questions for you –

1. What would be my Profit & Loss (P&L) on a per share and on an overall basis had I held the TCS futures from 15th Dec 2014 (Rs.2374.9) to 23rd Dec 2015 (Rs.2519.25)

2. On 16th Dec 2014 I squared off my position at Rs.2460/-, obviously by virtue of the square off the contract was transferred to a counterparty. Assuming the counterparty held on to the TCS futures position until 23rd Dec 2014, what would be his Profit & Loss (P&L) on a per share basis and on an overall basis ?

If you are unable to answer the above two questions, you can drop in a query in the comment box below and I will be happy to explain the answer. But I sincerely hope, you get the answers to the questions above yourself

In the next chapter we will discuss about margins, a very important aspect of futures trading.

Key takeaways from this chapter

1. If you have a directional view on an assets price, you can financially benefit from it by entering into a futures agreement
2. To transact in a futures contract one needs to deposit a token advance called the margin
3. When we transact in a futures contract, we digitally sign the agreement with the counter party, this obligates us to honor the contract
4. The futures price and the spot price of an asset are different, this is attributable to the futures pricing formula (we will discuss this topic later)
5. One lot refers to the minimum number of shares that needs to be transacted
6. Once we enter into a futures agreement there is no obligation to stick to the agreement until the contract expires
7. Every futures trade requires a margin amount, the margins are blocked the moment you enter a futures trade
8. We can exit the agreement anytime, which means you can exit the agreement within seconds of entering the agreement
9. When we square off an agreement we are essentially transferring the risk to someone else
10. Once we square off the futures position, margins are unblocked
11. The money that you make or lose in a futures transaction is credited or debited to your trading account the same day
12. In a futures contract, the buyer's gain is the sellers loss and vice versa

CHAPTER 4

Leverage & Payoff

4.1 – A quick recap

With the help of the Tata Consultancy Services (TCS) example in the previous chapter we got a working knowledge on how Futures trading works. The futures trade example required us to go long on TCS futures as the expectation was that the TCS stock price would increase in due course. Further we decided to square off the contract the very next day for a profit. However, if you recall, right at the beginning of the example we posed a very important question, let me rephrase and repost the same for your ready reference.

A rational to go long on TCS was built – the thought was that TCS stock price had over reacted to the management's statement. I expected the stock price to increase in due course of time. A directional view was established and hence a futures trade was initiated. Now, the question was – anyway the expectation is that the stock price will go higher, why should one bother about buying futures and why not the stock in spot market?

In fact buying futures requires one to enter a digital agreement with the counterparty. Besides, a futures agreement is time bound, meaning the directional view has to pan out within the specified time period. If it does not pan out within the specified time (as in the expiry) then one has to suffer a loss. Contrast this (futures buying) with just buying stock and letting it reside in your DEMAT account. There is no obligation of an agreement or the pressure of time. So why does one really need futures? What makes it so attractive? Why not just buy the stock and stay oblivious to the stock price and the time?

The answers to all these questions lie in the 'financial leverage' which is inherent in financial derivatives, including futures. Leverage as they say is a true financial innovation, if used in the right context and spirit leverage can create wealth. Without much ado, let us explore this angle of futures trading.

4.2 – Leverage in perspective

Leverage is something we use at some point or the other in our lives. It is just that we don't think about it in the way it is supposed to be thought about. We miss seeing through the numbers and therefore never really appreciate the essence of leverage.

Here is a classic example of leverage – many of you may relate to this one.

A friend of mine is a real estate trader, he likes to buy apartments, sites, and buildings holds them for a while and then sells them for a profit at a later stage. He believes this is better than trading in equities, I beg to differ – I could go on and on debating this, but maybe some other time.

Anyway, here is a summary of a recent real estate transaction he carried out. In November 2013, Prestige Builders (popular builders in Bangalore) identified a piece of land in South Bangalore and announced a new project – A luxurious apartment complex with state of the art amenities. My friend jumped in and booked a 2 bedroom, hall, and kitchen apartment, expected to come up on the 9th floor for a sum of Rs.10,000,000/-. The project is expected to be completed by mid 2018. Since the apartment was just notified and no work had started, the potential buyers were only required to pay 10% of the actual buy value. This is pretty much the norm when it comes to buying brand new apartments. The remaining 90% was scheduled to be paid as the construction progressed.

So back in Nov 2013, for an initial cash outlay of Rs.10,00,000/- (10% of 10,000,000/-) my friend was entitled to buy a property worth Rs.10,000,000/-. In fact the property was so hot; all the 120 apartments were sold out like hot cakes just within 2 months of Prestige Builder announcing the brand new project.

Fast forward to Dec 2014, my friend had a potential buyer for his apartment. Being a real estate trader, my friend jumped into the opportunity. A quick survey revealed that the property value in the area had appreciated by at least 25% (well, that's how crazy real estate is in Bangalore). So my friend's 9th floor apartment was now valued at Rs.12,500,000/-. My friend and the potential buyer struck a deal and settled on the sale at Rs.12,500,000/-.

Here is a table summarizing the transaction –

Particulars	Details
Initial Value of Apartment	Rs. 10,000,000/-
Date of Purchase	November 2013
Initial Cash outlay @ 10% of apartment value	Rs.10,00,000/-
Balance Payment to Builder	Rs.90,00,000/-
Appreciation in apartment value	25%
Value of the apartment in Dec 2014	Rs.12,500,000/-
New buyer agrees to pay the balance payment	Rs.90,00,000/- to the builder
My friend gets paid	12,500,000 – 9000000 = Rs. 35,00,000/-
My friend's profit on the transaction	Rs.35,00,000/- minus Rs.10,00,000/- = Rs.25,00,000/-
Return on investment	25,00,000 / 10,00,000 = 250%

Clearly, few things stand out in this transaction.

1. My friend was able to participate in a **large transaction** by paying only 10% of the transaction value

2. To enter into the transaction, my friend had to pay 10% of the actual value (call it the contract value)

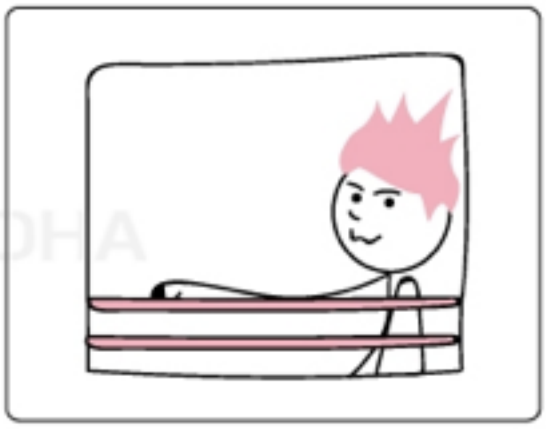
3. The initial value he pays (10 lakhs) can be considered as a token advance or in terms of 'Futures Agreement' it would be the initial margin deposit

4. A small change in the asset value impacts the return massively

5. This is quite obvious – a 25% increase in asset value resulted in a 250% return on investment

6. A transaction of this type is called a **"Leveraged Transaction"**

Do make sure you understand this example thoroughly because this is very similar to a futures trade, as all futures transactions are leveraged. Do keep this example in perspective as we will now move back to the TCS trade.



4.3 – Leverage

While we looked at the overall structure of the futures trade in the previous chapter, let us now re-work on the TCS example with some specific details. The trade details are as follows, for the sake of simplicity we will assume the opportunity to buy TCS occurs on 15th of Dec at Rs.2362/- per share. Further we will assume the opportunity to square off this position occurs on 23rd Dec 2014 at Rs.2519/-. Also, we will assume there is no difference between the spot and future price.

Particulars	Details
Underlying	TCS Limited
Directional View	Bullish
Action	Buy
Capital available for the trade	Rs.100,000/-
Trade Type	Short term
Remarks	The expectation is that the stock price will increase over the next few days
Buy Date	15th Dec 2014
Approximate buy Price	Rs.2362/- per share
Sell Date	23rd Dec 2014
Approximate Sell Price	Rs.2519/- per share

So with a bullish view on TCS stock price and Rs.100,000/ in hand we have to decide between the two options at our disposal – **Option 1** – Buy TCS stock in the spot market or **Op-**

tion 2 – Buy TCS futures from the Derivatives market. Let us evaluate each option to understand the respective dynamics.

Option 1 – Buy TCS Stock in spot market

Buying TCS in spot market requires us to check for the price at which the stock is trading, calculate the number of stocks we can afford to buy (with the capital at our disposal). After buying the stock in the spot market we have to wait for at least two working days (T+2) for the stock to get credited to our DEMAT account. Once the stocks resides in the DEMAT account we just have to wait for the right opportunity to sell the stocks.

Few salient features of buying the stock in the spot market (delivery based buying) –

1. Once we buy the stock (for delivery to DEMAT) we have to wait for at least 2 working days before we can decide to sell it. This means even if the very next day if a good opportunity to sell comes up, we cannot really sell the stock
2. We can buy the stock to the extent of the capital at our disposal. Meaning if our disposable cash is Rs.100,000/- we can only buy to the extent of Rs.100,000/- not beyond this
3. There is no pressure of time – as long as one has the time and patience one can wait for really long time before deciding to sell

Specifically with Rs.100,000/- at our disposal, on 15th Dec 2014 we can buy –

= 100,000 / 2362

~ 42 shares

Now, on 23rd Dec 2014, when TCS is trading at Rs.2519/- we can square off the position for a profit –

= 42 * 2519

= Rs.105,798/-

So Rs.100,000/- invested in TCS on 14th Dec 2014 has now turned into Rs.105,798/- on 23rd Dec 2014, generating Rs.5,798/- in profits. Interesting, let us check the return generated by this trade –

= [5798/100,000] * 100

= 5.79 %

A 5.79% return over 9 days is quite impressive. In fact a 9 day return of 5.79% when annualized yields about 235%. This is phenomenal!

But how does this contrast with option 2?

Option 2 – Buy TCS Stock in the futures market

Recall in futures market variables are pre determined. For instance the minimum number of shares (lot size) that needs to be bought in TCS is 125 or in multiples of 125. The lot size multiplied by the futures price gives us the 'contract value'. We know the futures price is Rs.2362/- per share, hence the contract value is –

= 125 * 2362

= Rs.295,250/-

Now, does that mean to participate in the futures market I need Rs.295,250/- in total cash? Not really, Rs.295,250/- is the contract value, however to participate in the futures market one just needs to deposit a margin amount which is a certain % of the contract value. In case of TCS futures, we need about 14% margin. At 14% margin, (14% of Rs.295,250/-) Rs.41,335/- is all we need to enter into a futures agreement. At this stage, you may get the following questions in your mind –

a. What about the balance money? i.e Rs.253,915/- (Rs.295,250/ minus Rs.41,335/-)

- Well, that money is never really paid out

b. What do I mean by 'never really paid out'?

- We will understand this in greater clarity when we take up the chapter on "Settlement – mark 2 markets"

c. Is 14% fixed for all stocks?

- No, it varies from stock to stock

So, keeping these few points in perspective let us explore the futures trade further. The cash available in hand is Rs.100,000/-. However the cash requirement in terms of margin amount is just Rs. Rs.41,335/-.

This means instead of 1 lot, maybe we can buy 2 lots of TCS futures. With 2 lots of TCS futures the number of shares would be 250 (125 * 2) – at the cost of Rs.82,670/- as margin requirement. After committing Rs.82,670/- as margin amount for 2 lots, we would still be left with Rs.17,330/- in cash. But we cannot really do anything with this money hence it is best left untouched.

Now here is how the TCS futures equation stacks up –

Lot Size – 125

No of lots – 2

Futures Buy price – Rs. 2362/-

Futures Contract Value at the time of buying = Lot size *number of lots* Futures Buy Price

= 125 * 2 * Rs. 2362/-

= Rs. 590,500/-

Margin Amount – Rs.82,670/-

Futures Sell price = Rs.2519/-

Futures Contract Value at the time of selling = 125 * 2 * 2519

= Rs.629,750/-

This translates to a profit of Rs. 39,250/- !

Can you see the difference? A move from 2361 to 2519 generated a profit of Rs.5,798/- in spot market, but the same move generated a profit of Rs. 39,250/- . Let us see how juicy this looks in terms of % return.

Remember our investment for the Futures trade is Rs.82,670/-, hence the return has to be calculated keeping this as the base –

[39,250 / 82,670]*100

Well, this translates to a whopping 47% over 9 days! Contrast that with 5.79% in the spot market. For sake of annualizing, this translates to an annual return of 1925 % …and with this; hopefully I should have convinced you why short term traders prefer transactions in Futures market as opposed to spot market transactions.

Futures offer something more than a plain vanilla spot market transaction. Thanks the existence of 'Margins' you require a much lesser amount to enter into a relatively large transaction. If you're directional view is right, your profits can be really large.

By virtue of margins, we can take positions much bigger than the capital available; this is called “Leverage”. Leverage is a double edged sword. If used in the right spirit and knowledge, leverage can create wealth, if not it can destroy wealth.

Before we proceed further, let us just summarize the contrast between the spot and futures market in the following table –

Particulars	Spot Market	Futures Markets
Capital Available	Rs.100,000/-	Rs.100,000/-
Buy Date	15th Dec 2014	15th Dec 2014
Buy Price	Rs.2362 per share	Rs.2362 per share
Qty	100,000 / 2362 = 42 shares	Depends on Lot size
Lot Size	Not Applicable	125
Margin	Not Applicable	14%
Contract value per lot	Not Applicable	125 * 2362 = 295,250/-
Margin Deposit per lot	Not Applicable	14% * 295,250 = 41,335/-
How many lots can be bought	Not Applicable	100,000/41,335= 2.4 or 2 Lots
Margin Deposit	Not Applicable	41,335 * 2 = 82,670/-
No of shares bought	42 (as calculated above)	125 * 2 = 250
Buy Value (Contract Value)	42 * 2362 = 100,000/-	2 * 125 * 2362 = 590,500/-
Sell Date	23rd Dec 2014	23rd Dec 2014
No of days trade was live	9 days	9 days
Sell Price	Rs.2519/- per share	Rs.2519/- per share
Sell Value	42 * 2519 = 105,798	250 * 2519 = 629,750/-
Profit earned	105798 – 100000 = Rs.5798/-	629750 – 590500 = Rs.39,250/-
Absolute Return for 9 days	5798 / 100,000 = 5.79 %	39250 / 82670 = 47%
% Return annualized	235%	1925%

All through we have discussed about rewards of transacting in futures, but what about the risk involved? What if the directional view does not pan out as expected? To understand both the sides of futures trade, we need to understand how much money we stand to make (or lose) based on the movement in the underlying. This is called the “Futures Payoff”.

4.4 – Leverage Calculation

Usually when we talk about leverage, the common questions one gets asked is – “How many times leverage are you exposed to?” The higher the leverage, higher is the risk, and the higher is the profit potential.

Calculating leverage is quite easy –

Leverage = [Contract Value/Margin].

Hence for TCS trade the leverage is

= [295,250/41,335]

= 7.14, which is read as 7.14 times or simply as a ratio – 1: 7.14.

This means every Rs.1/- in the trading account can buy upto Rs.7.14/- worth of TCS. This is a very manageable ratio. However if the leverage increases then the risk also increases. Allow me to explain.

At 7.14 times leverage, TCS has to fall by 14% for one to lose all the margin amount, this can be calculated as –

1 / Leverage

= 1/ 7.14

= 14%

Now for a moment assume the margin requirement was just Rs.7000/- instead of Rs.41,335/-. In this case, the leverage would be –

= 295,250 / 7000

= 42.17 times

This is clearly is a very high leverage ratio, one would lose all his capital if TCS falls by –

1/41.17

= 2.3%.

So, the higher the leverage, the higher is the risk. When leverage is high, only a small move in the underlying is required to wipe out the margin deposit.

Alternatively, at roughly 42 times leverage you just need a 2.3% move in the underlying to double your money.

I personally don't like to over leverage, I stick to trades where the leverage is about 1 :10 or about 1:12, not beyond this.

4.5 – The Futures payoff

Imagine this – when I bought TCS futures the expectation was that TCS stock price would go higher and therefore I would financially benefit from the futures transaction. But what if instead of going up, TCS stock price went down? I would obviously make a loss. Think about it after initiating a futures trade, at every price point I would either stand to make a profit or loss. The payoff structure of a futures transaction simply highlights the extent to which I either make a profit or loss at various possible price points.

To understand the payoff structure better, let us build one for the TCS trade. Remember it is a long trade initiated at Rs.2362/- on 16thof Dec. After initiating the trade, by 23rd Dec the price of TCS can go anywhere. Like I mentioned, at every price point I will either make a profit or a loss. Hence while building the pay off structure; I will assume various possible price point situations that can pan out by 23rdDec, and I will analyze the P&L situation at each of these possibilities. In fact the table below does the same –

Table 4.4 -Table showing the possible price point situation

Possible Price on 23rd Dec	Buyer P&L (Price on 23rd Dec – Buy Price)
2160	-202
2180	-182
2200	-162
2220	-142
2240	-122
2260	-102
2280	-82
2300	-62
2320	-42
2340	-22
2360	-2
2380	18
2400	38
2420	58
2440	78
2460	98
2480	118
2500	138
2520	158
2540	178
2560	198
2580	218
2600	238

This is the way you need to read this table, – considering you are a buyer at Rs.2362/- , what would be the P&L by 23rd Dec assuming TCS is trading is Rs.2160/-. As the table suggest, you would make a loss of Rs.202/-per share (2362 – 2160).

Likewise, what would be your P&L if TCS is trading at 2600? Well, as the table suggest you would make a profit of Rs.238/- per share (2600 – 2362). So on and so forth.

In fact if you recollect from the previous chapter we stated that if the buyer is making Rs.X/- as profit then the seller is suffering a loss to the extent of Rs.X/-. So assuming 23rd Dec TCS is Trading at 2600, the buyer makes a profit of Rs.238/- per share and the seller would be making a loss of Rs.238/- per share, provided that the seller has shorted the share at Rs.2362/-.

Another way to look at this is that the money is being transferred from the seller's pocket to the buyer's pocket. It is just a transfer of money and not creation of money!

There is a difference between the transfer of money and creation of money. Money is generated when value is created. For example you have bought TCS shares form a long term perspective, TCS as a business does well, profits and margins improve then obviously you as a shareholder will benefit by virtue of appreciation in share price. This is money creation or wealth generation. If you contrast this with Futures, money is not being created but rather moving from one pocket to another.

Precisely for this reasons Futures (rather financial derivatives in general) is called a "**Zero Sum Game".**

Further, let us now plot a graph of the possible price on 23rd December versus the buyers P&L. This is also called the "**Payoff Structure**".

As you can see, any price above the buy price (2362) results in a profit and any price below the buy price results in a loss. Since the trade involved purchasing 2 lots of futures (250 shares) a 1 point positive movement (from 2362 to 2363) results in a gain of Rs.250. Likewise a 1 point negative movement (from 2362 to 2361) results in a loss of Rs.250. Clearly there is a sense of proportionality here. The proportionality comes from the fact that the money made by the buyer is the loss suffered by the seller (provided they have bought/short the same price), and vice versa.

Most importantly, because the P&L is a smooth straight line, it is said that the futures is a "**Linear Payoff Instrument".**

Key takeaways from this chapter

1. Leverage plays a key role in futures trading
2. Margins allow us to deposit a small amount money and take exposure to a large value transaction
3. Margins charged is usually a % of the contract value
4. Spot market transactions are not leveraged, we can transact to the extent of the capital that we have
5. By virtue of leverage a small change in the underlying results in a massive impact on the P&L
6. The profits made by the buyer is equivalent to the loss made by the seller and vice versa
7. The higher the leverage, the higher is the risk and therefore the higher the chance of making money.
8. Futures Instrument simply allows one to transfer money from one pocket to another, hence it is called a "Zero Sum Game"
9. The payoff structure of a futures instrument is linear.

CHAPTER 5

Margin & M2M

5.1 – Things you should know by now

Margins clearly play a very crucial role in futures trading as it enables one to leverage. In fact, margins are the one that gives a 'Futures Agreement' the required financial twist (as compared to the spot market transaction). For this reason, understanding the margins and many facets of margins is extremely important.

However before we proceed any further, let us list down a list of things you should know by now. These are concepts we had learnt over the last 4 chapters, reiterating these crucial takeaways will help us consolidate all the learning. At this, if you are not clear about any of the following points you will need to revisit the previous chapters and refresh your understanding.

1. Futures is an improvisation over the Forwards
2. The futures agreement inherits the transactional structure of the forwards market
3. A futures agreement enables you to financially benefit if you have an accurate directional view on the asset price

4. The futures agreement derives its value from its corresponding underlying in the spot market

a. For example TCS Futures derives its value from the underlying in the TCS Spot market

5. The Futures price mimics the underlying price in the spot market

a. The futures price and the spot price of an asset are different, this is attributable to the futures pricing formula. We will discuss this point at a later stage in the module

6. The futures contract is a standardized contract wherein the variables of the agreement is predetermined – lot size and expiry date

a. Lot size is the minimum quantity specified in the futures contract

b. Contract value = Futures Price * Lot Size

c. Expiry is the last date up to which one can hold the futures agreement

7. To enter into a futures agreement one has to deposit a margin amount, which is calculated as a certain % of the contract value

a. Margins allow us to deposit a small amount of money and take exposure to a large value transaction, thereby leveraging on the transaction

8.When we transact in a futures contract, we digitally sign the agreement with the counter party, this obligates us to honor the contract upon expiry

9.The futures agreement is tradable. Which means you need not hold on to the agreement till the expiry

a. You can hold the futures contract till you have a conviction on the directional view on the asset, once your view changes you can get out of the futures agreement

b. You can even hold the futures agreement for a few minutes and financially benefit if the price moves in your favor

c. An example of the above point would be to buy Infosys Futures at 9:15 AM at a price of 1951 and sell it by 9:17AM at 1953. Since Infosys lot size is 250, one would stand to make Rs.500/- (2 * 250) within a matter of 2 minutes

d. You can even choose to hold it overnight for a few days or hold on to it till expiry.

10. Equity futures contracts are cash settled

11. By virtue of leverage a small change in the underlying, results in a massive impact on the P&L

12. The profits made by the buyer is equivalent to the loss made by the seller and vice versa

13. Futures Instrument allows one to transfer money from one pocket to another, hence it is called a "Zero Sum Game"

14. The higher the leverage, the higher the risk

15. The payoff structure of a futures instrument is linear

16. The futures market is regulated by Securities and Exchange Board of India (SEBI). Thanks to the watchful eye of SEBI, there have been no incidence of counterparty default in the futures market

If you can clearly understand the points mentioned above then I'd assume you are on the right track so far. If you have any questions on any of the above mentioned points then you need to revisit the previous four chapters to get the concept right.

Anyway, assuming you are clear so far let us now focus more on concept of margins and mark to market.

5.2 – Why are Margins charged?

Let us now rewind back to the example we quoted in the forwards market (chapter 1). In the example quoted, 3 months from now ABC Jewelers agrees to buy 15Kgs of Gold at Rs.2450/- per gram from XYZ Gold Dealers.

We can now clearly appreciate that any variation in the price of gold will either affect ABC or XYZ negatively. If the price of gold increases then XYZ suffers a loss and ABC makes a profit. Likewise, if the price of gold decreases ABC suffers a loss and XYZ makes a profit. Also we know that a forwards agreement works on a gentleman's word. Consider a situation where the price of gold has drastically gone up placing XYZ Gold Dealers in a difficult spot. Clearly XYZ can say they cannot make the necessary payment and thereby default on the deal. Obviously what follows will be a long and grueling legal chase, but that is outside our focus area. The point to be noted here is that, in a forwards agreement the scope and the incentive to default is very high.

Since futures market is an improvisation over the forwards market, the angle of default is carefully and intelligently dealt with. This is where the margins play a role.

In the forwards market there is no regulator. The agreement takes place between two parties with literally no intermediary watching over their transaction. However, in the futures market, all trades are routed through an exchange. The exchange in return takes the onus of guaranteeing the settlement of all the trades. When I say 'onus of guaranteeing', it literally means the exchange makes sure you get your money if you are entitled. This also means they ensure they collect the money from the party who is supposed to pay up.

So how does the exchange make sure this works seamlessly? Well, they make this happen by means of –

1. Collecting the margins
2. Marking the daily profits or losses to market (also called M2M)

We briefly looked into the concept of Margin in the previous chapter. The concept of Margin and M2M is something that you need to know in parallel to fully appreciate the dynamics of futures trading. However since it is difficult to explain both the concepts at the same time, I would like to pause a bit on margins and proceed to M2M. We will understand M2M completely and come back again to margins. We will then relook at margins keeping M2M in perspective. But before we move to M2M, I would like you to keep the following points in the back of your mind –

1. At the time of initiating the futures position, margins are blocked in your trading account
2. The margins that get blocked is also called the "Initial Margin"
3. The initial margin is made up of two components i.e. SPAN margin and the Exposure Margin
4. **Initial Margin = SPAN Margin + Exposure Margin**
5. Initial Margin will be blocked in your trading account for how many ever days you choose to hold the futures trade
    a. The value of initial margin varies daily as it depends on the futures price
    b. Remember, Initial Margin = % of Contract Value
    c. Contract Value = Futures Price * Lot Size
    d. Lot size is a fixed, but the futures price varies every day. This means the margins also vary everyday

So for now, remember just these points. We will go ahead to understand M2M and then we will come back to margins to complete this chapter.

5.3 – Mark to Market (M2M)

As we know the futures price fluctuates on a daily basis, by virtue of which you either stand to make a profit or a loss. Marking to market, or mark to market (M2M) is a simple accounting procedure which involves adjusting the profit or loss you have made for the day and entitling you the same. As long as you hold the futures contract, M2M is applicable. Let us take up a simple example to understand this.

Assume on 1st Dec 2014 at around 11:30 AM, you decide to buy Hindalco Futures at Rs.165/-. The Lot size is 2000. 4 days later on 4th Dec 2014 you decide to square off the position at 2:15 PM at Rs.170.10/-. Clearly as the calculation below shows, this is a profitable trade –

Buy Price = Rs.165

Sell Price = Rs.170.1

Profit per share = (170.1 – 165) = Rs.5.1/-

Total Profit = 2000 * 5.1

= Rs.10,200/-

However, the trade was held for 4 working days. Each day the futures contract is held, the profits or loss is marked to market. While marking to market, the previous day closing price is taken as the reference rate to calculate the profit or losses.

Day	Closing Price
1st Dec 2014	168.3
2nd Dec 2014	172.4
3rd Dec 2014	171.6
4th Dec 2014	169.9

The table above shows the futures price movement over the 4 days the contract was held. Let us look at what happens on a day to day basis to understand how M2M works –

On **Day 1** at 11:30AM the futures contract was purchased at Rs.165/-, clearly after the contract was purchased the price has gone up further to close at Rs.168.3/-. Hence profit for the day is 168.3 minus 165 = Rs.3.3/- per share. Since the lot size is 2000, the net profit for the day is 3.3*2000 = Rs.6600/-.

Hence the exchange ensures (via the broker) that Rs.6600/- is credited to your trading account at the end of the day.

1. But where is this money coming from?

a. Obviously it is coming from the counterparty. Which means the exchange is also ensuring that the counterparty is paying up Rs.6600/- towards his loss

2. But how does the exchange ensure they get this money from the party who is supposed to pay up?

a. Obviously through the margins that are deposited at the time of initiating the trade. But more on this later.

Now here is another important aspect you need to note – from an accounting perspective, the futures buy price is no longer treated as Rs.165 but instead it will be considered as Rs.168.3/- (closing price of the day). Why is that so you may ask? Well, the profit that was earned for the day has been given to you already by means of crediting the trading account. So you are fair and square for the day, and the next day is considered a fresh start. Hence the buy price is now considered at Rs. 168.3, which is the closing price of the day.

On **day 2**, the futures closed at Rs.172.4/-, clearly another day of profit. The profit earned for the day would be Rs.172.4/ – minus Rs.168.3/- i.e. Rs.4.1/- per share or Rs.8,200/- net profit. The profits that you are entitled to receive is credited to your trading account and the buy price is reset to the day's closing price i.e. 172.4/-.

On **day 3**, the futures closed at Rs.171.6/- which means with respect to the previous day's close price there is a loss to the extent of Rs.1600 /- (172.4 – 171.6 * 2000). The loss amount will be automatically debited from your trading account. Also, the buy price is now reset to Rs.171.6/-.

On **day 4**, the trader did not continue to hold the position through the day, but rather decided to square off the position mid day 2:15 PM at Rs.170.10/-. Hence with respect to the previous day's close he again made a loss. That would be a loss of Rs.171.6/- minus Rs.170.1/- = Rs.1.5/- per share and Rs.3000/- (1.5 * 2000) net loss. Needless to say after the square off, it does not matter where the futures price goes as the trader has squared off his position. Also, Rs.3000/- is debited from the trading account by end of the day.

Now, let us just tabulate the value of the daily mark to market and see how much money has come in and how much money has gone out –

Day	Ref Price for M2M	Closing Price	Daily M2M
1st Dec 2014	165	168.3	+ Rs.6,600/-
2nd Dec 2014		172.4	+Rs.8,200/-
3rd Dec 2014	168.3	171.6	-Rs.1,600/-
4th Dec 2014	171.6 & 170.1	169.9	– Rs.3,000/-
Total			**+Rs.10,200/-**

Well, if you summed up all the M2M cash flow you will end up the same amount that we originally calculated, which is –

Buy Price = Rs.165/-

Sell Price = Rs.170.1/-

Profit per share = (170.1 – 165) = Rs.5.1/-

Total Profit = 2000 * 5.1

= **Rs.10,200/-**

So, the mark to market is just a daily accounting adjustment where –

1. Money is either credited or debited (also called daily obligation) based on how the futures price behaves
2. The previous day close price is taken into consideration to calculate the present day M2M

Why do you think M2M is required in the first place? Well, think about it – M2M is a daily cash adjustment by means of which the exchange drastically reduces the counterparty default risk. As long a trader holds the contract, the exchange by virtue of the M2M ensures both the parties are fair and square on a daily basis.

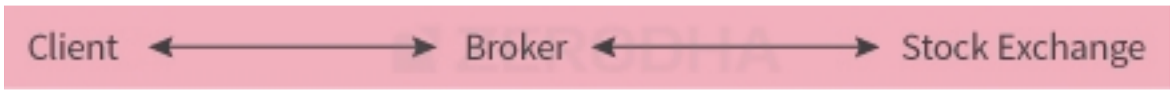
Now, keeping this basic concept of M2M, let us now move back to relook at margins and see how the trade evolves during its life.

5.4 – Margins, the bigger perspective

Let us now relook at margins keeping M2M in perspective. As mentioned earlier, the margins required at the time of initiating a futures trade is called "Initial Margin (IM)". Initial margin is a certain % of the contract value. We also know –

Initial Margin (IM) = SPAN Margin + Exposure Margin

Each and every time a trader initiates a futures trade (for that matter any trade) there are few financial intermediaries who work in the background making sure that the trade carries out smoothly. The two prominent financial intermediaries are the broker and the exchange.



Now if the client defaults on an obligation, obviously it has a financial repercussion on both the broker and the exchange. Hence if both the financial intermediaries have to be insulated against a possible client default, then both of them need to be covered adequately by means of a margin deposit.

In fact this is exactly how it works – 'SPAN Margin' is the minimum requisite margins blocked as per the exchange's mandate and 'Exposure Margin' is the margin blocked over and above the SPAN to cushion for any MTM losses. Do note both SPAN and Exposure margin are specified by the exchange. So at the time of initiating a futures trade the client has to adhere to the initial margin requirement. The entire initial margin (SPAN + Exposure) is blocked by the exchange.

Between the two margins, SPAN Margin is more important as not having this in your account means a penalty from the exchange. The SPAN margin requirement has to be strictly **maintained** as long as the trader wishes to carry his position overnight/next day. In fact for this reason, SPAN margin is also sometimes referred to as the **"Maintenance Margin".**

So how does the exchange decide what should be the SPAN margin requirement for a particular futures contract? Well, they use an advance algorithm to calculate the SPAN margins on a daily basis. One of the key inputs that goes into this algorithm is the 'Volatility' of the stock. Volatility is a very crucial concept; we will discuss it at length in the next module. For now just remember this – if volatility is expected to go up, the SPAN margin requirement also goes up.

Exposure margin, which is an additional margin, varies between 4% -5% of the contract value.

Now, let us look at a futures trade keeping both the margin and the M2M in perspective. The trade details are as shown below –

Particular	Details
Symbol	HDFC Bank Limited
Trade Type	Long
Buy Date	10th Dec 2014
Buy Price	Rs.938.7/- per share

Particular	Details
Sell Date	19th Dec
Sell Price	Rs.955/- per share
Lot Size	250
Contract Value	250*938.7 = Rs.234,675/-
SPAN Margin	7.5% of CV = Rs.17,600/-
Exp Margin	5.0% of CV = Rs.11,733/-
IM (SPAN + Exposure)	17600 + 11733 = Rs.29,334/-
P&L per share	Profit of Rs.16.3/- per share (955 – 938.7)
Net Profit	250 * 16.3 = Rs.4,075/-

If you are trading with Zerodha, you may know that we provide a Margin calculator that explicitly states the SPAN and Exposure margin requirements. Of course, at a later stage we will discuss in detail the utility of this extremely useful tool. But for now, you could check out this margin calculator.

So keeping the above trade details in perspective, let us look at how the margins and M2M plays a role simultaneously during the life of the trade. The table below shows how the dynamics change on a day to day basis –

Date	Close	CV	SPAN	Exposure	Total Margin	M2M	Cash Balance
10-Dec-14	940	235,000	17,625	11,750	29,375	325	29,659
11-Dec-14	939	234,750	17,606	11,738	29,344	(250)	29,409
12-Dec-14	930	232,500	17,438	11,625	29,063	(2,250)	27,159
15-Dec-14	949	237,250	17,794	11,863	29,656	4,750	31,909
16-Dec-14	933	233,250	17,494	11,663	29,156	(4,000)	27,909
17-Dec-14	925	231,250	17,344	11,563	28,906	(2,000)	25,909
18-Dec-14	938	234,500	17,588	11,725	29,313	3,250	29,159
19-Dec-14	955	238,750	17,906	11,938	29,844	4,250	33,409

Lot Size	250
SPAN	7.5% of CV
Exposure	5.0% of CV
Initial cash blocked	29,334
Cash Released	33,409
Difference	4,075
Total M2M	4,075
Profits Earned	4,075
% Return	13.9%

I hope you don't get intimidated looking at the table above, in fact it is quite easy to understand. Let us go through it sequentially, day by day.

10th Dec 2014

Sometime during the day, HDFC Bank futures contract was purchased at Rs.938.7/-. Lot size is 250, hence the contract value is Rs.234,675/-. As we can see from the box on the right, SPAN is 7.5% and Exposure is 5% of CV respectively.

Hence 12.5% of CV is blocked as margins (SPAN + Exposure), this works up to a total margin of Rs.29,334/-. The initial margin is also considered as the **initial cash blocked** by the broker.

Going ahead, HDFC closes at 940 for the day. At 940, the CV is now Rs.235,000/- and therefore the total margin requirement is Rs.29,375/- which is a marginal increase of Rs.41/- when compared to the margin required at the time of the trade initiation. The client is not required to infuse this money into his account as he is sufficiently covered with a M2M profit of Rs.325/- which will be credited to his account.

The total cash balance in the trading account = Cash Balance + M2M

= Rs.29,334 + Rs.325

= Rs.29,659/-

Clearly, the cash balance is more than the total margin requirement of Rs.29,375/- hence there is no problem. Further, the reference rate for the next day's M2M is now set to Rs.940/-.

11th Dec 2014

The next day, HDFC Bank drop by Rs.1/- to Rs.939/- per share impacting the M2M by negative Rs.250/-. This money is taken out from the cash balance (and will be credited to the person making this money). Hence the new cash balance will be –

= 29659 – 250

= Rs.29,409/-

Also, the new margin requirement is calculated as Rs.29,344/-. Clearly the cash balance is higher than the margin required, hence there is nothing to worry about. Also, the reference rate for the next day's M2M is reset at Rs.939/-

12th Dec 2014

This is an interesting day. The futures price fell by Rs.9/- taking the price to Rs.930/- per share. At Rs.930/- the margin requirement also falls to Rs.29,063/-. However because of an M2M loss of Rs.2250/- the cash balance drops to Rs.27,159/- (29409 – 2250), which is less than the total margin requirement. Now since the cash balance is less than the total margin requirement, is the client required to pump in the additional money? Not really.

Remember between the SPAN and Exposure margin, the most sacred one is the SPAN margin. Most of the brokers allow you to continue to hold your positions as long as you have the SPAN

Margin (or maintenance margin). Moment the cash balance falls below the maintenance margin, they will call you asking you to pump in more money. In the absence of which, they will force close the positions themselves. This call, that the broker makes requesting you to pump in the required margin money is also popularly called the "**Margin Call**". So, if you are getting a margin call from your broker, it means your cash balance is dangerously low to continue the position.

Going back to the example, the cash balance of Rs.27,159/- is above the SPAN margin (Rs.17,438/-) hence there is no problem. The M2M loss is debited from the trading account and the reference rate for the next day's M2M is reset to Rs.930/-.

Well, I hope you have got a sense of how both margins and M2M come into play simultaneously. I also hope you are able to appreciate how by virtue of the margins and M2M, the exchange can efficiently tackle the threat of a possible default by a client. The margin + M2M combination is virtually a fool proof method to ensure defaults don't occur.

Assuming you are getting a sense of the dynamics of margins and M2M calculation, I will now take the liberty to cut through the remaining days and proceed directly to the last day of trade.

19th Dec 2014

At 955, the trader decides to cash out and square off the trade. The reference rate for M2M is the previous day's closing rate which is Rs.938. So the M2M profit would Rs.4250/- which gets added to the previous day cash balance of Rs.29,159/-. The final cash balance of Rs.33,409/- (Rs.29,159 + Rs.4250) will be released by the broker as soon as the trader squares off the trade.

So what about the overall P&L of the trade? Well, there are many ways to calculate this –

Method 1) – Sum up all the M2M's

P&L = Sum of all M2M's

= 325 – 250 – 2250 + 4750 – 4000 – 2000 + 3250 + 4250

= Rs.4,075/-

Method 2) – Cash Release

P&L = Final Cash balance (released by broker) – Cash Blocked Initially (initial margin)

= 33409 – 29334

= Rs.4,075/-

Method 3) – Contract Value

P&L = Final Contract Value – Initial Contract Value

= Rs.238,750 – Rs.234,675

=Rs.4,075/-

Method 4) – Futures Price

P&L = (Difference b/w the futures buy & sell price) * Lot Size

Buy Price = 938.7, Sell Price = 955, Lot size = 250

= 16.3 * 250

= Rs. 4,075/-

As you can notice, either which ways you calculate, you arrive at the same P&L value.

5.5 – An interesting case of 'Margin Call'

For a moment, let us assume the trade was not closed on 19th Dec, and in fact carried forward to the next day i.e 20th Dec. Also, let us assume HDFC Bank drops heavily on 20th December – maybe a 8% drop, dragging the price to 880 all the way from 955. What do you think will happen? In fact, can you answer the following questions?

1. What is the M2M P&L?
2. What is the impact on cash balance?
3. What is the SPAN and Exposure margin required?
4. What action does the broker take?

I hope you are able to calculate and answer these questions yourself, if not here are the answers for you –

1. The M2M loss would be Rs.18,750/- = (955 – 880)*250. The cash balance on 19th Dec was Rs. 33,409/- from which the M2M loss would be deducted making the cash balance Rs.14,659/- (Rs.33,409 – Rs.18,750).
2. Since the price has dropped the new contract value would be Rs.220,000/- (250*880)
    a. SPAN = 7.5% * 220000 = Rs.16,500/-
    b. Exposure = Rs.11,000/-

c. Total Margin = Rs.27,500/-

3. Clearly, since the cash balance (Rs.14,659/-) is less than SPAN Margin (Rs.16,500/-), the broker will give a Margin Call to the client, or in fact some brokers will even cut the position real time as and when the cash balance drops below the SPAN requirement.

Key takeaways from this chapter

1. A margin payment is required (which will be blocked by your broker) as long as the futures trade is live
2. The margin blocked by the broker at the time of initiating the futures trade is called the initial margin
3. Both the buyer and the seller of the futures agreement will have to deposit the initial margin amount.
4. The margin amount collected acts as a leverage, as it allows you to deposit a small amount of money and take exposure to a large value transaction
5. M2M is a simple accounting adjustment, the process involves crediting or debiting the daily obligation money in your trading account based on how the futures price behaves
6. The previous day closing price figure is taken to calculate the current day's M2M
7. SPAN Margin is the margin collected as per the exchanges instruction and the Exposure Margin is collected as per the broker's requirement
8. The SPAN and Exposure Margin is determined as per the norms of the exchange
9. The SPAN Margin is popularly referred to as the Maintenance Margin
10. If the margin account goes below the SPAN, the investor must deposit more cash into his account if he aspires to carry forward the future position
11. The Margin Call is when the broker requests the trader to infuse the required margin money when the cash balance goes below the required level

CHAPTER 6

Margin Calculator (Part 1)

6.1 The Margin Calculator

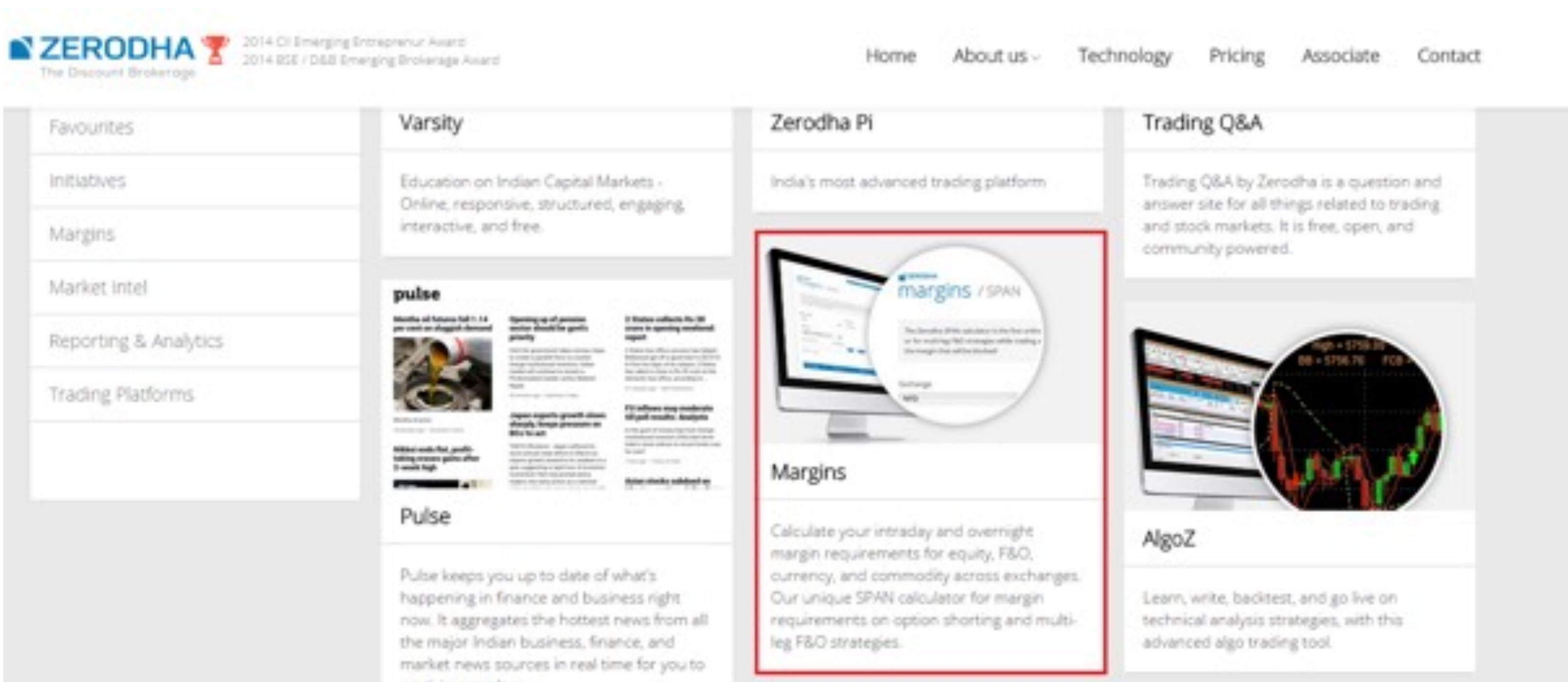
In continuation with our discussion on margins in the previous chapter, we will now discuss about the margin calculator. Over the next two chapters we will discuss about the margin calculator and also learn few associated topics related to margins.

Do recollect, in the previous chapter we learnt about the various types of margins required at the time of initiating a futures trade. Margins vary from one future contract to another as the margins depend on the volatility of the underlying. We will talk about volatility in the next module, but for now just remember that the volatility changes from one underlying to another, hence the margins vary from one underlying to another. So how do we know what is the margin requirement of a particular contract? Well, if you are trading with Zerodha, chances are you would have come across the 'Margin Calculator'.

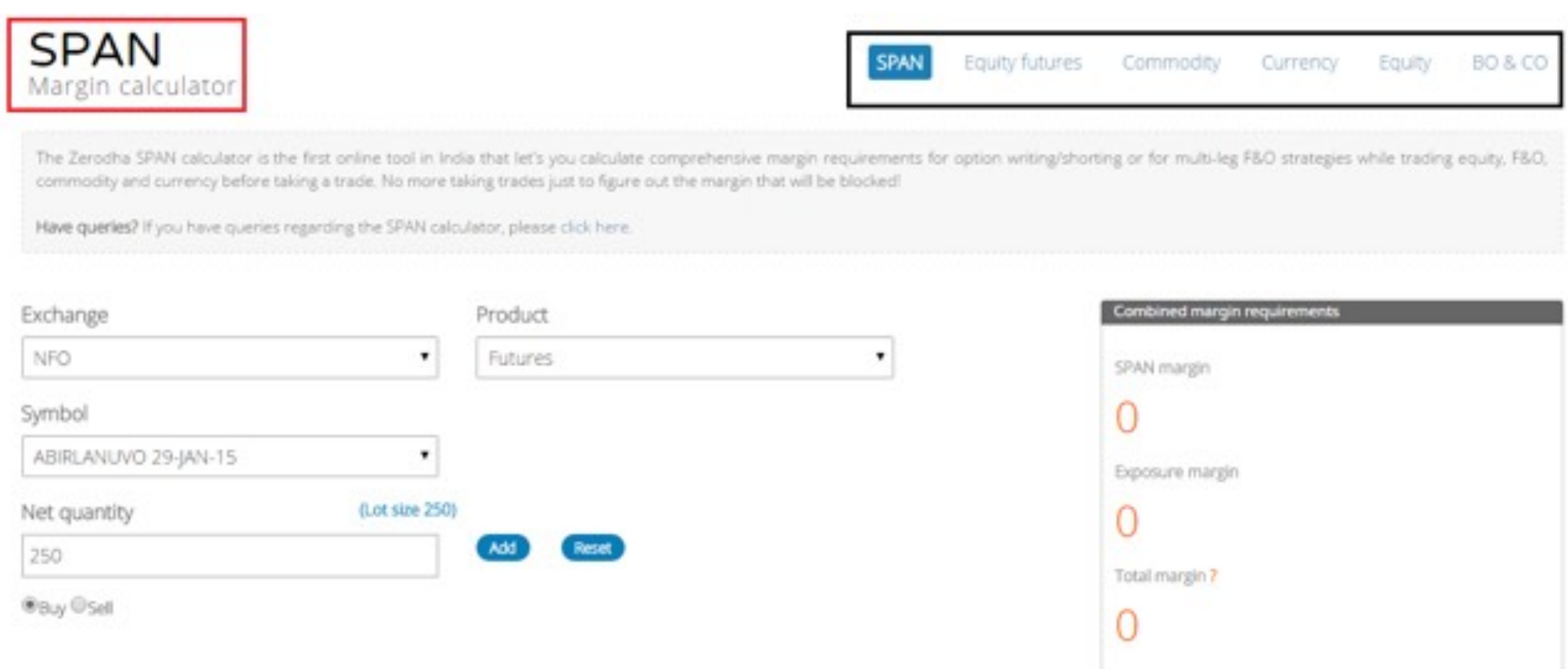
Zerodha's margin calculator is one of our popular offering, and rightly so. It is a simple to use tool that has a very sophisticated engine in the background. In this chapter I will just introduce you to the margin calculator and help you understand the margin requirement for the contract you choose. We will revisit this topic on the margin calculator when we take up the chapter on Options in the next module, at that point we will understand the complete versatility of Zerodha's margin calculator.

Let us take up a case where one decides to buy the futures contract of IDEA Cellular Limited, expiring on 29th January 2015. Now in order to initiate this trade one needs to deposit the initial margin amount. We also know that the Initial Margin (IM) = SPAN Margin + Exposure Margin. In order to find out the IM requirement, all you need to do is this –

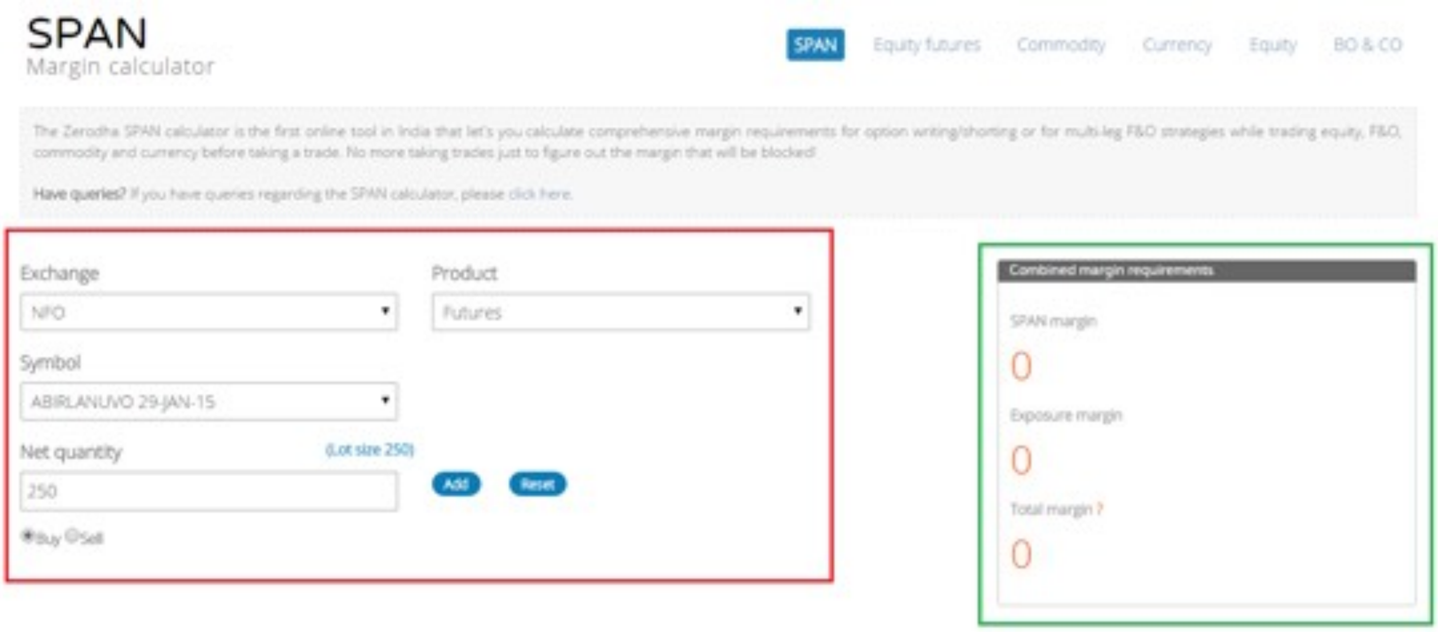
Step 1 – Visit https://zerodha.com/technology. Once you land here, click on 'Margins', I have highlighted the same in the image below



Step 2 – You will be taken to the margin calculator section. As you can see from the image below, there are many different options that are available (I have highlighted the same in black). However our focus for now will be on the first two options called 'SPAN' and 'Equity Futures". In fact by default you will land on the SPAN Margin Calculator sub page, highlighted in red.



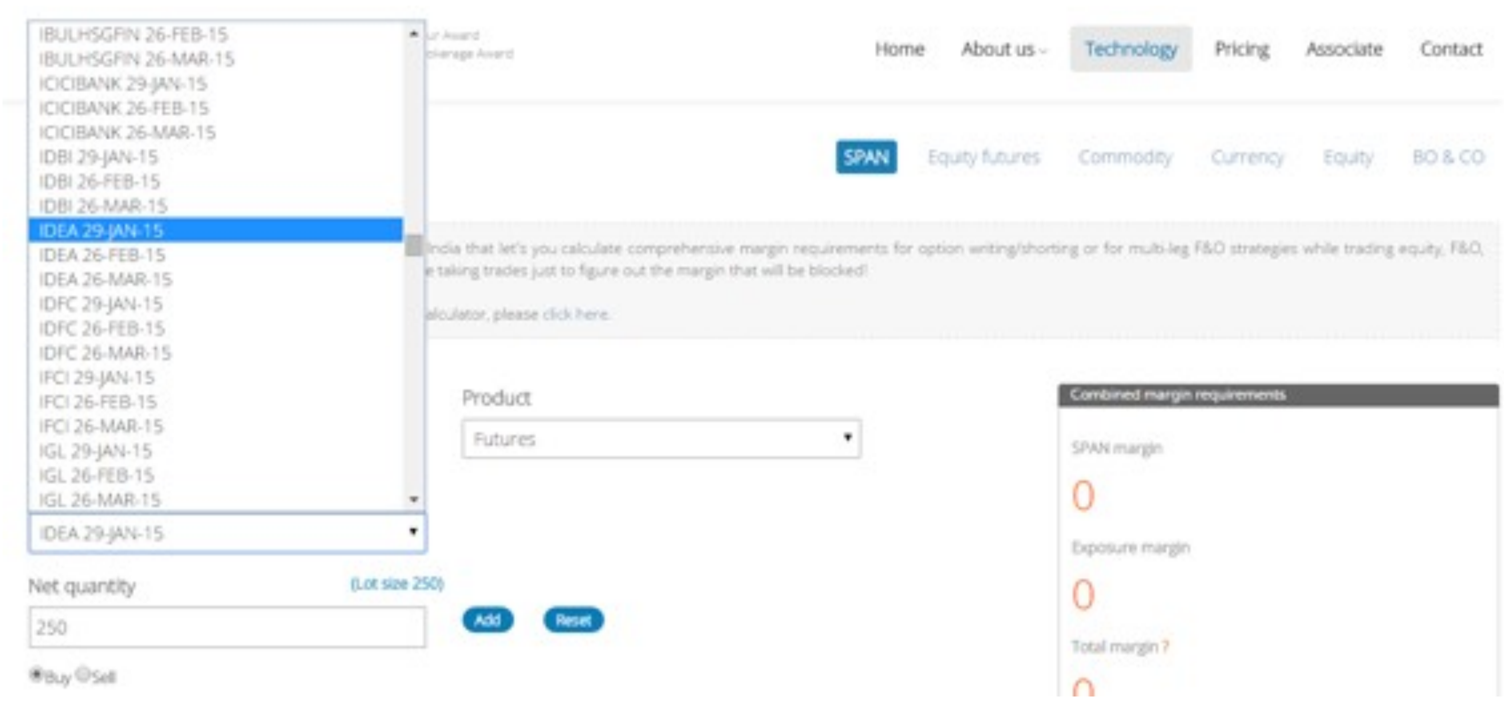
Step 3 – The SPAN Margin Calculator has two main sections within it, let us inspect the same –



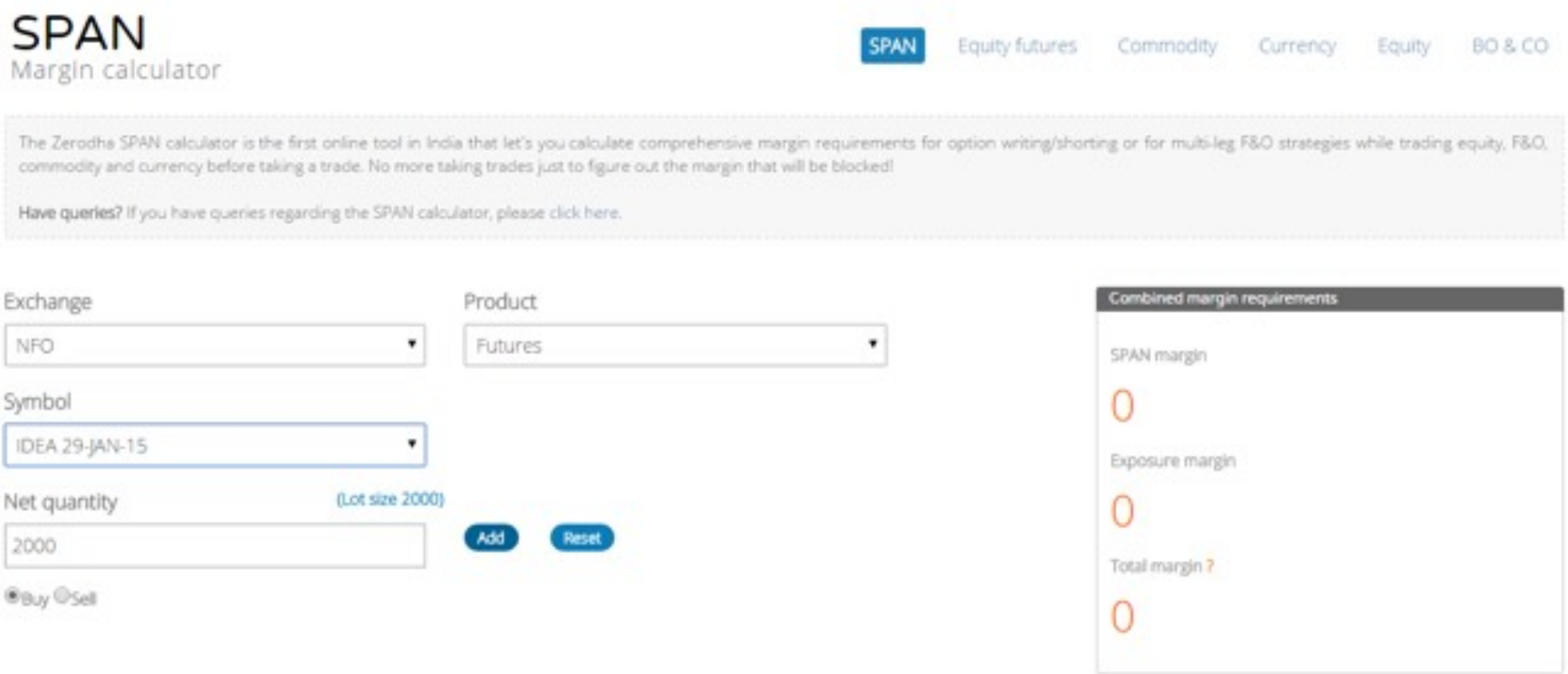
The resection has 3 drop down menu options. The 'Exchange' drop down option basically requires you to choose the exchange in which you wish to operate. Select –

1. NFO if you wish to trade Futures on NSE
2. MCX if you wish to trade commodity futures on MCX
3. CDS if you wish to trade currency derivatives on NSE

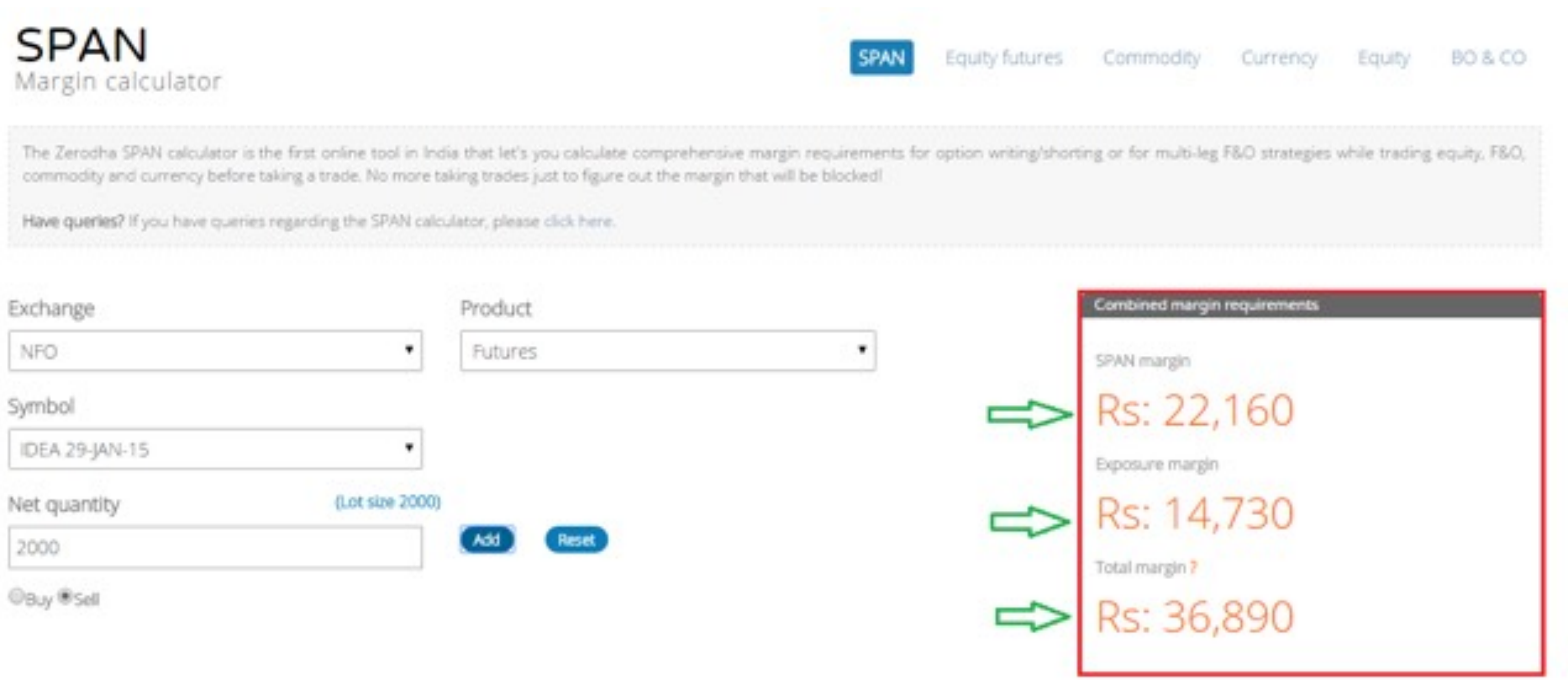
The next drop down on your right is the 'Product'; choose Futures if you wish to trade a futures contract, or if you wish to trade options, select Options. The third drop down menu is the list of symbols where all the futures and option contracts are made available. From this drop down menu, simply choose the contract you wish to trade. Since we are interested in IDEA Cellular Limited expiring on 29th Jan, I have selected the same, please see the image below –



Step 4 – Once you select the futures contract, the Net Quantity automatically gets pre populated to 1 lot. If you wish to trade more than one lot, then you need to enter the new quantity manually. Notice in the image below, as soon as I select IDEA futures contract, the net quality has changed to the respective lot size, which is 2000. If I wish to trade say 3 lots, then I have to type in 6000 (2000 * 3). Once this is done simply click on the radio button, either a buy or sell (depending on what you wish to do) and finally click on the blue "add" button



Once you instruct the SPAN calculator to add the margins, it will do the same and it will give you the split up between the SPAN, Exposure, and the total Initial margin. This is as shown below, highlighted in the red box –



The SPAN calculator is suggesting the following –

SPAN Margin = Rs.22,160/-

Exposure Margin = Rs.14,730/-

Initial Margin (SPAN + Exp) = Rs.36,890/-

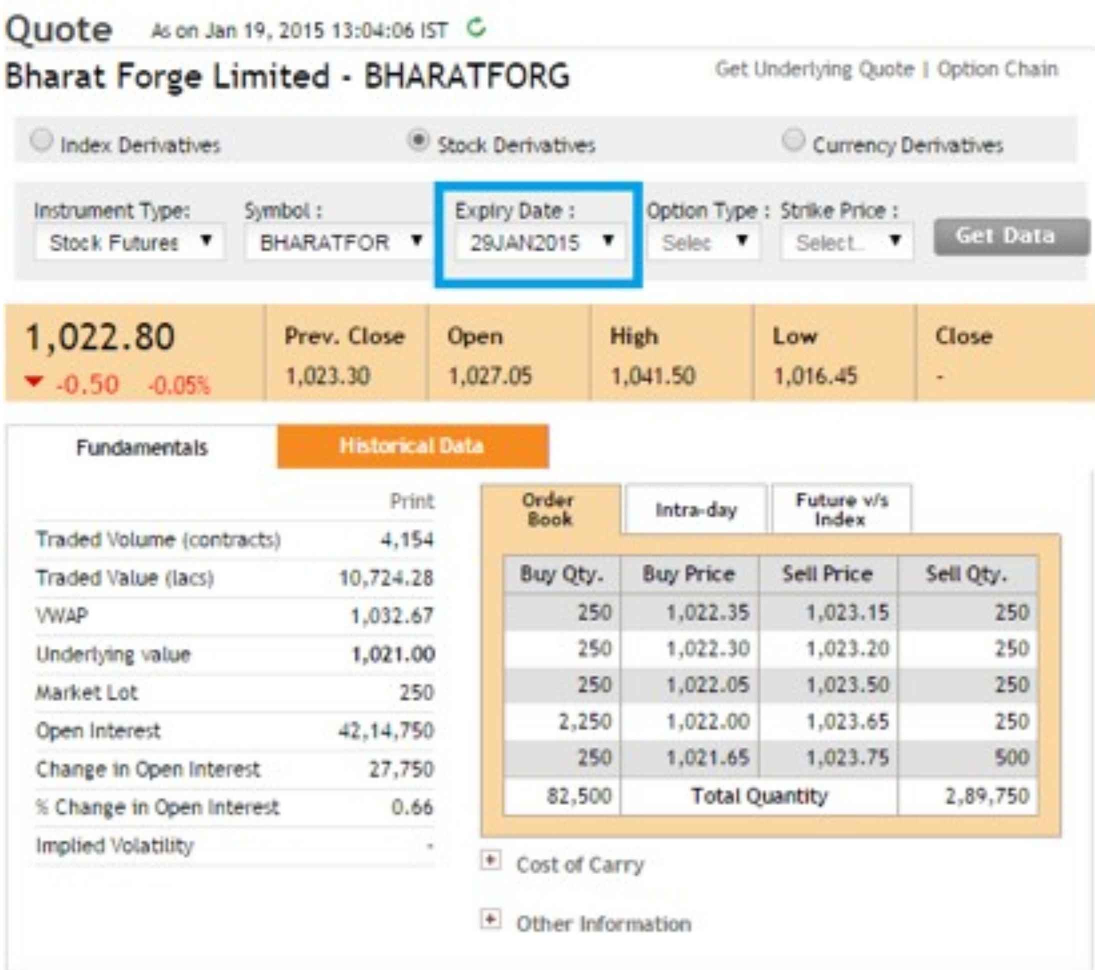
With this, you know how much money is required to initiate the futures trade on IDEA Cellular; it is as simple as that! The next interesting section within the margin calculator is the "Equity Futures". We will discuss the same in the next chapter, however, before we proceed to understand this, let us quickly understand 3 more topics namely the Expiry, Spreads, and Intraday order types. Once we understand these topics, we will be placed better to understand the "Equity Futures" on the margin calculator.

6.2 – Expiry

In the earlier chapters, we briefly figured out what the 'Expiry' of a futures contract means. Expiry specifies the last date up to which the contract lasts, beyond which it will cease to exist. Consider this, if I buy IDEA Cellular Limited futures contract at 149/- expiring on 29th January 2015, with an expectation that it will hit 155, it simply means that this move to 155 has to pan out by 29th January 2015. Obviously if the price of IDEA is below 149 before the expiry then I have to book a loss. Even if the price of IDEA futures hits 155 (or in fact any price above 149) on 30th January 2015 (1 day after the expiry) it is of no use to me as the contract has already expired. In simple words, when I buy a futures contract, it has to move in my favor on or before the expiry day, else there is no point.

Does it really have to be so rigid? Is there any flexibility in terms of going beyond the stated expiry date? Let me illustrate what I mean –

I know that the Central Government budget is expected sometime around the last week of February 2015, which is a little more than a month away (considering today is 19th Jan 2015). I personally expect a good budget this time around, and I'm also hopeful that the manufacturing sector will significantly benefit from the budget in the backdrop of the 'Make in India' campaign. Given this, I would like to bet that Bharat Forge, a manufacturing major will significantly benefit from the upcoming budget. To be precise I expect Bharat Forge to rally from now, all the way till the budget (pre budget rally). Therefore in order to exploit my directional point of view on Bharat Forge, I would like to buy its futures today. Have a look at the snapshot below –



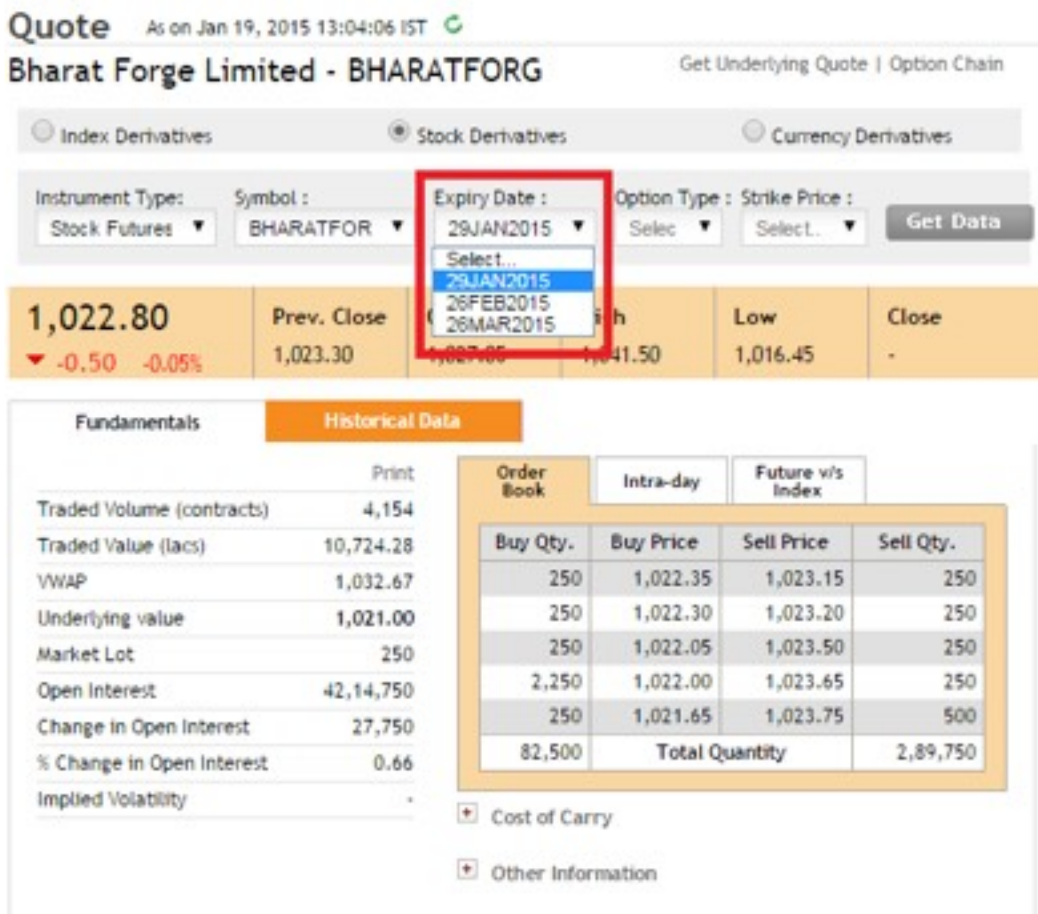
Bharat Forge January 2015 contract is trading at Rs.1022/-, but here is a situation – my view is that Bharat Forge will rally from now, all the way till the last week of Feb 2015. But If I buy the futures contract as shown above, then it expires on 29th Jan 2015, leaving me stranded half way through.

Clearly since my directional view goes beyond the January expiry period, I need not be bound to buy the January expiry contract. In fact for reasons similar to this, NSE allows you to select a contract that suites the expiry requirement.

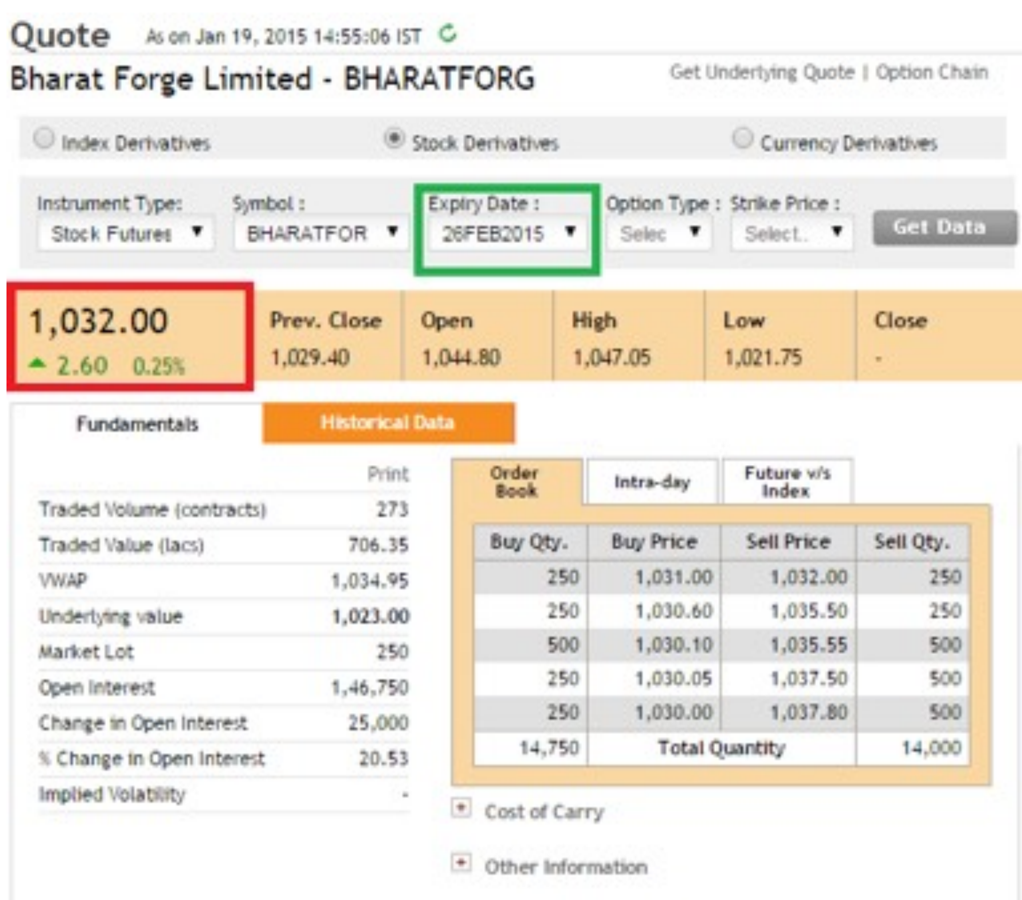
At any given point, NSE allows us to buy a futures contract with 3 different expiries. For example we are in the month of January; hence we have 3 contracts of Bharat Forge with different expiry –

1. 29th January 2015 – This is called the **near month** contract or the **current month** contract
2. 26th February 2015 – This is called the **mid month** contract
3. 26th March 2015 – This is called the **far month** contract

Have a look at the image below –



As you can see, from the expiry drop-down menu, I can choose any contract between the current month, mid month, or far month based on my specific requirement. Needless to say, I would choose the mid month contract expiring on 26th Feb 2015 in this particular case (as shown below) –



One thing that stands out clearly is the change in futures price. The contract expiring on 26th Feb 2015 is trading at Rs.1,032/- while at the same time the contract expiring on 29th Jan is trading at Rs.1,022.8/-. Which means the mid month contract is more expensive compared to the current month contract. This is always the case; the larger the time to expiry, the higher is the price. In fact as I write this, Bharat Forge Limited's March contract expiring on 29th March 2015 is trading at Rs.1,037.4/-.

For now just remember this – The current month futures price should be less than mid month futures price, which should be less than far month futures price. There is a mathematical reason for this, the same will be discussed when we take up the futures pricing formula.

Also, here is another important concept you need to remember – As I had mentioned earlier, at any given point the NSE ensures there are 3 future contracts (current, mid, and far month) available to trade. For now we know, Bharat Forge contract is expiring on 29th January 2015. This means the January contract can be traded till 3:30PM on 29th January 2015, after which it will cease to exist. So does that mean from 29th January 2015 onwards, the January contract goes out of the system leaving behind just the February and March contract?

Not really, till 3:30PM on January 29th 2015 the January contract is available, after which it will expire. On 9:15AM 30th January 2015, NSE will introduce April 2015 contract. So on 30th January we will have three contracts –

1. The February contract would now graduate as the current month contract from being the mid month contract until the previous day

2. The March contract would now be considered the mid month contract (graduated from being far month the previous day to mid month now)

3. The April contract, which is newly introduced, becomes the far month contract.

Likewise when the February contract expires, NSE will introduce the May contract. Hence the market will have March, April, and May contracts to trade. So on and so forth.

Anyway, continuing with Bharat Forge Limited futures contract example, because I have a slightly long term view, I can buy the futures contract expiring on 26th February 2015 and hold the February contract till I deem appropriate. However, there is another alternative as well – instead of buying the February contract, I can go ahead and buy the January contract, hold on to it till around expiry, and very close to expiry, I can square off the January contract and buy the February contract. This is called a '**rollover'**.

If you watch business news regularly, around the expiry time the TV anchor's usually talk about the 'rollover data'. Well, don't get too confused about this, in fact it is quite straight forward. All they are trying to convey is a % measure on how many traders have 'rolled over' (or carried over) their existing positions from the current month to the mid month. If there are many traders rolling over their existing long positions to the next month then it is considered bullish, likewise if a lot of traders are rolling over their existing short positions to the next month then it is considered bearish. This is as simple as that. Now is this a proven technique to draw any concrete inference about the markets? Not really, it is just a perception of the market.

So under what circumstances would one want to rollover rather than buy a long dated futures contract? Well, one of the main reasons for this is the ease of buying and selling aka 'The liquidity'. In simple words, at any given point there are more number of traders who prefer to trade current month contract as compared to the mid or far month contract. Obviously when there are more traders trading the same contract the ease of buying and selling gets better.

6.3 – Sneak Peak into Spreads

We are now at a very interesting stage. You may find some of the discussion below a bit confusing, but just read through this and try to grasp as much as you can. At the right time in future we will talk more about this in detail.

Just think about these two contracts –

1. Bharat Forge Limited Futures, expiring on 29th January 2015
2. Bharat Forge Limited Futures, expiring on 26th February 2015

For all practical purposes these are two different contracts, priced slightly differently, both derives its value from the same underlying i.e. Bharat Forge Limited, hence they behave exactly the same. Meaning if Bharat Forge stock price in the spot market goes up, then both January futures and February futures price would go up. Likewise if Bharat Forge stock price in the spot market goes down, then both January futures and February futures price would go down.

At times there are opportunities created where by simultaneously buying the current month contract and selling the mid month contract or vice versa, one can make money. Opportunities of this type are called 'Calendar Spreads'. How to identify such opportunities and setup trades is a different topic altogether. We will discuss this soon. But at this moment, I want to draw your attention to the margins aspect.

We know why margins are charged – mainly from the risk management perspective. Now, what kind of risk would exist if we are buying the contract on one hand and selling the same type of contract on the other? The risk is drastically reduced. Let me illustrate this with numbers –

Scenario 1 – Trader buys only Bharat Forge Limited's January Futures

Bharat Forge Spot Price = Rs.1021/- per share

Bharat Forge January contract Price= Rs.1023/- per share

Lot Size = 250

After buying, assume the spot price drops to Rs.1011/- (10 point fall)

Approximate futures price = Rs.1013/-

P&L = (10 * 250) = Rs.2500/- loss

Scenario 2 – Trader buys January and sells February Futures

Bharat Forge Spot Price = Rs.1021/- per share

Long on Bharat Forge January contract at Rs.1023/- per share

Short on Bharat Forge February contract at Rs.1033/- per share

Lot Size = 250

After setting up this trade, assume the spot price drops to 1011 (10 point fall)

Approximate price of January Futures = Rs.1013/-

Approximate price of February Futures = Rs.1023/-

P&L on January Contract = (10*250) = Rs.2500/- loss

P&L on February Contract = 10*250 = Rs.2500/- profit

Net P&L = – 2500 + 2500 = 0

Scenario 3 – Trader sells January and buys February Futures

Bharat Forge Spot Price = Rs.1021/- per share

Short on Bharat Forge January contract at Rs.1023/- per share

Long on Bharat Forge February contract at Rs.1033/- per share

Lot Size = 250

After setting up this trade, assume the spot price increases to 1031 (10 point increase)

Approximate price of January Futures = Rs.1033/-

Approximate price of February Futures = Rs.1043/-

P&L on January Contract = 10*250 = Rs.2500/- Profit

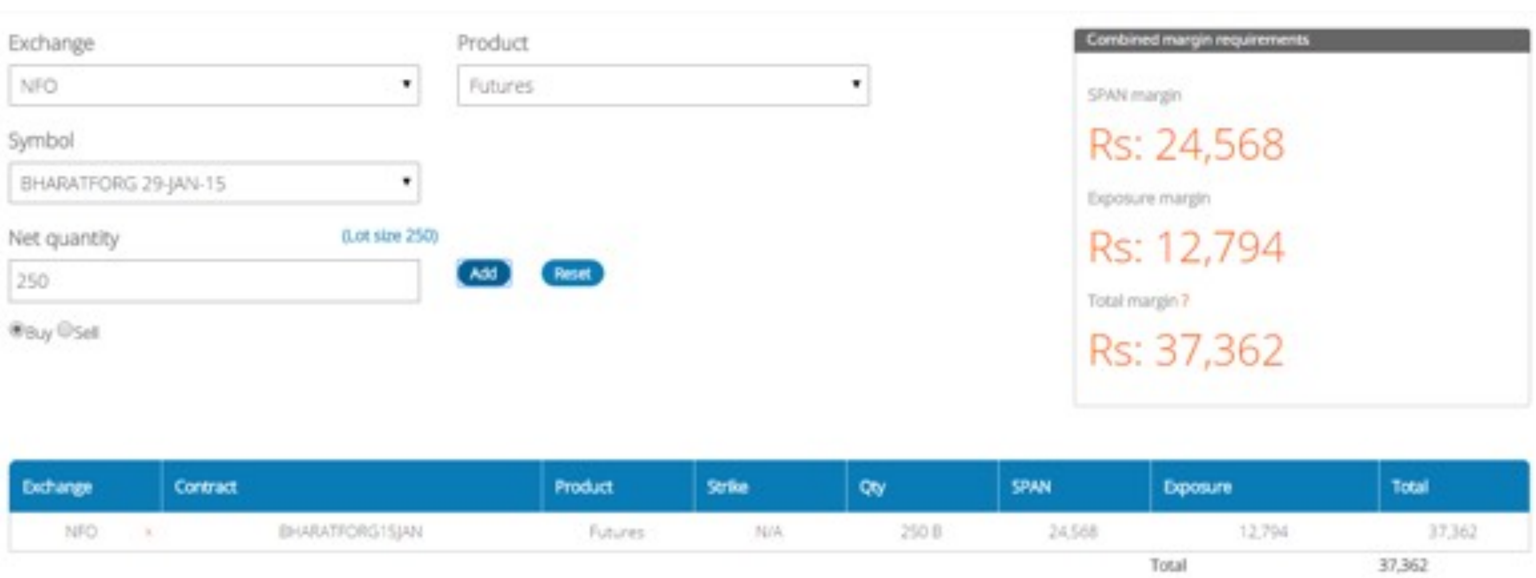
P&L on February Contract = (10*250) = Rs.2500/- Loss

Net P&L = + 2500 – 2500 = 0

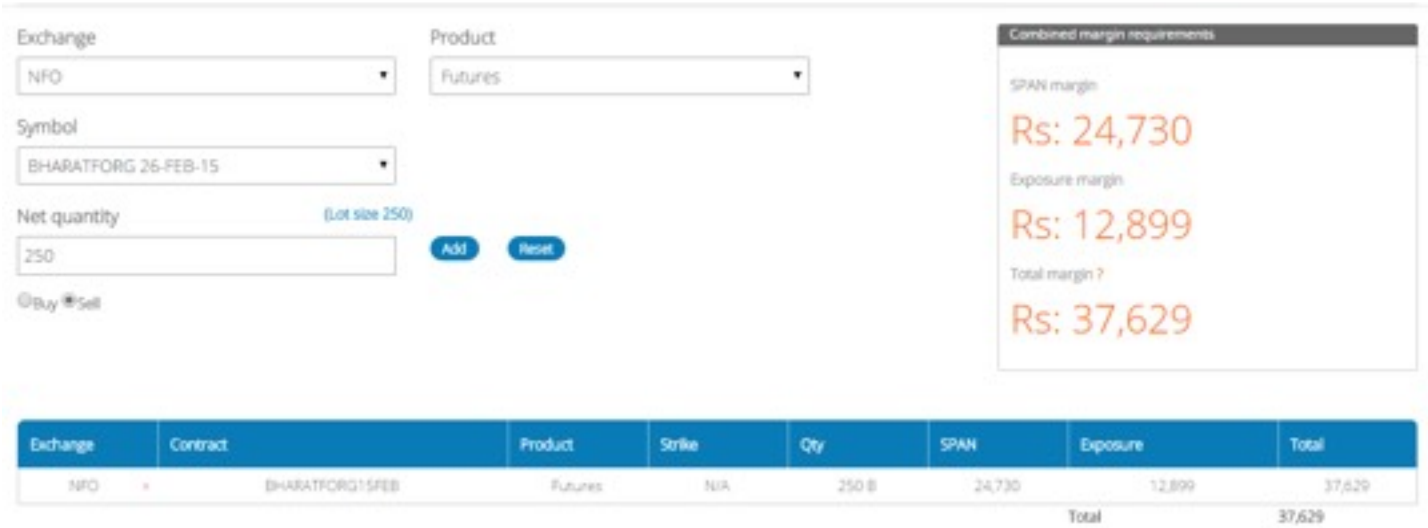
Clearly, the point that I'm trying to make here is that when you are long on one contract and short on another contract, the risk is virtually reduced to zero. However it is not completely risk free, one has to account for the liquidity, volatility, and execution risk etc. But by and large the risk reduces drastically. So when risk reduces drastically, the margins should also reduce drastically.

In fact this is what happens, have a look at the following snapshots –

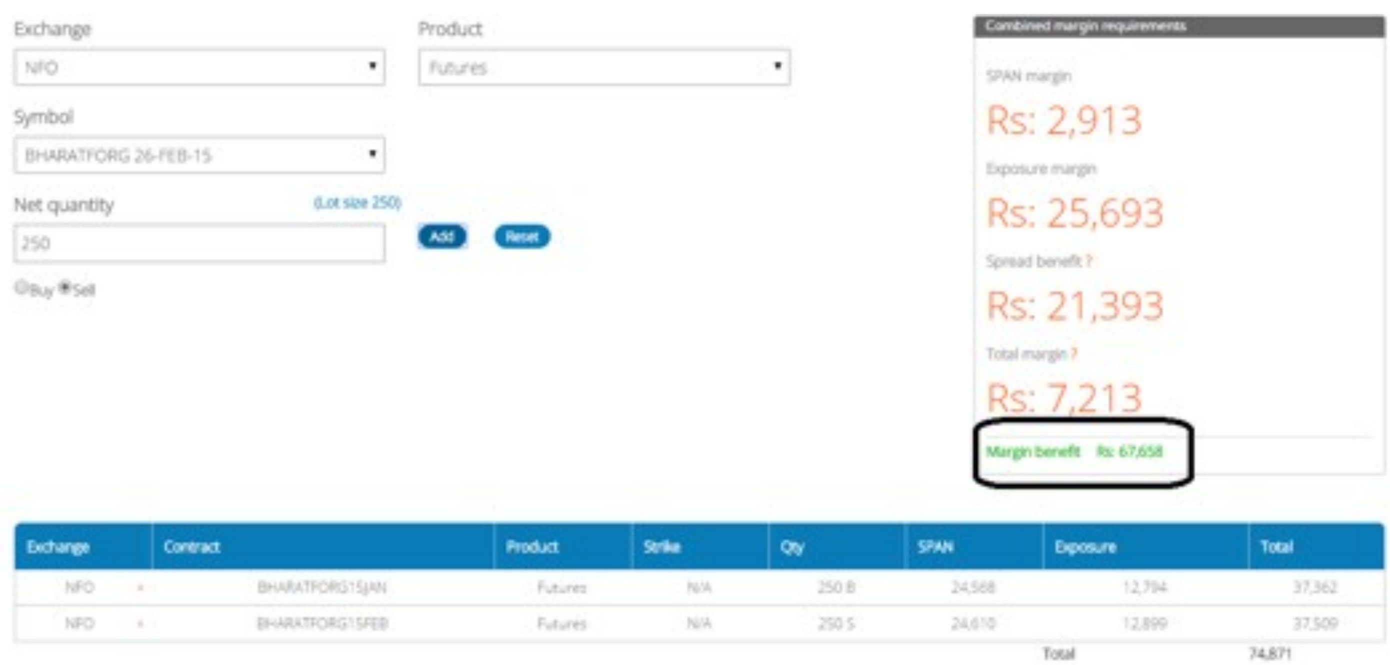
This is the margin requirement (Rs.37,362/-) when we intend to buy January contracts of Bharat Forge



This is the margin requirement (Rs.37,629/-) when we intend to sell February contracts of Bharat Forge



And this is the margin requirement (Rs.7,213/-) when we intend to buy January contract and sell February contract simultaneously.



As you can see, individually the January and February contracts require Rs.37,362/- and Rs.37,629/- respectively. Hence a total of Rs.74,991/-. However when a futures contract is bought and sold simultaneously the risk reduces drastically, hence the margin requirement. As we can see from the image above, the combined position just requires a margin of Rs.7,213/- only. Another way to look at it would be from a total of Rs.74,991/-, Rs.67,658/- i.e. Margin Benefit (highlighted in black) is reduced and the benefit is passed on to the client. But do remember this – A simultaneous long and short position is built only when opportunities arise. These opportunities are called the 'Calendar Spread'. If the calendar spread opportunity is not there, then there is no point initiating such trades.

Key Takeaways from this chapter

1. Zerodha's margin calculator is a simple tool that lets you calculate the margin required for a futures contract

2. The margin calculator has many versatile features inbuilt

3. The margin calculator gives the split up between the SPAN and Exposure margin

4. At any given point, NSE ensures there are three contracts of the same underlying which expire on 3 different (but consecutive) months

5. A trader can choose the contract of his choice based on the expiry data

6. The contract belonging to the present month is called 'Current Month Contract', the next month contract is called 'Mid Month', and the 3rd one is called "Far Month Contract'

7. On every expiry the current month contract expires and a new far month contract is introduced. In the process, the mid month contract would graduate to the current month contract

8. Calendar spread is trading technique which involves buying a certain month contract and selling another month contract simultaneously for the same underlying

9. When a calendar spread is initiated, the margins required are lower since the risk is drastically reduced

CHAPTER 7

Margin Calculator (Part 2)

7.1 – The trade information

I'm going to start this chapter by posting the same old question again – Why do you think margins are charged? Before you get annoyed and come chasing me, let me post the answer

Margins are charged from a risk management perspective. It helps in preventing any undesired counter party default. The risk management system at the broker's office (often called the RMS system) is responsible for overseeing the overall risk management. You may be interested to know that the RMS is a computer program, and all orders placed by the clients reach the exchange only once this program approves it (which takes a fraction of a second), and there are people monitoring if everything done is right/wrong.

When you place a trade, let us say to buy a futures contract (via a buy order entry form) you are essentially conveying the following details to the risk management system (RMS) –

1. The contract you wish to buy (like TCS futures, IDEA futures etc)
2. The quantity you wish to buy (number of lots)
3. The price at which you want to buy (market or limit)

Once you place the order, the RMS system evaluates the margin requirement and allows your trade to go through (provided you have the required margin amount).

However, the information that you **don't normally** provide to the RMS system is the following –

1. The duration up to which you wish to hold your trade – is your trade intraday or you would wish to hold on to it over multiple days?
2. The stoploss point – In case the trade goes against you, at what price point you would wish to book a loss and square off the position.

Now what would happen if you provided these additional details to the RMS system? Obviously, with the additional information flowing to the RMS system; it would develop a better clarity on your risk appetite.

For example, the detail on the **duration of the trade** would let the system know how much volatility you are exposed to. If your trade is intraday, you are only exposed to 1 day volatility. However if your trade is for multiple days then you are not only exposed to multiple days volatility, you are also exposed to the 'overnight risk'.

Overnight risk is risk of carrying the position overnight. For example assume I'm holding a long BPCL (a major oil marketing company in India) futures position overnight. BPCL is highly sensitive to fluctuations in crude oil prices. While I'm holding the BPCL futures, assume overnight the crude oil market shoots up by 5%. This will obviously have a negative impact on BPCL the next day as it becomes more expensive for BPCL to buy crude oil from the international markets. Hence by virtue of holding BPCL position overnight, I will suffer a loss, therefore a M2M cut. This is called 'overnight risk'. Anyway, the point that I'm trying to make here is straightforward – from the RMS system's perspective the longer you wish to hold the trade, the higher is the risk you are exposed to.

Likewise think about the **stoploss for the trade**. By **not** expressing your intended stoploss you are keeping the RMS system in total darkness with respect to your risk appetite. Do note, this is not mandatory information that you need to reveal. However, if you do, the RMS system gets more clarity on your trade. For example assume I buy BPCL futures Rs.649/-, in the absence of specifying a stoploss, I'm virtually exposed to an unlimited risk. However if I specify my stoploss as let us say Rs.9/-, then when BPCL falls to Rs.640/- (649 – 9) I would book a loss and get out of the trade. Hence there is complete clarity on the amount of risk I'm willing to take, which from the RMS system's perspective is a valuable information.

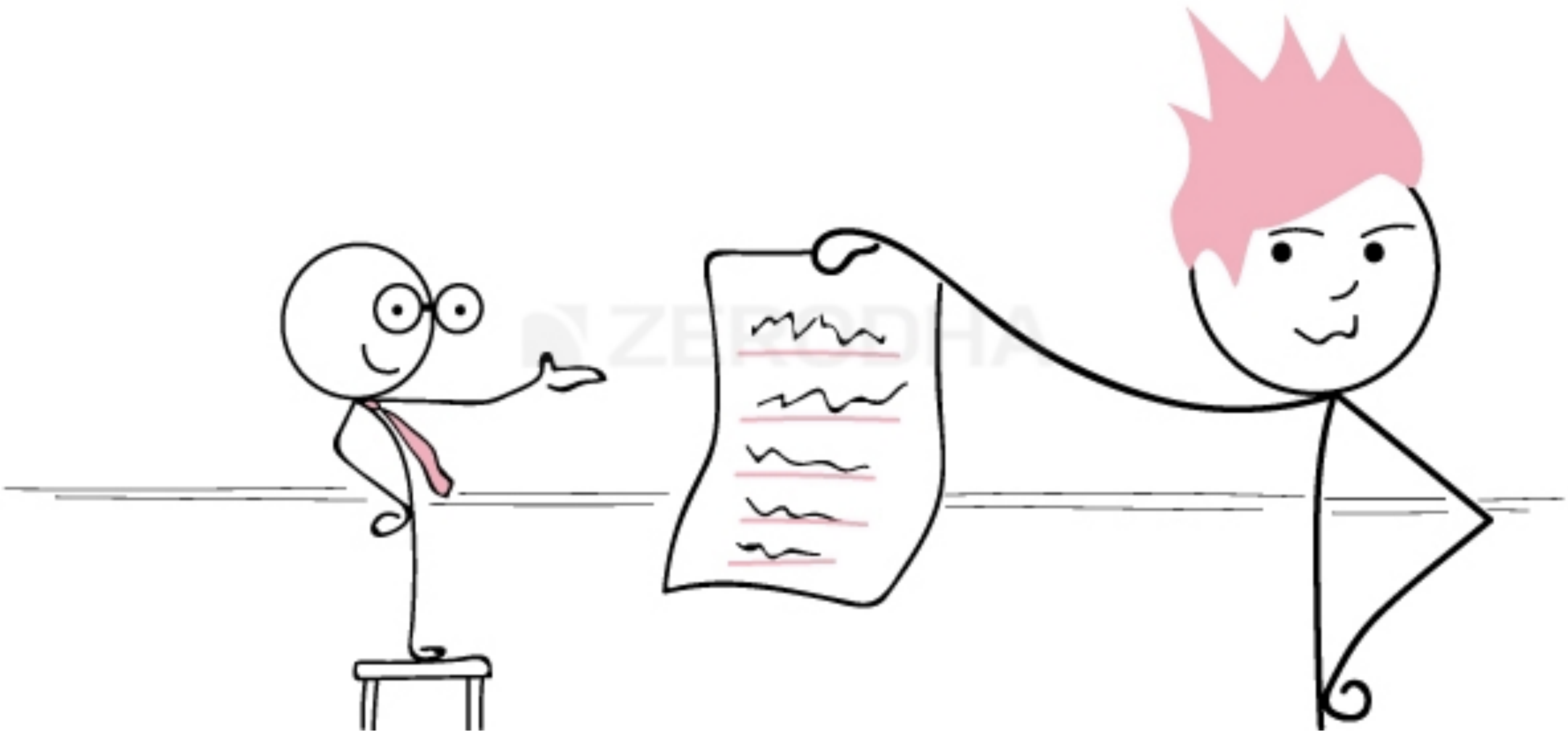
So both – the duration and the stoploss of the trade gives more clarity about your risk appetite to the RMS system. So what does this mean to you as a trader?

Well, think about it – the more clarity you provide in terms of the risk you face, the higher clarity the RMS system develops. The more clarity it has, the lesser the margins required!

Very loosely put, think about this as an equivalent to shopping for a television at a consumer electronic store. I know this may not be very apt, but I hope the following analogy gives you the right message.

If you go to a consumer electronic store and enquire about the price of a television, the seller will assume you are a regular customer and he will quote the normal selling price. However if you tell him that you are likely to purchase 50 televisions, he will instantly drop the price.

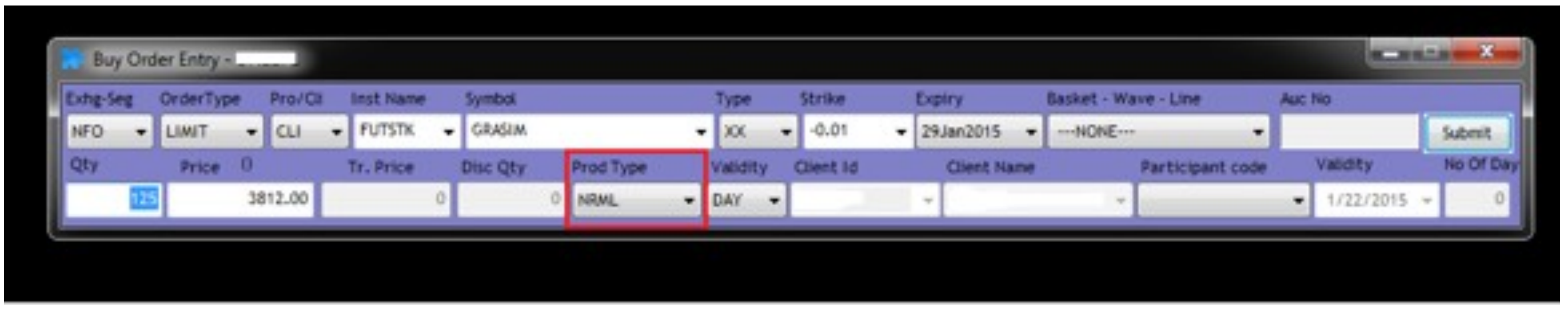
In addition if you tell him you are carrying the cash with you and are willing to finish the transaction right away, he will drop both his jaws and the prices even lower. The point is – as and when the shop keeper gets more information about the transaction, the more attractive the price gets.



7.2 – The Product types

So far, one thing is clear, the more information (in terms of risk) you are willing to convey to the RMS system, the lesser is the margin required. Needless to say, the lesser the margins required, the more you can do with your capital. So, how does a trader convey this information to the RMS system? Well, there are specific product types that are meant for this purpose. While placing an order (to either buy or sell) you can specify the product type. There are many Product types and they vary from one another mainly in terms of their functionality and the information they convey to the RMS system. While the core functionality of these product types is standard, every broker calls them with different names. I will of course talk about the product types used at Zerodha, if you are still trading with another broker, I would request you to speak to them and identify the nomenclature used.

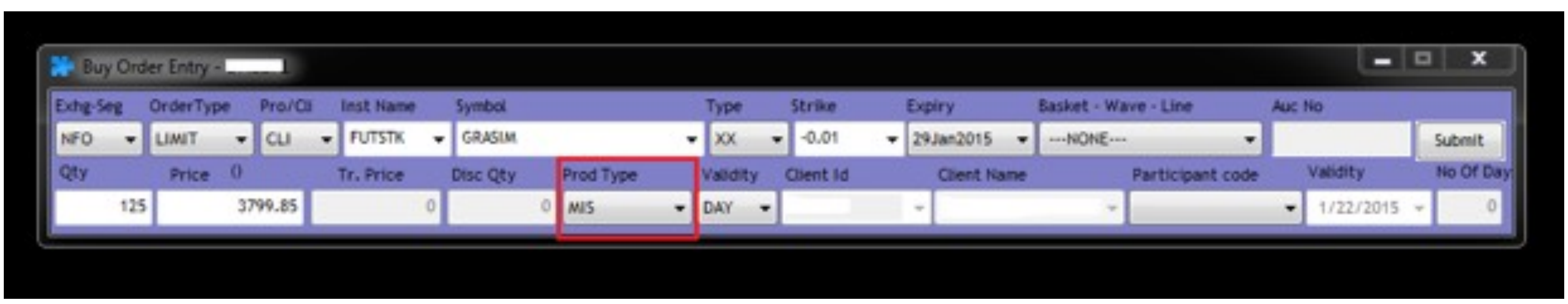
NRML – NRML is a standard product type. Use this when you intend to buy and hold the futures trade.



Remember when you use NRML, the risk management system has no additional information on the length of your trade (as you can continue to hold the contract till expiry) nor does it have any information on the stoploss. You suffer losses (and therefore continue to pump in the required margins). Hence because of the lack of clarity the broker's RMS system charges you the full margins (i.e. SPAN and Exposure).

Use NRML when you intend to buy and hold the futures position over multiple days. However do remember you can use NRML product type for intraday as well.

Margin Intraday Square off (MIS) – Zerodha's MIS is a pure intraday product, meaning all trades placed as MIS product type will indicate that the trade will last only for the day. You cannot select MIS as an order type and expect the position to be carried forward to the next day. You have to mandatorily cut the position by 3:20PM, failing which the RMS system will do the same.



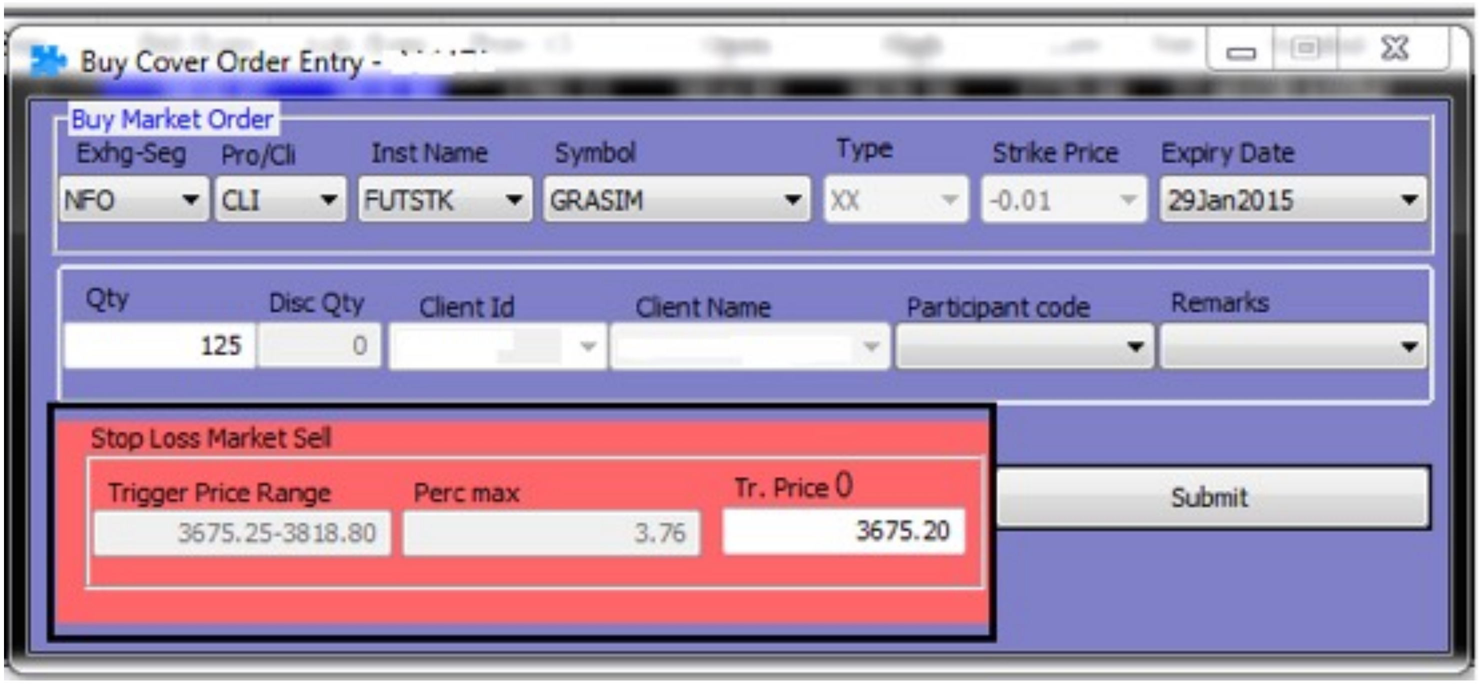
Now because the product type is MIS, the RMS system clearly knows that it is an intraday trade, which is a notch better than NRML **in terms of information flow**. Remember, when the trade is intraday, the trader is exposed to only 1 day's volatility. Hence the margin requirement is lower compared to the NRML margins.

Cover order (CO) – The concept of cover order is simple. To begin with, similar to MIS, the cover order (CO) is also an intraday product. However the CO conveys additional information in terms of stoploss. This means, at the time of placing a CO, you will have to specify the stoploss as well. Hence CO conveys both the vital information –

1. The length of the trade which is intraday

2. The stoploss, which is the maximum loss you will bear in case the trade moves against you

The snapshot below shows the buy CO form –



The area highlighted in black is where one is required to specify the stoploss. Of course, I will not get into the logistics bit, explaining how to place a CO from the trading terminal, as we have already done that through an article in z-connect.

The point that I want you to be aware is this – by placing a CO, you are not only conveying that your trade is intraday, but also conveying the maximum loss you are willing to bear. Hence by virtue of this, the margins should drop considerably (even lower than MIS).

Bracket Order (BO) – The bracket order is quite versatile. Consider the BO as an improvisation over the cover order. Needless to say, a BO is an intraday order, which means all BO orders have to be squared off within the day on or before 3:20PM. While placing a BO, you will have to mention a few other things –

1. The stoploss – At what place you would like to get out of the trade in case the trade moves against you

2. The Trailing stoploss – This is an optional feature where you can trail your stoploss. We have not spoken about "The trailing stoploss" so far. We will discuss the same towards the end of this chapter. But for now just remember the BO gives you an option to trail your stoploss, in fact this is one of the most popular feature of a BO

3. Target – If the trade moves in your favor, the BO also requires you to specify the price at which you would like to book the profits

The BO sends your order to the exchange where simultaneously you can specify the target and the stoploss. This is a huge relief to active traders as it helps them in many ways. Of course for the logistics bit on how to place a BO, you can check out this article as it beautifully explains what needs to be done.

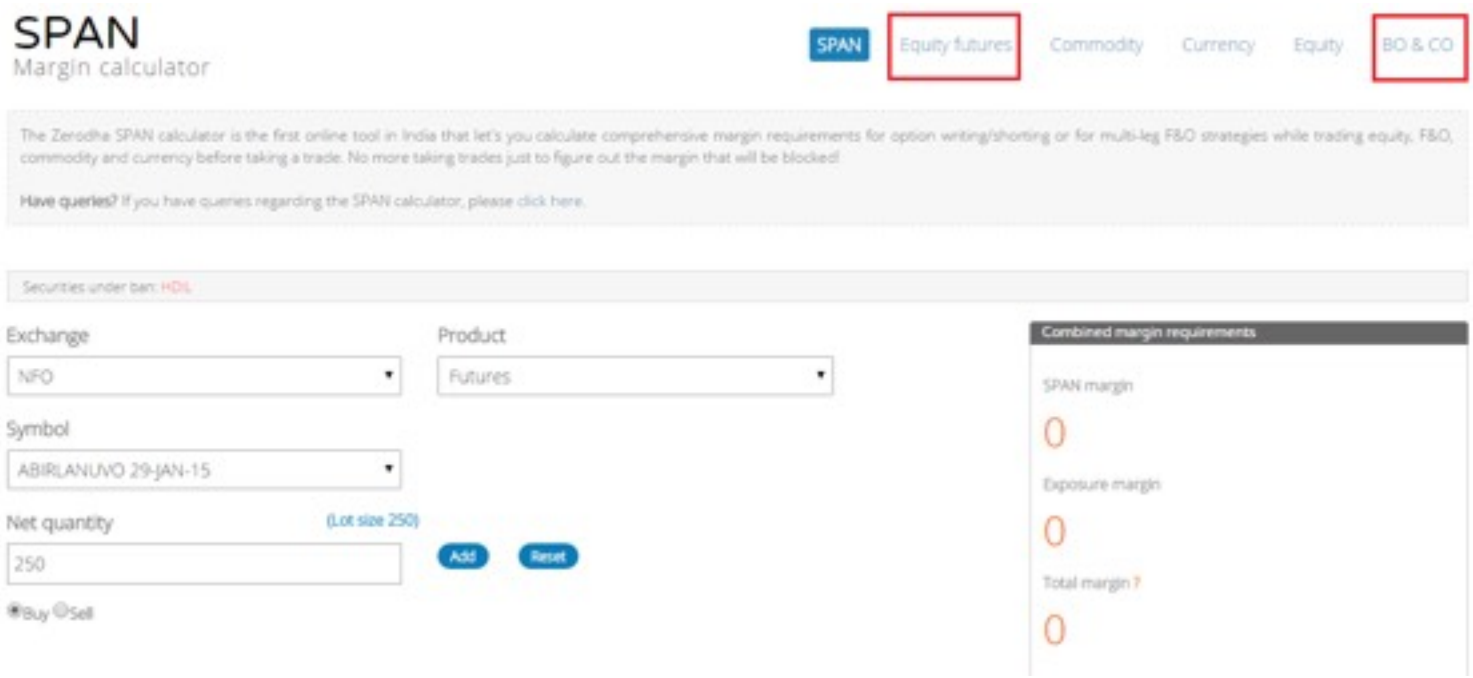
The snapshot below shows the BO buy order form, the green box highlights the SL placements –

If you think about the Bracket Order, the trader is conveying to the RMS system the same set of information as that of the CO. In addition through the BO, the trader is also conveying the target price. Now what difference does the information on the target price make to the RMS system? Well, it literally makes no difference to it from the risk management perspective. Remember the RMS is only worried about your risk, and not your reward. Hence for this reason, the margin charged for BO and CO is the same.

Let us now keep the above discussion in perspective and look into few other options available on Zerodha's margin calculator.

7.3 – Back to the Margin Calculator

Here is a quick recap – in the previous chapter we introduced Zerodha's margin calculator. The objective of the margin calculator is straight forward. It helps the trader figure out how much margin is required for the contract he wishes to trade. In our quest to understand the same we also understood concepts of expiry, rollover, and spread margins. With the help of this chapter, we are now clear about the information flow to the RMS system and its impact on the applicable margins. Let us keep these in perspective and look at the other two options highlighted in red provided in the margin calculator – "Equity Futures" and "BO&CO". Here is a snapshot, highlighting these features –



Equity Futures – The equity futures section in the margin calculator is a ready reckoner, as it helps the trader understand the following –

1. The NRML margin required for a particular contract
2. The MIS margin required for a particular contract
3. The number of lots that a trader can buy for the given amount of money in his trading account

The Equity Futures section contains nearly 475 contracts (as of January 2015). To understand this better, let us take up a few tasks. We will solve these tasks by using the Equity Futures section of the margin calculator. And hopefully in the process you will understand how to use the section better.

Task 1 – A trader has Rs.80,000/- in his trading account. He wants to buy ACC Cements Limited Futures expiring 26th February 2015 and hold the same for 3 trading sessions. Find out the margin requirement for this contract. He also wants to trade Infosys January futures for intraday, what is the margin required? Does he have sufficient margins to initiate both the trades?

Solution – Let us deal with the ACC futures first. Since the trader intends to hold the futures contract for 3 working days, we need to look for NRML margins. Do note, this task can be achieved by using the SPAN calculator as well. We discussed this in the previous chapter. However the Equity Futures calculator has a few more advantages over a SPAN calculator.

Visit the Equity Futures section and you can see all the contracts listed here, scroll till you find the desired contract. I have highlighted the same in green. Do notice, the calculator is also listing the contract's expiry date, lot size, and the price at which the contract is trading.

The black vertical box highlights the NRML margin for each contract.

#	Contract	Expiry	Lot size	Price	NRML Margin	MIS Margin	
1	ABIRLANUVO	29-JAN-15	250	1847.9	57838	23135	CALCULATE
2	ABIRLANUVO	26-FEB-15	250	1860.65	58228	23291	CALCULATE
3	ABIRLANUVO	26-MAR-15	250	1876.45	58655	23462	CALCULATE
4	ACC	29-JAN-15	250	1544.5	48343	19337	CALCULATE
5	ACC	26-FEB-15	250	1556.55	48686	19474	CALCULATE
6	ACC	26-MAR-15	250	1567.85	49020	19608	CALCULATE
7	ADANIENT	29-JAN-15	500	506.65	31706	12682	CALCULATE
8	ADANIENT	26-FEB-15	500	510.3	31922	12769	CALCULATE
9	ADANIENT	26-MAR-15	500	511	32065	12826	CALCULATE
10	ADANIPORTS	29-JAN-15	1000	329.95	41317	16527	CALCULATE
11	ADANIPORTS	26-FEB-15	1000	332.1	41585	16634	CALCULATE
12	ADANIPORTS	26-MAR-15	1000	334	41850	16740	CALCULATE
13	ADANIPOWER	29-JAN-15	8000	46.15	47420	18968	CALCULATE

From the table, it is clear that the ACC Feb 2015 requires a margin of Rs.48,686/-.

To find out the margin requirement for Infosys, I need to scroll down till I spot Infosys January contracts or simply type "Infy" in the search box provided.

infy

Product type	Name	Used for
NRML	Normal	Overnight/positional or intraday trade futures using NRML with margins mentioned below. Once a position taken as NRML, it can be held till the expiry provided the requesite NRML margin present in the trading account.
MIS	Margin Intraday Square off	Intraday trade using MIS for additional leverage (40% of NRML margin) between 9:15 AM and 3:20 PM. All open MIS positions get squared off at 3:20 PM.
CO	Cover Order	Please use the Bracket Order & Cover Order calculator for CO calculations

Zerodha is among select few brokerages which settle with NSE on T+0 and hence has the lowest margin(NRML) requirement for trading futures for overnight/positional.

Securities under ban: HDIL

Last updated: 22 Jan 2015 Equity SPAN margin (PDF)

#	Contract	Expiry	Lot size	Price	NRML Margin	MIS Margin	
235	INFY	29-JAN-15	250	2166.3	67698	27079	CALCULATE
236	INFY	26-FEB-15	250	2178.85	68123	27249	CALCULATE
237	INFY	26-MAR-15	250	2190.6	68537	27415	CALCULATE

As we can see, Infy's NRML margin is Rs.67,698/-(highlighted in the black arrow) and MIS margin is Rs.27,079/-(highlighted in the red arrow) . Do note the MIS margin amount is drastically lower compared to the NRML margin, Clearly since the trade is for intraday the trader can choose MIS product type and benefit from a lower margin requirement, which is Rs.27,079/-. Do note, the trader can select NRML product type even for intraday, there is no harm doing so. But when one does this, the NRML margin amount gets blocked. If one is clear in his mind about the trade being intraday, then it makes sense to opt for MIS and efficiently use the capital available.

Anyway, the trader's total margin requirement would be –

1. 48,686/- towards the ACC contract (NRML margin as the trader wishes to hold the position for 3 days)

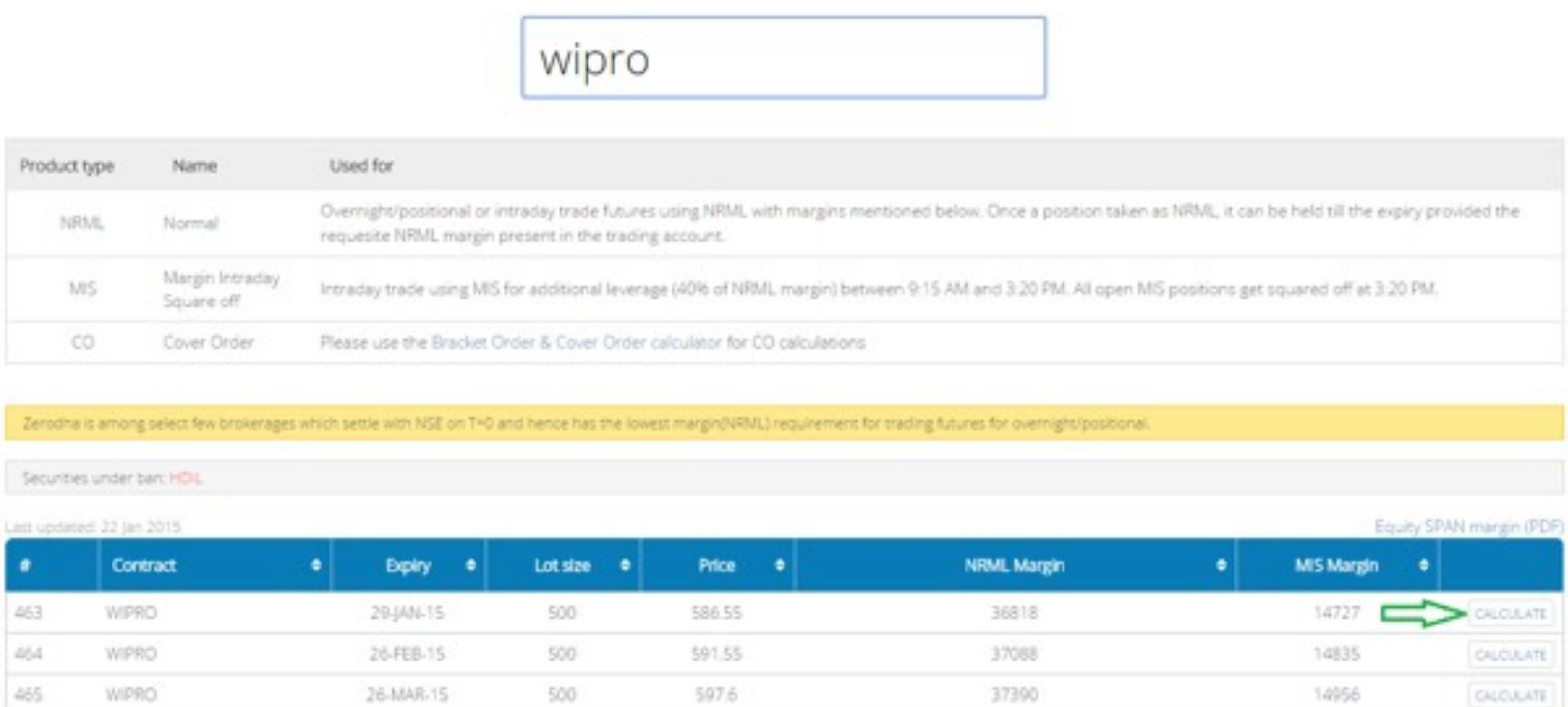
2. 27,079/- towards the Infosys contract (MIS margins as it is a pure intraday product)**.**

3. Total margin of Rs.75,765/- (48,686 + 27079)

Clearly since the trader has Rs.80,000/- in his account, he can initiate both the trades.

Task 2 – A trader has Rs.120,000/- in his trading account. How many lots of Wipro January Futures can he buy on an intraday basis and on a multiple day basis?

Solution – Search for Wipro in the search box provided. Next to the MIS margin column, there is an option to click on "Calculate" (highlighted in green arrow). Click on the same.


wipro

Product type	Name	Used for
NRML	Normal	Overnight/positional or intraday trade futures using NRML with margins mentioned below. Once a position taken as NRML, it can be held till the expiry provided the requesite NRML margin present in the trading account.
MIS	Margin Intraday Square off	Intraday trade using MIS for additional leverage (40% of NRML margin) between 9:15 AM and 3:20 PM. All open MIS positions get squared off at 3:20 PM.
CO	Cover Order	Please use the Bracket Order & Cover Order calculator for CO calculations

Zerodha is among select few brokerages which settle with NSE on T+0 and hence has the lowest margin(NRML) requirement for trading futures for overnight/positional.

Securities under ban: HDIL

Last updated: 22 Jan 2015

Equity SPAN margin (PDF)

#	Contract	Expiry	Lot size	Price	NRML Margin	MIS Margin	
463	WIPRO	29-JAN-15	500	586.55	36818	14727	CALCULATE
464	WIPRO	26-FEB-15	500	591.55	37088	14835	CALCULATE
465	WIPRO	26-MAR-15	500	597.6	37390	14956	CALCULATE

After you click on it, a form sort of window opens up, you just need to enter –

1. The amount of cash in your trading account (by default this is set to Rs.100,000/- you can edit the same to meet your requirement)

2. The price at which the contract is trading (in fact this is pre-populated)

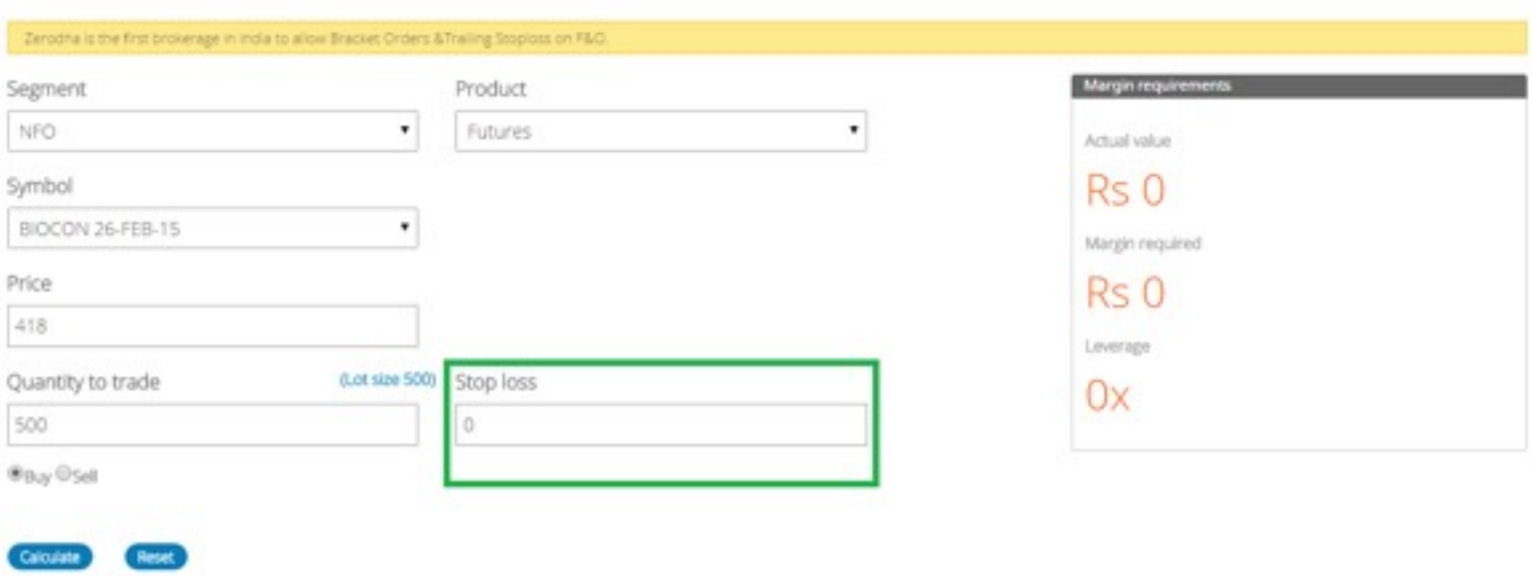
Have a look at the screen shot below –

The calculator suggests that I can trade up to 3 lots of Wipro futures under the NRML product type, considering NRML margin is Rs.36,806/- per lot. Also, under the MIS product type, I can trade up to 8 lots, considering the margin requirement is just Rs.14,722/- per lot.

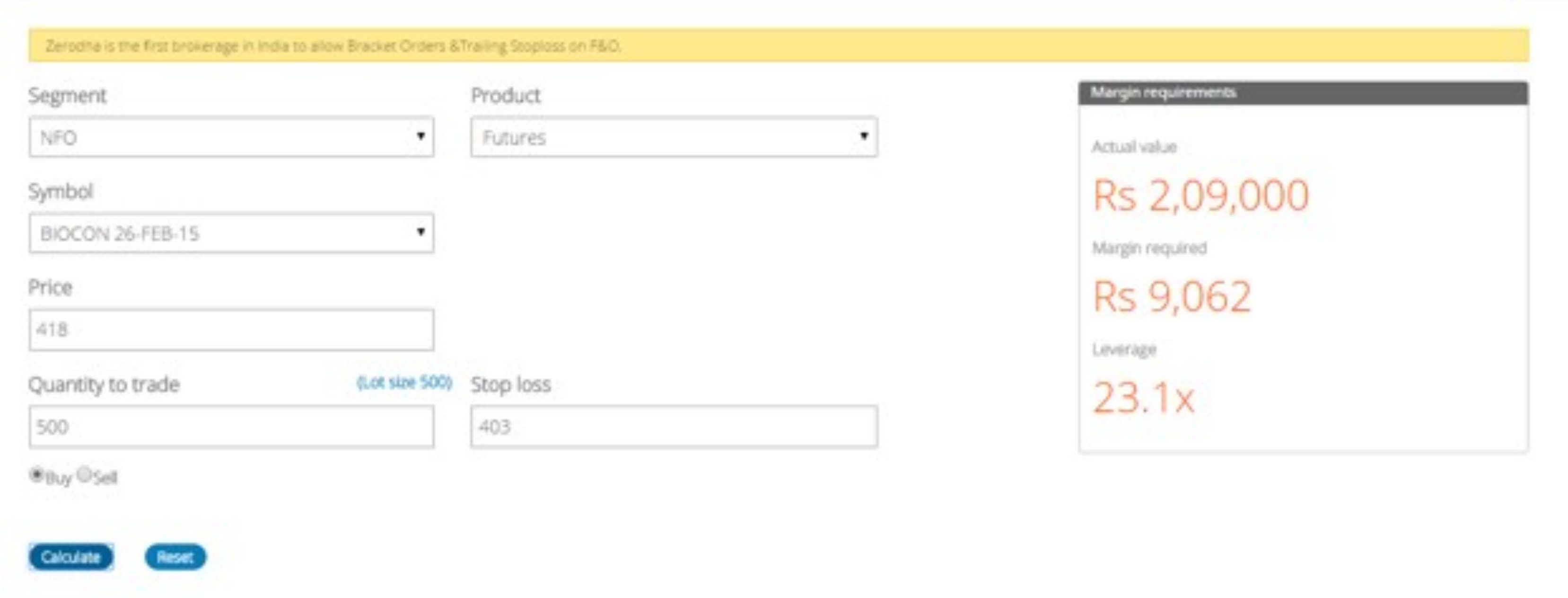
And with that, we know all the functionalities of the Equity Futures section of the margin calculator, as easy as thatJ. We now move over to the BO&CO calculator.

7.4 – BO & CO Margin Calculator

Both bracket order and cover order have similar margin requirements for reasons we discussed earlier. Using the BO&CO calculator is quite simple; in fact it is quite similar to the SPAN calculator. In the following snapshot, I'm trying to calculate the margin requirement for Biocon Futures expiring on February 2015. Notice, I have selected everything that I need to, except for the stoploss.



Without selecting the stoploss, I proceed and press the 'calculate' button. Notice when I do so, the calculator calculates the default stoploss that one can choose and the margin required. Now once I mention the stop loss, the calculator calculates the amount as shown below



As per the BO&CO calculator, the stoploss one can choose is Rs.403. Of course you can vary the stoploss to any point, and the margins will change accordingly. Anyway, the margin required is Rs.9,062/-, which is remarkably lower compared to NRML margin of Rs.26,135/- and MIS margin of Rs.11,545.

7.5 – The trailing stoploss

Before we conclude this chapter, let us briefly discuss the 'trailing stoploss'. The concept of trailing stoploss finds its application in bracket orders and in general plays a crucial role while trading. Hence I guess it is important to know how to trail your stoploss. Consider this situation (in fact most of us would have been in this situation) – you buy a stock at Rs.250, with an expectation that the stock price will hit Rs.270 sooner or later. You keep a stoploss at Rs.240 (just in case the trade goes against you), and hope for the best.

Things move as expected, the stock rallies all the way from Rs.250 to Rs.265 (just a few Rupees away from your target of Rs.270), however thanks to market volatility it starts to retrace back…all the way to hit your stoploss at Rs.240. So in essence you saw profits coming in for a brief while, but were eventually forced to book a loss. How do you deal with such a situation? More often than not we are always put in such a spot, where we are right about the overall direction but get 'stopped out' due to market volatility.

Well, thanks to the technique of 'trailing your stoploss' you can prevent yourself from being in this situation. In fact at times trailing stoploss gives you a chance of making a better profit than you originally thought about.

Trailing stoploss is a simple concept. All one needs to do is adjust the stoploss based on the movement in the stock. Let me illustrate this with an example. Here is a typical trade setup –

Trade type	Long
Script	Infosys
Instrument	Futures
Futures Price	Rs.2175/-
Target	Rs.2220/-
Stoploss	Rs.2150/-
Risk	Rs.25 (2175 – 2150)
Reward	Rs.45 (2220 – 2175)

Clearly the idea is to go long at Rs.2175 and keep a stoploss at Rs.2150. The idea is to adjust the stoploss as and when the price moves in the direction of the trade. To be precise, for every 15 points of price move in the direction of the trade the SL can be adjusted accordingly. The SL can be adjusted to any level with an idea of locking in the profits. When you adjust the SL with an intention to lock the profits, it is called "Trailing Stop Loss". Do note, in this example I have randomly opted for a 15 point move, but in reality it can be any kind of price move. Have a look at the following table, as and when the price moves 15 points in the trades favor, I trail my SL and thereby lock in certain amount of profit.

Day	Trade Price	Pts moved in trades favor	Stop Loss	Thoughts with respect to the stoploss	Potential P&L (keeping the SL in perspective)
1	2175	0	2150	SL at initial level	Risk of losing Rs.25
2	2181	6	2150	SL at initial level	Risk of losing Rs.25
3	2176	1	2150	SL at initial level	Risk of losing Rs.25
4	2182	7	2150	SL at initial level	Risk of losing Rs.25
5	2190	15	2175	Price moves in trade favor(15 points), so increase the SL	No Profit No Loss
6	2202	27	2175	SL of 2175 has not been hit, hence stay in the trade	No Profit No Loss
7	2195	20	2175	SL of 2175 has not been hit, hence stay in the trade	No Profit No Loss
8	2190	15	2175	SL of 2175 has not been hit, hence stay in the trade	No Profit No Loss
9	2202	27	2175	SL of 2175 has not been hit, hence stay in the trade	No Profit No Loss
10	2209	34	2200	Price moves another 15 points in trade favor, so increase the SL	Locking in a Profit of Rs.25
11	2212	37	2200	SL of 2200 has not been hit, hence stay in the trade	Locking in a Profit of Rs.25
12	2222	47	2220	Another 15 points move, orginal target has been hit. Trail the SL	Locking in a profit of Rs.45
13	2229	54	2220	SL of 2220 has not been hit, hence stay in the trade	Locking in a profit of Rs.45
14	2235	60	2230	Another 15 points move in trade favor, so increase the SL	Locking in a profit of Rs.55
15	2230	55	SL triggered	Square off the Trade	Book profit of Rs.55

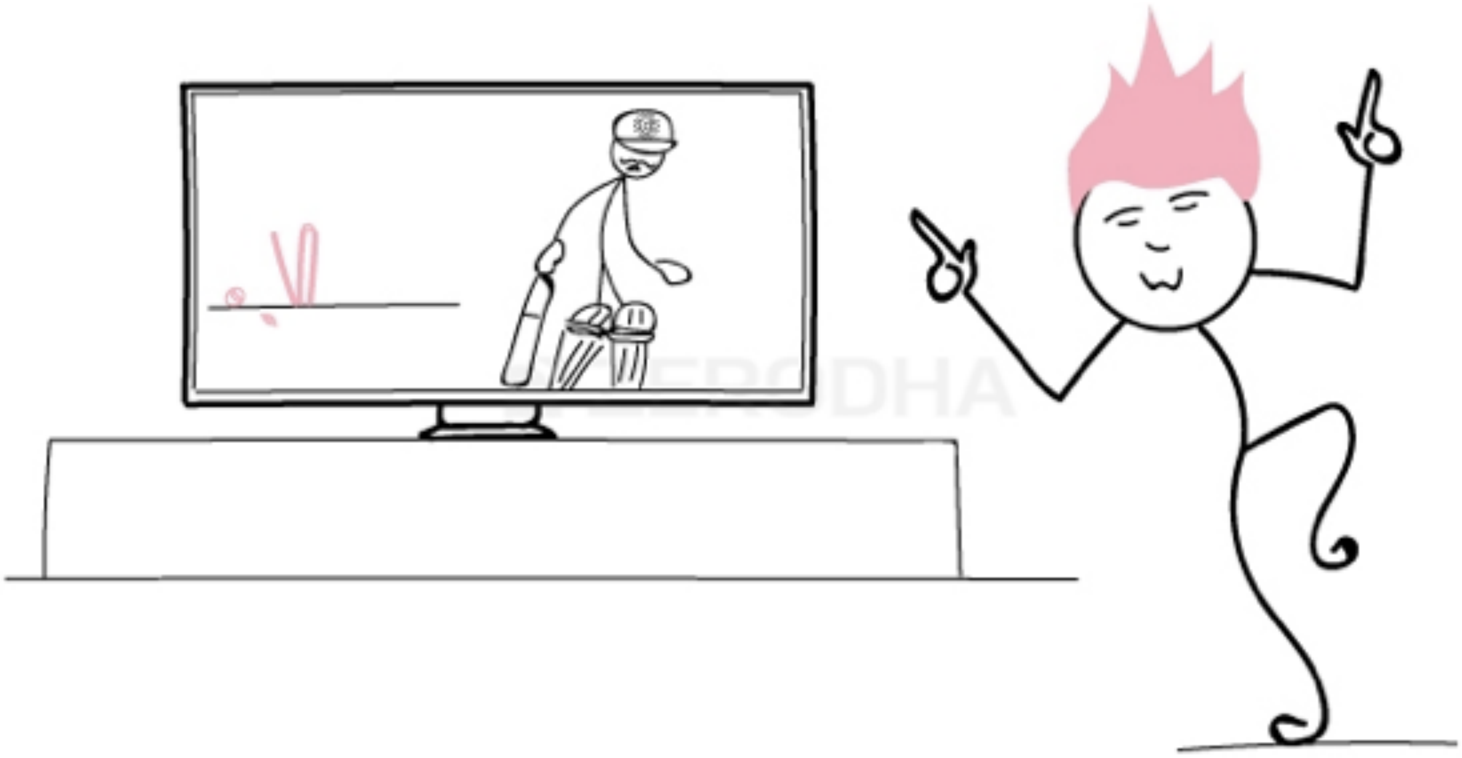
Do note, the original price target was Rs.2220, but thanks to the trailing SL technique, I can ride the momentum and close in on a higher profit.

Key takeaways from this chapter

1. The more information one conveys to the RMS system in terms of trade duration and stoploss the lesser is the margin requirement
2. Use NRML product type when you want to initiate a trade and carry it overnight
3. NRML margins are the highest (SPAN + Exposure)
4. MIS is a pure intraday trade, hence the MIS margin is lesser than the NRML margin
5. In a MIS trade only time information is conveyed (intraday) but not the information about the stoploss
6. A cover order (CO) is also an intraday product, besides in a CO one has to specify the stoploss
7. A CO conveys both the time and the SL information, hence margins are lesser than MIS
8. The margins for a Bracket Order (BO) is similar to a CO
9. In a BO product type one has the option to specify both the SL and target price at one go. Besides one can also trail the stop loss
10. A trailing SL technique requires one to adjust the SL as and when the script moves in favor of the trade
11. A trailing SL is a great way to ride the momentum in a script
12. There are no fixed rules for trailing, one can choose the trailing SL based on the market situation

CHAPTER 8

All about Shorting



8.1 – Shorting in a nutshell

We briefly discussed shorting in **Module 1**. However in this chapter we will look at shorting in greater detail. Shorting is a tricky concept because we are not used to shorting in our day to day transaction. For example imagine this transaction – You buy an apartment today for let us say Rs.X, sell it 2 years later for Rs.X+Y. The profit made on the transaction is the incremental value over and above Rs.X, which happens to be Rs.Y. This is a simple and a highly intuitive transaction. In fact most of the day to day transactions requires us to buy something first and sell it later (maybe for a profit or a loss). These are simple to understand transactions and we are used to it. However in a short sale or a just 'shorting' we carry out the transactions in the exact opposite direction i.e. to sell first and buy later.

So what would compel a trader to sell something first and then buy it later? Well, it is quite simple – When we believe the price of an asset such as a stock is likely to increase we buy the stock first and sell it later. However, when we believe the price of the stock is going to decline, we usually sell it first and buy it later!

Confused? Well, let me try giving you a rudimentary analogy just so that you can get the gist of the concept at this stage. Imagine your friend and you are watching a nail biting India Pakistan cricket match. Both of you are in a mood for a little wager.

You bet that India is going to win the match, and your friend bets that India will lose the match. Quite naturally this means you make money if India wins. Likewise your friend would make money if India were to lose the match. Now for a minute think of the India (as in the Indian cricket team in this context) as a stock trading in the stock market. When you do so, your bet is equivalent to saying that you would make money if the stock goes up (India wins the match), and your friend would make money if the stock goes down (India loses the match). In market parlance, you are long on India and your friend is short on India.

Still confused? May not be I suppose, but I would imagine a few unanswered questions crawling in your mind. If you are completely new to shorting, just remember this one point for now – **When you feel the price of a stock is likely to decline, you can make money by shorting the stock. To short stock or futures, you will have to sell first and buy later**. In fact the best way to learn shorting is by actually shorting a stock/futures and experiencing the P&L. However in this chapter, I will try and explain all the things you need to know before you go ahead and short the stock/futures.

8.2 – Shorting stocks in the spot market

Before we understand how one can short a stock in the futures market, we need to understand how shorting works in the spot market. Think about the following hypothetical situation –

1. A trader looks at the daily chart of HCL Technologies Limited and identifies the formation of a bearish Marubuzo

2. Along with the bearish Marubuzo, other checklist items (as discussed in TA module) complies as well

- **a.** Above average volumes
- **b.** Presence of the resistance level
- **c.** Indicators confirm
- **d.** The Risk & Reward ratio is satisfactory

3. Based on the analysis the trader is convinced that HCL Technologies will decline by at least 2.0% the following day

Now given this outlook, the trader wants to profit by the expected price decline. Hence he decides to short the stock. Let us understand this better by defining the trade –

Stock	HCL Technologies
Trade Type	Short (sell first and buy later)
Trade Duration	Intra day
Short Price	Rs.1990/-
Number of shares	50
Target Price	Rs.1950/-
% Profit Expected	2.0%
Stoploss	Rs.2000/-
Risk	Rs.10/-
Reward	Rs.40/-

As we know, when one shorts a stock or stock futures, the expectation is that the stock price goes down and therefore one can profit out of the falling prices. So from the table above the idea is to short the stock at Rs.1990.

On the trading platform when you are required to short, all you need to do is highlight the stock (or futures contract) you wish to short and press F2 on your **trading platform**. Doing so invokes the sell order form; enter the quantity and other details before you hit Submit. When you hit submit, the order hits the exchange and assuming it gets filled, you would have created a short open position for yourself.

Anyway, now think about this – When you enter a trading position, under what circumstances would you make a loss? Well, quite obviously you would lose money when the stock price goes against your expected direction. So,

1. When you short a stock what is the expected directional move?
    a. The expectation is that the stock price would decline, so the directional view is downwards
2. So when would you start making a loss?
    a. When the stock moves against the expected direction
3. And what would that be?
    a. This means you will start making a loss if the stock price instead of going down starts to move up

For this reason whenever you short, the stoploss price is always higher than the price at which you have shorted the stock. Therefore from the table above you can see that the short trade entry is Rs.1990/- and the stoploss is Rs.2000/-, which is Rs.10/- higher than the entry price.

Now, after initiating the short trade at Rs.1990/- let us now hypothetically imagine 2 scenarios.

Scenario 1 – The stock price hits the target of Rs.1950/-

In this case the stock has moved as per the expectation. The stock has fallen from Rs.1990/- to Rs.1950/-. Since the target has been achieved, the trader is expected to close the position. As we know in a short position the trader is required to –

1. First sell @ Rs.1990/- and
2. Later buy @ Rs.1950/-

In the whole process, the trader would have made a profit equal to the differential between the selling and buying price – i.e. Rs.40/- (1990 – 1950).

If you look at it from another angle (i.e. the usual buy first and sell later angle), this is as good as buying at Rs.1950 and selling at Rs.1990. It is just that the trader has reversed the transaction order by selling first and buying later.

Scenario 2 – The stock price increases to Rs.2000/-

In this case the stock has gone higher than the short price of Rs.1990/-. Recollect when you short, for you to profit the stock needs to decline in price. If the stock price goes up instead then there would be a loss. In this case the stock has gone up, hence there would be a loss –

1. The trader shorted @ Rs.1990/-. After shorting, the stock went up as opposed to the trader's expectation
2. The stock hits Rs.2000/- and triggers the stoploss. To prevent further losses, the trader will have to close the position by buying the stock back.

In the whole process the trader would have suffered a loss of Rs.10/- (2000 – 1990). If you look at it from the regular buy first sell later angle – this transaction is as good as buying at Rs.2000/- and selling at Rs.1990/ , and again if we reverse the order it would be sell first and buy later.

Hopefully the above two scenarios should have convinced you about the fact that, when you short you make money when the price goes down and you lose when the price increases.

8.3 – Shorting in spot (The stock exchange's perspective)

Shorting in the spot market has one restriction – it strictly has to be done on an intraday basis. Meaning you can initiate the short trade anytime during the day, but you will have to buy back the shares (square off) by end of the day before the market closes. You cannot carry forward the short position for multiple days. To understand why shorting in the spot market is strictly an intraday affair we need to understand how the exchange treats the short position.

When you short in the spot market, you obviously sell first. The moment you sell a stock, the backend process would alert the exchange that you have sold a particular stock. The exchange does not differentiate between a regular selling of stock (from DEMAT account) and a short sale. From their perspective they are of the opinion that you have sold the shares which would obligate you to deliver the same. In order to do so, you need to keep the shares ready in your DEMAT account by next day. However the exchange would know about your obligation only after the market closes and not during the market hours.

Keep the above discussion in the back of your mind. Now for a moment let us assume you have shorted a stock and hope to benefit from the price decline. After you short, the price has not declined as expected and hence you decide to wait for another day. However at the end of the day, exchange would figure out that you have sold shares during the day, hence you would be required to keep these shares ready for delivery. However you do not have these shares for meeting your delivery obligation. This means you will default against your obligation; hence there would be a hefty penalty for this default. This situation is also referred to as "Short Delivery".

Under a short delivery situation, the exchange would take up the issue and settle it in the auction market. I would encourage you to read this article on Z-Connect which beautifully explains the auction market procedures and how penalty is imposed on the client defaulting on delivery obligation. A piece of advice here, never get into the 'short delivery' situation, always make sure you close your short trade before the market close, else the penalty could be as high as 20% above your short price.

Also, this leads us to an important thought – the exchange anyway checks for the obligations after the market closes. Hence before the exchange can run the 'obligation check' if one were to cover the short position (by squaring off) then there would be no obligation at all by end of the day. Hence for this reason, shorting in spot market has to be done strictly as an intraday trade without actually carrying forward the delivery obligation.

So does that mean all short positions have to be closed within the day? Not really. A short position created in the futures market can be carried forward overnight.

8.4 – Shorting in the Futures Market

Shorting a stock in the futures segment has no restrictions like shorting the stock in the spot market. In fact this is one of the main reasons why trading in futures is so popular. Remember the 'futures' is a derivative instrument that just mimics the movement of its respective underlying. So if the underlying value is going down, so would the futures. This means if you are bearish about a stock then you can initiate a short position on its futures and hold on to the position overnight.

Similar to depositing a margin while initiating a long position, the short position also would require a margin deposit. The margins are similar for both the long and short positions and they do not really change.

To help you understand the market to market (M2M) perspective when you short futures, let us take up the following example. Imagine you have shorted HCL Technologies Limited at Rs.1990/-. The lot size is 125. The table below shows the stock price movement over the next few days and the respective M2M –

Day	Ref price for M2M	Closing Price	P&L for the day
01 – (Initiate short)	1990	1982	125 x 8 = 1000
2	1982	1975	125 x 7 + 875
3	1975	1980	125 x 5 = 625
4	1980	1989	125 x 9 = 1125
5	1989	1970	125 x 19 = 2375
06 – (Square off)	1970	1965	125 x 5 = 625

The two lines marked in red highlights the fact that they are loss making days. To get the overall profitability of the trade we could just add up all the M2M values –

+ 1000 + 875 – 625 – 1125 + 2375 + 625

= Rs.3125/-

Alternatively we could look at it as –

(Selling Price – Buying price) * Lot Size

= (1990 – 1965) * 125

= 25*125

=Rs.3125/-

So, shorting futures is very similar to initiating a long futures position, except that when you short you profit only if the price declines. Besides this, the margin requirement and the M2M calculation remains the same.

Shorting is a very integral part of active trading. I would suggest you get as comfortable with initiating a short trade as you would with a long trade.

Key takeaways from this chapter

1. Shorting requires us to sell first and buy later
2. Short trade is profitable only when the closing price is lower than the entry price
3. When the price goes higher than the price at which one has shorted, then there would be a loss
4. The stoploss in a short trade is always higher than the price at which one has shorted
5. One can only short on an intraday basis in the spot market
6. The short positions cannot be carried overnight in the spot market
7. The short position in the futures market can be carried forward overnight
8. The margins requirement for both short and long trades are similar
9. The M2M computation is also similar for both short and long trades

The Nifty Futures

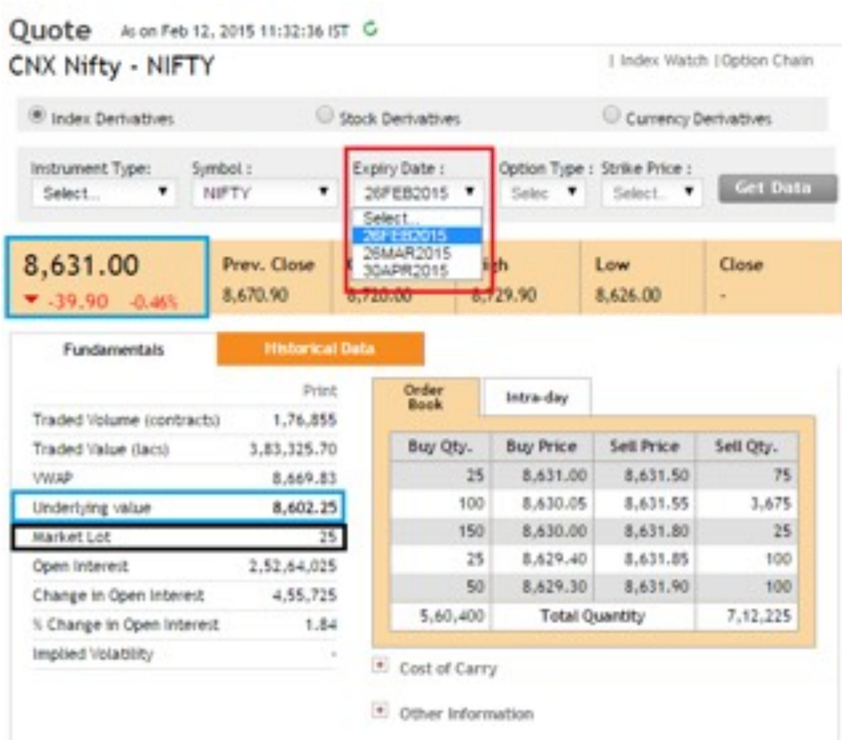
9.1 – Basics of the Index Futures

Within the Indian derivatives world, the Nifty Futures has a very special place. The 'Nifty Futures' is the most widely traded futures instrument, thus making it the most liquid contract in the Indian derivative markets. In fact you may be surprised to know that Nifty Futures is easily one of the top 10 index futures contracts traded in the world. Once you get comfortable with futures trading I would imagine, like many of us you too would be actively trading the Nifty Futures. For this reason, it would make sense to understand Nifty futures thoroughly. However before we proceed any further, I would request you to refresh your memory on the Index, we have discussed the same **here**.

I assume you are comfortable with the basic understanding of the index; therefore I will proceed to discuss the Index Futures or the Nifty Futures.

As we know the futures instrument is a derivative contract that derives its value from an underlying asset. In the context of Nifty futures, the underlying is the Index itself. Hence the Nifty Futures derives its value from the Nifty Index. This means if the value of Nifty Index goes up, then the value of Nifty futures also goes up. Likewise if the value of Nifty Index declines, so would the Index futures.

Here is the snapshot of Nifty Futures Contract –



Like any other futures contract, Nifty Futures is also available in three variants – current month, mid month, and far month. I have highlighted the same in red for your reference. Further in blue I have highlighted the Nifty Futures price which at the time of taking this snapshot was Rs.8631 per unit of Nifty. The corresponding underlying value (index value in spot) was Rs. 8602.29. Of course there is a difference between the spot price and the futures price, which is due to the futures pricing formula. We will understand the concepts related to futures pricing in the next chapter.

Further, if you notice the lot size here is 25 (this has been reduced to 25 from 50). We know the contract value is –

CV = Futures Price * Lot Size

= 8631 * 25

= Rs.215,775/-

Here are the margin requirements for trading Nifty Futures; I've used Zerodha Margin Calculator to get the margin values –

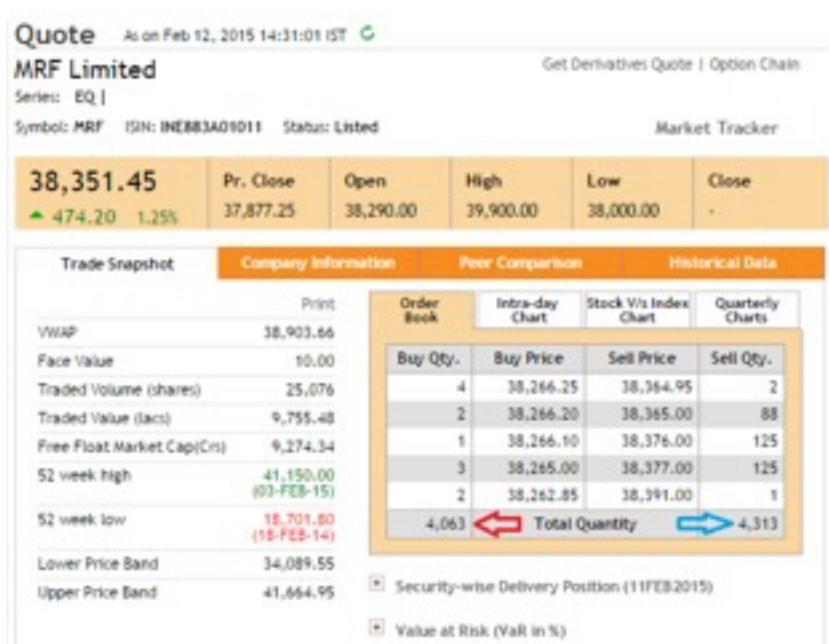
Order Type	Margin
NRML	Rs.17,323/-
MIS	Rs.6,937/-
BO & CO	Rs.6,233/-

These details should give you a basic overview of the Nifty Futures. One of the main features of Nifty Futures that makes it so popular is its liquidity. Let us now proceed to understand what liquidity is and how one would measure it.

9.2 – Impact Cost

You would often hear the term 'liquidity' while trading the markets. Liquidity is the ease at which one can buy or sell a particular stock or futures. If a stock is highly liquid (read it as very easy to buy/sell) then it would attract seasoned traders to trade in large quantities at ease, without really affecting the stock prices. A highly liquid stock/contract invariably attracts a lot of institutional interest as well. Besides if stock/futures is highly liquid then it usually translates to lesser volatility. Most importantly, if the stock is liquid then placing a 'market order' is hassle free.

Let us take up the example of MRF Limited to understand liquidity. Assume a foreign institutional investor intends to buy 5000 shares of MRF Limited. As you may know MRF Limited is probably the most expensive stock (in terms of price and not valuation) in the Indian markets. MRF stock is currently trading at Rs.38,351/- per share. Therefore buying 5000 shares at this price would translate to a transaction worth around 20 Crs (38351*5000). Do note a transaction of 20 Crs is not really a large one for a typical Foreign Institution. Anyway given that they want to buy 5000 shares let us look into MRF's liquidity in the market. Here is the snapshot of MRF Limited's order book / market depth as taken from NSE India website –



If you wish to buy large quantity of shares, then you need to look at how many shares are being offered in the market. As you can see from the snapshot above there are only about 4313 shares in the market (highlighted by blue arrow). Clearly the number of shares in the market is lesser than what is required, hence the MRF counter is considered shallow or illiquid. Liquidity can also be measured by looking at the bid-ask spread and estimating the impact cost. Knowing about the impact cost is particularly helpful while placing a market order.

Impact cost is the loss associated by executing a '**round-trip**' trade. The loss is expressed as a percentage of the average of the bid and ask price. Round-tripping is an instantaneous arbitrary trade you carry out by buying at the first best available sell price and selling at the first best available buy price. Let us execute this on MRF (please refer to the order book snapshot above) –

Buy Price – Rs.38,364.95

Sell Price – Rs.38,266.25

So if I were to do a round trip, I would clearly lose money on it. In fact all round – trip trades result in a loss. The loss in this case would be –

= 38,364.95 – 38,266.25

= **Rs. 98.7**

Further, the average of bid and ask is calculated as follows –

= (38,364.95 + 38,266.25) / 2

= **Rs.38,315.60**

Hence the impact cost would be –

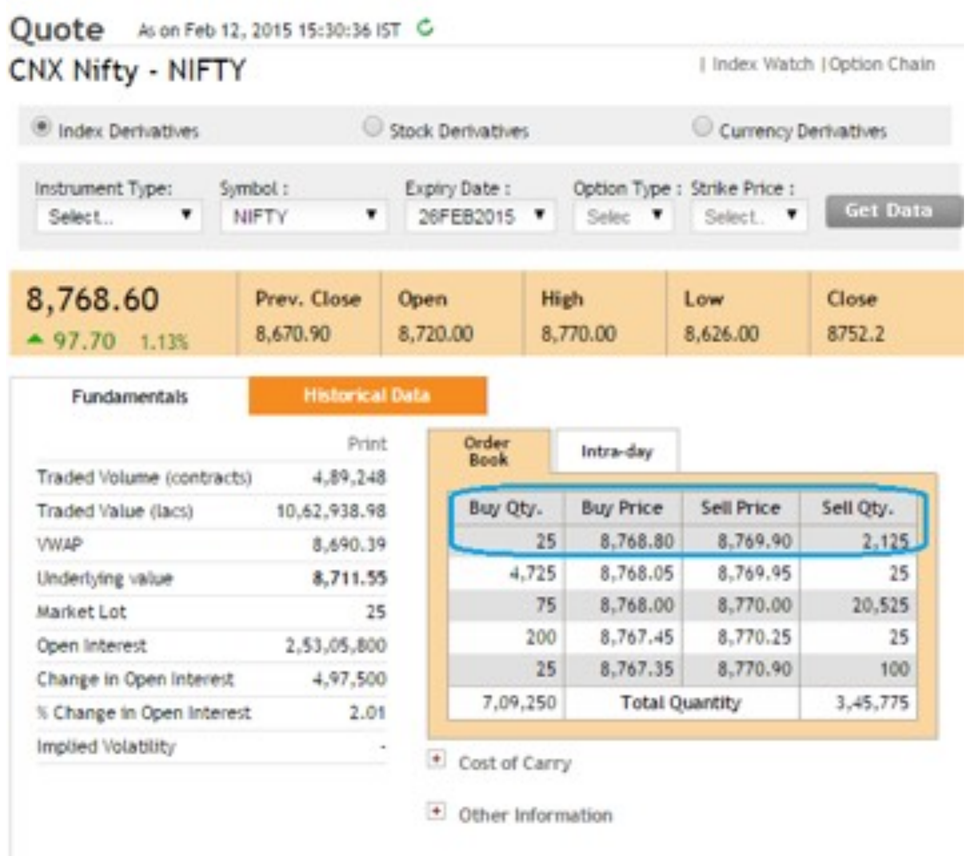
= Round Trip loss / Average of bid ask spread

= 98.7 / 38315.6

~ **0.3%**

So how do you use this information? Well, it simply means if you were to place a market order to either buy or sell the stock, **you are likely** to lose 0.3% due to impact cost. This may not always be true but you need to be aware that based on the number of shares you wish to transact in, you are likely lose about 0.3% owing to impact cost while placing a market order. Next time you call your broker to buy or sell a stock at market, the price you see on your screen and the price at which the trade executes may vary, do remember this is attributable to the impact cost!

Now a 0.3% loss due to impact cost is extremely high. To give you a perspective, let us run through the same exercise on Nifty futures –



Price at which you can Buy = Rs. 8,769.9

Price at which you can sell = Rs. 8,768.8

Round trip Loss = Rs. 1.1 (8769.9 – 8768.8)

Average of Bid Ask = (8769.9 + 8768.8)/2

= 8769.35

Impact Cost = 1.1 / 8769.35

= 0.0125%

This means if you buy or sell nifty futures at market price, you are likely to lose just about 0.0125%. Contrast Nifty's impact cost of 0.0125% with MRF's impact cost of 0.3% and you will know the importance of liquidity. The few key messages that I want you to take away from this discussion are these –

1. Impact cost gives a sense of liquidity
2. The higher the liquidity in a stock, the lesser is the impact cost
3. The spread between the buying and selling price is also an indicator of liquidity
    a. Higher the spread, the higher the impact cost
    b. Lower the spread, the lower is the impact cost

4. Higher the liquidity, lesser the volatility

5. If the stock is not liquid, placing market orders is not a great idea

Considering Nifty Futures is the most liquid contract in India, it is safe to set 0.0125% as a benchmark for impact cost. Going by this, MRF's 0.3% is way higher than Nifty's impact cost hence it is right to say that MRF is highly illiquid.

You may also be interested to know that besides Nifty Futures there are few other future contracts that are quite liquid in the Indian markets such as the Bank Nifty Futures, Reliance Industries, Tata Motors, SBIN, Infosys, TCS, ITC, DLF, Cipla etc. Maybe you can calculate the impact cost for a few of these futures contracts to get a sense of their liquidity.

9.3 – Why trading Nifty makes sense

As you know the Nifty Index is a basket of 50 stocks. These stocks are selected to represent a wide section of the India economic sectors. This makes Nifty a good representative of the broader economic activity in India. This naturally means if the general economic activity is going up or at least expected to go up then Nifty's value also goes up, and vice versa. This also makes trading Nifty Futures a much better choice as compared to single stock futures. There are many reasons for this, here are some –

1. **It is diversified** – At times taking a directional call on a single stock can be a tough task, this is mainly from the risk perceptive. For example let us just say I decide to buy Infosys Limited with a hope that the quarterly results would be good. In case the results don't impress the markets, then obviously the stock would take a knock and so would my P&L. Nifty futures on the other hand has a diversified portfolio of 50 stocks. As it is a portfolio of stocks, the movement of the Index does not really depend on a single stock. Of course occasionally a few stocks (index heavy weights) can influence Nifty to some extent but not on an everyday basis. In other words when you trade Nifty futures you completely eliminate 'unsystematic risk' and deal with only with 'systematic risk'. I know these are new jargons being introduced here, we will discuss these terms in more detail at a later stage when we talk about hedging.

2. **Hard to manipulate** – The movement in Nifty is a response to the collective movement in the top 50 companies in India (by market capitalization). Hence there is virtually no scope to manipulate the Nifty index. However the same cannot be said about individual stocks (remember Satyam, DHCL, Bhushan Steel etc)

3. **Highly Liquid (easy fills, less slippage)** – We discussed liquidity earlier in the chapter. Since the Nifty is so highly liquid you can literally transact any quantity of Nifty without wor-

rying about losing money on the impact cost. Besides there is so much liquidity that you can literally transact any number of contracts that you wish.

4. **Lesser margins** – Nifty futures require much lesser margins as compared to individual stock futures. To give you a perspective Nifty's margin requirement varies between 12-15%, however individual stock margins can go as high as 45-60%.

5. **Broader economic call** – Trading the Nifty futures requires one to take a broad based economic call rather than company specify directional calls. From my experience, doing the former is much easier than the latter.

6. **Application of Technical Analysis** – Technical Analysis works best on liquid instruments. Liquid stocks are hard to manipulate, hence they usually move based on the demand supply dynamics of the market, which obviously is what a TA mainly relies on

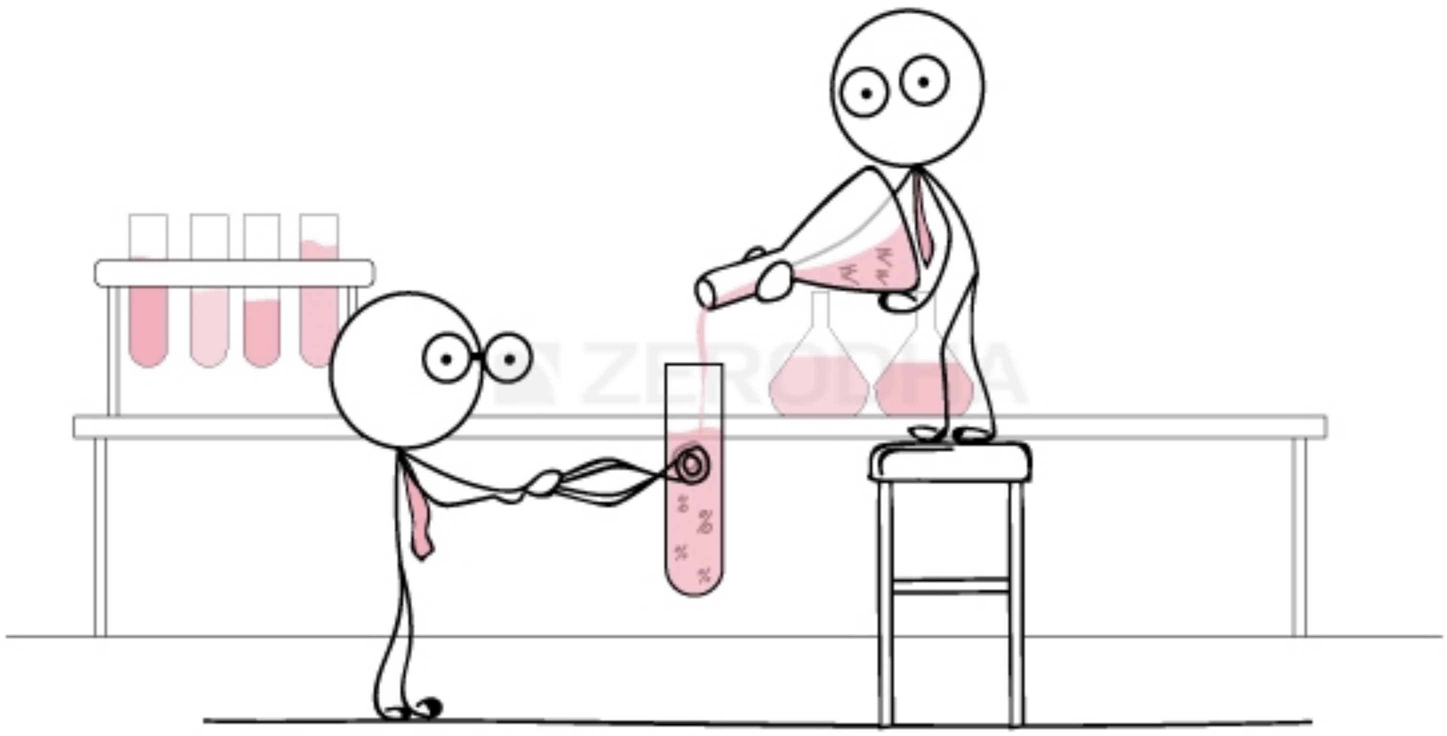
7. **Less volatile** – Nifty futures are less volatile compared to individual stock futures. To give you perspective the Nifty futures has an annualized volatility of around 16-17%, where as individual stocks like say Infosys has annualized volatility of upwards of 30%.

Key takeaways from this chapter

1. Nifty Futures derives its value based on the Nifty Index in spot, which is its underlying
2. At present the Nifty futures lot size is 25
3. The Nifty futures is the most liquid futures contract in India
4. Just like other future contracts, Nifty Futures contracts are also available with three different expiry options (Current month, Mid Month, and Far Month)
5. A round trip trade is an arbitrary quick instantaneous trade which involves buying at the best available sell price and selling at the best available buy price
6. A round trip trade always results in a loss
7. Impact cost measures the loss of a round trip as a % of average of bid and ask
8. Higher the impact cost, lesser the liquidity and vice versa
9. When you place a market order to transact, you may lose some money owing to impact cost
10. Nifty has an impact cost close to 0.0125%, which makes it the most liquid contract to trade

CHAPTER 10

The Futures Pricing



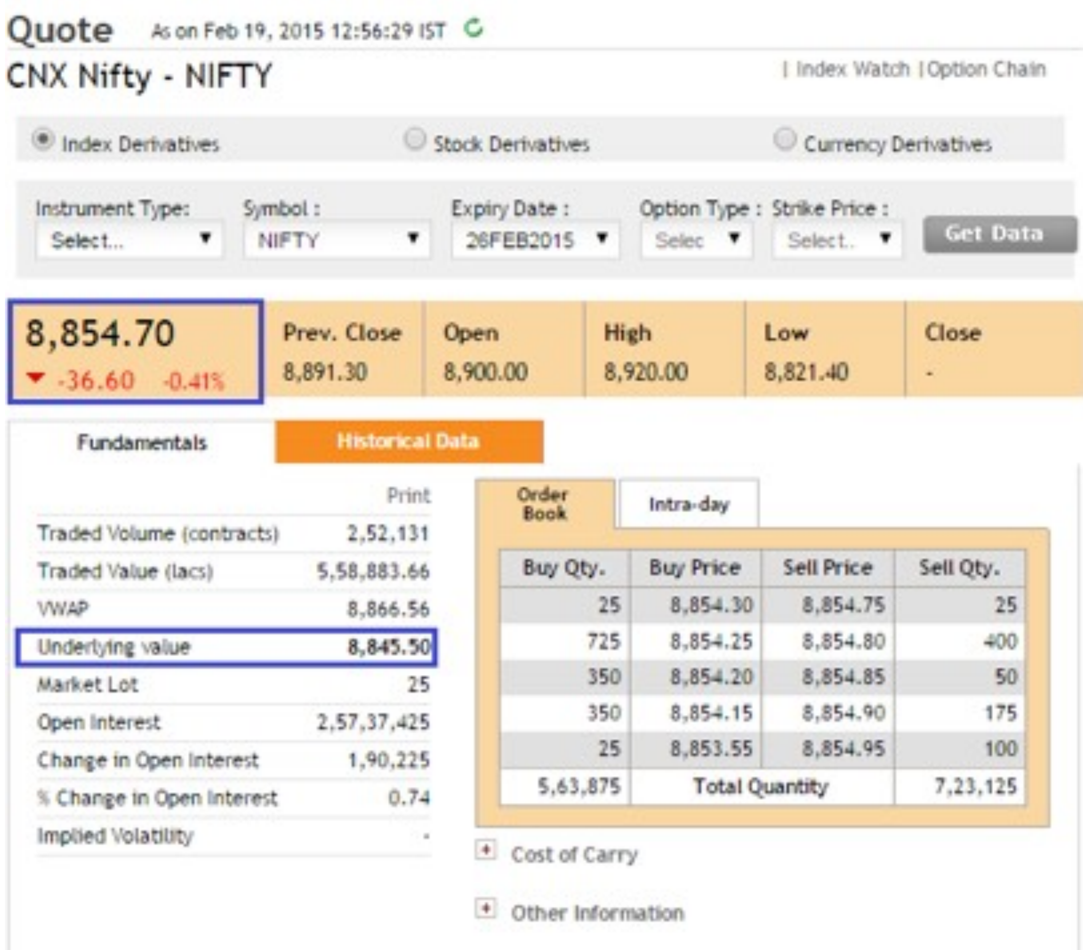
10.1 – The Pricing Formula

If you were to take a conventional course on Futures trading, you would probably be introduced to the futures pricing formula right at the very beginning of the course. However we have deliberately opted to talk about it now, at a much later stage. The reason is simple – if you are trading futures based on technical analysis (I assume a vast majority of you are doing this) then you would not really need to know how the futures are priced, although a good working knowledge would help. However if you aspire to trade futures by employing quantitative strategies such as Calendar Spreads or Index Arbitrage then you certainly need to know this. In fact we will have a module dedicated to 'Trading Strategies' where we would discuss some of these strategies, hence the discussion in this chapter will lay down a foundation for the forthcoming modules.

If you recall, in some of the earlier chapters occasionally we discussed the 'Futures Pricing Formula' as the prime reason for the difference between the spot price and the futures price. Well, I guess it is time now to lift the veil and introduce the 'Future Pricing Formula'.

We know the futures instrument derives its value from its respective underlying. We also know that the futures instrument moves in sync with its underlying.

If the underlying price falls, so would the futures price and vice versa. However, the underlying price and the futures price differs and they are not really the same. To give you a perspective as I write this, Nifty Spot is at 8,845.5 whereas the corresponding current month contract is trading at 8,854.7, please refer to the snap shot below. This difference in price between the futures price and the spot price is called the **"basis or spread".** In case of the Nifty example below, the spread is 9.2 points (8854.7 – 8845.5).



The difference in price is attributable to the **'Spot – Future Parity'**. The spot future parity the difference between the spot and futures price that arises due to variables such as interest rates, dividends, time to expiry etc. In a very loose sense it is simply is a mathematical expression to equate the underlying price and its corresponding futures price. This is also known as the **futures pricing formula.**

The futures pricing formula simply states –

Futures Price = Spot price *(1+ rf – d)

Where,

rf = Risk free rate

d – Dividend

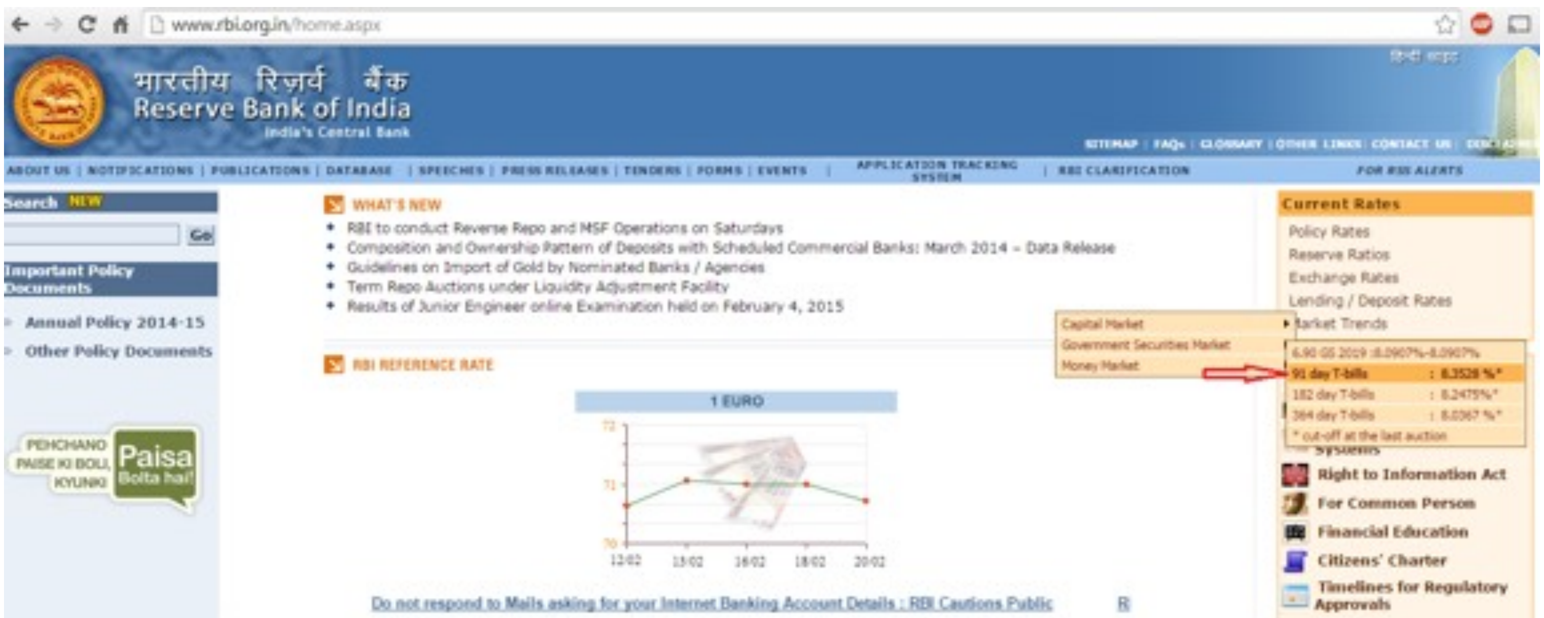
Note, ‘rf’ is the risk free rate that you can earn for the entire year (365 days); considering the expiry is at 1, 2, and 3 months one may want to scale it proportionately for time periods other than the exact 365 days. Therefore a more generic formula would be –

Futures Price = Spot price * [1+ rf*(x/365) – d]

Where,

x = number of days to expiry.

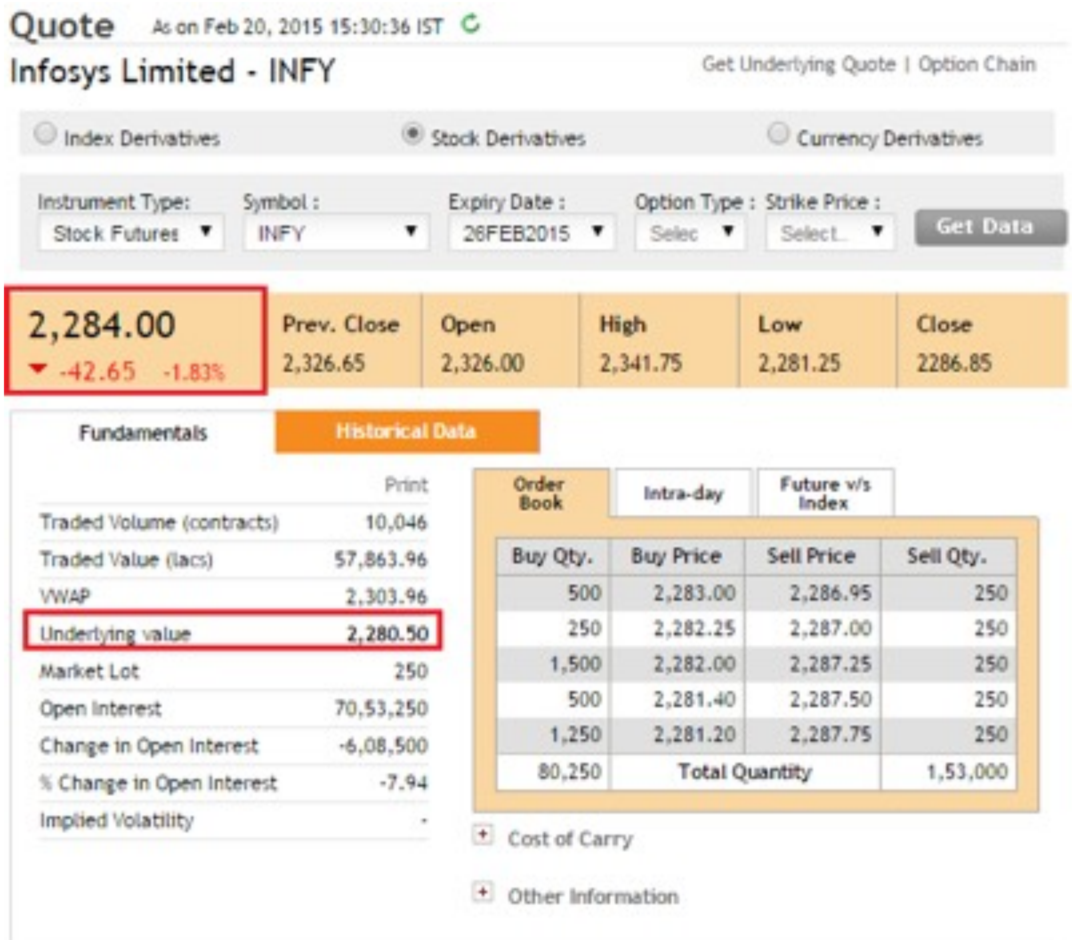
One can take the RBI’s 91 day Treasury bill as a proxy for the short term risk free rate. You can find the same on the RBI’s home page, as shown in the snapshot below –



As we can see from the image above, the current rate is 8.3528%. Keeping this in perspective let us work on a pricing example. Assume Infosys spot is trading at 2,280.5 with 7 more days to expiry, what should Infosys’s current month futures contract be priced at?

Futures Price = 2280.5 * [1+8.3528 %(7/365)] – 0

Do note, Infosys is not expected to pay any dividend over the next 7 days, hence I have assumed dividend as 0. Solving the above equation, the future price turns out to be 2283. This is called the **‘Fair value’** of futures. However the actual futures price as you can see from the image below is 2284. The actual price at which the futures contract trades is called the **‘Market Price’.**



The difference between the fair value and market price mainly occurs due to market costs such as transaction charges, taxes, margins etc. However by and large the fair value reflects where the futures should be trading at a given risk free rate and number of days to expiry. Let us take this further, and figure out the futures price for mid month and far month contracts.

Mid month calculation

Number of days to expiry = 34 (as the contract expires on 26th March 2015)

Futures Price = 2280.5 * [1+8.3528 %(34/365)] – 0

= 2299

Far month calculation

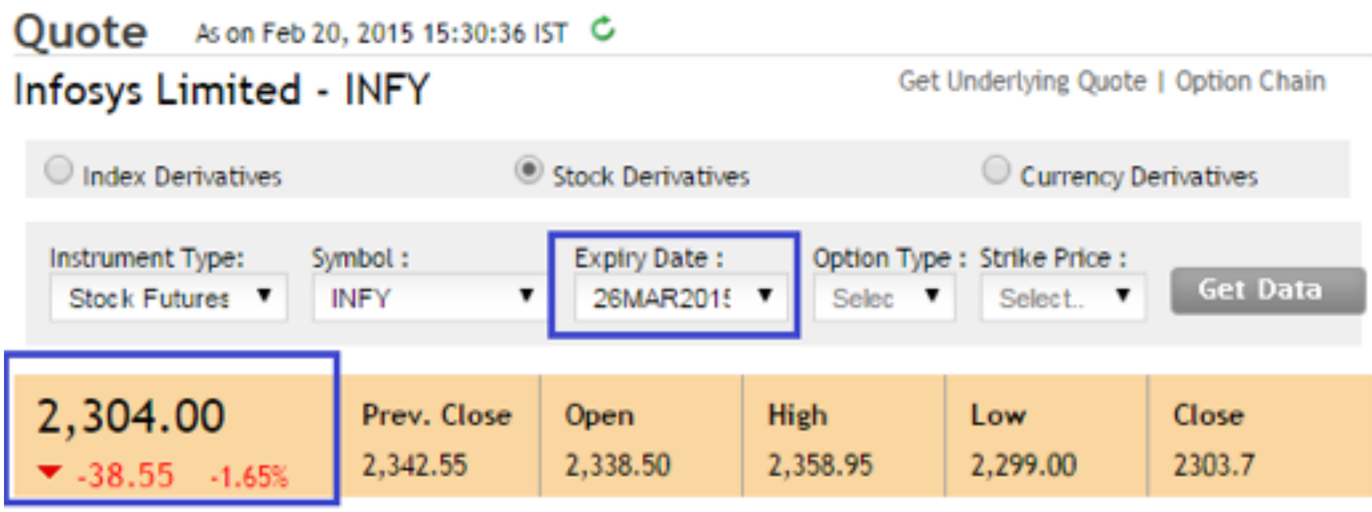
Number of days to expiry = 80 (as the contract expires on 30th April 2015)

Futures Price = 2280.5 * [1+8.3528 %(80/365)] – 0

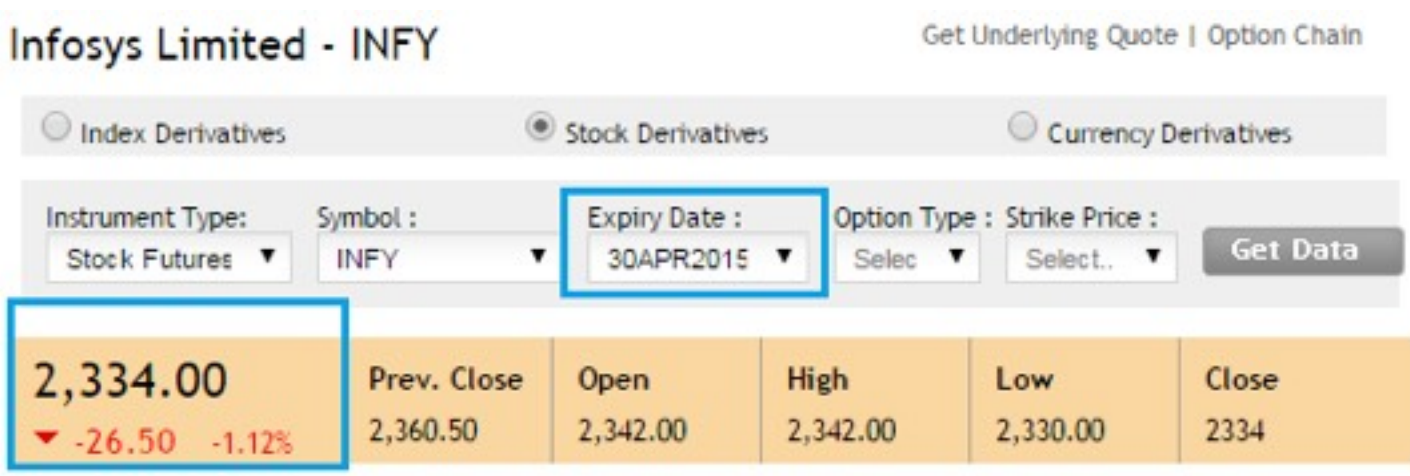
= 2322

From NSE website let us take a look at the actual market prices –

Snapshot of Infosys's mid month contract



Snapshot of Infosys's mid month contract

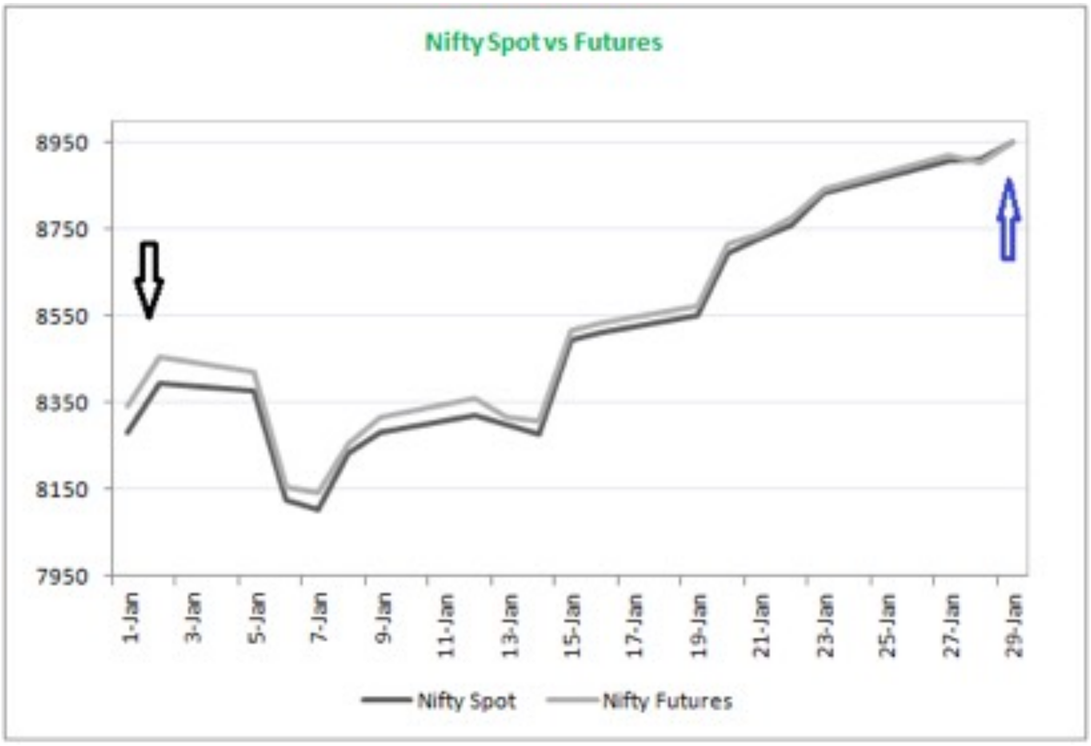


Clearly there is a difference between the calculated fair value and the market price. I would attribute this to the applicable costs. Besides, the market could be factoring in some financial yearend dividends as well. However the key point to note is as the number of days to expiry increases, the difference between the fair value and market value widens.

In fact this leads us to another important commonly used market terminology – **the discount and the premium.**

If the futures is trading higher than the spot, which mathematically speaking is the natural order of things, then the futures market is said to be at '**premium**'. While 'Premium' is a term used in the Equity derivatives markets, the commodity derivatives market prefer to refer to the same phenomenon as **'Contango'**. However, both contango and premium refer to the same fact – The Futures are trading higher than the Spot.

Here is a plot of Nifty spot and its corresponding futures for the January 2015 series. As you can see the Nifty futures is trading above the spot during the entire series.



I specifically want to draw your attention to the following few points –

1. At the start of the series (highlighted by a black arrow) the spread between the spot and futures is quite high. This is because the number of days to expiry is high hence the x/365 factor in the futures pricing formula is also high**.**

2. The futures remained at premium to the spot throughout the series

3. At the end of the series (highlighted by a blue arrow) the futures and the spot have converged. In fact this always happens. Irrespective of whether the future is at a premium or a discount, on the day of the expiry, the futures and spot will always converge.

4. If you have a futures position and if you fail to square off the position by expiry, then the exchange will square off the position automatically and it will be settled at the spot price as both futures and spot converges on the day of the expiry

Not always does the futures trade richer than the spot. There could be instances – mainly owing to short term demand and supply imbalances where the futures would trade cheaper than its corresponding spot. This situation is when the futures is said to be trading at a discount to the spot. In the commodities world, the same situation is referred to as the **"backwardation".**

10.2 – Practical Application

Before we conclude this chapter, let us put the futures pricing formula to some practical use.

Like I had mentioned earlier, futures pricing formula comes very handy when you aspire to trade employing quantitative trading techniques. Please note, the following discussion is only a preview window into the world of trading strategies. We will discuss all these things plus more in greater detail when we take up the module on “Trading Strategies”. Consider this situation –

Wipro Spot = 653

Rf – 8.35%

x = 30

d = 0

Given this, the futures should be trading at –

Futures Price = 653*(1+8.35 %(30/365)) – 0

= 658

Accommodate for market charges, the futures should be trading in and around 658. Now what if instead the futures contract is trading at a drastically different price? Let’s say 700? Clearly there is a trade here. The difference between the spot and futures should ideally be just 5 points, but due to market imbalances the difference has shot up to 47 points. This is a spread that we can capture by deploying a trade.

Here is how one can do this – since the future contract is trading above its fair value, we term the futures market price as **expensive relative to its fair value**. Alternatively we can say, the spot is trading cheaper with respect to the futures.

The thumb rule in any sort of ‘spread trade’ is to buy the cheaper asset and sell the expensive one. Hence going by this, we can sell Wipro Futures on one hand and simultaneously buy Wipro in the spot market. Let us plug in the numbers and see how this goes –

Buy Wipro in Spot @ 653

Sell Wipro in Futures @ 700

Now we know that on the expiry day, both the spot and the futures converge into one single price (refer to the Nifty graph posted above). Let us assume a few random values at which the futures and the spot converge – 675, 645, 715 and identify what happens to the trade –

Expiry Value	Spot Trade P&L (Long)	Futures Trade P&L (Short)	Net P&L
675	675 – 653 = +22	700 – 675 = +25	+22 + 25 = +47
645	645 – 653 = -08	700 – 645 = +55	-08 + 55 = +47
715	715 – 653 = +62	700 – 715 = -15	+62 – 15 = +47

As you can notice, once you have executed the trade at the expected price you have essentially locked in the spread. So irrespective of where the market goes by expiry, the profits are guaranteed! Of course, it goes without saying that it makes sense to square off the positions just before the expiry of the futures contract. This would require you to sell Wipro in spot market and buy back Wipro in Futures market.

This kind of trade between the futures and the spot to extract and profit from the spread is also called the **'Cash & Carry Arbitrage'**.

10.3 – Calendar Spreads

The calendar spread is a simple extension of the cash & carry arbitrage. In a calendar spread, we attempt to extract and profit from the spread created between two futures contracts of the same underlying but with different expiries. Let us continue with the Wipro example and understand this better –

Wipro Spot is trading at = 653

Current month futures fair value (30 days to expiry) = 658

Actual market value of current month futures = 700

Mid month futures fair value (65 days to expiry) = 663

Actual market value of mid month futures = 665

From the above example, clearly the current month futures contract is trading way above its expected theoretical fair value. However the mid month contract is trading close to its actual fair value estimate. With these observations, I will make an assumption that the current month contract's basis will eventually narrow down and the mid month contract will continue to trade close to its fair value.

Now with respect to the mid month contract, the current month contract appears to be expensive. Hence we sell the expensive contract and buy the relatively cheaper one. Therefore the trade set up would require me to buy the mid month futures contract @ 665 and sell the current month contract @ 700.

What do you think is the spread here? Well, the spread is the difference between the two future contracts i.e 700 – 665 = 35 points.

The trade set up to capture the spread goes like this –

Sell the current month futures @ 700

Buy the mid month futures @ 665

Do note – because you are buying and selling the same underlying futures of different expiries, the margins are greatly reduced as this is a hedged position.

Now after initiating the trade, one has to wait for the current month's futures to expire. Upon expiry, we know the current month futures and the spot will converge to a single price. Of course on a more practical note, it makes sense to unwind the trade just before the expiry.

Let us arbitrarily take a few scenarios as below and see how the P&L pans out -

Expiry Value	Current month P&L (Short)	Mid Month P&L (Long)	Net P&L
660	700 – 660 = +40	660 – 665 = -5	+40 – 5 = +35
690	700 – 690 = +10	690 – 665 = +25	+10 + 25 = +35
725	700 – 725 = -25	725 – 665 = +60	-25 + 60 = +35

Of course, do recall the critical assumption we have made here is that i.e. the mid month contract will stick close to its fair value. From my trading experience this happens most of the times.

Most importantly please do bear in mind the discussion with respect to spreads in this chapter is just a sneak peek into the world of trading strategies. We will discuss these strategies in a separate module which would give you an in depth analysis on how one can professionally deploy these strategies.

Key takeaways from this chapter

1. The futures pricing formula states that the Futures Price = Spot price *(1+Rf (x/365)) – d
2. The difference between futures and spot is called the basis or simply the spread
3. The futures price as estimated by the pricing formula is called the "Theoretical fair value"
4. The price at which the futures trade in the market is called the 'market value'
5. The theoretical fair value of futures and market value by and large should be around the same value. However there could be slight variance mainly due to the associated costs
6. If the futures is rich to spot then the futures is said to be at premium else it is said to be at a discount
7. In commodity parlance Premium = Contango and Discount = Backwardation
8. Cash and carry is a spread where one can buy in the spot and sell in the futures
9. Calendar spread is an extension of a cash and carry where one buys a contract and simultaneously sells another contract (with a different expiry) but of the same underlying

CHAPTER 11

Hedging with Futures

11.1 – Hedging, what is it?

One of the most important and practical applications of Futures is 'Hedging'. In the event of any adverse market movements, hedging is a simple work around to protect your trading positions from making a loss. Let me to attempt giving you an analogy to help you understand what hedging really is.

Imagine you have a small bit of vacant barren land just outside your house, instead of seeing it lie vacant and barren you decide to lawn the entire plot and plant few nice flowering plants. You nurture the little garden, water it regularly, and watch it grow. Eventually your efforts are paid off and the lawn grows lush green and the flowers finally start to blossom. As the plants grow and flowers start to bloom it starts to attract attention of the wrong kind. Soon you realize your little garden has become a hot destination for a few stray cows. You notice these stray cows merrily gazing away the grass and spoiling the nice flowers. You are really annoyed with this and decide to protect your little garden? A simple work around is what you have in mind – you erect a fence (maybe a wooden hedge) around the garden to prevent the cows from entering your garden. This little work around ensures your garden stays protected and also lets your garden flourish.

Let us now correlate this analogy to the markets –

- ◉ Imagine you nurture a portfolio by picking each stock after careful analysis. Slowly you invest a sizable corpus in your portfolio. This is equivalent to the garden you grow
- ◉ At some point after your money is invested in the markets you realize that the markets may soon enter a turbulent phase which would result in portfolio losses. This is equivalent to the stray cow grazing your lawn and spoiling your flower plants
- ◉ To prevent your market positions from losing money you construct a portfolio hedge by employing futures. This is equivalent to erecting a fence (wooden hedge) around your garden

I hope the above analogy gave you got a fair sense of what 'hedging' is all about. Like I had mentioned earlier, hedging is a technique to ensure your position in the market is not affected by any adverse movements. Please don't be under the impression that hedging is done only to protect a portfolio of stocks, in fact you can employ a hedge to protect individual stock positions, albeit with some restrictions.

11.2 – Hedge – But why?

A common question that gets asked frequently when one discusses about hedging is why really hedge a position? Imagine this – A trader or an investor has a stock which he has purchased at Rs.100. Now he feels the market is likely to decline and so would his stock. Given this, he can choose to do one of the following –

1. Take no action and let his stock decline with a hope it will eventually bounce back
2. Sell the stock and hope to buy it back later at a lower price
3. Hedge the position

Firstly let us understand what really happens when the trader decides not to hedge. Imagine the stock you invested declines from Rs.100 to let us say Rs.75. We will also assume eventually as time passes by the stock will bounce back to Rs.100. So the point here is when the stock eventually moves back to its original price, why should one really hedge?

Well, you would agree the drop from Rs.100/- to Rs.75/- is a 25% drop. However when the stock has to move back from Rs.75/- to Rs.100/- it is no longer a scale back of 25% instead it works out to that the stock has to move by 33.33% to reach the original investment value! This means when the stock drops it takes less effort do to so, but it requires extra efforts to scale back to the original value. Also, from my experience I can tell you stocks do not really go up that easily unless it is a raging bull market. Hence for this reason, whenever one anticipates a reasonably massive adverse movement in the market, it is always prudent to hedge the positions.

But what about the 2nd option ? Well, the 2nd option where the investor sells the position and buys back the same at a later stage requires one to time the market, which is not something easy to do. Besides when the trader transacts frequently, he will also not get the benefit of Long term capital tax. Needless to say, frequent transaction also incurs additional transactional fees.

For all these reasons, hedging makes sense as he is virtually insulates the position in the market and is therefore becomes indifferent to what really happens in the market. It is like taking vaccine shot against a virus. Hence when the trader hedges he can be rest assured the adverse movement in the market will not affect his position.

11.3 – Risk

Before we proceed to understand how we could hedge our positions in the market, I guess it is important to understand what is that we are trying to hedge. Quite obviously as you can imagine, we are hedging the risk, but what kind of risk?

When you buy the stock of a company you are essentially exposed to risk. In fact there are two types of risk – **Systematic Risk and Unsystematic Risk**. When you buy a stock or a stock future, you are automatically exposed to both these risks.

The stock can decline (resulting in losses for you) for many reasons. Reasons such as –

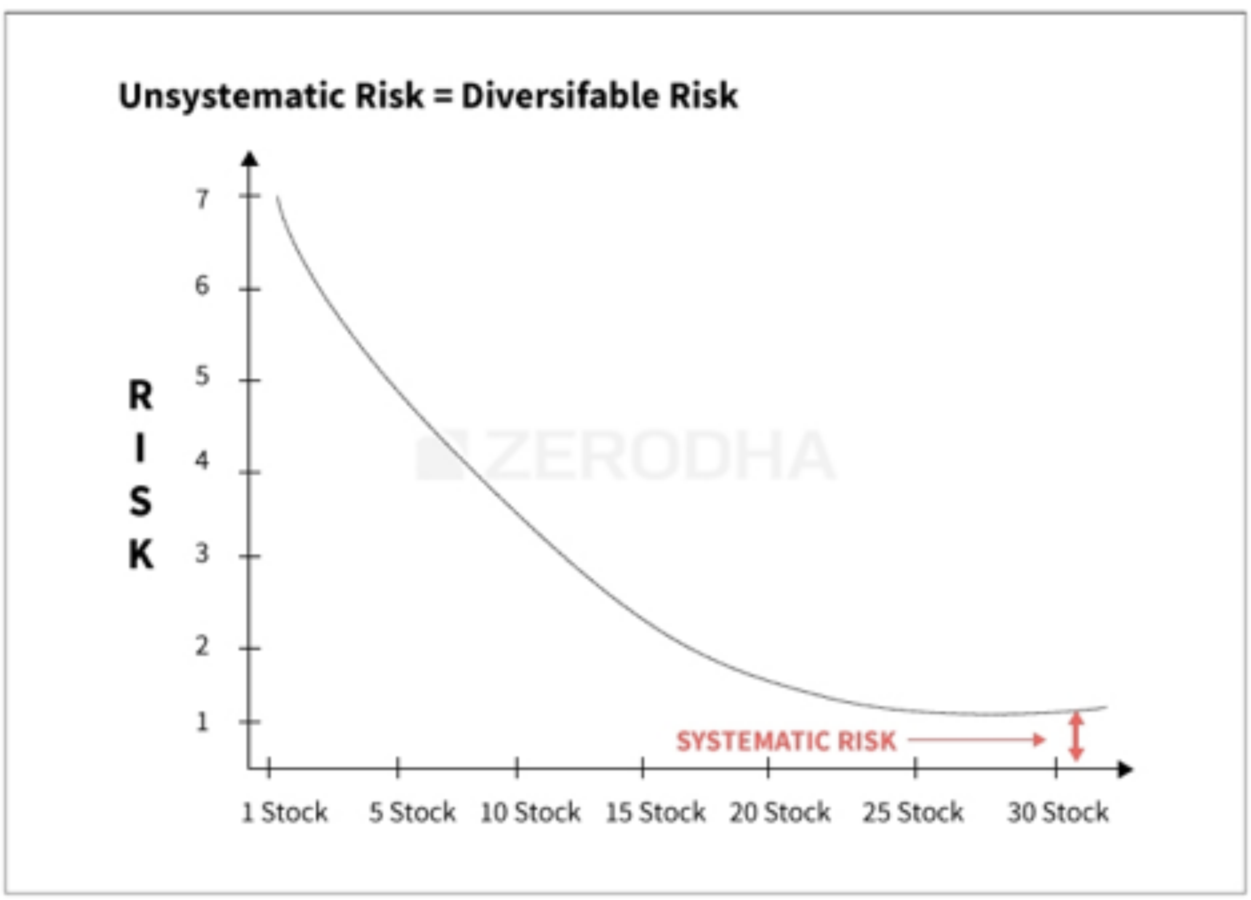
1. Declining revenue
2. Declining profit margins
3. Higher financing cost
4. High leverage
5. Management misconduct

All these reasons represent a form of risk, in fact there could be many other similar reasons and this list can go on. However if you notice, there is one thing common to all these risks – they are all **company specific risk**. For example imagine you have an investable capital of Rs.100,000/-. You decide to invest this money in HCL Technologies Limited. Few months later HCL makes a statement that their revenues have declined. Quite obviously HCL stock price will decline. Which means you will lose money on your investment. However this news will not impact HCL's competitor's (Tech Mahindra or Mindtree) stock price. Likewise if the management is guilty of any misconduct, then Tech Mahindra's stock price will go down and not its competitors. Clearly these risks which are specific to the company affect only the company in question and not others. Such risks are often called the **"Unsystematic Risk"**.

Unsystematic risk can be diversified, meaning instead of investing all the money in one company, you can choose to diversify and invest in 2-3 different companies (preferably from different sectors). When you do so, unsystematic risk is drastically reduced. Going back to the above example imagine instead of buying HCL for the entire capital, you decide to buy HCL for Rs.50,000/- and maybe Karnataka Bank Limited for the other Rs.50,000/-. Under such a circumstance, even if HCL stock price declines (owing to the unsystematic risk) the damage is only on half of the investment as the other half is invested in a different company. In fact instead of just two stocks you can have a 5 stock or 10 or maybe 20 stock portfolio. The higher the number of stocks in your portfolio, higher the diversification and therefore lesser the unsystematic risk.

This leads us to a very important question – how many stocks should a good portfolio have so that the unsystematic risk is completely diversified. Research has it that up to 21 stocks in the portfolio will have the required necessary diversification effect and anything beyond 21 stocks may not help much in diversification.

The graph below should give you a fair sense of how diversification works –



As you can notice from the graph above, the unsystematic risk drastically reduces when you diversify and add more stocks. However after about 20 stocks the unsystematic risk is not really diversifiable, this is evident as the graph starts to flatten out after 20 stocks. In fact the risk that remains even after diversification is called the **“Systematic Risk”**.

Systematic risk is the risk that is common to all stocks. These are usually the macroeconomic risks which tend to affect the whole market. Example of systematic risk include –

1. De-growth in GDP
2. Interest rate tightening
3. Inflation
4. Fiscal deficit
5. Geo political risk

Of course the list can go on but I suppose you got a fair idea of what constitutes systematic risk. Systematic risk affects all stocks. So assuming you have a well diversified 20 stocks portfolio, a de-growth in GDP will certainly affect all 20 stocks and hence they are all likely to decline. Systematic risk is **inherent in the system** and it cannot really be diversified. However systematic risk can be **‘hedged’**. So when we are talking about hedging, do bear in mind that it is not the same as diversification.

Remember, we diversify to minimize unsystematic risk and we hedge to minimize systematic risk.

11.4 – Hedging a single stock position

We will first talk about hedging a single stock future as it is relatively simple and straight forward to implement. We will also understand its limitation and then proceed to understand how to hedge a portfolio of stocks.

Imagine you have bought 250 shares of Infosys at Rs.2,284/- per share. This works out to an investment of Rs.571,000/-. Clearly you are ‘**Long’** on Infosys in the spot market. After you initiated this position, you realize the quarterly results are expected soon. You are worried Infosys may announce a not so favorable set of numbers, as a result of which the stock price may decline considerably. To avoid making a loss in the spot market you decide to hedge the position.

In order to hedge the position in spot, we simply have to enter a counter position in the futures market. Since the position in the spot is **‘long’**, we have to **‘short’** in the futures market.

Here are the short futures trade details –

Short Futures @ 2285/-

Lot size = 250

Contract Value = Rs.571,250/-

Now on one hand you are long on Infosys (in spot market) and on the other hand we are short on Infosys (in futures price), although at different prices. However the variation in price is not of concern as directionally we are **'neutral'.** You will shortly understand what this means.

After initiating this trade, let us arbitrarily imagine different price points for Infosys and see what will be the overall impact on the positions.

Arbitrary Price	Long Spot P&L	Short Futures P&L	Net P&L
2200	2200 – 2284 = – 84	2285 – 2200 = +85	-84 + 85 = +1
2290	2290 – 2284 = +6	2285 – 2290 = -5	+6 – 5 = +1
2500	2500 – 2284 = +216	2285 – 2500 = -215	+216 – 215 = +1

The point to note here is – irrespective of where the price is headed (whether it increases or decreases) the position will neither make money nor lose money. It is as if the overall position is frozen. In fact the position becomes indifferent to the market, which is why we say when a position is hedged it stays 'neutral' to the overall market condition. As I had mentioned earlier, hedging single stock positions is very straight forward with no complications. We can use the stock's futures contract to hedge the position. But to use the stocks futures position one must have the same number of shares as that of the lot size. If they vary, the P&L will vary and position will no longer be perfectly hedged. This leads to a few important questions –

1. What if I have a position in a stock that does not have a futures contract? For example South Indian Bank does not have a futures contract, does that mean I cannot hedge a spot position in South Indian Bank?

2. The example considered the spot position value was Rs.570,000/-, but what if I have relatively small positions – say Rs.50,000/- or Rs.100,000/- is it possible to hedge such positions?

In fact the answer to both these questions is not really straight forward. We will understand how and why shortly. For now we will proceed to understand how we can hedge multiple spot positions (usually a portfolio). In order to do so, we first need to understand something called as **"Beta"** of a stock.

11.5 – Understanding Beta (β)

Beta, denoted by the Greek symbol β, plays a very crucial concept in market finance as it finds its application in multiple aspects of market finance. I guess we are at a good stage to introduce beta, as it also finds its application in hedging portfolio of stocks.

In plain words Beta measures the sensitivity of the stock price with respect to the changes in the market, which means it helps us answer these kinds of questions –

1. If market moves up by 2% tomorrow, what is the likely movement in stock XYZ?
2. How risky (or volatile)is stock XYZ compared to market indices (Nifty, Sensex)?
3. How risky is stock XYZ compared to stock ABC?

The beta of a stock can take any value greater or lower than zero. However, the beta of the market indices (Sensex and Nifty) is always +1. Now for example assume beta of BPCL is +0.7, the following things are implied –

1. For every +1.0% increase in market, BPCL is expected to move up by 0.7%
    a. If market moves up by 1.5%, BPCL is expected to move up by 1.05%
    b. If market decreases by 1.0%, BPCL is expected to decline by 0.7%
2. Because BPCL's beta is less than the market beta (0.7% versus 1.0%) by 0.3%, it is believed that BPCL is 30% less risky than markets
    a. One can even say, BPCL relatively carries less systematic risk
3. Assuming HPCL's beta is 0.85%, then BPCL is believed to be less volatile compared HPCL, therefore less risky

The following table should help you get a perspective on how to interpret beta value for stock –

If Beta of a stock is	Interpretation
Less than 0, Ex : -0.4	A -ve sign indicates the stock price and markets move in the opposite direction. If market moves up by 1%, then –ve beta stock of -0.4 is expected to decline by 0.4%
Equal to 0	It means the stock is independent of the market movement.The variation in the market is not likely to affect the movement in the stock. However, stocks with 0 beta is hard to find

If Beta of a stock is	Interpretation
Higher than 0 lesser than 1, Ex : 0.6	It means the stock and the market move in the same direction;however the stock is relatively less risky. A move of 1% in the market influences the stock to move up by 0.6%. These are generally called the low beta stocks.
Higher than 1, Ex : 1.2	It means the stock moves in the same direction as the markets;however the stock tends to move 20% more than the market.Meaning, if the market increases by 1.0%, the stock is expected to go up by 1.2%. Likewise if the market declines by 1% the stock is expected to decline by 1.2%. These are generally called the high beta stocks.

As of January 2015, here is the Beta value for a few blue chip stocks –

Stock Name	Beta Value
ACC Limited	1.22
Axis Bank Limited	1.40
BPCL	1.42
Cipla	0.59
DLF	1.86
Infosys	0.43
LT	1.43
Maruti Suzuki	0.95
Reliance	1.27
SBI Limited	1.58

11.6 – Calculating beta in MS Excel

You can easily calculate the beta value of any stock in excel by using a function called '=SLOPE'. Here is a step by step method to calculate the same; I have taken the example of TCS.

1. Download the last 6 months daily close prices of Nifty and TCS. You can get this from the NSE website

2. Calculate the daily return of both Nifty and TCS.

a. Daily return = [Today Closing price / Previous day closing price]-1

3. In a blank cell enter the slope function

a. Format for the slope function is =SLOPE(known_y's,known_x's), where known_y's is the array of daily return of TCS, and known_x's is the array of daily returns of Nifty.

d. TCS 6 month beta (3rd September 2014 to 3rd March 2015) works out to 0.62

You can refer to this **excel sheet** for the above calculation

11.7 – Hedging a stock Portfolio

Let us now focus back to hedging a portfolio of stocks by employing Nifty futures. However before we proceed with this, you may have this question – why should we use Nifty Futures to hedge a portfolio? Why not something else?

Do recall there are 2 types of risk – systematic and unsystematic risk. When we have a diversified portfolio we are naturally minimizing the unsystematic risk. What is left after this is the systematic risk. As we know systematic risk is the risk associated with the markets, hence the best way to insulate against market risk is by employing an index which represents the market. Hence the Nifty futures come as a natural choice to hedge the systematic risk.

Assume I have Rs.800,000/- invested across the following stocks –

Sl No	Stock Name	Stock Beta	Investment Amount
1	ACC Limited	1.22	Rs.30,000/-
2	Axis Bank Limited	1.40	Rs.125,000/-
3	BPCL	1.42	Rs.180,000/-
4	Cipla	0.59	Rs.65,000/-
5	DLF	1.86	Rs.100,000/-
6	Infosys	0.43	Rs.75,000/-
7	LT	1.43	Rs.85,000/-
8	Maruti Suzuki	0.95	Rs.140,000/-
Total			Rs.800,000/-

Step 1 – Portfolio Beta

There are a few steps involved in hedging a stock portfolio. As the first step we need to calculate the overall **"Portfolio Beta"**.

- Portfolio beta is the sum of the "weighted beta of each stock".
- Weighted beta is calculated by multiplying the individual stock beta with its respective weightage in the portfolio
- Weightage of each stock in the portfolio is calculated by dividing the sum invested in each stock by the total portfolio value
- For example, weightage of Axis Bank is 125,000/800,000 = 15.6%
    - Hence the weighted beta of Axis Bank on the portfolio would be 15.6% * 1.4 = 0.21

The following table calculates the weighted beta of each stock in the portfolio –

Sl No	Stock Name	Beta	Investment	Weight in Portfolio	Weighted Beta
1	ACC Limited	1.22	Rs.30,000/-	3.8%	0.046
2	Axis Bank Limited	1.40	Rs.125,000/-	15.6%	0.219
3	BPCL	1.42	Rs.180,000/-	22.5%	0.320
4	Cipla	0.59	Rs.65,000/-	8.1%	0.048
5	DLF	1.86	Rs.100,000/-	12.5%	0.233
6	Infosys	0.43	Rs.75,000/-	9.4%	0.040
7	LT	1.43	Rs.85,000/-	10.6%	0.152
8	Maruti Suzuki	0.95	Rs.140,000/-	17.5%	0.166
Total			Rs.800,000/-	100%	1.223

The sum of the weighted beta is the overall **Portfolio Beta**. For the portfolio above the beta happens to be 1.223. This means, if Nifty goes up by 1%, the portfolio as a whole is expected to go up by 1.223%. Likewise if Nifty goes down, the portfolio is expected to go down by 1.223%.

Step 2 – Calculate the hedge value

Hedge value is simply the product of the Portfolio Beta and the total portfolio investment

= 1.223 * 800,000

= 978,400/-

Remember this is a long only portfolio, where we have purchased these stocks in the spot market. We know in order to hedge we need to take a counter position in the futures markets. The hedge value suggests, to hedge a portfolio of Rs.800,000/- we need to short futures worth Rs.978,400/-. This should be quite intuitive as the portfolio is a 'high beta portfolio'.

Step 3 – Calculate the number of lots required

At present Nifty futures is trading at 9025, and with the current lot size of 25, the contract value per lot works out to –

= 9025 * 25

= Rs.225,625/-

Hence the number of lots required to short Nifty Futures would be

= Hedge Value / Contract Value

= 978,400 / 225625

= 4.33

The calculation above suggests that, in order to perfectly hedge a portfolio of Rs.800,000/- with a beta of 1.223, one needs to short 4.33 lots of Nifty futures. Clearly we cannot short 4.33 lots as we can short either 4 or 5 lots, fractional lot sizes are not available.

If we choose to short 4 lots, we would be slightly **under hedged**. Likewise if we short 5 units we would be **over hedged**. In fact for this reason, we cannot always perfectly hedge a portfolio.

Now, let as assume after employing the hedge, Nifty in fact goes down by 500 points (or about 5.5%). With this we will calculate the effectiveness of the portfolio hedge. Just for the purpose of illustration, I will assume we can short 4.33 lots.

Nifty Position

Short initiated at – 9025

Decline in Value – 500 points

Nifty value – 8525

Number of lots – 4.33

P & L = 4.33 * 25 * 500 = **Rs.54,125**

The short position has gained Rs.54,125/-. We will look into what could have happened on the portfolio.

Portfolio Position

Portfolio Value = Rs.800,000/-

Portfolio Beta = 1.223

Decline in Market = 5.5%

Expected Decline in Portfolio = 5.5% * 1.233 = 6.78%

= 6.78% * 800000

= Rs. 54,240

Hence as you can see, one hand the Nifty short position has gained Rs.54,125 and on the other hand the long portfolio has lost Rs.54,240/-. As a net result, there is no loss or gain (please ignore the minor difference) in the net position in the market. The loss in portfolio is offset by the gain in the Nifty futures position.

With this, I hope you are now in a position to understand how you could hedge a portfolio of stocks. I would encourage you to replace 4.33 lots by either 4 or 5 lots and run the same exercise.

Finally before we wrap up this chapter, let us revisit two unanswered questions that we posted when we discussed hedging single stock positions. I will repost the same here for your convenience –

1. What if I have a position in a stock that does not have a futures contract? For example South Indian Bank does not have a futures contract, does that mean I cannot hedge a spot position in South Indian Bank?
2. The example considered, the spot position value was Rs.570,000/-, but what if I have relatively small positions – say Rs.50,000/- or Rs.100,000/- is it possible to hedge such positions?

Well, you can hedge stocks that do not have stock futures. For example assume you have Rs.500,000/- worth of South Indian Bank. All you need to do is multiply the stocks beta with the investment value to identify the hedge value. Assuming the stock has a beta of 0.75, the hedge value would be

500000*0.75

= 375,000/-

Once you arrive at this, directly divide the hedge value by the Nifty's contract value to estimate the number of lots required (to short) in the futures market, and hence with this you can hedge the spot position safely.

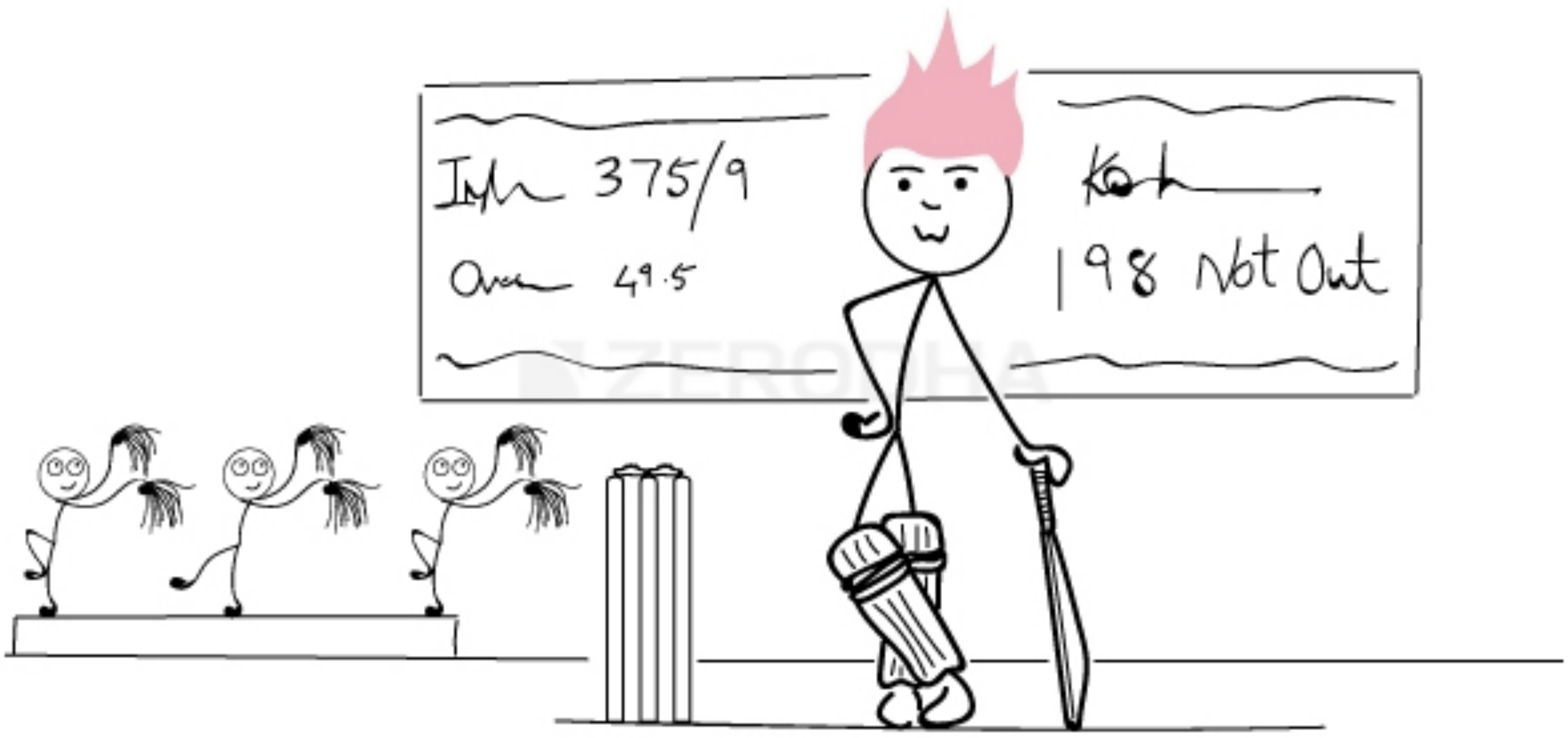
As far as the 2nd question goes – no, you cannot hedge small positions whose value is relatively lower than the contract value of Nifty. However you can hedge such positions by employing options. We will discuss the same when we take up options.

Key takeaways from this chapter

1. Hedging allows you to insulate your market position against any adverse movements in the market
2. When you hedge your loss in the spot market it is offset by gains in the futures market
3. There are two types of risk – systematic and unsystematic risk
4. Systematic risk is risk specific to macroeconomic events. Systematic risk can be hedged. Systematic risk is common to all stocks
5. Unsystematic risk is the risk associated with the company. This is unique to each company. Unsystematic risk cannot be hedge, but can be diversified
6. Research suggests, beyond 21 stocks unsystematic risk cannot be diversified any further
7. To hedge a single stock position in spot we simply have to take a counter position in the futures market. But the extent of spot value and futures value have to be same
8. Market beta is always +1.0
9. Beta measures the sensitivity of stock
    a. Stock with Beta of less than 1 is called low beta stock
    b. Stocks with Beta higher than 1 is called a high beta stock
10. One can easily estimate the stock beta in MS Excel by employing the 'Slope' function
11. To hedge a portfolio of stocks we need to follow the following steps
    a. Calculate individual stock beta
    b. Calculate individual weightage of each stock in the portfolio
    c. Estimate the weighted beta of each stock
    d. Sum up the weighted beta to get the portfolio beta
    e. Multiply the portfolio beta with Portfolio value to get the hedge value
    f. Divide the hedge value by Nifty Contract Value to get the number of lots
    g. Short the required number of lots in the futures market
12. Remember a perfect hedge is difficult to construct, for this reason we are forced to either under hedge or over hedge.

CHAPTER 12

Open Interest



12.1 – Open Interest and its calculation

Before we conclude this module on "Futures Trading", we must address one of the questions that is often asked- "What is Open Interest (OI)?", "How is it different from Volumes?", and "How can we benefit from the Volumes and Open interest data?" Let me attempt to answer these questions and more in this chapter. After reading this, you will be able to interpret OI data in conjunction with the Volumes to make better decisions while trading. Also, I would suggest you refresh your understanding on Volumes from here.

Open Interest (OI) is a number that tells you how many futures (or Options) contracts are currently outstanding (open) in the market. Remember that there are always 2 sides to a trade – a buyer and a seller. Let us say the seller sells 1 contract to the buyer. The buyer is said to be long on the contract and the seller is said to be short on the **same contract**. The open interest in this case is said to be 1.

Let me illustrate OI with an example. Assume the market consists of 5 traders who trade NIFTY futures. We will name them Arjun, Neha, Varun, John, and Vikram. Let us go through their day to day trading activity and observe how open interest varies. Please note, you need to exercise some patience while understanding the flow of events below, else you can quite easily get frustrated!

Lets get started.

Monday: Arjun buys 6 futures contracts and Varun buys 4 futures contracts, while Neha sells all of those 10 contracts. After this transaction, there are 10 contracts in total with 10 on the long side (6 + 4) and another 10 on the short side; hence the open interest is 10. This is summarized in the table below.

	Monday		
Trader	Buy	Sell	Contracts Held
Arjun →	6 L		6 L
Varun →	4 L		4 L
Neha →		10 S	10 S
John →			
Vikram →			
Contracts Outstanding			10

Tuesday: Neha wants to get rid of 8 contracts out of the 10 contracts she holds, which she does. John comes into the market and takes on the 8 shorts contracts from her. You must realize that **this transaction did not create any new contracts** in the market. It was a simple transfer from one person to another. Hence the OI will still stand at 10. Tuesday's transaction is summarized in the table below.

	Monday			Tuesday		
Trader	Buy	Sell	Contracts Held	Buy	Sell	Contracts Held
Arjun →	6 L		6 L			6 L
Varun →	4 L		4 L			4 L
Neha →		10 S	10 S	8 L		2 S
John →					8 S	8 S
Vikram →						
Contracts Outstanding			10			10

Wednesday: To the existing 8 short contracts, John wants to add 7 more short positions, while at the same time both Arjun and Varun decide to increase their long position. Hence John sold 3 contracts to Arjun and 2 contracts to Varun. Note, these are 5 new contracts created. Neha decides to close out her open positions. By going long on 2 contracts, she effectively transferred 2 of her short contracts to John and hence Neha holds no more contracts. The table now looks like this:

	Monday			Tuesday			Wednesday		
Trader	Buy	Sell	Contracts Held	Buy	Sell	Contracts Held	Buy	Sell	Contracts Held
Arjun →	6 L		6 L			6 L	3 L		9 L
Varun →	4 L		4 L			4 L	2 L		6 L
Neha →		10 S	10 S	8 L		2 S	2 L		0
John →					8 S	8 S		7 S	15 S
Vikram →									
Contracts Outstanding			10			10			15

By the end of Wednesday, there are 15 long (9+6) and 15 short positions in the market, hence OI stands at 15!

Thursday: A big guy named Vikram comes to the market and sells 25 contracts. John decides to liquidate 10 contracts, and hence buys 10 contracts from Vikram, effectively transferring his 10 contracts to Vikram. Arjun adds 10 more contracts from Vikram and finally Varun decides to buy the remaining 5 contracts from Vikram. In summary, 15 new contracts got added to the system. OI would now stands at 30.

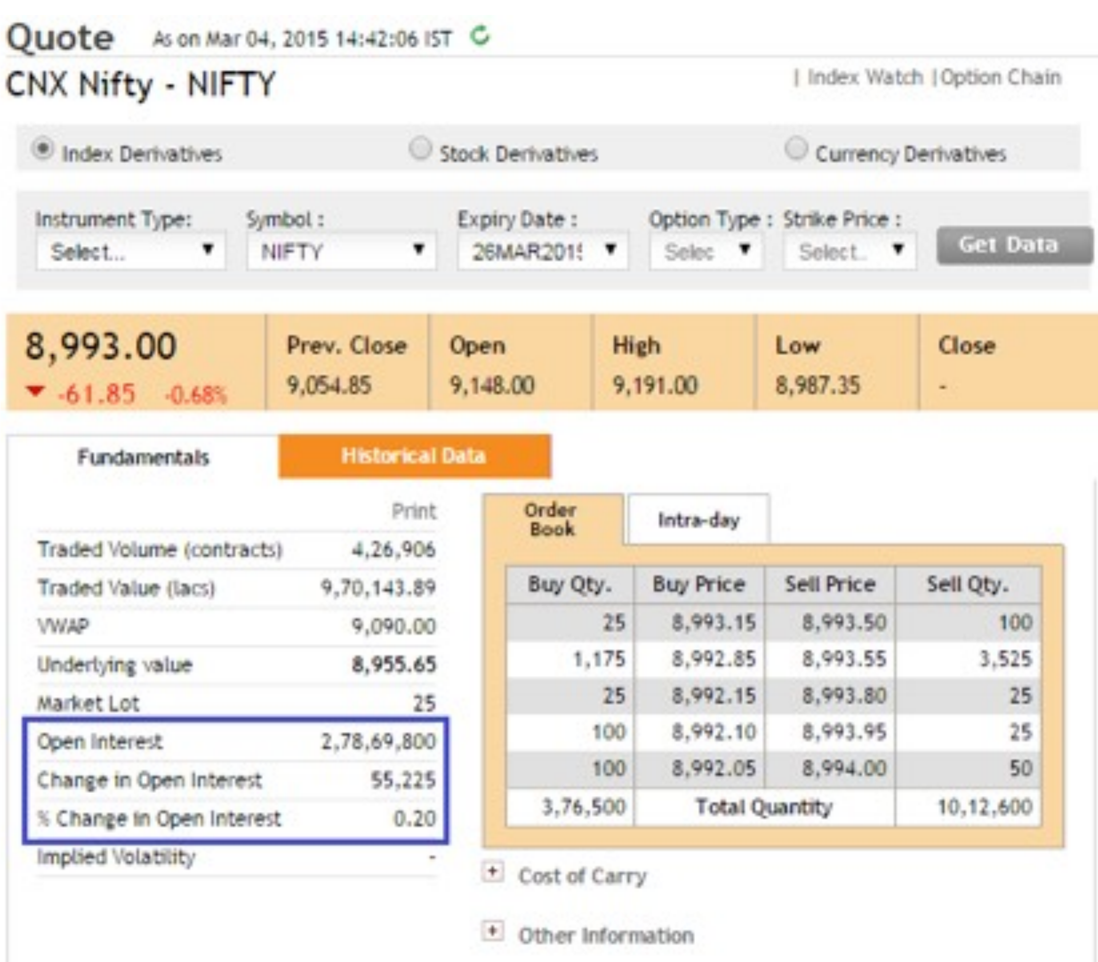
	Monday			Tuesday			Wednesday			Thursday		
Trader	Buy	Sell	Contracts Held	Buy	Sell	Contracts Held	Buy	Sell	Contracts Held	Buy	Sell	Contracts Held
Arjun →	6 L		6 L			6 L	3 L		9 L	10 L		19 L
Varun →	4 L		4 L			4 L	2 L		6 L	5 L		11 L
Neha →		10 S	10 S	8 L		2 S	2 L		0			0
John →					8 S	8 S		7 S	15 S	10 L		5 S
Vikram →											25 S	25 S
Contracts Outstanding			10			10			15			30

Friday: Vikram decides to square off 20 of the 25 contracts he had sold previously. So he buys 10 contracts each from Arjun and Varun. This means, 20 contracts in system got squared off, hence OI reduces by 20 contracts. The new OI is 30-20 = 10. The final summary is listed in the table below.

	Monday			Tuesday			Wednesday			Thursday			Friday		
Trader	Buy	Sell	Contracts Held	Buy	Sell	Contracts Held	Buy	Sell	Contracts Held	Buy	Sell	Contracts Held	Buy	Sell	Contracts Held
Arjun →	6 L		6 L			6 L	3 L		9 L	10 L		19 L		10 S	9 L
Varun →	4 L		4 L			4 L	2 L		6 L	5 L		11 L		10 S	1 L
Neha →		10 S	10 S	8 L		2 S	2 L		0			0			
John →					8 S	8 S		7 S	15 S	10 L		5 S			5 S
Vikram →											25 S	25 S	20 L		5 S
Contracts Outstanding			10			10			15			30			10

So on and so forth; I hope the above discussion is giving you a fair sense of what Open Interest (OI) is all about. The OI information just indicates how many open positions are there in the market. Here is something you should have noticed by now. In the 'contracts held' column, if you assign a +ve sign to a long position and a –ve sign to a short position and add up the long and short positions, it always equates to zero. In fact this is one of the primary reasons derivatives is often termed as a **zero sum game!**

Have a look at the following snapshot –



As of 4th March 2015, OI on Nifty futures is roughly 2.78 Crores. It means that there are 2.78 crore Long Nifty positions and 2.78 crore Short Nifty positions. Also, about 55,255 (or 0.2% over 2.78 Crs) new contracts have been added today. OI is very useful in understanding how liquid the market is. Bigger the open interest, more liquid the market is. And hence it will be easier to enter or exit trades at competitive bid / ask rates.

12.2 – OI and Volume interpretation

Open interest information tells us how many contracts are open and live in the market. Volume on the other hand tells us how many trades were executed on the given day. For every 1 buy and 1 sell, volume adds up to 1. For instance, on a given day, 400 contracts were bought and 400 were sold, then the volume for the day is 400 and not 800. Clearly volumes and open interest are two different; buy seemingly similar set of information. The volume counter starts from zero at the start of the day and increments as and when new trades occur. Hence the volume data always increases on an intra-day basis. However, OI is not discrete like volumes, OI stacks up or reduces based on the entry and exit of traders. In fact for the example we have just discussed, let us summarize the OI and volume information.

Day	Trader	Action	Qty (in lots)	Volume	OI
Monday	Ajay	Buy	6	10	10
	Varun	Buy	4		
	Neha	Sell	10		
Tuesday	Neha	Buy	8	8	10
	John	Sell	8		
Wednesday	John	Sell	7	7	15
	Neha	Buy	2		
	Arjun	Buy	3		
	Varun	Buy	2		
Thursday	Vikram	Sell	25	25	30
	John	Buy	10		
	Arjun	Buy	10		
	Varun	Buy	5		
Friday	Vikram	Buy	20	20	10
	Arjun	Sell	10		
	Varun	Sell	10		

Notice how OI and volume change on a daily basis. Today's volume has no implication on tomorrow's volume. However, it is not true for OI. From a stand-alone perspective both OI and volume numbers are pretty useless. However traders generally associate these numbers with prices to draw an inference about the market.

The following tables summarizes the trader's perspective with respect to changes in volume and prices –

Price	OI	Trader's Perception
Increase	Increase	Bullish
Decrease	Decrease	Bearish trend could probably end, expect reversal
Decrease	Increase	Bearish
Increase	Decrease	Bullish trend could probably end, expect reversal

Unlike volumes, the change in Open interest does not really convey any directional view on markets. However it does give a sense of strength between bullish and bearish positions. The following tables summarizes the trader's perspective with respect to changes in the OI and prices –

Price	Volume	Trader's Perception
Increase	Increase	Bullish
Decrease	Decrease	Bearish trend could probably end, expect reversal
Decrease	Increase	Bearish
Increase	Decrease	Bullish trend could probably end, expect reversal

Unlike volumes, the change in Open interest does not really convey any directional view on markets. However it does give a sense of strength between bullish and bearish positions. The following tables summarizes the trader's perspective with respect to changes in the OI and prices –

Price	Volume	Trader's Perception
Increase	Increase	More trades on the long side
Decrease	Decrease	Longs are covering their position, also called long unwinding

Price	Volume	Trader's Perception
Decrease	Increase	More trades on the short side
Increase	Decrease	Shorts are covering their position, also called short covering

Do note, if there is an abnormally high OI backed by a rapid increase or decrease in prices then be cautious. This situation simply means that there is a lot of euphoria and leverage being built up in the market. In situations like this, even a small trigger could lead to a lot of panic in the market.

And with this, I would like to conclude this module on Futures Trading. I hope you enjoyed reading through this module as much as I enjoyed writing it!

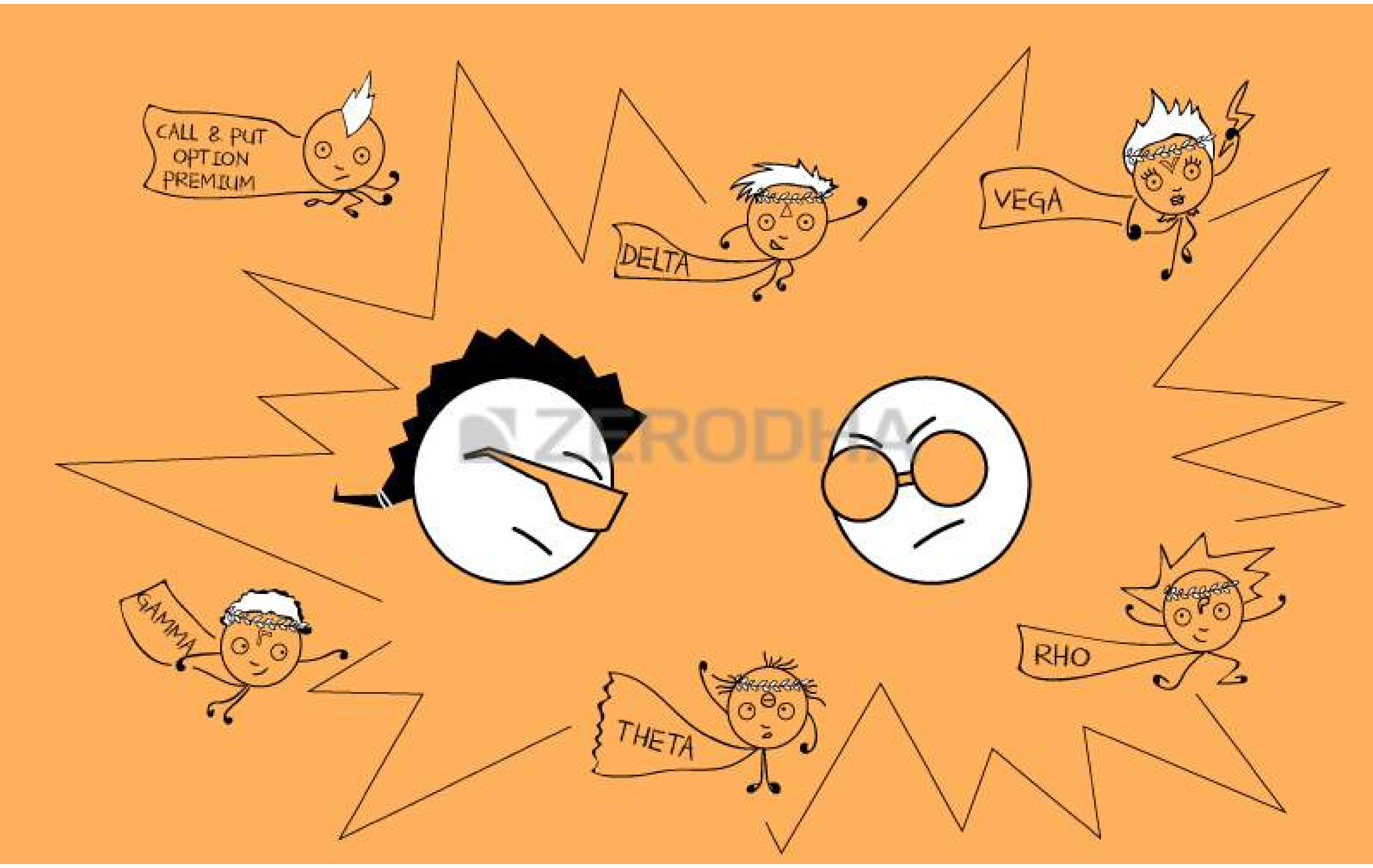
Onwards to Option Theory now!

Key takeaways from this chapter

1. Open Interest (OI) is a number that tells you how many contracts are currently outstanding (open) in the market
2. OI increases when new contracts are added. OI decreases when contracts are squared off
3. OI does not change when there is transfer of contracts from one party to another
4. Unlike volumes, OI is continuous data
5. On a stand along basis OI and Volume information does not convey information, hence it makes sense to always pair it with the price to understand the impact of their respective variation
6. Abnormally high OI indicates high leverage, beware of such situations.

Module 5

Options Theory for Professional Trading



Call Option Basics

1.1– Breaking the Ice

As with any of the previous modules in Varsity, we will again make the same old assumption that you are new to options and therefore know nothing about options. For this reason we will start from scratch and slowly ramp up as we proceed. Let us start with running through some basic background information.

The options market makes up for a significant part of the derivative market, particularly in India. I would not be exaggerating if I were to say that nearly 80% of the derivatives traded are options and the rest is attributable to the futures market. Internationally, the option market has been around for a while now, here is a quick background on the same –

- Custom options were available as Over the Counter (OTC) since the 1920's. These options were mainly on commodities
- Options on equities began trading on the Chicago Board Options Exchange (CBOE) in 1972
- Options on currencies and bonds began in late 1970s. These were again OTC trades
- Exchange-traded options on currencies began on Philadelphia Stock Exchange in 1982
- Interest rate options began trading on the CME in 1985

Clearly the international markets have evolved a great deal since the OTC days. However in India from the time of inception, the options market was facilitated by the exchanges. However options were available in the off market 'Badla' system. Think of the 'badla system' as a grey market for derivatives transactions. The badla system no longer exists, it has become obsolete. Here is a quick recap of the history of the Indian derivative markets –

- June 12th 2000 – Index futures were launched
- June 4th 2001 –Index options were launched
- July 2nd 2001 – Stock options were launched
- November 9th 2001 – Single stock futures were launched.

Though the options market has been around since 2001, the real liquidity in the Indian index options was seen only in 2006! I remember trading options around that time, the spreads were high and getting fills was a big deal. However in 2006, the Ambani brothers formally split up and their respective companies were listed as separate entities, thereby unlocking the value to the shareholders. In my opinion this particular corporate event triggered vibrancy in the Indian markets, creating some serious liquidity. However if you were to compare the liquidity in Indian stock options with the international markets, we still have a long way to catch up.

1.2 – A Special Agreement

There are two types of options – The Call option and the Put option. You can be a buyer or seller of these options. Based on what you choose to do, the P&L profile changes. Of course we will get into the P&L profile at a much later stage. For now, let us understand what "The Call Option" means. In fact the best way to understand the call option is to first deal with a tangible real world example, once we understand this example we will extrapolate the same to stock markets. So let's get started.

Consider this situation; there are two good friends, Ajay and Venu. Ajay is actively evaluating an opportunity to buy 1 acre of land that Venu owns. The land is valued at Rs.500,000/-. Ajay has been informed that in the next 6 months, a new highway project is likely to be sanctioned near the land that Venu owns. If the highway indeed comes up, the valuation of the land is bound to increase and therefore Ajay would benefit from the investment he would make today. However if the 'highway news' turns out to be a rumor- which means Ajay buys the land from Venu today and there is no highway tomorrow, then Ajay would be stuck with a useless piece of land!

So what should Ajay do? Clearly this situation has put Ajay in a dilemma as he is uncertain whether to buy the land from Venu or not. While Ajay is muddled in this thought, Venu is quite clear about selling the land if Ajay is willing to buy.

Ajay wants to play it safe, he thinks through the whole situation and finally proposes a special structured arrangement to Venu, which Ajay believes is a win-win for both of them, the details of the arrangement is as follows –

1. Ajay pays an upfront fee of Rs.100,000/- today. Consider this as a non refundable agreement fees that Ajay pays
2. Against this fees, Venu agrees to sell the land after 6 months to Ajay
3. The price of the sale(which is expected 6 months later) is fixed today at Rs.500,000/-
4. Because Ajay has paid an upfront fee, only he can call off the deal at the end of 6 months (if he wants to that is), Venu cannot
5. In the event Ajay calls off the deal at the end of 6 months, Venu gets to keep the upfront fees

So what do you think about this special agreement? Who do you think is smarter here – Is it Ajay for proposing such a tricky agreement or Venu for accepting such an agreement? Well, the answer to these questions is not easy to answer, unless you analyze the details of the agreement thoroughly. I would suggest you read through the example carefully (it also forms the basis to understand options) – Ajay has plotted an extremely clever deal here! In fact this deal has many faces to it.

Let us break down Ajay's proposal to understand some details –

- By paying an agreement fee of Rs.100,000/-, Ajay is binding Venu into an obligation. He is forcing Venu to lock the land for him for the next 6 months
- Ajay is fixing the sale price of the land based on today's price i.e Rs.500,000/- which means irrespective of what the price would be 6 months later he gets to buy the land at today's price. Do note, he is fixing a price and paying an additional Rs.100,000/- today
- At the end of the 6 months, if Ajay does not want to buy the land he has the right to say 'no' to Venu, but since Venu has taken the agreement fee from Ajay, Venu will not be in a position to say no to Ajay
- The agreement fee is non negotiable, non refundable

Now, after initiating this agreement both Ajay and Venu have to wait for the next 6 months to figure out what would actually happen. Clearly, the price of the land will vary based on the outcome of the 'highway project'. However irrespective of what happens to the highway, there are only three possible outcomes –

1. Once the highway project comes up, the price of the land would go up, say it shoots up to Rs.10,00,000/-
2. The highway project does not come up, people are disappointed, the land price collapses, say to Rs.300,000/-
3. Nothing happens, price stays flat at Rs.500,000/-

I'm certain there could be no other possible outcomes that can occur apart from the three mentioned above.

We will now step into Ajay's shoes and think through what he would do in each of the above situations.

Scenario 1 – Price goes up to Rs.10,00,000/-

Since the highway project has come up as per Ajay's expectation, the land price has also increased. Remember as per the agreement, Ajay has the right to call off the deal at the end of 6 months. Now, with the increase in the land price, do you think Ajay will call off the deal? Not really, because the dynamics of the sale are in Ajay's favor –

Current Market price of the land = Rs.10,00,000/-

Sale agreement value = Rs.500,000/-

This means Ajay now enjoys the right to buy a piece of land at Rs.500,000/- when in the open market the same land is selling at a much higher value of – Rs.10,00,000/-. Clearly Ajay is making a steal deal here. Hence he would go ahead and demand Venu to sell him the land. Venu is obligated to sell him the land at a lesser value, simply because he had accepted Rs.100,000/- agreement fees from Ajay 6 months earlier.

So how much money is Ajay making? Well, here is the math –

Buy Price = Rs.500,000/-

Add: Agreement Fees = Rs.100,000/- (remember this is a non refundable amount)

Total Expense = 500,000 + 100,000 = 600,000/-

Current Market of the land = Rs.10,00,000/-

Hence his profit is Rs.10,00,000 – Rs.600,000 = **Rs.400,000/-**

Another way to look at this is – For an initial cash commitment of Rs.100,000/- Ajay is now making 4 times the money! Venu even though very clearly knows that the value of the land is much higher in the open market, is forced to sell it at a much lower price to Ajay. The profit that Ajay makes (Rs.400,000/-) is exactly the notional loss that Venu would incur.

Scenario 2 – Price goes down to Rs.300,000/-

It turns out that the highway project was just a rumor, and nothing really is expected to come out of the whole thing. People are disappointed and hence there is a sudden rush to sell out the land. As a result, the price of the land goes down to Rs.300,000/-.

So what do you think Ajay will do now? Clearly it does not make sense to buy the land, hence he would walk away from the deal. Here is the math that explains why it does not make sense to buy the land –

Remember the sale price is fixed at Rs.500,000/-, 6 months ago. Hence if Ajay has to buy the land he has to shell out Rs.500,000/- plus he had paid Rs.100,000/- towards the agreement fees. Which means he is in effect paying Rs.600,000/- to buy a piece of land worth just Rs.300,000/-. Clearly this would not make sense to Ajay, since he has the right to call of the deal, he would simply walk away from it and would not buy the land. However do note, as per the agreement Ajay has to let go of Rs.100,000/-, which Venu gets to pocket.

Scenario 3 – Price stays at Rs.500,000/-

For whatever reasons after 6 months the price stays at Rs.500,000/- and does not really change. What do you think Ajay will do? Well, he will obviously walk away from the deal and would not buy the land. Why you may ask, well here is the math –

Cost of Land = Rs.500,000/-

Agreement Fee = Rs.100,000/-

Total = Rs.600,000/-

Value of the land in open market = Rs.500,000/-

Clearly it does not make sense to buy a piece of land at Rs.600,000/- when it is worth Rs.500,000/-. Do note, since Ajay has already committed 1lk, he could still buy the land, but ends up paying Rs 1lk extra in this process. For this reason Ajay will call off the deal and in the process let go of the agreement fee of Rs.100,000/- (which Venu obviously pockets).

I hope you have understood this transaction clearly, and if you have then it is good news as through the example you already know how the call options work! But let us not hurry to extrapolate this to the stock markets; we will spend some more time with the Ajay-Venu transaction.

Here are a few Q&A's about the transaction which will throw some more light on the example –

1. Why do you think Ajay took such a bet even though he knows he will lose his 1 lakh if land prices does not increase or stays flat?

1. Agreed Ajay would lose 1 lakh, but the best part is that Ajay knows his maximum loss (which is 1 lakh) before hand. Hence there are no negative surprises for him. Also, as and when the land

prices increases, so would his profits (and therefore his returns). At Rs.10,00,000/- he would be making Rs.400,000/- profit on his investment of Rs.100,000/- which is 400%.

2. Under what circumstances would a position such as Ajay's make sense?
   1. Only that scenario when the price of the land increases
3. Under what circumstances would Venu's position makes sense
   1. Only that scenario when the price of the land decreases of stays flat
4. Why do you think Venu is taking such a big risk? He would lose a lot of money if the land prices increases after 6 months right?
   1. Well, think about it. There are only 3 possible scenarios, out which 2 indeed benefit Venu. Statistically, Venu has 66.66% chances of winning the bet as opposed to Ajay's 33.33% chance

Let us summarize a few important points now –

- The payment from Ajay to Venu ensures that Ajay has a right (remember only he can call off the deal) and Venu has an obligation (if the situation demands, he has to honor Ajay's claim)
- The outcome of the agreement at termination (end of 6 months) is determined by the price of the land. Without the land, the agreement has no value
- Land is therefore called an underlying and the agreement is called a derivative
- An agreement of this sort is called an "Options Agreement"
- Since Venu has received the advance from Ajay, Venu is called the 'agreement seller or Writer' and Ajay is called the 'agreement buyer'
- In other words since this agreement is called "an options agreement", Ajay can be called an Options Buyer and Venu the Options Seller/writer.
- The agreement is entered after the exchange of 1 lakh, hence 1 lakh is the price of this option agreement. This is also called the "Premium" amount
- Every variable in the agreement – Area of the land, price and the date of sale is fixed.
- As a thumb rule, in an options agreement the buyer always has a right and the seller has an obligation

I would suggest you be absolutely thorough with this example. If not, please go through it again to understand the dynamics involved. Also, please remember this example, as we will revisit the same on a few occasions in the subsequent chapters.

Let us now proceed to understand the same example from the stock market perspective.

1.3 – The Call Option

Let us now attempt to extrapolate the same example in the stock market context with an intention to understand the 'Call Option'. Do note, I will deliberately skip the nitty-gritty of an option trade at this stage. The idea is to understand the bare bone structure of the call option contract.

Assume a stock is trading at Rs.67/- today. You are given a right today to buy the same one month later, at say Rs. 75/-, but only if the share price on that day is more than Rs. 75, would you buy it?. Obviously you would, as this means to say that after 1 month even if the share is trading at 85, you can still get to buy it at Rs.75!

In order to get this right you are required to pay a small amount today, say Rs.5.0/-. If the share price moves above Rs. 75, you can exercise your right and buy the shares at Rs. 75/-. If the share price stays at or below Rs. 75/- you do not exercise your right and you do not need to buy the shares. All you lose is Rs. 5/- in this case. An arrangement of this sort is called Option Contract, a **'Call Option'** to be precise.

After you get into this agreement, there are only three possibilities that can occur. And they are-

1. The stock price can go up, say Rs.85/-
2. The stock price can go down, say Rs.65/-
3. The stock price can stay at Rs.75/-

Case 1 – If the stock price goes up, then it would make sense in exercising your right and buy the stock at Rs.75/-.

The P&L would look like this –

Price at which stock is bought = Rs.75

Premium paid =Rs. 5

Expense incurred = Rs.80

Current Market Price = Rs.85

Profit = 85 – 80 = Rs.5/-

Case 2 – If the stock price goes down to say Rs.65/- obviously it does not makes sense to buy it at Rs.75/- as effectively you would spending Rs.80/- (75+5) for a stock that's available at Rs.65/- in the open market.

Case 3 – Likewise if the stock stays flat at Rs.75/- it simply means you are spending Rs.80/- to buy a stock which is available at Rs.75/-, hence you would not invoke your right to buy the stock at Rs.75/-.

This is simple right? If you have understood this, you have essentially understood the core logic of a call option. What remains unexplained is the finer points, all of which we will learn soon.

At this stage what you really need to understand is this – For reasons we have discussed so far whenever you expect the price of a stock (or any asset for that matter) to increase, it always makes sense to buy a call option!

Now that we are through with the various concepts, let us understand options and their associated terms

Variable	Ajay – Venu Transaction	Stock Example	Remark
Underlying	1 acre land	Stock	Do note the concept of lot size is applicable in options. So just like in the land deal where the deal was on 1 acre land, not more or not less, the option contract will be the lot size
Expiry	6 months	1 month	Like in futures there are 3 expiries available
Reference Price	Rs.500,000/-	Rs.75/-	This is also called the strike price
Premium	Rs.100,000/-	Rs.5/-	Do note in the stock markets, the premium changes on a minute by minute basis. We will understand the logic soon
Regulator	None, based on good faith	Stock Exchange	All options are cash settled, no defaults have occurred until now.

Finally before I end this chapter, here is a formal definition of a call options contract –

"*The buyer of the call option has the right, but not the obligation to buy an agreed quantity of a particular commodity or financial instrument (the underlying) from the seller of the option at a certain time (the expiration date) for a certain price (the strike price). The seller (or "writer") is obligated to sell the commodity or financial instrument should the buyer so decide. The buyer pays a fee (called a premium) for this right".*

In the next chapter we will look into a few finer details with regard to the 'Call Option'.

Key takeaways form this chapter

1. Options are traded in the Indian markets for over 15 years, but the real liquidity was available only since 2006
2. An Option is a tool for protecting your position and reducing risk
3. A buyer of the call option has the right and the seller has an obligation to make delivery
4. The option is only given to one party in the transaction (buyer of an option)
5. The option seller is also called the option writer
6. At the time of agreement the option buyer pays a certain amount to the option seller, this is called the 'Premium' amount
7. The agreement happens at a pre specified price, often called the 'Strike Price'
8. The option buyer benefits only if the price of the asset increases higher than the strike price
9. If the asset price stays at or below the strike, the buyer does not benefit, for this reason it always makes sense to buy options when you expect the price to increase
10. Statistically the option seller has higher odds of winning in an typical option contract
11. The directional view has to pan out before the expiry date, else the option will expire worthless

Basic Option Jargons

2.1– Decoding the basic jargons

In the previous chapter, we understood the basic call option structure. The idea of the previous chapter was to capture a few essential 'Call Option' concepts such as –

1. It makes sense to be a buyer of a call option when you expect the underlying price to increase
2. If the underlying price remains flat or goes down then the buyer of the call option loses money
3. The money the buyer of the call option would lose is equivalent to the premium (agreement fees) the buyer pays to the seller/writer of the call option.

In the next chapter i.e. Call Option (Part 2), we will attempt to understand the call option in a bit more detail. However before we proceed further let us decode a few basic option jargons. Discussing these jargons at this stage will not only strengthen our learning, but will also make the forthcoming discussion on the options easier to comprehend.

Here are a few jargons that we will look into –

1. Strike Price
2. Underlying Price
3. Exercising of an option contract
4. Option Expiry
5. Option Premium
6. Option Settlement

Do remember, since we have only looked at the basic structure of a call option, I would encourage you to understand these jargons only with respect to the call option.

Strike Price

Consider the strike price as the anchor price at which the two parties (buyer and seller) agree to enter into an options agreement. For instance, in the previous chapter's 'Ajay – Venu' example the anchor price was Rs.500,000/-, which is also the 'Strike Price' for their deal. We also looked into a stock example where the anchor price was Rs.75/-, which is also the strike price. For all 'Call' options the strike price represents the price at which the stock can be bought on the expiry day.

For example, if the buyer is willing to buy ITC Limited's Call Option of Rs.350 (350 being the strike price) then it indicates that the buyer is willing to pay a premium today to buy the rights of 'buying ITC at Rs.350 on expiry'. Needless to say he will buy ITC at Rs.350, only if ITC is trading above Rs.350.

In fact here is a snap shot from NSE's website where I have captured different strike prices of ITC and the associated premium.

Option Chain (Equity Derivatives)

Underlying Stock: ITC 336.90 As on Mar 17

View Options Contracts for: Select Index OR Search for an underlying stock: GO Filter by: Expiry Date 26MAR2015 Fut

CALLS												PUTS								
Chart	OI	Chng in OI	Volume	IV	LTP	Net Chng	Bid Qty	Bid Price	Ask Price	Ask Qty	Strike Price	Bid Qty	Bid Price	Ask Price	Ask Qty	Net Chng	LTP	IV	Volume	Chng in
	-	-	-	-	-	-	2,000	74.65	86.10	2,000	260.00	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	5,000	66.00	69.35	5,000	270.00	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	7,000	56.35	59.60	7,000	280.00	2,000	0.05	0.35	2,000	-	-	-	-	
	-	-	-	-	-	-	8,000	45.95	50.05	8,000	290.00	1,000	0.10	0.30	1,000	-	-	-	-	
	1,000	-	-	-	-	-	2,000	34.65	43.75	2,000	300.00	19,000	0.15	0.30	1,000	-	0.25	40.71	1	1,0
	2,000	-	-	-	-	-	2,000	27.45	30.05	13,000	310.00	3,000	0.25	0.40	1,000	-0.15	0.25	31.14	11	-5,0
	6,000	-	-	-	-	-	1,000	17.85	19.10	11,000	320.00	13,000	0.70	0.80	8,000	-0.15	0.80	28.46	112	6,0
	253,000	-	63	28.49	10.65	0.70	1,000	10.00	10.50	11,000	330.00	11,000	2.20	2.35	8,000	-0.45	2.30	24.92	541	-2,0
	1,875,000	-21,000	1,081	27.23	4.75	0.05	4,000	4.60	4.70	1,000	340.00	8,000	6.30	6.80	4,000	-0.95	6.30	24.30	522	-174,0
	4,836,000	26,000	1,212	30.52	2.15	-0.15	11,000	2.10	2.20	6,000	350.00	4,000	13.85	14.20	1,000	-1.40	13.65	26.12	75	-16,0
	4,126,000	-239,000	733	34.80	1.15	-0.10	19,000	1.05	1.15	13,000	360.00	2,000	22.70	23.25	1,000	-	23.00	27.05	13	-3,0
	2,753,000	-77,000	252	38.24	0.60	-0.20	12,000	0.60	0.65	12,000	370.00	2,000	32.35	32.85	2,000	-0.15	32.35	32.34	19	4,0
	2,482,000	-76,000	281	44.02	0.45	-0.05	9,000	0.40	0.45	35,000	380.00	12,000	39.75	42.40	1,000	-0.35	39.95	-	13	-12,0
	1,685,000	-2,000	105	48.07	0.30	-0.05	78,000	0.30	0.35	59,000	390.00	2,000	49.65	52.35	1,000	-2.00	50.00	-	1	-1,0
	2,411,000	-3,000	157	51.59	0.20	-0.10	224,000	0.20	0.25	49,000	400.00	1,000	61.30	62.50	1,000	-3.80	58.85	-	1	
	445,000	-14,000	24	57.86	0.15	-0.10	59,000	0.15	0.20	2,000	410.00	2,000	64.60	75.50	1,000	-	-	-	-	
	395,000	-	4	61.41	0.15	-	4,000	0.15	0.20	7,000	420.00	1,000	78.20	84.40	1,000	-	-	-	-	
	169,000	-1,000	5	63.72	0.10	-0.05	1,000	0.10	0.15	5,000	430.00	-	-	-	-	-	-	-	-	
	264,000	-	-	-	-	-	26,000	0.10	0.25	7,000	440.00	-	-	-	-	-	-	-	-	
	163,000	-8,000	13	74.00	0.10	-	72,000	0.05	0.20	1,000	450.00	-	-	-	-	-	-	-	-	
	19,000	-	-	-	-	-	12,000	0.05	0.20	10,000	460.00	-	-	-	-	-	-	-	-	
	3,000	-	-	-	-	-	1,000	0.05	0.40	1,000	470.00	-	-	-	-	-	-	-	-	
	3,000	-	-	-	-	-	3,000	0.10	0.90	1,000	480.00	-	-	-	-	-	-	-	-	

Top

The table that you see above is called an 'Option Chain', which basically lists all the different strike prices available for a contract along with the premium for the same.

Besides this information, the option chain has a lot more trading information such as Open Interest, volume, bid-ask quantity etc. I would suggest you ignore all of it for now and concentrate only on the highlighted information –

1. The highlight in maroon shows the price of the underlying in the spot. As we can see at the time of this snapshot ITC was trading at Rs.336.9 per share
2. The highlight in blue shows all the different strike prices that are available. As we can see starting from Rs.260 (with Rs.10 intervals) we have strike prices all the way up to Rs.480
3. Do remember, each strike price is independent of the other. One can enter into an options agreement , at a specific strike price by paying the required premium
4. For example one can enter into a 340 call option by paying a premium of Rs.4.75/- (highlighted in red)

1. This entitles the buyer to buy ITC shares at the end of expiry at Rs.340. Of course, you now know under which circumstance it would make sense to buy ITC at 340 at the end of expiry

Underlying Price

As we know, a derivative contract derives its value from an underlying asset. The underlying price is the price at which the underlying asset trades in the spot market. For example in the ITC example that we just discussed, ITC was trading at Rs.336.90/- in the spot market. This is the underlying price. For a call option, the underlying price has to increase for the buyer of the call option to benefit.

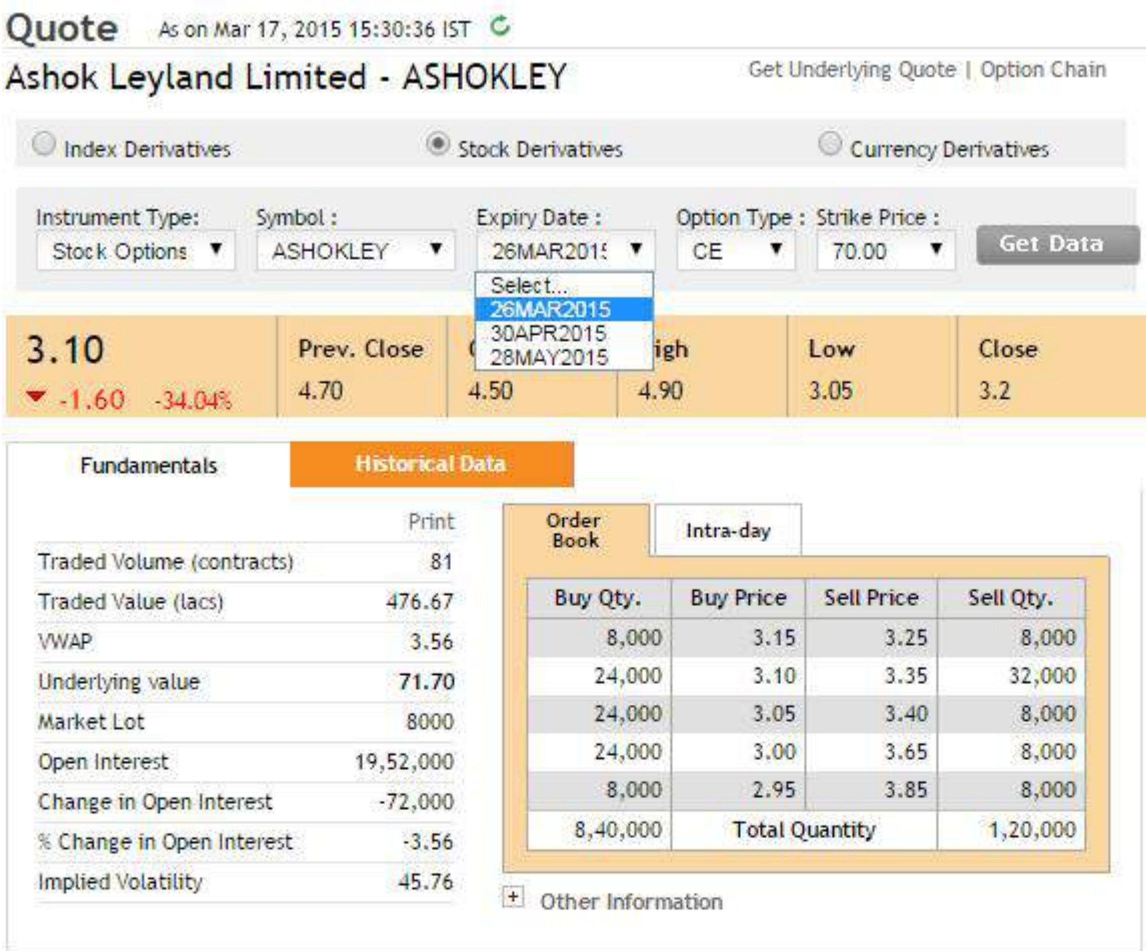
Exercising of an option contract

Exercising of an option contract is the act of claiming your right to buy the options contract at the end of the expiry. If you ever hear the line "exercise the option contract" in the context of a **call option**, it simply means that one is claiming the right to buy the stock at the agreed strike price. Clearly he or she would do it only if the stock is trading above the strike. Here is an important point to note – you can exercise the option only on the day of the expiry and not anytime before the expiry.

Hence, assume with 15 days to expiry one buys ITC 340 Call option when ITC is trading at 330 in the spot market. Further assume, after he buys the 340 call option, the stock price increases to 360 the very next day. Under such a scenario, the option buyer cannot ask for a settlement (he cannot exercise) against the call option he holds. Settlement will happen **only on** the day of the expiry, based on the price the asset is trading in the spot market on the expiry day.

Option Expiry

Similar to a futures contract, options contract also has expiry. In fact both equity futures and option contracts expire on the last Thursday of every month. Just like futures contracts, option contracts also have the concept of current month, mid month, and far month. Have a look at the snapshot below –



This is the snapshot of the call option to buy Ashok Leyland Ltd at the strike price of Rs.70 at Rs.3.10/-. As you can see there are 3 expiry options – 26th March 2015 (current month), 30th April 2015 (mid month), and 28th May 2015 (far month). Of course the premium of the options changes as and when the expiry changes. We will talk more about it at an appropriate time. But at this stage, I would want you to remember just two things with respect to expiry – like futures there are 3 expiry options and the premium is not the same across different expiries.

Option Premium

Since we have discussed premium on a couple instances previously, I guess you would now be clear about a few things with respect to the 'Option Premium'. Premium is the money required to be paid by the option buyer to the option seller/writer. Against the payment of premium, the option buyer buys the right to exercise his desire to buy (or sell in case of put options) the asset at the strike price upon expiry.

If you have got this part clear till now, I guess we are on the right track. We will now proceed to understand a new perspective on 'Premiums'. Also, at this stage I guess it is important to let you know that the whole of option theory hinges upon 'Option Premium'. Option premiums play an extremely crucial role when it comes to trading options. Eventually as we progress through this module you will see that the discussions will be centered heavily on the option premium.

Let us revisit the 'Ajay-Venu' example, that we took up in the previous chapter. Consider the circumstances under which Venu accepted the premium of Rs.100,000/- from Ajay –

1. **News flow** – The news on the highway project was only speculative and no one knew for sure if the project would indeed come up
    1. Think about it, we discussed 3 possible scenarios in the previous chapter out of which 2 were favorable to Venu. So besides the natural statistical edge that Venu has, the fact that the highway news is speculative only increases his chance of benefiting from the agreement
2. **Time** – There was 6 months time to get clarity on whether the project would fructify or not.
    1. This point actually favors Ajay. Since there is more time to expiry the possibility of the event working in Ajay's favor also increases. For example consider this – if you were to run 10kms, in which time duration are you more likely to achieve it – within 20 mins or within 70 mins? Obviously higher the time duration higher is the probability to achieve it.

Now let us consider both these points in isolation and figure out the impact it would have on the option premium.

News – When the deal was done between Ajay and Venu, the news was purely speculative, hence Venu was happy to accept Rs.100,000/- as premium. However for a minute assume the news was not speculative and there was some sort of bias. Maybe there was a local politician who hinted in the recent press conference that they may consider a highway in that area. With this information, the news is no longer a rumor. Suddenly there is a possibility that the highway may indeed come up, albeit there is still an element of speculation.

With this in perspective think about this – do you think Venu will accept Rs.100,000/- as premium? Maybe not, he knows there is a good chance for the highway to come up and therefore the land prices would increase. However because there is still an element of chance he may be willing to take the risk, provided the premium will be more attractive. Maybe he would consider the agreement attractive if the premium was Rs.175,000/- instead of Rs.100,000/-.

Now let us put this in stock market perspective. Assume Infosys is trading at Rs.2200/- today. The 2300 Call option with a 1 month expiry is at Rs.20/-. Put yourself in Venu's shoes (option writer) – would you enter into an agreement by accepting Rs.20/- per share as premium?

If you enter into this options agreement as a writer/seller, then you are giving the right (to the buyer) of buying Infosys option at Rs. 2300 one month down the lane from now.

Assume for the next 1 month there is no foreseeable corporate action which will trigger the share price of Infosys to go higher. Considering this, maybe you may accept the premium of Rs.20/-.

However what if there is a corporate event (like quarterly results) that tends to increase the stock price? Will the option seller still go ahead and accept Rs.20/- as the premium for the agreement? Clearly, it may not be worth to take the risk at Rs.20/-.

Having said this, what if despite the scheduled corporate event, someone is willing to offer Rs.75/- as premium instead of Rs.20/-? I suppose at Rs.75/-, it may be worth taking the risk.

Let us keep this discussion at the back of our mind; we will now take up the 2nd point i.e. '**time'**

When there was 6 months time, clearly Ajay knew that there was ample time for the dust to settle and the truth to emerge with respect to the highway project. However instead of 6 months, what if there was only 10 days time? Since the time has shrunk there is simply not enough time for the event to unfold. Under such a circumstance (with time not being on Ajay's side), do you think Ajay will be happy to pay Rs.100,000/- premium to Venu?. I don't think so, as there is no incentive for Ajay to pay that kind of premium to Venu. Maybe he would offer a lesser premium, say Rs.20,000/- instead.

Anyway, the point that I want to make here keeping both **news and time** in perspective is this – premium is never a fixed rate. It is sensitive to several factors. Some factors tend to increase the premium and some tend to decrease it, and in real markets, all these factors act simultaneously affecting the premium. To be precise there are 5 factors (similar to news and time) that tends to affect the premium. These are called the 'Option Greeks'. We are too early to understand Greeks, but will understand the Greeks at a much later stage in this module.

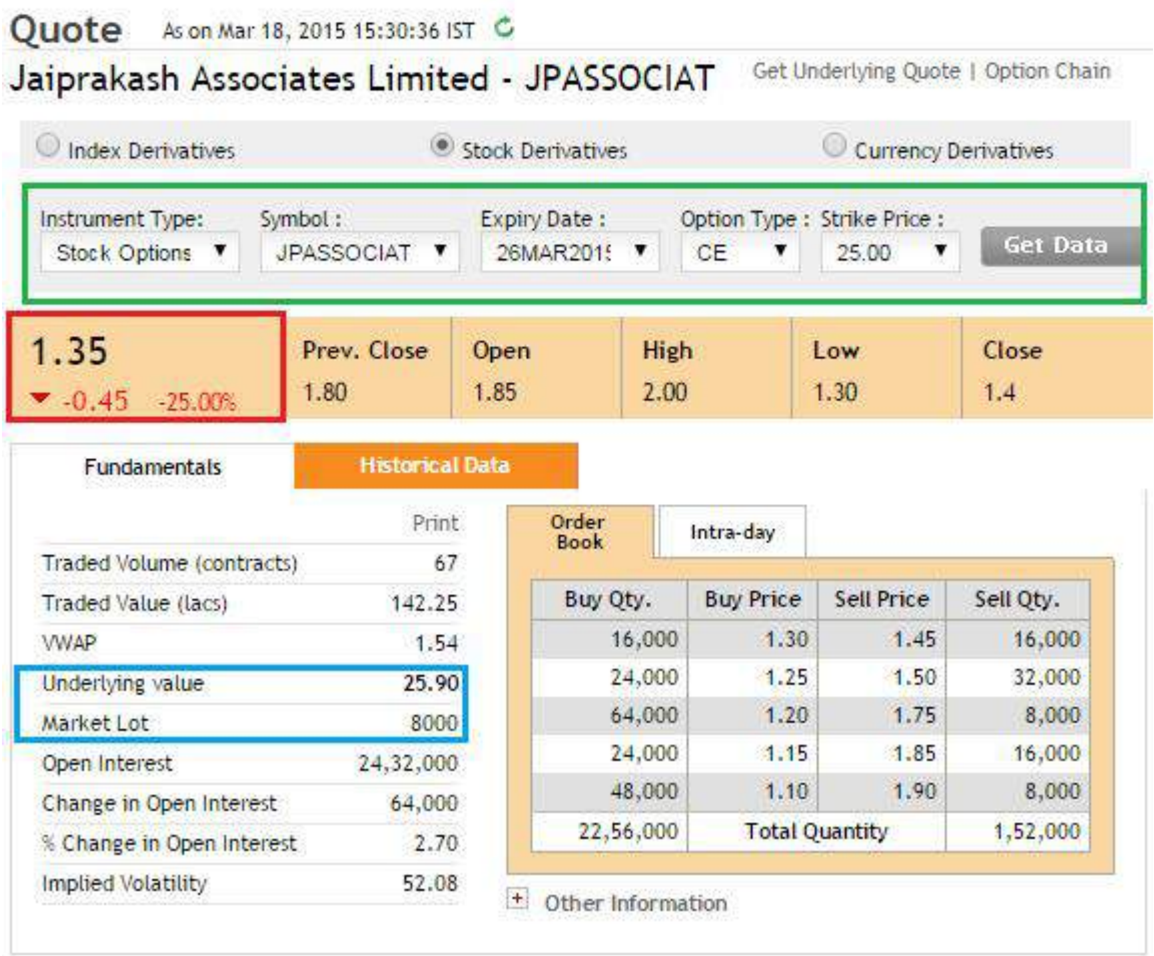
For now, I want you to remember and appreciate the following points with respect to option premium –

1. The concept of premium is pivotal to the Option Theory
2. Premium is never a fixed rate, it is a function of many (influencing) factors
3. In real markets premiums vary almost on a minute by minute basis

If you have gathered and understood these points so far, I can assure that you are on the right path.

Options Settlement

Consider this Call option agreement –



As highlighted in green, this is a Call Option to buy JP Associates at Rs.25/-. The expiry is 26th March 2015. The premium is Rs.1.35/- (highlighted in red), and the market lot is 8000 shares.

Assume there are 2 traders – 'Trader A' and 'Trader B'. Trader A wants to buy this agreement (option buyer) and Trader B wants to sell (write) this agreement. Considering the contract is for 8000 shares, here is how the cash flow would look like –

Since the premium is Rs.1.35/- per share, Trader A is required to pay the total of

= 8000 * 1.35

= Rs.10,800/- as premium amount to Trader B.

Now because Trader B has received this Premium form Trader A, he is obligated to sell Trader A 8000 shares of JP Associates on 26th March 2015, **if** Trader A decides to exercise his agreement. However, this does not mean that Trader B should have 8000 shares with him on 26th March. Options are cash settled in India, this means on 26th March, in the event Trader A decides to exercise his right, Trader B is obligated to pay just the cash differential to Trader A.

To help you understand this better, consider on 26th March JP Associates is trading at Rs.32/-. This means the option buyer (Trader A) will exercise his right to buy 8000 shares of JP Associates at 25/-. In other words, he is getting to buy JP Associates at 25/- when the same is trading at Rs.32/- in the open market.

Normally, this is how the cash flow should look like –

- On 26th Trader A exercises his right to buy 8000 shares from Trader B
- The price at which the transaction will take place is pre decided at Rs.25 (strike price)
- Trader A pays Rs.200,000/- (8000 * 25) to Trader B
- Against this payment Trader B releases 8000 shares at Rs.25 to Trader A
- Trader A almost immediately sells these shares in the open market at Rs.32 per share and receives Rs.256,000/-
- Trader A makes a profit of Rs.56,000/- (256000 – 200000) on this transaction

Another way to look at it is that the option buyer is making a profit of Rs.7/- per shares (32-25) per share. Because the option is cash settled, instead of giving the option buyer 8000 shares, the option seller directly gives him the cash equivalent of the profit he would make. Which means Trader A would receive

= 7*8000

= Rs.56,000/- from Trader B.

Of course, the option buyer had initially spent Rs.10,800/- towards purchasing this right, hence his real profits would be –

= 56,000 – 10,800

= Rs.45,200/-

In fact if you look at in a percentage return terms, this turns out to be a whopping return of 419% (without annualizing).

The fact that one can make such large asymmetric return is what makes options an attractive instrument to trade. This is one of the reasons why Options are massively popular with traders.

Key takeaways from this chapter

1. It makes sense to buy a call option only when one anticipates an increase in the price of an asset

2. The strike price is the anchor price at which both the option buyer and option writer enter into an agreement
3. The underlying price is simply the spot price of the asset
4. Exercising of an option contract is the act of claiming your right to buy the options contract at the end of the expiry
5. Similar to futures contract, options contract also have an expiry. Option contracts expire on the last Thursday of every month
6. Option contracts have different expiries – the current month, mid month, and far month contracts
7. Premiums are not fixed, in fact they vary based on several factors that act upon it
8. Options are cash settled in India.

Buying a Call Option

3.1 – Buying call option

In the previous chapters we looked at the basic structure of a call option and understood the broad context under which it makes sense to buy a call option. In this chapter, we will formally structure our thoughts on the call option and get a firm understanding on both buying and selling of the call option. Before we move ahead any further in this chapter, here is a quick recap of what we learnt in the first chapter –

1. It makes sense to be a buyer of a call option when you expect the underlying price to increase
2. If the underlying price remains flat or goes down then the buyer of the call option loses money
3. The money the buyer of the call option would lose is equivalent to the premium (agreement fees) the buyer pays to the seller/writer of the call option

We will keep the above three points in perspective (which serves as basic guidelines) and understand the call option to a greater extent.

3.2 – Building a case for a call option

There are many situations in the market that warrants the purchase of a call option. Here is one that I just discovered while writing this chapter, thought the example would fit well in the context of our discussions. Have a look at the chart below –

The stock in consideration is Bajaj Auto Limited. As you may know, they are one of the biggest manufacturers of two wheelers in India. For various reasons the stock has been beaten down in the market, so much so that the stock is trading at its 52 week low price. I believe there could be an opportunity to initiate a trade here. Here are my thoughts with respect to this trade –

1. Bajaj Auto is a quality fundamental stock, there is no denying this.
2. The stock has been beaten down so heavily, makes me believe this could be the market's over reaction to volatility in Bajaj Auto's business cycle.
3. I expect the stock price to stop falling sometime soon and eventually rise.
4. However I do not want to buy the stock for delivery (yet) as I'm worried about a further decline of the stock.
5. Extending the above point, the worry of M2M losses prevents me from buying Bajaj Auto's futures as well.
6. At the same time I don't want to miss an opportunity of a sharp reversal in the stock price.

   To sum up, I'm optimistic on the stock price of Bajaj Auto (the stock price to eventually increase) but I'm kind of uncertain about the immediate outlook on the stock. The uncertainty is mainly due the fact that my losses in the short term could be intense if the weakness in the stock persists. However as per my estimate the probability of the loss is low, but nevertheless the probability still exists. So what should I do?

Now, if you realize I'm in a similar dilemma that was Ajay was in (recall the Ajay – Venu example from chapter 1). A circumstance such as this, builds up for a classic case of an options trade.

In the context of my dilemma, clearly buying a call option on Bajaj Auto makes sense for reasons I will explain shortly. Here is a snapshot of Bajaj Auto's option chain –

Option Chain (Equity Derivatives)

Underlying Stock: **BAJAJ-AUTO 2026.90**

View Options Contracts for: Select Index ▼ OR Search for an underlying stock: GO Filter by: Expiry Date 26MAR2015 ▼

CALLS												PUTS								
Chart	OI	Chng in OI	Volume	IV	LTP	Net Chng	Bid Qty	Bid Price	Ask Price	Ask Qty	Strike Price	Bid Qty	Bid Price	Ask Price	Ask Qty	Net Chng	LTP	IV	Volume	Ch
	-	-	-	-	-	-	1,500	413.10	439.70	1,500	1600.00	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,875	369.35	389.70	1,875	1650.00	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,875	319.35	339.70	1,875	1700.00	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	2,250	263.30	289.65	2,250	1750.00	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	2,250	219.55	239.70	2,250	1800.00	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	2,250	169.65	189.70	2,250	1850.00	-	-	-	-	-	-	-	-	
	125	-	-	-	-	-	125	123.70	199.90	250	1900.00	125	0.35	2.50	1,000	-4.50	0.50	43.28	1	
	125	-	-	-	-	-	2,250	64.95	89.90	2,250	1950.00	625	1.05	2.25	125	0.85	1.85	36.71	66	
	7,625	125	11	35.22	37.35	-3.45	250	29.85	34.05	250	2000.00	875	3.95	5.60	125	-0.20	4.00	22.67	58	
	26,750	-7,750	196	25.01	6.35	-5.15	125	5.70	6.35	250	2050.00	1,625	24.65	28.25	250	-1.85	23.15	10.17	24	
	59,125	-1,625	61	32.13	1.50	-1.55	125	1.25	1.95	375	2100.00	625	68.65	82.05	375	16.20	79.00	48.39	14	
	33,125	-4,750	63	44.32	1.00	-0.10	500	0.80	1.65	375	2150.00	2,000	106.00	124.35	375	15.15	122.00	-	38	
	69,625	1,000	42	54.20	0.65	-0.35	500	0.55	0.85	125	2200.00	2,250	160.50	172.50	125	16.25	172.00	-	4	
	29,750	-500	11	72.14	1.10	0.05	625	0.40	1.05	1,000	2250.00	125	217.80	230.50	2,250	54.05	225.00	83.09	12	
	30,500	-500	18	67.52	0.20	0.10	1,875	0.20	0.60	500	2300.00	1,875	259.50	279.40	2,000	82.25	269.40	-	3	
	6,625	-	-	-	-	-	750	0.05	1.60	375	2350.00	-	-	-	-	-	-	-	-	
	11,625	-	-	-	-	-	125	0.05	1.00	500	2400.00	1,500	360.10	492.00	125	-	-	-	-	
	875	-	2	137.31	2.75	2.70	250	0.10	1.95	250	2450.00	500	419.15	428.00	1,500	12.05	426.90	149.90	20	
	625	-	-	-	-	-	-	-	1.80	500	2500.00	250	467.30	482.65	1,125	3.55	469.00	-	1	
	125	-	-	-	-	-	-	-	0.75	125	2700.00	-	-	-	-	-	-	-	-	

As we can see the stock is trading at Rs.2026.9 (highlighted in blue). I will choose to buy 2050 strike call option by paying a premium of Rs.6.35/- (highlighted in red box and red arrow). You may be wondering on what basis I choose the 2050 strike price when in fact there are so many different strike prices available (highlighted in green)?. Well, the process of strike price selection is a vast topic on its own, we will eventually get there in this module, but for now let us just believe 2050 is the right strike price to trade.

3.3 – Intrinsic value of a call option (upon expiry)

So what happens to the call option now considering the expiry is 15 days away? Well, broadly speaking there are three possible scenarios which I suppose you are familiar with by now –

Scenario 1 – The stock price goes above the strike price, say 2080

Scenario 2 – The stock price goes below the strike price, say 2030

Scenario 3 – The stock price stays at 2050

The above 3 scenarios are very similar to the ones we had looked at in chapter 1, hence I will also assume that you are familiar with the P&L calculation at the specific value of the spot in the given scenarios above (if not, I would suggest you read through Chapter 1 again).

The idea I'm interested in exploring now is this –

1. You will agree there are only 3 broad scenarios under which the price movement of Bajaj Auto can be classified (upon expiry) i.e. the price either increases, decreases, or stays flat
2. But what about all the different prices in between? For example if as per Scenario 1 the price is considered to be at 2080 which is above the strike of 2050. What about other strike prices such as 2055, 2060, 2065, 2070 etc? Can we generalize anything here with respect to the P&L?
3. In scenario 2, the price is considered to be at 2030 which is below the strike of 2050. What about other strike prices such as 2045, 2040, 2035 etc? Can we generalize anything here with respect to the P&L?

What would happen to the P&L at various possible prices of spot (upon expiry) – I would like to call these points as the "Possible values of the spot on expiry" and sort of generalize the P&L understanding of the call option.

In order to do this, I would like to first talk about (**in part and not the full concept**) the idea of the 'intrinsic value of the option upon expiry'.

The intrinsic value (IV) of the option upon expiry (**specifically a call option for now**) is defined as the **non – negative value** which the option buyer is entitled to if he were to exercise the call option. In simple words ask yourself (assuming you are the buyer of a call option) how much money you would receive upon expiry, if the call option you hold is profitable. Mathematically it is defined as –

IV = Spot Price – Strike Price

So if Bajaj Auto on the day of expiry is trading at 2068 (in the spot market) the 2050 Call option's intrinsic value would be –

= 2068 – 2050

= 18

Likewise, if Bajaj Auto is trading at 2025 on the expiry day the intrinsic value of the option would be –

= 2025 – 2050

= -25

But remember, IV of an option (irrespective of a call or put) is a non negative number; hence we leave the IV at 2025

= **0**

Now our objective is to keep the idea of intrinsic value of the option in perspective, and to identify how much money I will make at every possible expiry value of Bajaj Auto and in the process make some generalizations on the call option buyer's P&L.

3.4 – Generalizing the P&L for a call option buyer

Now keeping the concept of intrinsic value of an option at the back of our mind, let us work towards building a table which would help us identify how much money, I as the buyer of Bajaj Auto's 2050 call option would make under the various possible spot value changes of Bajaj Auto (in spot market) on expiry. Do remember the premium paid for this option is Rs 6.35/–. Irrespective of how the spot value changes, the fact that I have paid Rs.6.35/- remains unchanged. This is the cost that I have incurred in order to buy the 2050 Call Option. Let us keep this in perspective and work out the P&L table –

Please note – the negative sign before the premium paid represents a cash out flow from my trading account.

Serial No.	Possible values of spot	Premium Paid	Intrinsic Value (IV)	P&L (IV + Premium)
01	1990	(-) 6.35	1990 – 2050 = 0	= 0 + (– 6.35) = – 6.35
02	2000	(-) 6.35	2000 – 2050 = 0	= 0 + (– 6.35) = – 6.35
03	2010	(-) 6.35	2010 – 2050 = 0	= 0 + (– 6.35) = – 6.35
04	2020	(-) 6.35	2020 – 2050 = 0	= 0 + (– 6.35) = – 6.35
05	2030	(-) 6.35	2030 – 2050 = 0	= 0 + (– 6.35) = – 6.35

06	2040	(-) 6.35	2040 – 2050 = 0	= 0 + (– 6.35) = – 6.35
07	2050	(-) 6.35	2050 – 2050 = 0	= 0 + (– 6.35) = – 6.35
08	2060	(-) 6.35	2060 – 2050 = 10	= 10 +(-6.35) = + 3.65
09	2070	(-) 6.35	2070 – 2050 = 20	= 20 +(-6.35) = + 13.65
10	2080	(-) 6.35	2080 – 2050 = 30	= 30 +(-6.35) = + 23.65
11	2090	(-) 6.35	2090 – 2050 = 40	= 40 +(-6.35) = + 33.65
12	2100	(-) 6.35	2100 – 2050 = 50	= 50 +(-6.35) = + 43.65

So what do you observe? The table above throws out 2 strong observations –

1. Even if the price of Bajaj Auto goes down (below the strike price of 2050), the maximum loss seems to be just Rs.6.35/-

1. **Generalization 1** – For a call option buyer a loss occurs when the spot price moves below the strike price. However the loss to the call option buyer is **restricted** to the extent of the premium he has paid

2. The profit from this call option seems to increase exponentially as and when Bajaj Auto starts to move above the strike price of 2050

1. **Generalization 2 –** The call option becomes profitable as and when the spot price moves over and above the strike price. The higher the spot price goes from the strike price, the higher the profit.

3. From the above 2 generalizations it is fair for us to say that the buyer of the call option has a limited risk and a potential to make an unlimited profit.

   Here is a general formula that tells you the Call option P&L for a given spot price –

   P&L = Max [0, (Spot Price – Strike Price)] – Premium Paid

   Going by the above formula, let's evaluate the P&L for a few possible spot values on expiry –

1. 2023
2. 2072

3. 2055

The solution is as follows –

@2023

= Max [0, (2023 – 2050)] – 6.35

= Max [0, (-27)] – 6.35

= 0 – 6.35

= **– 6.35**

The answer is in line with Generalization 1 (loss restricted to the extent of premium paid).

@2072

= Max [0, (2072 – 2050)] – 6.35

= Max [0, (+22)] – 6.35

= 22 – 6.35

= **+15.65**

The answer is in line with Generalization 2 (Call option gets profitable as and when the spot price moves over and above the strike price).

@2055

= Max [0, (2055 – 2050)] – 6.35

= Max [0, (+5)] – 6.35

= 5 – 6.35

= **-1.35**

So, here is a tricky situation, the result what we obtained here is against the 2nd generalization. Despite the spot price being above the strike price, the trade is resulting in a loss! Why is this so? Also if you observe the loss is much lesser than the maximum loss of Rs.6.35/-, it is in fact just Rs.1.35/-. To understand why this is happening we should diligently inspect the P&L behavior around the spot value which is slightly above the strike price (2050 in this case).

Serial No.	Possible values of spot	Premium Paid	Intrinsic Value (IV)	P&L (IV + Premium)
01	2050	(-) 6.35	2050 – 2050 = 0	= 0 + (– 6.35) = – 6.35
02	2051	(-) 6.35	2051 – 2050 = 1	= 1 + (– 6.35) = – 5.35
03	2052	(-) 6.35	2052 – 2050 = 2	= 2 + (– 6.35) = – 4.35
04	2053	(-) 6.35	2053 – 2050 = 3	= 3 + (– 6.35) = – 3.35
05	2054	(-) 6.35	2054 – 2050 = 4	= 4 + (– 6.35) = – 2.35
06	2055	(-) 6.35	2055 – 2050 = 5	= 5 + (– 6.35) = – 1.35
07	2056	(-) 6.35	2056 – 2050 = 6	= 6 + (– 6.35) = – 0.35
08	2057	(-) 6.35	2057 – 2050 = 7	= 7 +(- 6.35) = + 0.65
09	2058	(-) 6.35	2058 – 2050 = 8	= 8 +(- 6.35) = + 1.65
10	2059	(-) 6.35	2059 – 2050 = 9	= 9 +(- 6.35) = + 2.65

As you notice from the table above, the buyer suffers a maximum loss (Rs. 6.35 in this case) till the spot price is equal to the strike price. However, when the spot price starts to move above the strike price, the loss starts to **minimize.** The losses keep getting minimized till a point where the trade neither results in a profit or a loss. This is called the **breakeven point**.

The formula to identify the breakeven point for any call option is –

B.E = Strike Price + Premium Paid

For the Bajaj Auto example, the 'Break Even' point is –

= 2050 + 6.35

= **2056.35**

In fact let us find out find out the P&L at the breakeven point

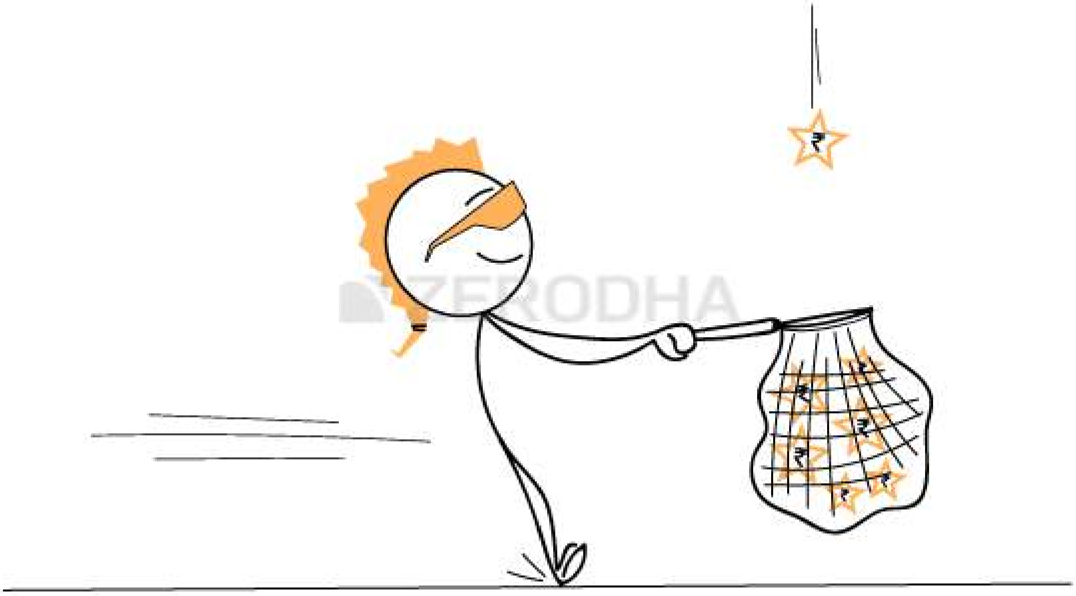
= Max [0, (2056.35 – 2050)] – 6.35

= Max [0, (+6.35)] – 6.35

= +6.35 – 6.35

= 0

As you can see, at the breakeven point we neither make money nor lose money. In other words, if the call option has to be profitable it not only has to move above the strike price but it has to move above the breakeven point.



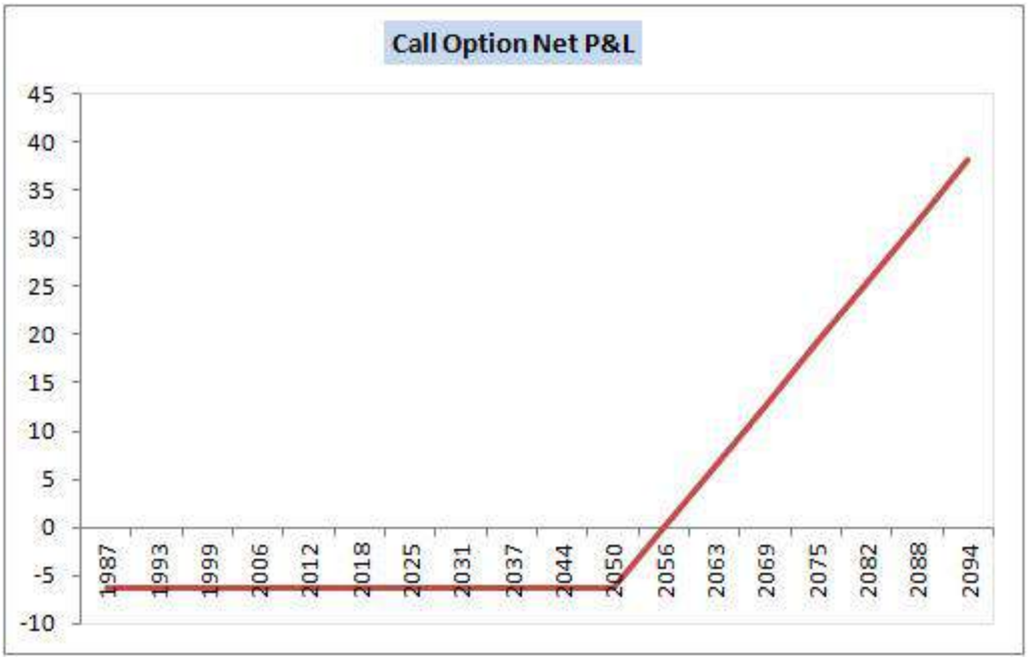
3.5 – Call option buyer's payoff

So far we have understood a few very important features with respect to a call option buyer's payoff; I will reiterate the same –

1. The maximum loss the buyer of a call option experiences is, to the extent of the premium paid. The buyer experiences a loss as long as the spot price is below the strike price
2. The call option buyer has the potential to realize unlimited profits provided the spot price moves higher than the strike price
3. Though the call option is supposed to make a profit when the spot price moves above the strike price, the call option buyer first needs to recover the premium he has paid

4. The point at which the call option buyer completely recovers the premium he has paid is called the breakeven point
5. The call option buyer truly starts making a profit only beyond the breakeven point (which naturally is above the strike price)

   Interestingly, all these points can be visualized if we plot the chart of the P&L. Here is the P&L chart of Bajaj Auto's Call Option trade –



From the chart above you can notice the following points which are in line with the discussion we have just had –

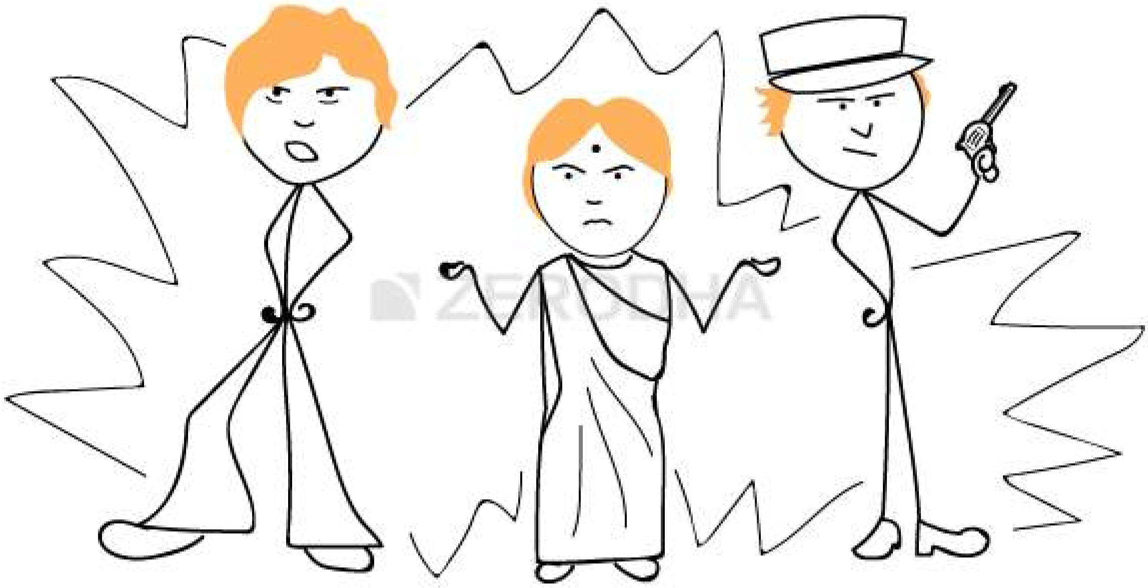
1. The loss is restricted to Rs.6.35/- as long as the spot price is trading at any price below the strike of 2050
2. From 2050 to 2056.35 (breakeven price) we can see the losses getting minimized
3. At 2056.35 we can see that there is neither a profit nor a loss
4. Above 2056.35 the call option starts making money. In fact the slope of the P&L line clearly indicates that the profits start increasing exponentially as and when the spot value moves away from the strike

   Again, from the graph one thing is very evident – A call option buyer has a limited risk but unlimited profit potential. And with this I hope you are now clear with the call option from the buyer's perspective. In the next chapter we will look into the Call Option from the seller's perspective.

Key takeaways from this chapter

1. It makes sense to be a buyer of a call option when you expect the underlying price to increase
2. If the underlying price remains flat or goes down then the buyer of the call option loses money
3. The money the buyer of the call option would lose is equivalent to the premium (agreement fees) the buyer pays to the seller/writer of the call option
4. Intrinsic value (IV) of a call option is a non negative number
5. IV = Max[0, (spot price – strike price)]
6. The maximum loss the buyer of a call option experiences is to the extent of the premium paid. The loss is experienced as long as the spot price is below the strike price
7. The call option buyer has the potential to make unlimited profits provided the spot price moves higher than the strike price
8. Though the call option is supposed to make a profit when the spot price moves above the strike price, the call option buyer first needs to recover the premium he has paid
9. The point at which the call option buyer completely recovers the premium he has paid is called the breakeven point
10. The call option buyer truly starts making a profit only beyond the breakeven point (which naturally is above the strike price).

Selling/Writing a Call Option



4.1 – Two sides of the same coin

Do you remember the 1975 Bollywood super hit flick 'Deewaar', which attained a

cult status for the incredibly famous 'Mere paas maa hai' dialogue ? The movie is about two brothers from the same mother. While one brother, righteous in life grows up to become a cop, the other brother turns out to be a notorious criminal whose views about life is diametrically opposite to his cop brother.

Well, the reason why I'm taking about this legendary movie now is that the option writer and the option buyer are somewhat comparable to these brothers. They are the two sides of the same coin. Of course, unlike the Deewaar brothers there is no view on morality when it comes to Options trading; rather the view is more on markets and what one expects out of the markets. However, there is one thing that you should remember here – whatever happens to the option seller in terms of the P&L, the exact opposite happens to option buyer and vice versa. For example if the option writer is making Rs.70/- in profits, this automatically means the option buyer is losing Rs.70/-. Here is a quick list of such generalisations –

- If the option buyer has **limited risk** (to the extent of premium paid), then the option seller has **limited profit** (again to the extent of the premium he receives)

- If the option buyer has **unlimited profit** potential then the option seller potentially has **unlimited risk**
- The breakeven point is the point at which the option buyer starts to make money, this is the exact same point at which the option writer starts to lose money
- If option buyer is making Rs.X in profit, then it implies the option seller is making a loss of Rs.X
- If the option buyer is losing Rs.X, then it implies the option seller is making Rs.X in profits
- Lastly if the option buyer is of the opinion that the market price will increase (above the strike price to be particular) then the option seller would be of the opinion that the market will stay **at or below** the strike price…and vice versa.

To appreciate these points further it would make sense to take a look at the Call Option from the seller's perspective, which is the objective of this chapter.

Before we proceed, I have to warn you something about this chapter – since there is P&L symmetry between the option seller and the buyer, the discussion going forward in this chapter will look very similar to the discussion we just had in the previous chapter, hence there is a possibility that you could just skim through the chapter. Please don't do that, I would suggest you stay alert to notice the subtle difference and the **huge impact** it has on the P&L of the call option writer.

4.2 – Call option seller and his thought process

Recall the 'Ajay-Venu' real estate example from chapter 1 – we discussed 3 possible scenarios that would take the agreement to a logical conclusion –

1. The price of the land moves above Rs.500,000 (good for Ajay – option buyer)
2. The price stays flat at Rs.500,000 (good for Venu – option seller)
3. The price moves lower than Rs.500,000 (good for Venu – option seller)

If you notice, the option buyer has a statistical **disadvantage** when he buys options – only 1 possible scenario out of the three benefits the option buyer. In other words 2 out of the 3 scenarios benefit the option seller. This is just **one** of the incentives for the option writer to sell options. Besides this natural statistical edge, if the option seller also has a good market insight then the chances of the option seller being profitable are quite high.

Please do note, I'm only talking about a natural statistical edge here and by no way am I suggesting that an option seller will always make money.

Anyway let us now take up the same 'Bajaj Auto' example we took up in the previous chapter and build a case for a **call option seller** and understand how he would view the same situation. Allow me repost the chart –

- The stock has been heavily beaten down, clearly the sentiment is extremely weak
- Since the stock has been so heavily beaten down – it implies many investors/traders in the stock would be stuck in desperate long positions
- Any increase in price in the stock will be treated as an opportunity to exit from the stuck long positions
- Given this, there is little chance that the stock price will increase in a hurry – especially in the near term
- Since the expectation is that the stock price won't increase, selling the Bajaj Auto's call option and collecting the premium can be perceived as a good trading opportunity

With these thoughts, the option writer decides to sell a call option. The most important point to note here is – the option seller is selling a call option because he believes that the price of Bajaj Auto will NOT increase in the near future. Therefore he believes that, selling the call option and collecting the premium is a good strategy.

As I mentioned in the previous chapter, selecting the right strike price is a very important aspect of options trading. We will talk about this in greater detail as we go forward in this module. For now, let us assume the option seller decides to sell Bajaj

Auto's 2050 strike option and collect Rs.6.35/- as premiums. Please refer to the option chain below for the details –

Option Chain (Equity Derivatives)

Underlying Stock: **BAJAJ-AUTO 2026.90**

View Options Contracts for: Select Index OR Search for an underlying stock: GO Filter by: Expiry Date 26MAR2015

CALLS												PUTS								
Chart	OI	Chng in OI	Volume	IV	LTP	Net Chng	Bid Qty	Bid Price	Ask Price	Ask Qty	Strike Price	Bid Qty	Bid Price	Ask Price	Ask Qty	Net Chng	LTP	IV	Volume	Ch
	-	-	-	-	-	-	1,500	413.10	439.70	1,500	1600.00	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,875	369.35	389.70	1,875	1650.00	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,875	319.35	339.70	1,875	1700.00	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	2,250	263.30	289.65	2,250	1750.00	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	2,250	219.55	239.70	2,250	1800.00	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	2,250	169.65	189.70	2,250	1850.00	-	-	-	-	-	-	-	-	
	125	-	-	-	-	-	125	123.70	199.90	250	1900.00	125	0.35	2.50	1,000	-4.50	0.50	43.28	1	
	125	-	-	-	-	-	2,250	64.95	89.90	2,250	1950.00	625	1.05	2.25	125	0.85	1.85	36.71	66	
	7,625	125	11	35.22	37.35	-3.45	250	29.85	34.05	250	2000.00	875	3.95	5.60	125	-0.20	4.00	22.67	58	
	26,750	-7,750	196	25.01	6.35	-5.15	125	5.70	6.35	250	2050.00	1,625	24.65	28.25	250	-1.85	23.15	10.17	24	
	59,125	-1,625	61	32.13	1.50	-1.55	125	1.25	1.95	375	2100.00	625	68.65	82.05	375	16.20	79.00	48.39	14	
	33,125	-4,750	63	44.32	1.00	-0.10	500	0.80	1.65	375	2150.00	2,000	106.00	124.35	375	15.15	122.00	-	38	
	69,625	1,000	42	54.20	0.65	-0.35	500	0.55	0.85	125	2200.00	2,250	160.50	172.50	125	16.25	172.00	-	4	
	29,750	-500	11	72.14	1.10	0.05	625	0.40	1.05	1,000	2250.00	125	217.80	230.50	2,250	54.05	225.00	83.09	12	
	30,500	-500	18	67.52	0.20	0.10	1,875	0.20	0.60	500	2300.00	1,875	259.50	279.40	2,000	82.25	269.40	-	3	
	6,625	-	-	-	-	-	750	0.05	1.60	375	2350.00	-	-	-	-	-	-	-	-	
	11,625	-	-	-	-	-	125	0.05	1.00	500	2400.00	1,500	360.10	492.00	125	-	-	-	-	
	875	-	2	137.31	2.75	2.70	250	0.10	1.95	250	2450.00	500	419.15	428.00	1,500	12.05	426.90	149.90	20	
	625	-	-	-	-	-	-	-	1.80	500	2500.00	250	467.30	482.65	1,125	3.55	469.00	-	1	
	125	-	-	-	-	-	-	-	0.75	125	2700.00	-	-	-	-	-	-	-	-	

Let us now run through the same exercise that we ran through in the previous chapter to understand the P&L profile of the call option seller and in the process make the required generalizations. The concept of an intrinsic value of the option that we discussed in the previous chapter will hold true for this chapter as well.

Serial No.	Possible values of spot	Premium Received	Intrinsic Value (IV)	P&L (Premium – IV)
01	1990	+ 6.35	1990 – 2050 = 0	= 6.35 – 0 = + 6.35
02	2000	+ 6.35	2000 – 2050 = 0	= 6.35 – 0 = + 6.35
03	2010	+ 6.35	2010 – 2050 = 0	= 6.35 – 0 = + 6.35
04	2020	+ 6.35	2020 – 2050 = 0	= 6.35 – 0 = + 6.35

05	2030	+ 6.35	2030 – 2050 = 0	= 6.35 – 0 = + 6.35
06	2040	+ 6.35	2040 – 2050 = 0	= 6.35 – 0 = + 6.35
07	2050	+ 6.35	2050 – 2050 = 0	= 6.35 – 0 = + 6.35
08	2060	+ 6.35	2060 – 2050 = 10	= 6.35 – 10 = – 3.65
09	2070	+ 6.35	2070 – 2050 = 20	= 6.35 – 20 = – 13.65
10	2080	+ 6.35	2080 – 2050 = 30	= 6.35 – 30 = – 23.65
11	2090	+ 6.35	2090 – 2050 = 40	= 6.35 – 40 = – 33.65
12	2100	+ 6.35	2100 – 2050 = 50	= 6.35 – 50 = – 43.65

Before we proceed to discuss the table above, please note –

1. The positive sign in the 'premium received' column indicates a cash inflow (credit) to the option writer
2. **The intrinsic value of an option** (upon expiry) remains the same irrespective of call option buyer or seller
3. The net P&L calculation for an option writer changes slightly, the logic goes like this

1. When an option seller sells options he receives a premium (for example Rs.6.35/). He would experience a loss only after he losses the entire premium. Meaning after receiving a premium of Rs.6.35, if he loses Rs.5/- it implies he is still in profit of Rs.1.35/-. Hence for an option seller to experience a loss he has to first lose the premium he has received, any money he loses over and above the premium received, will be his real loss. Hence the P&L calculation would be 'Premium – Intrinsic Value'
2. You can extend the same argument to the option buyer. Since the option buyer pays a premium, he first needs to recover the premium he has paid, hence he would be profitable over and above the premium amount he has received, hence the P&L calculation would be ' Intrinsic Value – Premium'.

The table above should be familiar to you now. Let us inspect the table and make a few generalizations (do bear in mind the strike price is 2050) –

1. As long as Bajaj Auto stays at or below the strike price of 2050, the option seller gets to make money – as in he gets to pocket the entire premium of Rs.6.35/-. However, do note the profit remains constant at Rs.6.35/-.
    1. **Generalization 1** – The call option writer experiences a maximum profit to the extent of the premium received as long as the spot price remains at or below the strike price (for a call option)
2. The option writer experiences an exponential loss as and when Bajaj Auto starts to move above the strike price of 2050
    1. **Generalization 2 –** The call option writer starts to lose money as and when the spot price moves over and above the strike price. Higher the spot price moves away from the strike price, larger the loss.
3. From the above 2 generalizations it is fair to conclude that, the option seller can earn limited profits and can experience unlimited loss

We can put these generalizations in a formula to estimate the P&L of a Call option seller –

P&L = Premium – Max [0, (Spot Price – Strike Price)]

Going by the above formula, let's evaluate the P&L for a few possible spot values on expiry –

1. 2023
2. 2072
3. 2055

The solution is as follows –

@2023

= 6.35 – Max [0, (2023 – 2050)]

= 6.35 – Max [0, -27]

= 6.35 – 0

= **6.35**

The answer is in line with Generalization 1 (profit restricted to the extent of premium received).

@2072

= 6.35 – Max [0, (2072 – 2050)]

= 6.35 – 22

= **-15.56**

The answer is in line with Generalization 2 (Call option writers would experience a loss as and when the spot price moves over and above the strike price)

@2055

= 6.35 – Max [0, (2055 – 2050)]

= 6.35 – Max [0, +5]

= 6.35 – 5

= **1.35**

Though the spot price is higher than the strike, the call option writer still seems to be making some money here. This is against the 2nd generalization. I'm sure you would know this by now, this is because of the 'breakeven point' concept, which we discussed in the previous chapter.

Anyway let us inspect this a bit further and look at the P&L behavior in and around the strike price to see exactly at which point the option writer will start making a loss.

Serial No.	Possible values of spot	Premium Received	Intrinsic Value (IV)	P&L (Premium – IV)
01	2050	+ 6.35	2050 – 2050 = 0	= 6.35 – 0 = 6.35
02	2051	+ 6.35	2051 – 2050 = 1	= 6.35 – 1 = 5.35
03	2052	+ 6.35	2052 – 2050 = 2	= 6.35 – 2 = 4.35
04	2053	+ 6.35	2053 – 2050 = 3	= 6.35 – 3 = 3.35
05	2054	+ 6.35	2054 – 2050 = 4	= 6.35 – 4 = 2.35
06	2055	+ 6.35	2055 – 2050 = 5	= 6.35 – 5 = 1.35

07	2056	+ 6.35	2056 – 2050 = 6	= 6.35 – 6 = 0.35
08	2057	+ 6.35	2057 – 2050 = 7	= 6.35 – 7 = – 0.65
09	2058	+ 6.35	2058 – 2050 = 8	= 6.35 – 8 = – 1.65
10	2059	+ 6.35	2059 – 2050 = 9	= 6.35 – 9 = – 2.65

Clearly even when the spot price moves higher than the strike, the option writer still makes money, he continues to make money till the spot price increases more than **strike + premium** received. At this point he starts to lose money, hence calling this the '**breakdown point**' seems appropriate.

Breakdown point for the call option seller = Strike Price + Premium Received

For the Bajaj Auto example,

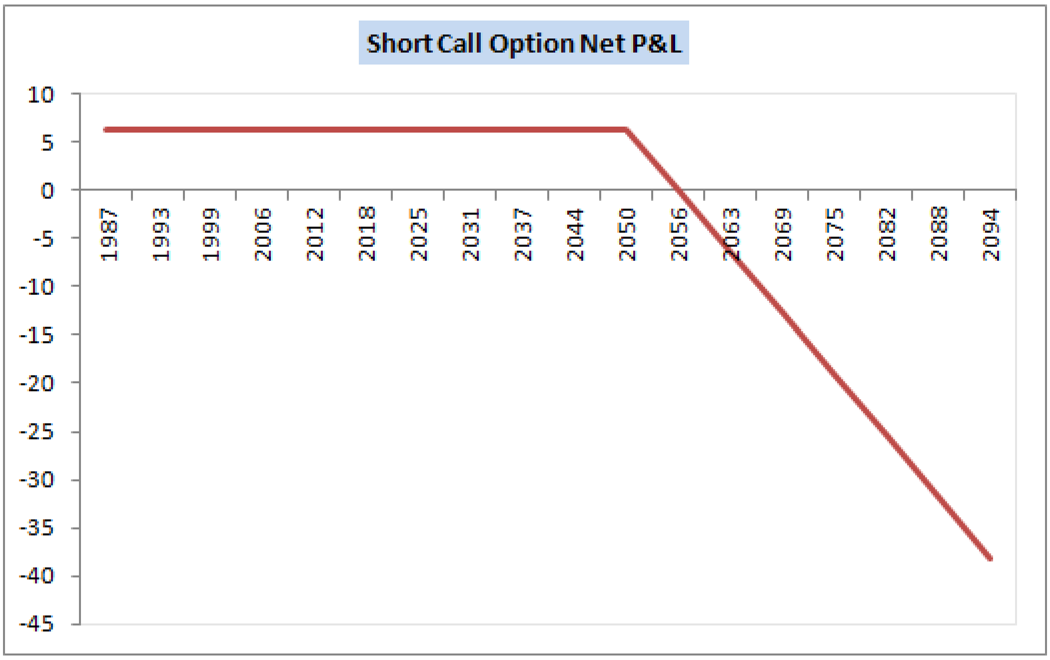
= 2050 + 6.35

= 2056.35

So, the breakeven point for a call option buyer becomes the breakdown point for the call option seller.

4.3 – Call Option seller pay-off

As we have seen throughout this chapter, there is a great symmetry between the call option buyer and the seller. In fact the same can be observed if we plot the P&L graph of an option seller. Here is the same –



The call option sellers P&L payoff looks like a mirror image of the call option buyer's P&L pay off. From the chart above you can notice the following points which are in line with the discussion we have just had –

1. The profit is restricted to Rs.6.35/- as long as the spot price is trading at any price below the strike of 2050
2. From 2050 to 2056.35 (breakdown price) we can see the profits getting minimized
3. At 2056.35 we can see that there is neither a profit nor a loss
4. Above 2056.35 the call option seller starts losing money. In fact the slope of the P&L line clearly indicates that the losses start to increase exponentially as and when the spot value moves away from the strike price

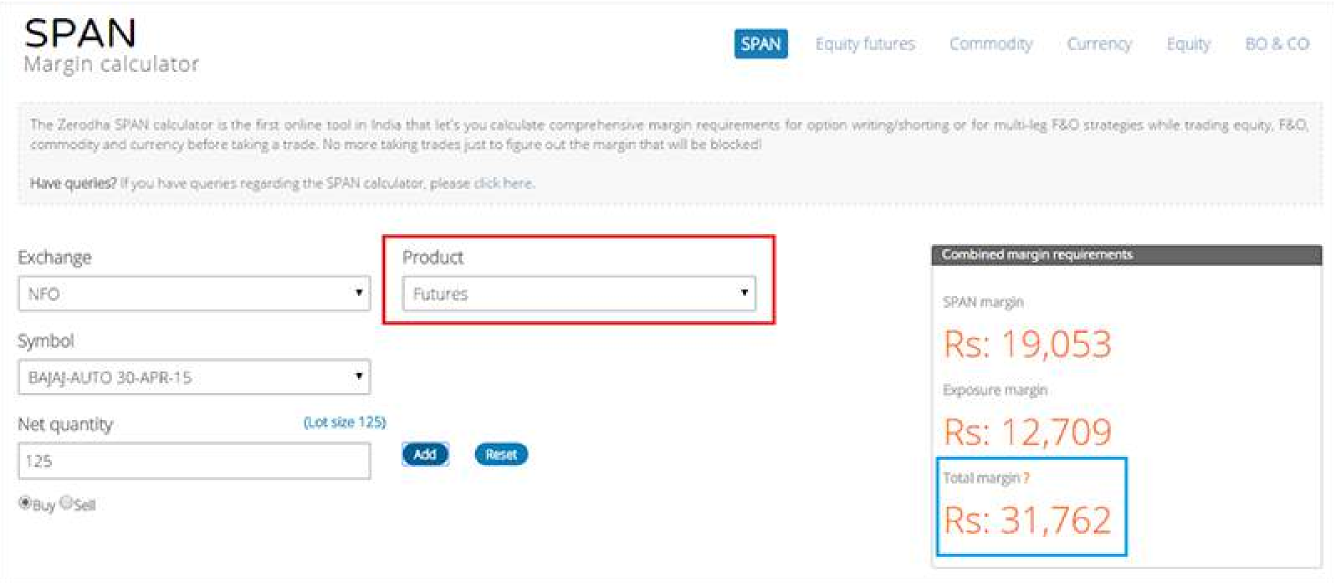
4.4 – A note on margins

Think about the risk profile of both the call option buyer and a call option seller. The call option buyer bears no risk. He just has to pay the required premium amount to the call option seller, against which he would buy the right to buy the underlying at a later point. We know his risk (maximum loss) is restricted to the premium he has already paid.

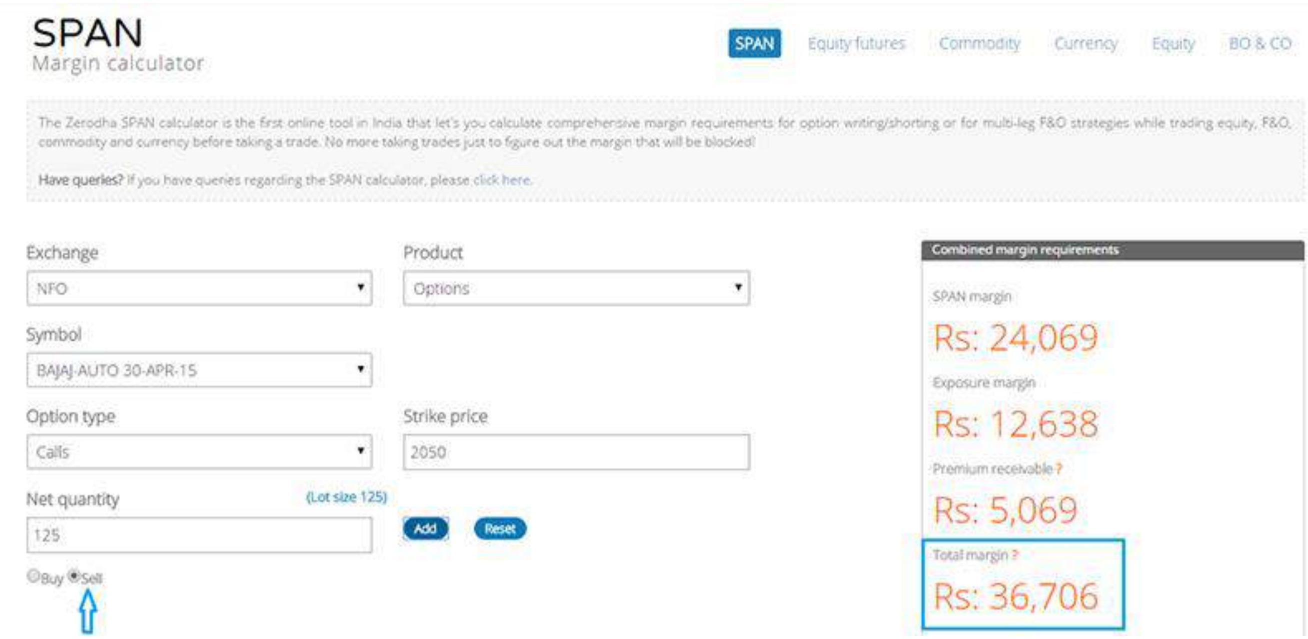
However when you think about the risk profile of a call option seller, we know that he bears an unlimited risk. His potential loss can exponentially increase as and when the spot price moves above the strike price. Having said this, think about the stock exchange – how can they manage the risk exposure of an option seller in the backdrop of an 'unlimited loss' potential? What if the loss becomes so huge that the option seller decides to default?

Clearly the stock exchange cannot afford to permit a derivative participant to carry such a huge default risk, hence it is mandatory for the option seller to park some money as margins. The margins charged for an option seller is similar to the margin requirement for a futures contract.

Here is the snapshot from the Zerodha Margin calculator for Bajaj Auto futures and Bajaj Auto 2050 Call option, both expiring on 30th April 2015.



And here is the margin requirement for selling 2050 call option.



As you can see the margin requirements are somewhat similar in both the cases (option writing and trading futures). Of course there is a small difference; we will deal with it at a later stage. For now, I just want you to note that option selling requires margins similar to futures trading, and the margin amount is roughly the same.

4.5 – Putting things together

I hope the last four chapters have given you all the clarity you need with respect to call options buying and selling. Unlike other topics in Finance, options are a little heavy duty. Hence I guess it makes sense to consolidate our learning at every opportunity and then proceed further. Here are the key things you should remember with respect to buying and selling call options.

With respect to option buying

- You buy a call option only when you are bullish about the underlying asset. Upon expiry the call option will be profitable only if the underlying has moved over and above the strike price
- Buying a call option is also referred to as 'Long on a Call Option' or simply '**Long Call**'
- To buy a call option you need to pay a premium to the option writer
- The call option buyer has limited risk (to the extent of the premium paid) and an potential to make an unlimited profit
- The breakeven point is the point at which the call option buyer neither makes money nor experiences a loss
- P&L = Max [0, (Spot Price – Strike Price)] – Premium Paid
- Breakeven point = Strike Price + Premium Paid

With respect to option selling

- You sell a call option (also called option writing) only when you believe that upon expiry, the underlying asset will not increase beyond the strike price
- Selling a call option is also called 'Shorting a call option' or simply '**Short Call**'
- When you sell a call option you receive the premium amount
- The profit of an option seller is restricted to the premium he receives, however his loss is potentially unlimited
- The breakdown point is the point at which the call option seller gives up all the premium he has made, which means he is neither making money nor is losing money
- Since short option position carries unlimited risk, he is required to deposit margin
- Margins in case of short options is similar to futures margin
- P&L = Premium – Max [0, (Spot Price – Strike Price)]
- Breakdown point = Strike Price + Premium Received

Other important points

- When you are bullish on a stock you can either buy the stock in spot, buy its futures, or buy a call option
- When you are bearish on a stock you can either sell the stock in the spot (although on a intraday basis), short futures, or short a call option
- The calculation of the intrinsic value for call option is standard, it does not change based on whether you are an option buyer/ seller
- However the intrinsic value calculation changes for a 'Put' option
- The net P&L calculation methodology is different for the call option buyer and seller.
- Throughout the last 4 chapters we have looked at the P&L keeping the expiry in perspective, this is only to help you understand the P&L behavior better
- One need not wait for the option expiry to figure out if he is going to be profitable or not
- Most of the option trading is based on the change in premiums
- For example, if I have bought Bajaj Auto 2050 call option at Rs.6.35 in the morning and by noon the same is trading at Rs.9/- I can choose to sell and book profits
- The premiums change dynamically all the time, it changes because of many variables at play, we will understand all of them as we proceed through this module
- Call option is abbreviated as 'CE'. So Bajaj Auto 2050 Call option is also referred to as Bajaj Auto 2050CE. CE is an abbreviation for 'European Call Option'.

4.6 – European versus American Options

Initially when option was introduced in India, there are two types of options available – European and American Options. All index options (Nifty, Bank Nifty options) were European in nature and the stock options were American in nature. The difference between the two was mainly in terms of 'Options exercise'.

European Options – If the option type is European then it means that the option buyer will have to mandatory wait till the expiry date to exercise his right. **The settlement is based on the value of spot market on expiry day**. For example if he has bought a Bajaj Auto 2050 Call option, then for the buyer to be profitable Bajaj Auto has to go higher than the breakeven point on the day of the expiry. Even not it the option is worthless to the buyer and he will lose all the premium money that he paid to the Option seller.

American Options – In an American Option, the option buyer can exercise his right to buy the option whenever he deems appropriate during the tenure of the options expiry. **The settlement is dependent of the spot market at that given moment and not really depended on expiry**. For instance he buys Bajaj Auto 2050 Call option today when Bajaj is trading at 2030 in spot market and there are 20 more days for expiry. The next day Bajaj Auto crosses 2050. In such a case, the buyer of Baja Auto 2050 American Call option can exercise his right, which means the seller is obligated to settle with the option buyer. The expiry date has little significance here.

For people familiar with option you may have this question – 'Since we can anyway buy an option now and sell it later, maybe in 30 minutes after we purchase, how does it matter if the option is American or European?'.

Valid question, well think about the Ajay-Venu example again. Here Ajay and Venu were to revisit the agreement in 6 months time (this is like a European Option). If instead of 6 months, imagine if Ajay had insisted that he could come anytime during the tenure of the agreement and claim his right (like an American Option). For example there could be a strong rumor about the highway project (after they signed off the agreement). In the back of the strong rumor, the land prices shoots up and hence Ajay decides exercise his right, clearly Venu will be obligated to deliver the land to Ajay (even though he is very clear that the land price has gone up because of strong rumors). Now because Venu carries addition risk of getting 'exercised' on any day as opposed to the day of the expiry, the premium he would need is also higher (so that he is compensated for the risk he takes).

For this reason, American options are always more expensive than European Options.

Also, you maybe interested to know that about 3 years ago NSE decided to get rid of American option completely from the derivatives segment. **So all options in India are now European in nature**, which means the buyer can exercise his option based on the spot price on the expiry day.

We will now proceed to understand the 'Put Options'.

Key takeaways from this chapter

1. You sell a call option when you are bearish on a stock
2. The call option buyer and the seller have a symmetrically opposite P&L behavior
3. When you sell a call option you receive a premium
4. Selling a call option requires you to deposit a margin
5. When you sell a call option your profit is limited to the extent of the premium you receive and your loss can potentially be unlimited
6. P&L = Premium – Max [0, (Spot Price – Strike Price)]
7. Breakdown point = Strike Price + Premium Recieved
8. In India all options are European in nature

The Put Option Buying

5.1 – Getting the orientation right

I hope by now you are through with the practicalities of a Call option from both the buyers and sellers perspective. If you are indeed familiar with the call option then orienting yourself to understand 'Put Options' is fairly easy. The only change in a put option (from the buyer's perspective) is the view on markets should be bearish as opposed to the bullish view of a call option buyer.

The put option buyer is betting on the fact that the stock price will go down (by the time expiry approaches). Hence in order to profit from this view he enters into a Put Option agreement. In a put option agreement, the buyer of the put option can buy the right to sell a stock at a price (strike price) irrespective of where the underlying/stock is trading at.

Remember this generality – whatever the buyer of the option anticipates, the seller anticipates the exact opposite, therefore a market exists. After all, if everyone expects the same a market can never exist. So if the Put option buyer expects the market to go down by expiry, then the put option seller would expect the market (or the stock) to go up or stay flat.

A put option buyer **buys the right to sell** the underlying to the put option writer at a predetermined rate (Strike price. This means the put option seller, upon expiry will have to buy if the 'put option buyer' is selling him. Pay attention here – at the time of the agreement the put option seller is selling a right to the put option buyer where in the buyer can 'sell' the underlying to the 'put option seller' at the time of expiry.

Confusing? well, just think of the 'Put Option' as a simple contract where two parties meet today and agree to enter into a transaction based on the price of an underlying –

- The party agreeing to pay a premium is called the 'contract buyer' and the party receiving the premium is called the 'contract seller'
- The contract buyer pays a premium and buys himself a **right**
- The contract seller receives the premium and **obligates** himself
- The contract buyer will decide whether or not to exercise his right on the expiry day

- If the contract buyer decides to exercise his right then he gets to sell the underlying (maybe a stock) at the agreed price (strike price) and the contract seller will be obligated to buy this underlying from the contract buyer
- Obviously the contract buyer will exercise his right only if the underlying price is trading below the strike price – this means by virtue of the contract the buyer holds, he can sell the underlying at a much higher price to the contract seller when the same underlying is trading at a lower price in the open market.

  Still confusing? Fear not, we will deal with an example to understand this more clearly.

  Consider this situation, between the **Contract buyer** and the **Contract seller** –

- Assume Reliance Industries is trading at Rs.850/-
- Contract buyer buys the right to sell Reliance to contract seller at Rs.850/- upon expiry
- To obtain this right, contract buyer has to pay a premium to the contract seller
- Against the receipt of the premium contract seller will agree to buy Reliance Industries shares at Rs.850/- upon expiry but only if contract buyer wants him to buy it from him
- For example if upon expiry Reliance is at Rs.820/- then contract buyer can demand contract seller to buy Reliance at Rs.850/- from him
- This means contract buyer can enjoy the benefit of selling Reliance at Rs.850/- when it is trading at a lower price in the open market (Rs.820/-)
- If Reliance is trading at Rs.850/- or higher upon expiry (say Rs.870/-) it does not make sense for contract buyer to exercise his right and ask contract seller to buy the shares from him at Rs.850/-. This is quite obvious since he can sell it at a higher rate in the open market
- A agreement of this sort where one obtains the right to sell the underlying asset upon expiry is called a 'Put option'
- Contract seller will be obligated to buy Reliance at Rs.850/- from contract buyer because he has sold Reliance 850 Put Option to contract buyer

I hope the above discussion has given you the required orientation to the Put Options. If you are still confused, it is alright as I'm certain you will develop more clarity as we proceed further. However there are 3 key points you need to be aware of at this stage –

- The buyer of the put option is bearish about the underlying asset, while the seller of the put option is neutral or bullish on the same underlying
- The buyer of the put option has the right to sell the underlying asset upon expiry at the strike price
- The seller of the put option is obligated (since he receives an upfront premium) to buy the underlying asset at the strike price from the put option buyer if the buyer wishes to exercise his right.

5.2 – Building a case for a Put Option buyer

Like we did with the call option, let us build a practical case to understand the put option better. We will first deal with the Put Option from the buyer's perspective and then proceed to understand the put option from the seller's perspective.

Here is the end of day chart of Bank Nifty (as on 8th April 2015) –

Here are some of my thoughts with respect to Bank Nifty –

1. Bank Nifty is trading at 18417
2. 2 days ago Bank Nifty tested its resistance level of 18550 (resistance level highlighted by a green horizontal line)
3. I consider 18550 as resistance since there is a price action zone at this level which is well spaced in time (for people who are not familiar with the concept of resistance I would suggest you read about it **here**
4. I have highlighted the price action zone in a blue rectangular boxes
5. On 7th of April (yesterday) RBI maintained a status quo on the monetary rates – they kept the key central bank rates unchanged (as you may know RBI monetary policy is the most important event for Bank Nifty)
6. Hence in the backdrop of a technical resistance and lack of any key fundamental trigger, banks may not be the flavor of the season in the markets
7. As result of which traders may want to sell banks and buy something else which is the flavor of the season
8. For these reasons I have a bearish bias towards Bank Nifty
9. However shorting futures maybe a bit risky as the overall market is bullish, it is only the banking sector which is lacking luster
10. Under circumstances such as these employing an option is best, hence buying a Put Option on the bank Nifty may make sense
11. Remember when you buy a put option you benefit when the underlying goes down

Backed by this reasoning, I would prefer to buy the 18400 Put Option which is trading at a premium of Rs.315/-. Remember to buy this 18400 Put option, I will have to pay the required premium (Rs.315/- in this case) and the same will be received by the 18400 Put option seller.

Option Chain (Equity Derivatives)

Underlying Index: **BANKNIFTY 18416.60** As on Apr 08, 2015 5:30:36 IST

View Options Contracts for: BANKNIFTY OR Search for an underlying stock: GO Filter by: Expiry Date 30APR2015 Futures contracts

CALLS												PUTS										
Chart	OI	Chng in OI	Volume	IV	LTP	Net Chng	Bid Qty	Bid Price	Ask Price	Ask Qty	Strike Price	Bid Qty	Bid Price	Ask Price	Ask Qty	Net Chng	LTP	IV	Volume	Chng in OI	OI	Chart
	100	-	-	-	2,469.30	-	25	2,273.80	2,341.05	25	16200.00	125	9.90	10.10	2,000	-1.55	10.10	27.47	10	125	12,400	
	-	-	-	-	-	-	375	2,134.55	2,275.20	375	16300.00	2,500	2.00	-	-	-	16.05	-	-	-	375	
	175	-	-	-	1,950.90	-	25	2,043.05	2,190.45	25	16400.00	25	7.05	16.80	2,000	-	-	-	-	-	-	
	350	-	-	-	2,100.00	-	25	1,961.55	2,049.50	25	16500.00	25	13.25	13.75	25	-1.80	13.35	25.41	2,509	-1,900	47,625	
	-	-	-	-	-	-	375	1,856.00	1,978.00	375	16600.00	2,000	5.25	20.00	25	-	16.00	-	-	-	1,725	
	13,050	-	2	-	1,800.00	-93.85	25	1,774.15	1,827.75	25	16700.00	75	15.05	23.30	25	-4.90	15.10	23.71	14	-	16,500	
	975	-25	1	26.39	1,750.00	-102.10	25	1,658.35	1,735.85	25	16800.00	2,500	3.50	29.00	25	-2.25	24.05	24.74	26	-	8,725	
	-	-	-	-	-	-	50	1,572.60	1,665.10	50	16900.00	50	15.55	31.95	50	-10.00	32.00	25.05	10	50	4,925	
	43,400	1,475	101	-	1,510.00	-41.85	25	1,515.80	1,544.00	25	17000.00	1,000	33.25	34.30	25	-2.60	33.05	23.96	29,328	2,000	398,875	
	-	-	-	-	-	-	375	1,377.95	1,502.65	375	17100.00	25	38.30	49.00	50	2.15	42.00	24.06	28	-	8,100	
	50	-	-	-	1,745.00	-	25	1,300.65	1,427.95	25	17200.00	25	40.05	51.00	100	4.50	51.40	23.98	136	50	13,775	
	-	-	-	-	-	-	375	1,206.45	1,304.15	375	17300.00	25	55.05	68.30	1,000	-2.85	56.00	23.15	428	-1,325	9,200	
	175	-	-	-	1,200.00	-	375	1,095.25	1,211.75	375	17400.00	750	60.10	70.40	25	-1.45	69.25	23.19	64	-225	8,975	
	10,225	-250	54	22.59	1,100.00	20.40	25	1,069.90	1,089.40	25	17500.00	500	79.25	80.00	125	-2.90	80.00	22.76	37,881	-39,100	421,775	
	100	-	1	21.00	1,000.00	41.30	375	930.10	1,054.50	375	17600.00	1,750	84.25	101.00	25	-2.75	93.75	22.46	201	-1,550	8,450	
	1,000	-	-	-	836.90	-	25	900.00	958.00	375	17700.00	25	110.00	112.00	125	5.55	111.50	22.32	908	-2,900	15,300	
	1,000	-100	23	25.36	900.00	15.35	50	792.50	859.35	25	17800.00	150	125.00	131.60	25	4.25	129.00	21.95	822	-3,400	30,450	
	3,325	-	6	23.43	800.00	138.15	25	733.10	777.10	50	17900.00	50	147.05	153.50	100	3.95	150.15	21.68	428	1,250	18,575	
	67,125	-3,950	1,517	20.81	690.00	-55.15	250	677.95	694.00	50	18000.00	25	174.10	176.00	50	0.40	176.00	21.51	43,576	-19,600	353,800	
	7,150	-1,375	71	20.95	624.00	-28.05	200	611.00	640.40	50	18100.00	1,000	202.25	214.95	100	18.80	213.65	21.88	1,240	-1,850	16,575	
	13,125	-25	147	20.78	557.05	-57.25	50	540.00	559.45	25	18200.00	3,650	237.00	238.55	25	7.85	237.00	21.14	1,802	475	34,175	
	17,925	-375	156	20.40	490.00	-44.05	25	478.75	500.35	25	18300.00	25	270.75	275.30	25	6.65	271.90	20.88	1,240	650	34,875	
	25,350	-275	572	20.24	430.90	-41.50	50	426.15	436.00	25	18400.00	25	312.35	316.00	250	9.45	315.30	20.89	1,978	2,500	28,900	
	229,950	-20,300	18,068	20.03	375.00	-34.70	25	375.90	382.00	75	18500.00	1,000	355.70	362.00	25	12.30	[illegible]	20.78	21,766	15,750	215,225	
	37,275	6,525	2,466	20.29	332.00	-39.15	25	330.00	335.00	100	18600.00	25	403.70	422.00	150	30.05	[illegible]	20.40	991	1,475	20,325	
	43,375	11,075	3,630	20.21	287.00	-28.80	200	284.00	294.00	100	18700.00	100	464.00	472.10	250	27.65	464.00	20.54	750	1,800	18,600	

Of course buying the Put option is quite simple – the easiest way is to call your broker and ask him to buy the Put option of a specific stock and strike and it will be done for you in matter of a few seconds. Alternatively you can buy it yourself through a trading terminal such as **Zerodha Pi** We will get into the technicalities of buying and selling options via a trading terminal at a later stage.

Now assuming I have bought Bank Nifty's 18400 Put Option, it would be interesting to observe the P&L behavior of the Put Option upon its expiry. In the process we can even make a few generalizations about the behavior of a Put option's P&L.

5.3 – Intrinsic Value (IV) of a Put Option

Before we proceed to generalize the behavior of the Put Option P&L, we need to understand the calculation of the intrinsic value of a Put option. We discussed the concept of intrinsic value in the previous chapter; hence I will assume you know the concept behind IV. Intrinsic Value represents the value of money the buyer will receive if he were to exercise the option upon expiry.

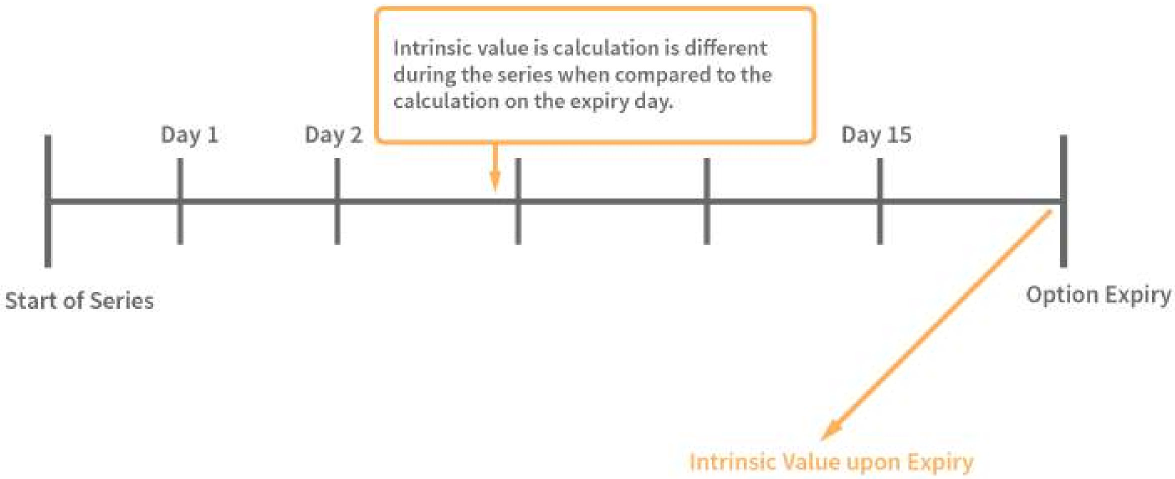
The calculation for the intrinsic value of a Put option is slightly different from that of a call option. To help you appreciate the difference let me post here the intrinsic value formula for a Call option –

IV (Call option) = Spot Price – Strike Price

The intrinsic value of a Put option is –

IV (Put Option) = Strike Price – Spot Price

I want you to remember an important aspect here with respect to the intrinsic value of an option – consider the following timeline –



The formula to calculate the intrinsic value of an option that we have just looked at, is applicable **only on the day of the expiry**. However the calculation of intrinsic value of an option is different **during the series**. Of course we will understand how to calculate (and the need to calculate) the intrinsic value of an option during the expiry. But for now, we only need to know the calculation of the intrinsic value upon expiry.

5.4 – P&L behavior of the Put Option buyer

Keeping the concept of intrinsic value of a put option at the back of our mind, let us work towards building a table which would help us identify how much money, I as the buyer of Bank Nifty's 18400 put option would make under the various possible spot value changes of Bank Nifty (in spot market) on expiry. Do remember the premium paid for this option is Rs 315/–. Irrespective of how the spot value changes, the fact that I have paid Rs.315/- will remain unchanged. This is the cost that I have incurred in order to buy the Bank Nifty 18400 Put Option. Let us keep this in perspective and work out the P&L table –

Please note – the negative sign before the premium paid represents a cash outflow from my trading account.

Serial No.	Possible values of spot	Premium Paid	Intrinsic Value (IV)	P&L (IV + Premium)
01	16195	-315	18400 – 16195 = 2205	2205 + (-315) = + 1890
02	16510	-315	18400 – 16510 = 1890	1890 + (-315)= + 1575
03	16825	-315	18400 – 16825 = 1575	1575 + (-315) = + 1260
04	17140	-315	18400 – 17140 = 1260	1260 + (-315) = + 945
05	17455	-315	18400 – 17455 = 945	945 + (-315) = + 630
06	17770	-315	18400 – 17770 = 630	630 + (-315) = + 315
07	18085	-315	18400 – 18085 = 315	315 + (-315) = 0
08	18400	-315	18400 – 18400 = 0	0 + (-315)= – 315
09	18715	-315	18400 – 18715 = 0	0 + (-315) = -315
10	19030	-315	18400 – 19030 = 0	0 + (-315) = -315
11	19345	-315	18400 – 19345 = 0	0 + (-315) = -315
12	19660	-315	18400 – 19660 = 0	0 + (-315) = -315

Let us make some observations on the behavior of the P&L (and also make a few P&L generalizations). For the above discussion, set your eyes at row number 8 as your reference point –

1. The objective behind buying a put option is to benefit from a falling price. As we can see, the profit increases as and when the price decreases in the spot market (with reference to the strike price of 18400).
1. **Generalization 1** – Buyers of Put Options are profitable as and when the spot price goes below the strike price. In other words buy a put option only when you are bearish about the underlying
2. As the spot price goes above the strike price (18400) the position starts to make a loss. However the loss is restricted to the extent of the premium paid, which in this case is Rs.315/-
1. Generalization 2 – A put option buyer experiences a loss when the spot price goes higher than the strike price. However the maximum loss is **restricted** to the extent of the premium the put option buyer has paid.

Here is a general formula using which you can calculate the P&L from a Put Option position. Do bear in mind this formula is applicable on positions held till expiry.

P&L = [Max (0, Strike Price – Spot Price)] – Premium Paid

Let us pick 2 random values and evaluate if the formula works –

1. 16510
2. 19660

@16510 (spot below strike, position has to be profitable)

= Max (0, 18400 -16510)] – 315

= 1890 – 315

= + 1575

@19660 (spot above strike, position has to be loss making, restricted to premium paid)

= Max (0, 18400 – 19660) – 315

= Max (0, -1260) – 315

= – 315

Clearly both the results match the expected outcome.

Further, we need to understand the breakeven point calculation for a Put Option buyer. Note, I will take the liberty of skipping the explanation of a breakeven point as we have already dealt with it in the previous chapter; hence I will give you the formula to calculate the same –

Breakeven point = Strike Price – Premium Paid

For the Bank Nifty breakeven point would be

= 18400 – 315

= 18085

So as per this definition of the breakeven point, at 18085 the put option should neither make any money nor lose any money. To validate this let us apply the P&L formula –

= Max (0, 18400 – 18085) – 315

= Max (0, 315) – 315

= 315 – 315

=**0**

The result obtained in clearly in line with the expectation of the breakeven point.

Important note – The calculation of the intrinsic value, P&L, and Breakeven point are all with respect to the expiry. So far in this module, we have assumed that you as an option buyer or seller would set up the option trade with an intention to hold the same till expiry.

But soon you will realize that that more often than not, you will initiate an options trade only to close it much earlier than expiry. Under such a situation the calculations of breakeven point may not matter much, however the calculation of the P&L and intrinsic value does matter and there is a different formula to do the same.

To put this more clearly let me assume two situations on the Bank Nifty Trade, we know the trade has been initiated on 7th April 2015 and the expiry is on 30th April 2015–

1. What would be the P&L assuming spot is at 17000 on 30th April 2015?
2. What would be the P&L assuming spot is at 17000 on 15th April 2015 (or for that matter any other date apart from the expiry date)

Answer to the first question is fairly simple, we can straight way apply the P&L formula –

= Max (0, 18400 – 17000) – 315

= Max (0, 1400) – 315

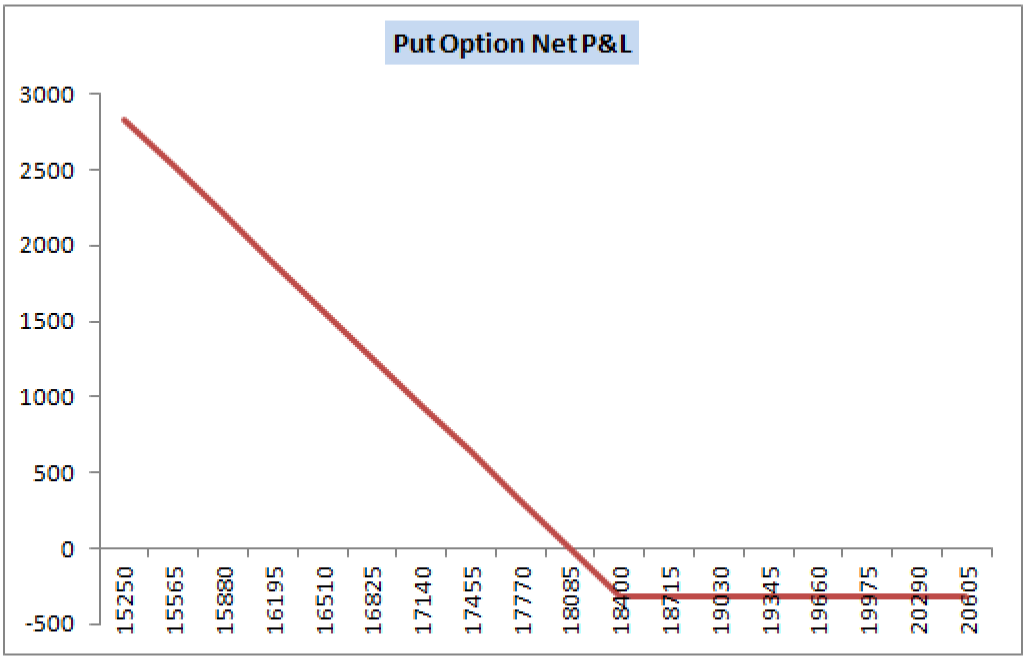
= 1400 – 315

= 1085

Going on to the 2nd question, if the spot is at 17000 on any other date apart from the expiry date, the P&L is **not** going to be 1085, it will be **higher**. We will discuss why this will be higher at an appropriate stage, but for now just keep this point in the back of your mind.

5.5 – Put option buyer's P&L payoff

If we connect the P&L points of the Put Option and develop a line chart, we should be able to observe the generalizations we have made on the Put option buyers P&L. Please find below the same –



Here are a few things that you should appreciate from the chart above, remember 18400 is the strike price –

1. The Put option buyer experienced a loss only when the spot price goes above the strike price (18400 and above)
2. However this loss is limited to the extent of the premium paid
3. The Put Option buyer will experience an exponential gain as and when the spot price trades below the strike price
4. The gains can be potentially unlimited
5. At the breakeven point (18085) the put option buyer neither makes money nor losses money. You can observe that at the breakeven point, the P&L graph just recovers from a loss making situation to a neutral situation. It is only above this point the put option buyer would start to make money.

Key takeaways from this chapter

1. Buy a Put Option when you are bearish about the prospects of the underlying. In other words a Put option buyer is profitable only when the underlying declines in value
2. The intrinsic value calculation of a Put option is slightly different when compared to the intrinsic value calculation of a call option
3. **IV (Put Option) = Strike Price – Spot Price**
4. The P&L of a Put Option buyer can be calculated as **P&L = [Max (0, Strike Price – Spot Price)] – Premium Paid**
5. The breakeven point for the put option buyer is calculated as **Strike – Premium Paid**

The Put Option selling

6.1 – Building the case

Previously we understood that, an option seller and the buyer are like two sides of the same coin. They have a diametrically opposite view on markets. Going by this, if the Put option buyer is bearish about the market, then clearly the put option seller must have a bullish view on the markets. Recollect we looked at the Bank Nifty's chart in the previous chapter; we will review the same chart again, but from the perspective of a put option seller.

The typical thought process for the Put Option Seller would be something like this –

1. Bank Nifty is trading at 18417
2. 2 days ago Bank Nifty tested its resistance level at 18550 (resistance level is highlighted by a green horizontal line)
3. 18550 is considered as resistance as there is a price action zone at this level which is well spaced in time (for people who are not familiar with the concept of resistance I would suggest you read about it **here**)
4. I have highlighted the price action zone in a blue rectangular boxes

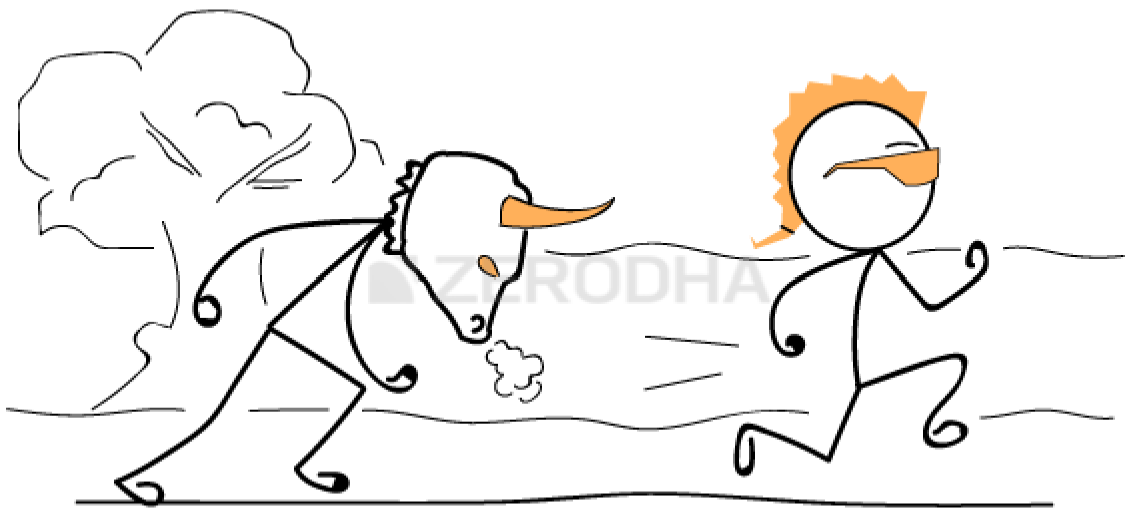
5. Bank Nifty has attempted to crack the resistance level for the last 3 consecutive times
6. All it needs is 1 good push (maybe a large sized bank announcing decent results – HDFC, ICICI, and SBI are expected to declare results soon)
7. A positive cue plus a move above the resistance will set Bank Nifty on the upward trajectory
8. Hence writing the Put Option and collecting the premiums may sound like a good idea

   You may have a question at this stage – If the outlook is bullish, why write (sell) a put option and why not just buy a call option?

   Well, the decision to either buy a call option or sell a put option really depends on how attractive the premiums are. At the time of taking the decision, if the call option has a low premium then buying a call option makes sense, likewise if the put option is trading at a very high premium then selling the put option (and therefore collecting the premium) makes sense. Of course to figure out what exactly to do (buying a call option or selling a put option) depends on the attractiveness of the premium, and to judge how attractive the premium is you need some background knowledge on 'option pricing'. Of course, going forward in this module we will understand option pricing.

   So, with these thoughts assume the trader decides to write (sell) the 18400 Put option and collect Rs.315 as the premium. As usual let us observe the P&L behavior for a Put Option seller and make a few generalizations.

   Do Note – when you write options (regardless of Calls or Puts) margins are blocked in your account. We have discussed this perspective **here,** request you to go through the same.



6.2 – P&L behavior for the put option seller

Please do remember the calculation of the intrinsic value of the option remains the same for both writing a put option as well as buying a put option. However the P&L calculation changes, which we will discuss shortly. We will assume various possible scenarios on the expiry date and figure out how the P&L behaves.

Serial No.	Possible values of spot	Premium Received	Intrinsic Value (IV)	P&L (Premium – IV)
01	16195	+ 315	18400 – 16195 = 2205	315 – 2205 = – 1890
02	16510	+ 315	18400 – 16510 = 1890	315 – 1890 = – 1575
03	16825	+ 315	18400 – 16825 = 1575	315 – 1575 = – 1260
04	17140	+ 315	18400 – 17140 = 1260	315 – 1260 = – 945
05	17455	+ 315	18400 – 17455 = 945	315 – 945 = – 630
06	17770	+ 315	18400 – 17770 = 630	315 – 630 = – 315
07	18085	+ 315	18400 – 18085 = 315	315 – 315 = 0
08	18400	+ 315	18400 – 18400 = 0	315 – 0 = + 315
09	18715	+ 315	18400 – 18715 = 0	315 – 0 = + 315
10	19030	+ 315	18400 – 19030 = 0	315 – 0 = + 315
11	19345	+ 315	18400 – 19345 = 0	315 – 0 = + 315

12	19660	+ 315	18400 – 19660 = 0	315 – 0 = + 315

I would assume by now you will be in a position to easily generalize the P&L behavior upon expiry, especially considering the fact that we have done the same for the last 3 chapters. The generalizations are as below (make sure you set your eyes on row 8 as it's the strike price for this trade) –

1. The objective behind selling a put option is to collect the premiums and benefit from the bullish outlook on market. Therefore as we can see, the profit stays flat at Rs.315 (premium collected) as long as the spot price stays above the strike price.
1. **Generalization 1** – Sellers of the Put Options are profitable as long as long as the spot price remains at or higher than the strike price. In other words sell a put option only when you are bullish about the underlying or when you believe that the underlying will no longer continue to fall.
2. As the spot price goes below the strike price (18400) the position starts to make a loss. Clearly there is no cap on how much loss the seller can experience here and it can be theoretically be unlimited
1. **Generalization 2** – A put option seller can potentially experience an unlimited loss as and when the spot price goes lower than the strike price.

Here is a general formula using which you can calculate the P&L from writing a Put Option position. Do bear in mind this formula is applicable on positions held till expiry.

P&L = Premium Recieved – [Max (0, Strike Price – Spot Price)]

Let us pick 2 random values and evaluate if the formula works –

- 16510
- 19660

@16510 (spot below strike, position has to be loss making)

= 315 – Max (0, 18400 -16510)

= 315 – 1890

= – 1575

@19660 (spot above strike, position has to be profitable, restricted to premium paid)

= 315 – Max (0, 18400 – 19660)

= 315 – Max (0, -1260)

= 315

Clearly both the results match the expected outcome.

Further, the breakdown point for a Put Option seller can be defined as a point where the Put Option seller starts making a loss after giving away all the premium he has collected –

Breakdown point = Strike Price – Premium Received

For the Bank Nifty, the breakdown point would be

= 18400 – 315

= 18085

So as per this definition of the breakdown point, at 18085 the put option seller should neither make any money nor lose any money. Do note this also means at this stage, he would lose the entire Premium he has collected. To validate this, let us apply the P&L formula and calculate the P&L at the breakdown point –

= 315 – Max (0, 18400 – 18085)

= 315 – Max (0, 315)

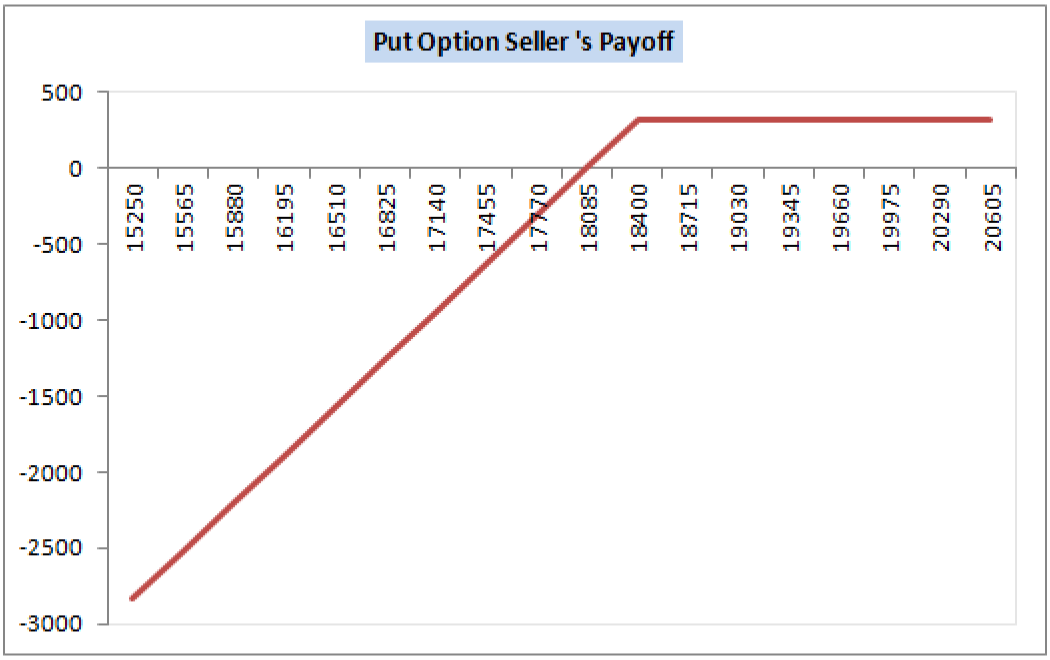
= 315 – 315

=**0**

The result obtained in clearly in line with the expectation of the breakdown point.

6.3 – Put option seller's Payoff

If we connect the P&L points (as seen in the table earlier) and develop a line chart, we should be able to observe the generalizations we have made on the Put option seller's P&L. Please find below the same –



Here are a few things that you should appreciate from the chart above, remember 18400 is the strike price –

1. The Put option seller experiences a loss only when the spot price goes below the strike price (18400 and lower)
2. The loss is theoretically unlimited (therefore the risk)
3. The Put Option seller will experience a profit (to the extent of premium received) as and when the spot price trades above the strike price
4. The gains are restricted to the extent of premium received
5. At the breakdown point (18085) the put option seller neither makes money nor losses money. However at this stage he gives up the entire premium he has received.
6. You can observe that at the breakdown point, the P&L graph just starts to buckle down – from a positive territory to the neutral (no profit no loss) situation. It is only below this point the put option seller starts to lose money.

And with these points, hopefully you should have got the essence of Put Option selling. Over the last few chapters we have looked at both the call option and the put option from both the buyer and sellers perspective. In the next chapter we will quickly summarize the same and shift gear towards other essential concepts of Options.

Key takeaways from this chapter

1. You sell a Put option when you are bullish on a stock or when you believe the stock price will no longer go down
2. When you are bullish on the underlying you can either buy the call option or sell a put option. The decision depends on how attractive the premium is
3. Option Premium pricing along with Option Greeks gives a sense of how attractive the premiums are
4. The put option buyer and the seller have a symmetrically opposite P&L behavior
5. When you sell a put option you receive premium
6. Selling a put option requires you to deposit margin
7. When you sell a put option your profit is limited to the extent of the premium you receive and your loss can potentially be unlimited
8. P&L = Premium received – Max [0, (Strike Price – Spot Price)]
9. Breakdown point = Strike Price – Premium Paid

Summarizing Call & Put Options

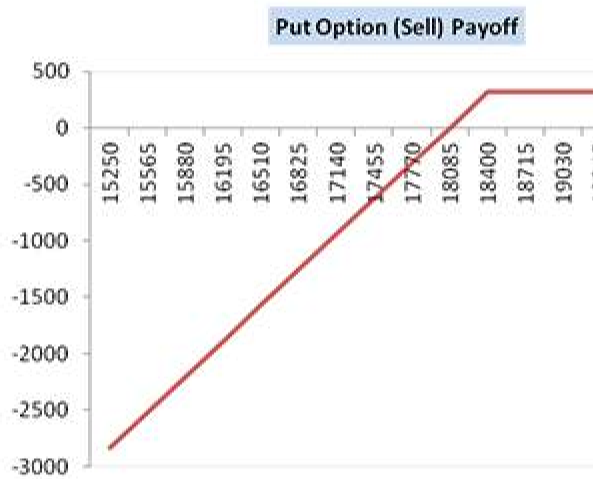
7.1 – Remember these graphs

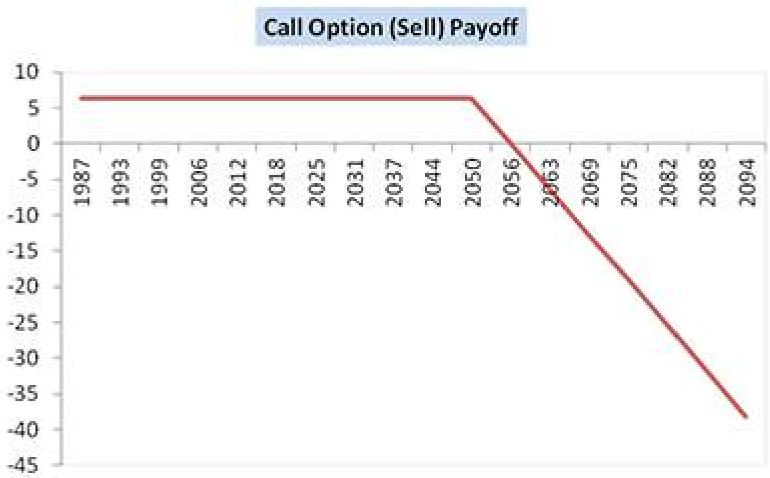
Over the last few chapters we have looked at two basic option type's i.e. the 'Call Option' and the 'Put Option'. Further we looked at four different variants originating from these 2 options –

1. Buying a Call Option
2. Selling a Call Option
3. Buying a Put Option
4. Selling a Put Option

With these 4 variants, a trader can create numerous different combinations and venture into some really efficient strategies generally referred to as 'Option Strategies'. Think of it this way – if you give a good artist a color palette and canvas he can create some really interesting paintings, similarly a good trader can use these four option variants to create some really good trades. Imagination and intellect is the only requirement for creating these option trades. Hence before we get deeper into options, it is important to have a strong foundation on these four variants of options. For this reason, we will quickly summarize what we have learnt so far in this module.

Please find below the pay off diagrams for the four different option variants –





Arranging the Payoff diagrams in the above fashion helps us understand a few things better. Let me list them for you –

1. Let us start from the left side – if you notice we have stacked the pay off diagram of Call Option (buy) and Call option (sell) one below the other. If you look at the payoff diagram carefully, they both look like a mirror image. The mirror image of the payoff emphasis the fact that the risk-reward characteristics of an option buyer and seller are opposite. The maximum loss of the call option buyer is the maximum profit of the call option seller. Likewise the call option buyer has unlimited profit potential, mirroring this the call option seller has maximum loss potential
2. We have placed the payoff of Call Option (buy) and Put Option (sell) next to each other. This is to emphasize that both these option variants make money only when the market is expected to go higher. In other words, do not buy a call option or do not sell a put option when you sense there is a chance for the markets to go down. You will not make money doing so, or in other words you will certainly lose money in such circumstances. Of course there is an angle of volatility here which we have

not discussed yet; we will discuss the same going forward. The reason why I'm talking about volatility is because volatility has an impact on option premiums

3. Finally on the right, the pay off diagram of Put Option (sell) and the Put Option (buy) are stacked one below the other. Clearly the pay off diagrams looks like the mirror image of one another. The mirror image of the payoff emphasizes the fact that the maximum loss of the put option buyer is the maximum profit of the put option seller. Likewise the put option buyer has unlimited profit potential, mirroring this the put option seller has maximum loss potential

   Further, here is a table where the option positions are summarized.

Your Market View	Option Type	Position also called	Other Alternatives	Premium
Bullish	Call Option (Buy)	Long Call	Buy Futures or Buy Spot	Pay
Flat or Bullish	Put Option (Sell)	Short Put	Buy Futures or Buy Spot	Receive
Flat or Bearish	Call Option (Sell)	Short Call	Sell Futures	Receive
Bearish	Put Option (Buy)	Long Put	Sell Futures	Pay

It is important for you to remember that when you buy an option, it is also called a 'Long' position. Going by that, buying a call option and buying a put option is called Long Call and Long Put position respectively.

Likewise whenever you sell an option it is called a 'Short' position. Going by that, selling a call option and selling a put option is also called Short Call and Short Put position respectively.

Now here is another important thing to note, you can buy an option under 2 circumstances –

1. You buy with an intention of creating a fresh option position
2. You buy with an intention to close an existing short position

   The position is called 'Long Option' only if you are creating a fresh buy position. If you are buying with and intention of closing an existing short position then it is merely called a 'square off' position.

Similarly you can sell an option under 2 circumstances –

1. You sell with an intention of creating a fresh short position
2. You sell with an intention to close an existing long position

   The position is called 'Short Option' only if you are creating a fresh sell (writing an option) position. If you are selling with and intention of closing an existing long position then it is merely called a 'square off' position.

7.2 – Option Buyer in a nutshell

By now I'm certain you would have a basic understanding of the call and put option both from the buyer's and seller's perspective. However I think it is best to reiterate a few key points before we make further progress in this module.

Buying an option (call or put) makes sense only when we expect the market to move strongly in a certain direction. If fact, for the option buyer to be profitable the market should move away from the selected strike price. Selecting the right strike price to trade is a major task; we will learn this at a later stage. For now, here are a few key points that you should remember –

1. P&L (Long call) upon expiry is calculated as *P&L = Max [0, (Spot Price – Strike Price)] – Premium Paid*
2. P&L (Long Put) upon expiry is calculated as *P&L = [Max (0, Strike Price – Spot Price)] – Premium Paid*
3. The above formula is applicable only when the trader intends to hold the long option till expiry
4. The intrinsic value calculation we have looked at in the previous chapters is only applicable on the expiry day. We CANNOT use the same formula during the series
5. The P&L calculation changes when the trader intends to square off the position well before the expiry
6. The buyer of an option has limited risk, to the extent of premium paid. However he enjoys an unlimited profit potential

7.2 – Option seller in a nutshell

The option sellers (call or put) are also called the option writers. The buyers and sellers have exact opposite P&L experience. Selling an option makes sense when you expect the market to remain flat or below the strike price (in case of calls) or above strike price (in case of put option).

I want you to appreciate the fact that all else equal, markets are slightly favorable to option sellers. This is because, for the option sellers to be profitable the market has to be either flat or move in a certain direction (based on the type of option). However for the option buyer to be profitable, the market has to move in a certain direction. Clearly there are two favorable market conditions for the option seller versus one favorable condition for the option buyer. But of course this in itself should not be a reason to sell options.

Here are few key points you need to remember when it comes to selling options –

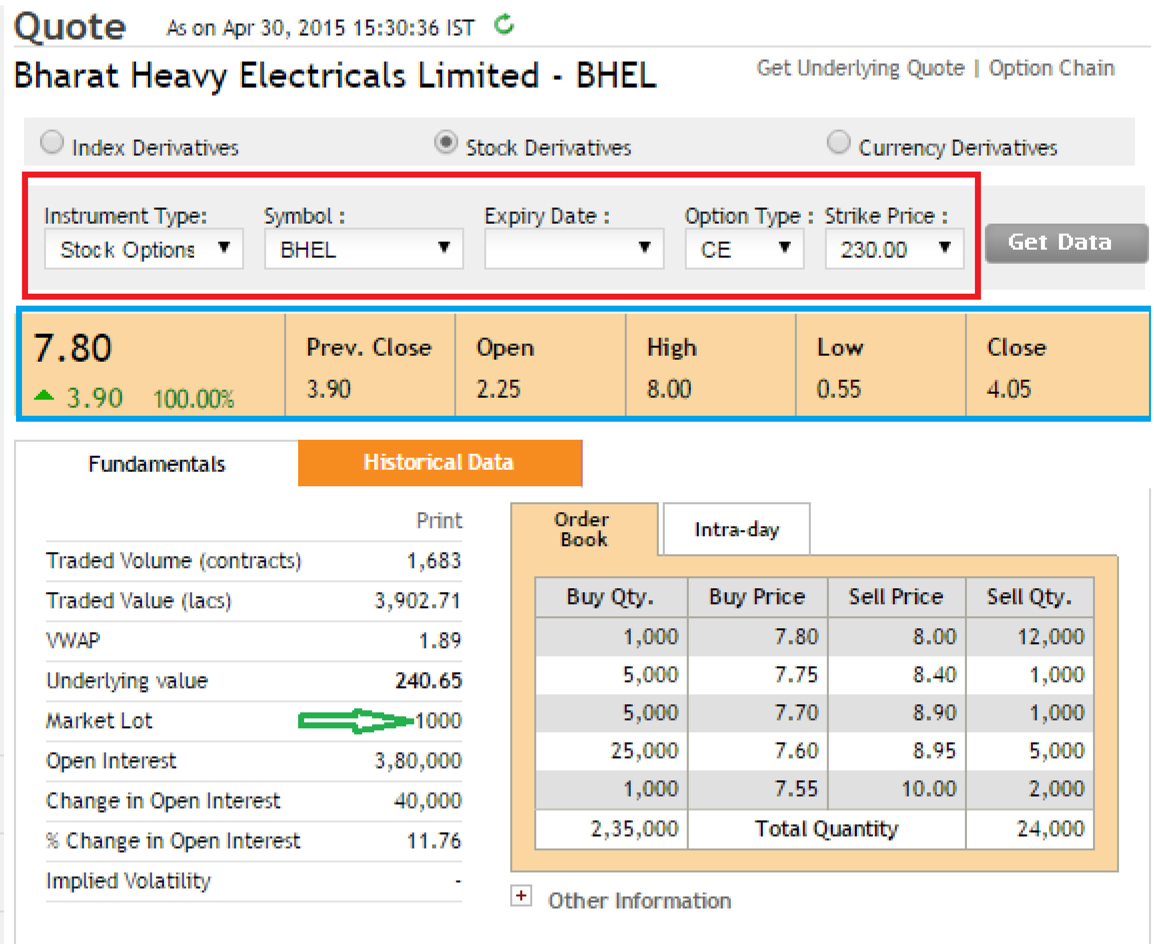
1. P&L for a short call option upon expiry is calculated as *P&L = Premium Received – Max [0, (Spot Price – Strike Price)]*
2. P&L for a short put option upon expiry is calculated as *P&L = Premium Received – Max (0, Strike Price – Spot Price)*
3. Of course the P&L formula is applicable only if the trader intends to hold the position till expiry
4. When you write options, margins are blocked in your trading account
5. The seller of the option has unlimited risk but very limited profit potential (to the extent of the premium received)

   Perhaps this is the reason why Nassim Nicholas Taleb in his book "Fooled by Randomness" says "Option writers eat like a chicken but shit like an elephant". This means to say that the option writers earn small and steady returns by selling options, but when a disaster happens, they tend to lose a fortune.

Well, with this I hope you have developed a strong foundation on how a Call and Put option behaves. Just to give you a heads up, the focus going forward in this module will be on moneyness of an option, premiums, option pricing, option Greeks, and strike selection. Once we understand these topics we will revisit the call and put option all over again. When we do so, I'm certain you will see the calls and puts in a new light and perhaps develop a vision to trade options professionally.

7.3 – A quick note on Premiums

Have a look at the snapshot below –


Quote As on Apr 30, 2015 15:30:36 IST

Bharat Heavy Electricals Limited - BHEL

Get Underlying Quote | Option Chain

Index Derivatives   Stock Derivatives   Currency Derivatives

Instrument Type:	Symbol :	Expiry Date :	Option Type :	Strike Price :
Stock Options	BHEL		CE	230.00

Get Data

7.80	Prev. Close	Open	High	Low	Close
3.90 100.00%	3.90	2.25	8.00	0.55	4.05

Fundamentals   Historical Data

Print

Traded Volume (contracts)	1,683
Traded Value (lacs)	3,902.71
VWAP	1.89
Underlying value	240.65
Market Lot	1000
Open Interest	3,80,000
Change in Open Interest	40,000
% Change in Open Interest	11.76
Implied Volatility	-

Order Book   Intra-day

Buy Qty.	Buy Price	Sell Price	Sell Qty.
1,000	7.80	8.00	12,000
5,000	7.75	8.40	1,000
5,000	7.70	8.90	1,000
25,000	7.60	8.95	5,000
1,000	7.55	10.00	2,000
2,35,000	Total Quantity		24,000

Other Information

This is the snapshot of how the premium has behaved on an intraday basis (30th April 2015) for BHEL. The strike under consideration is 230 and the option type is a European Call Option (CE). This information is highlighted in the red box. Below the red box, I have highlighted the price information of the premium. If you notice, the premium of the 230 CE opened at Rs.2.25, shot up to make a high of Rs.8/- and closed the day at Rs.4.05/-.

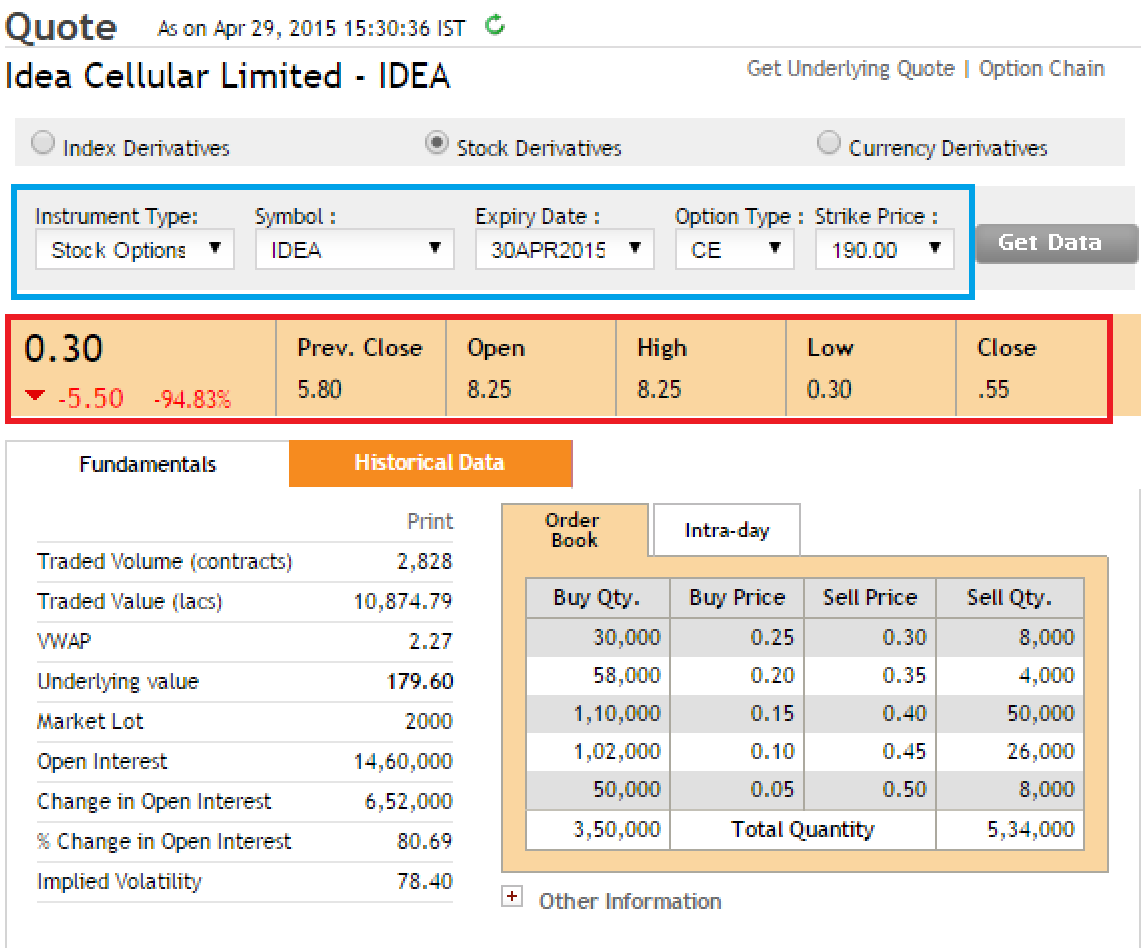
Think about it, the premium has gyrated over 350% intraday! i.e. from Rs.2.25/- to Rs.8/-, and it roughly closed up 180% for the day i.e. from Rs.2.25/- to Rs.4.05/-.

Moves like this should not surprise you. These are fairly common to expect in the options world.

Assume in this massive swing you managed to capture just 2 points while trading this particular option intraday. This translates to a sweet Rs.2000/- in profits considering the lot size is 1000 (highlighted in green arrow). In fact this is exactly what happens in the real world. Traders just trade premiums. Hardly any traders hold option contracts until expiry. Most of the traders are interested in initiating a trade now and squaring it off in a short while (intraday or maybe for a few days) and capturing the movements in the premium. They do not really wait for the options to expire.

In fact you might be interested to know that a return of 100% or so while trading options is not really a thing of surprise. But please don't just get carried away with what I just said; to enjoy such returns consistently you need develop a deep insight into options.

Have a look at this snapshot –



This is the option contract of IDEA Cellular Limited, strike price is 190, expiry is on 30th April 2015 and the option type is a European Call Option . These details are marked in the blue box. Below this we can notice the OHLC data, which quite obviously is very interesting.

The 190CE premium opened the day at Rs.8.25/- and made a low of Rs.0.30/-. I will skip the % calculation simply because it is a ridiculous figure for intraday. However assume you were a seller of the 190 call option intraday and you managed to capture just 2 points again, considering the lot size is 2000, the 2 point capture on the premium translates to Rs.4000/- in profits intraday, good enough for that nice dinner at Marriot with your better half J.

The point that I'm trying to make is that, traders (most of them) trade options only to capture the variations in premium. They don't really bother to hold till expiry. However by no means I am suggesting that you need not hold until expiry, in fact I do hold options till expiry in certain cases. Generally speaking option sellers tend to hold contracts till expiry rather than option buyers. This is because if you have written an option for Rs.8/- you will enjoy the full premium received i.e. Rs.8/- only on expiry.

So having said that the traders prefer to trade just the premiums, you may have a few fundamental questions cropping up in your mind. Why do premiums vary? What is the basis for the change in premium? How can I predict the change in premiums? Who decides what should be the premium price of a particular option?

Well, these questions and therefore the answers to these form the crux of option trading. If you can master these aspects of an option, let me assure you that you would set yourself on a professional path to trade options.

To give you a heads up – the answers to all these questions lies in understanding the 4 forces that simultaneously exerts its influence on options premiums, as a result of which the premiums vary. Think of this as a ship sailing in the sea. The speed at which the ship sails (assume its equivalent to the option premium) depends on various forces such as wind speed, sea water density, sea pressure, and the power of the ship. Some forces tend to increase the speed of the ship, while some tend to decrease the speed of the ship. The ship battles these forces and finally arrives at an optimal sailing speed.

Likewise the premium of the option depends on certain forces called as the 'Option Greeks'. Crudely put, some Option Greeks tends to increase the premium, while some try to reduce the premium. A formula called the 'Black & Scholes Option Pricing Formula' employs these forces and translates the forces into a number, which is the premium of the option.

Try and imagine this – the Option Greeks influence the option premium however the Option Greeks itself are controlled by the markets. As the markets change on a minute by minute basis, therefore the Option Greeks change and therefore the option premiums!

Going forward in this module, we will understand each of these forces and its characteristics. We will understand how the force gets influenced by the markets and how the Option Greeks further influences the premium.

So the end objective here would be to be –

1. To get a sense of how the Option Greeks influence premiums
2. To figure out how the premiums are priced considering Option Greeks and their influence
3. Finally keeping the Greeks and pricing in perspective, we need to smartly select strike prices to trade

One of the key things we need to know before we attempt to learn the option Greeks is to learn about the 'Moneyness of an Option'. We will do the same in the next chapter.

A quick note here – the topics going forward will get a little complex, although we will try our best to simplify it. While we do that, we would request you to please be thorough with all the concepts we have learnt so far.

Key takeaways from this chapter

1. Buy a call option or sell a put option only when you expect the market to go up
2. Buy a put option or sell a call option only when you expect the market to go down
3. The buyer of an option has an unlimited profit potential and limited risk (to the extent of premium paid)
4. The seller of an option has an unlimited risk potential and limited reward (to the extent of premium received)
5. Majority of option traders prefer to trade options only to capture the variation in premiums
6. Option premiums tend to gyrate drastically – as an options trader you can expect this to happen quite frequently
7. Premiums vary as a function of 4 forces called the Option Greeks
8. Black & Sholes option pricing formula employs four forces as inputs to give out a price for the premium
9. Markets control the Option Greeks and the Greek's variation itself

Moneyness of an Option Contract

8.1 – Intrinsic Value

The moneyness of an option contract is a classification method wherein each option (strike) gets classified as either – In the money (ITM), At the money (ATM), or Out of the money (OTM) option. This classification helps the trader to decide which strike to trade, given a particular circumstance in the market. However before we get into the details, I guess it makes sense to look through the concept of intrinsic value again.

The intrinsic value of an option is the money the option buyer makes from an options contract provided he has the right to exercise that option on the given day. Intrinsic Value is always a positive value and can never go below 0. Consider this example –

Underlying	CNX Nifty
Spot Value	8070
Option strike	8050
Option Type	Call Option (CE)
Days to expiry	15
Position	Long

Given this, assume you bought the 8050CE and instead of waiting for 15 days to expiry you had the right to exercise the option today. Now my question to you is – How much money would you stand to make provided you exercised the contract today?

Do remember when you exercise a long option, the money you make is equivalent to the intrinsic value of an option minus the premium paid. Hence to answer the above question we need to calculate the intrinsic value of an option, for which we need to pull up the call option intrinsic value formula from Chapter 3.

Here is the formula –

Intrinsic Value of a Call option = Spot Price – Strike Price

Let us plug in the values

= 8070 – 8050

= 20

So, if you were to exercise this option today, you are entitled to make 20 points (ignoring the premium paid).

Here is a table which calculates the intrinsic value for various options strike (these are just random values that I have used to drive across the concept) –

Option Type	Strike	Spot	Formula	Intrinsic Value	Remarks
Long Call	280	310	Spot Price – Strike Price	310 – 280 = 30	
Long Put	1040	980	Strike Price – Spot Price	1040 -980 = 60	
Long Call	920	918	Spot Price – Strike Price	918 – 920 = 0	Since IV cannot be -ve
Long Put	80	88	Strike Price – Spot Price	80 – 88 = 0	Since IV cannot be -ve

With this, I hope you are clear about the intrinsic value calculation for a given option strike. Let me summarize a few important points –

1. Intrinsic value of an option is the amount of money you would make if you were to exercise the option contract
2. Intrinsic value of an options contract can never be negative. It can be either zero or a positive number
3. Call option Intrinsic value = Spot Price – Strike Price
4. Put option Intrinsic value = Strike Price – Spot price

Before we wrap up this discussion, here is a question for you – Why do you think the intrinsic value cannot be a negative value?

To answer this, let us pick an example from the above table – Strike is 920, spot is 918, and option type is long call. Let us assume the premium for the 920 Call option is Rs.15.

Now,

1. If you were to exercise this option, what do you get?
1. Clearly we get the intrinsic value.
2. How much is the intrinsic value?
1. Intrinsic Value = 918 – 920 = **-2**
3. The formula suggests we get '**– Rs.2**'. What does this mean?
1. This means Rs.2 is going from our pocket
4. Let us believe this is true for a moment, what will be the total loss?
1. 15 + 2 = Rs.17/-
5. But we know the maximum loss for a call option buyer is limited to the extent of premium one pays, in this case it will be Rs.15/-
1. However if we include a negative intrinsic value this property of option payoff is not obeyed (Rs.17/- loss as opposed to Rs.15/-). Hence in order to maintain the non linear property of option payoff, the Intrinsic value can never be negative
6. You can apply the same logic to the put option intrinsic value calculation

Hopefully this should give you some insights into why the intrinsic value of an option can never go negative.

8.2 – Moneyness of a Call option

With our discussions on the intrinsic value of an option, the concept of moneyness should be quite easy to comprehend. Moneyness of an option is a classification method which classifies each option strike based on how much money a trader is likely to make if he were to exercise his option contract today. There are 3 broad classifications –

1. In the Money (ITM)
2. At the Money (ATM)
3. Out of the Money (OTM)

And for all practical purposes I guess it is best to further classify these as –

1. Deep In the money
2. In the Money (ITM)

3. At the Money (ATM)
4. Out of the Money (OTM)
5. Deep Out of the Money

   Understanding these option strike classification is very easy. All you need to do is figure out the intrinsic value. If the intrinsic value is a non zero number, then the option strike is considered 'In the money'. If the intrinsic value is a zero the option strike is called 'Out of the money'. The strike which is closest to the Spot price is called 'At the money'.

Let us take up an example to understand this well. As of today (7th May 2015) the value of Nifty is at 8060, keeping this in perspective I've take the snapshot of all the available strike prices (the same is highlighted within a blue box). The objective is to classify each of these strikes as ITM, ATM, or OTM. We will discuss the 'Deep ITM' and 'Deep OTM' later.

752,675	-200	569	-	967.00	-46.85	50	963.65	969.00	25	7100.00
-	-	-	-	-	-	2,000	741.30	1,072.50	2,000	7150.00
179,750	-1,650	187	-	864.35	-53.75	50	863.45	872.20	125	7200.00
-	-	-	-	-	-	2,000	641.30	972.50	2,000	7250.00
20,275	1,075	157	-	780.35	-37.85	125	766.60	791.70	50	7300.00
-	-	-	-	-	-	2,000	546.15	876.55	2,000	7350.00
18,550	1,275	63	-	684.30	-30.45	125	673.15	681.65	25	7400.00
-	-	-	-	-	-	2,000	451.00	780.60	2,000	7450.00
525,425	13,450	2,363	-	583.00	-39.65	25	581.30	586.40	50	7500.00
-	-	-	-	-	-	2,000	367.35	680.60	2,000	7550.00
90,775	7,975	499	-	486.90	-48.30	50	489.55	495.40	50	7600.00
100	100	4	-	333.30	-870.80	100	286.85	584.60	100	7650.00
138,750	13,950	1,650	13.56	406.90	-43.60	25	405.00	410.00	25	7700.00
-	-	-	-	-	-	2,000	203.40	-	-	7750.00
350,250	119,650	11,537	16.10	325.65	-40.50	75	322.10	328.15	100	7800.00
-	-	-	-	-	-	1,000	242.00	420.85	2,000	7850.00
217,950	50,375	14,855	17.12	252.60	-36.65	125	252.45	253.85	25	7900.00
3,600	3,600	158	16.47	211.00	-716.10	125	205.45	305.05	125	7950.00
921,000	214,775	111,929	17.34	187.40	-34.95	100	186.05	189.00	100	8000.00
34,075	32,175	4,758	17.38	159.85	-27.25	50	156.05	162.45	100	8050.00
1,192,900	439,975	376,448	17.30	133.00	-30.25	5,500	133.00	133.40	825	8100.00
110,275	14,500	12,682	17.13	111.90	-25.25	25	108.00	111.85	50	8150.00
2,573,325	463,400	774,529	17.07	89.00	-25.10	25	88.25	89.00	600	8200.00
122,875	-25,475	17,657	17.17	72.00	-20.65	400	70.20	73.20	25	8250.00
3,396,200	163,025	736,709	17.07	56.45	-18.50	2,075	56.30	56.45	75	8300.00
182,025	-6,025	11,633	17.04	42.05	-17.35	100	43.20	46.00	175	8350.00
3,201,050	-2,025	643,267	17.07	33.50	-12.60	25	33.65	33.85	200	8400.00
155,125	-18,275	10,499	16.99	25.30	-9.20	25	25.00	25.85	50	8450.00
4,402,950	49,700	555,081	17.30	19.65	-7.25	475	19.65	19.90	25	8500.00
108,425	4,250	4,126	17.85	15.00	-6.00	175	14.25	16.20	75	8550.00
4,056,750	197,225	348,205	17.54	11.50	-4.20	200	11.50	11.70	1,050	8600.00
54,600	4,325	1,890	17.70	13.50	1.45	25	8.75	11.00	10,000	8650.00
2,736,750	85,075	159,108	18.09	7.05	-2.20	50	7.05	7.30	150	8700.00

As you can notice from the image above, the available strike prices trade starts from 7100 all the way upto 8700.

We will first identify 'At **the Money Option (ATM)**' as this is the easiest to deal with.

From the definition of ATM option that we posted earlier we know, ATM option is that option strike which is closest to the spot price. Considering the spot is at 8060, the closest strike is probably 8050. If there was 8060 strike, then clearly 8060 would be the ATM option. But in the absence of 8060 strike the next closest strike becomes ATM. Hence we classify 8050 as, the ATM option.

Having established the ATM option (8050), we will proceed to identify ITM and OTM options. In order to do this we will pick few strikes and calculate the intrinsic value.

1. 7100
2. 7500

3. 8050
4. 8100
5. 8300

   Do remember the spot price is 8060, keeping this in perspective the intrinsic value for the strikes above would be –

   @ 7100

   Intrinsic Value = 8060 – 7100

   = 960

   Non zero value, hence the strike should be In the Money (ITM) option

   @7500

   Intrinsic Value = 8060 – 7500

   = 560

   Non zero value, hence the strike should be In the Money (ITM) option

   @8050

   We know this is the ATM option as 8050 strike is closest to the spot price of 8060. So we will not bother to calculate its intrinsic value.

   @ 8100

   Intrinsic Value = 8060 – 8100

   = – 40

   Negative intrinsic value, therefore the intrinsic value is 0. Since the intrinsic value is 0, the strike is Out of the Money (OTM).

   @ 8300

   Intrinsic Value = 8060 – 8300

   = – 240

   Negative intrinsic value, therefore the intrinsic value is 0. Since the intrinsic value is 0, the strike is Out of the Money (OTM).

   You may have already sensed the generalizations (for call options) that exists here, however allow me to restate the same again

1. All option strikes that are higher than the ATM strike are considered OTM

2. All option strikes that are below the ATM strike are considered ITM

   In fact I would suggest you relook at the snapshot we just posted –

752,675	-200	569	-	967.00	-46.85	50	963.65	969.00	25	7100.00
-	-	-	-	-	-	2,000	741.30	1,072.50	2,000	7150.00
179,750	-1,650	187	-	864.35	-53.75	50	863.45	872.20	125	7200.00
-	-	-	-	-	-	2,000	641.30	972.50	2,000	7250.00
20,275	1,075	157	-	780.35	-37.85	125	766.60	791.70	50	7300.00
-	-	-	-	-	-	2,000	546.15	876.55	2,000	7350.00
18,550	1,275	63	-	684.30	-30.45	125	673.15	681.65	25	7400.00
-	-	-	-	-	-	2,000	451.00	780.60	2,000	7450.00
525,425	13,450	2,363	-	583.00	-39.65	25	581.30	586.40	50	7500.00
-	-	-	-	-	-	2,000	367.35	680.60	2,000	7550.00
90,775	7,975	499	-	486.90	-48.30	50	489.55	495.40	50	7600.00
100	100	4	-	333.30	-870.80	100	286.85	584.60	100	7650.00
138,750	13,950	1,650	13.56	406.90	-43.60	25	405.00	410.00	25	7700.00
-	-	-	-	-	-	2,000	203.40	-	-	7750.00
350,250	119,650	11,537	16.10	325.65	-40.50	75	322.10	328.15	100	7800.00
-	-	-	-	-	-	1,000	242.00	420.85	2,000	7850.00
217,950	50,375	14,855	17.12	252.60	-36.65	125	252.45	253.85	25	7900.00
3,600	3,600	158	16.47	211.00	-716.10	125	205.45	305.05	125	7950.00
921,000	214,775	111,929	17.34	187.40	-34.95	100	186.05	189.00	100	8000.00
34,075	32,175	4,758	17.38	159.85	-27.25	50	156.05	162.45	100	8050.00
1,192,900	439,975	376,448	17.30	133.00	-30.25	5,500	133.00	133.40	825	8100.00
110,275	14,500	12,682	17.13	111.90	-25.25	25	108.00	111.85	50	8150.00
2,573,325	463,400	774,529	17.07	89.00	-25.10	25	88.25	89.00	600	8200.00
122,875	-25,475	17,657	17.17	72.00	-20.65	400	70.20	73.20	25	8250.00
3,396,200	163,025	736,709	17.07	56.45	-18.50	2,075	56.30	56.45	75	8300.00
182,025	-6,025	11,633	17.04	42.05	-17.35	100	43.20	46.00	175	8350.00
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155,125	-18,275	10,499	16.99	25.30	-9.20	25	25.00	25.85	50	8450.00
4,402,950	49,700	555,081	17.30	19.65	-7.25	475	19.65	19.90	25	8500.00
108,425	4,250	4,126	17.85	15.00	-6.00	175	14.25	16.20	75	8550.00
4,056,750	197,225	348,205	17.54	11.50	-4.20	200	11.50	11.70	1,050	8600.00
54,600	4,325	1,890	17.70	13.50	1.45	25	8.75	11.00	10,000	8650.00
2,736,750	85,075	159,108	18.09	7.05	-2.20	50	7.05	7.30	150	8700.00

NSE presents ITM options with a pale yellow background and all OTM options have a regular white background. Now let us look at 2 ITM options – 7500 and 8000. The intrinsic value works out to be 560 and 60 respectively (considering the spot is at 8060). Higher the intrinsic value, deeper the moneyness of the option. Therefore 7500 strike is considered as 'Deep In the Money' option and 8000 as just 'In the money' option.

I would encourage you to observe the premiums for all these strike prices (highlighted in green box). Do you sense a pattern here? The premium decreases as you traverse from 'Deep ITM' option to 'Deep OTM option'. In other words ITM options are always more expensive compared to OTM options.

8.3 – Moneyness of a Put option

Let us run through the same exercise to find out how strikes are classified as ITM and OTM for Put options. Here is the snapshot of various strikes available for a Put option. The strike prices on the left are highlighted in a blue box. Do note at the time of taking the snap shot (8th May 2015) Nifty's spot value is 8202.

7100.00	5,550	2.55	2.60	575	-1.30	2.60	29.06	3,344	-23,750	363,700
7150.00	7,000	0.65	-	-	-	-	-	-	-	-
7200.00	2,725	3.60	3.65	75	-2.30	3.70	28.02	11,339	15,400	422,700
7250.00	300	2.25	5.00	2,000	-0.05	8.00	30.53	2	50	2,175
7300.00	25	4.95	5.00	900	-4.10	4.95	26.78	25,241	-4,500	1,638,800
7350.00	4,800	3.50	-	-	-	-	-	-	-	50
7400.00	1,100	6.50	6.60	2,550	-5.95	6.60	25.41	40,016	110,000	895,775
7450.00	5,000	5.00	-	-	-	-	-	-	-	100
7500.00	2,550	9.55	9.65	1,400	-8.70	9.65	24.48	59,225	125,225	2,214,225
7550.00	100	11.00	18.00	25	-7.45	12.00	24.31	25	450	1,700
7600.00	1,150	14.05	14.20	575	-12.75	14.15	23.68	90,633	-43,425	1,052,900
7650.00	50	16.50	18.00	100	-15.50	16.30	23.02	150	1,975	17,575
7700.00	975	20.70	20.85	475	-18.50	20.75	22.78	157,222	274,000	3,268,875
7750.00	100	25.00	27.65	100	-21.55	24.55	22.44	494	1,375	15,900
7800.00	500	31.15	31.35	125	-26.25	31.40	22.20	229,216	243,350	3,119,375
7850.00	25	37.55	39.45	50	-29.45	39.30	21.96	677	3,800	17,775
7900.00	100	46.20	46.40	125	-35.60	46.45	21.57	222,647	443,325	2,941,075
7950.00	125	55.60	57.00	150	-41.60	55.00	21.39	2,308	10,350	51,800
8000.00	100	66.70	67.00	200	-47.55	66.80	20.88	313,092	629,200	5,014,975
8050.00	50	79.15	80.10	150	-52.85	79.85	20.60	6,735	43,950	110,750
8100.00	100	94.25	94.45	375	-61.45	94.60	20.17	313,481	1,516,625	5,169,650
8150.00	150	111.50	112.95	150	-67.25	112.00	19.94	7,576	-6,375	109,000
8200.00	150	131.40	132.00	50	-78.70	131.35	19.53	177,149	307,650	3,375,625
8250.00	25	155.20	157.75	50	-94.85	154.90	18.96	759	-4,350	40,375
8300.00	25	180.50	182.20	50	-96.00	180.70	19.26	49,997	23,500	2,606,675
8350.00	25	207.80	210.30	100	-106.05	203.30	18.47	163	-650	30,750
8400.00	25	240.85	242.15	25	-107.75	239.85	19.06	13,154	-62,900	1,137,325
8450.00	50	258.35	288.60	50	-142.00	278.00	19.56	18	-100	23,225
8500.00	75	312.35	315.20	25	-120.55	313.85	18.97	6,378	-53,575	1,162,600
8550.00	25	342.10	370.40	175	-73.85	387.00	25.12	16	-75	4,650
8600.00	100	391.80	395.45	25	-124.35	394.85	18.98	2,153	-19,175	687,550
8650.00	50	399.30	684.80	50	-	-	-	-	-	3,000
8700.00	25	484.05	486.00	25	-133.15	485.00	19.75	4,789	-94,550	537,700

As you can see there are many strike prices available right from 7100 to 8700. We will first classify the ATM option and then proceed to identify ITM and OTM option. Since the spot is at 8202, the nearest strike to spot should be the ATM option. As we can see from the snapshot above there is a strike at 8200 which is trading at Rs.131.35/-. This obviously becomes the ATM option.

We will now pick a few strikes above and below the ATM and figure out ITM and OTM options. Let us go with the following strikes and evaluate their respective intrinsic value (also called the moneyness) –

1. 7500
2. 8000
3. 8200
4. 8300
5. 8500

@ 7500

We know the intrinsic value of put option can be calculated as = **Strike – Spot**

Intrinsic Value = 7500 – 8200

= – 700

Negative intrinsic value, therefore the option is OTM

@ 8000

Intrinsic Value = 8000 – 8200

= – 200

Negative intrinsic value, therefore the option is OTM

@8200

8200 is already classified as ATM option, hence we will skip this and move ahead.

@ 8300

Intrinsic Value = 8300 – 8200

= +100

Positive intrinsic value, therefore the option is ITM

@ 8500

Intrinsic Value = 8500 – 8200

= +300

Positive intrinsic value, therefore the option is ITM

Hence, an easy generalization for Put options are –

1. All strikes **higher than** ATM options are considered ITM
2. All strikes **lower than** ATM options are considered OTM

And as you can see from the snapshot, the premiums for ITM options are much higher than the premiums for the OTM options.

I hope you have got a clear understanding of how option strikes are classified based on their moneyness. However you may still be wondering about the need to classify options based on their moneyness. Well the answer to this lies in 'Option Greeks' again. As you briefly know by now, Option Greeks are the market forces which act upon options strikes and therefore affect the premium associated with these strikes. So a certain market force will have a certain effect on ITM option while at the same time it will have a different effect on an OTM option. Hence classifying the option strikes will help us in understanding the Option Greeks and their impact on the premiums better.

8.4 – The Option Chain

The Option chain is a common feature on most of the exchanges and trading platforms. The option chain is a ready reckoner of sorts that helps you identify all the strikes that are available for a particular underlying and also classifies the strikes based on their moneyness. Besides, the option chain also provides information such as the premium price (LTP), bid –ask price, volumes, open interest etc for each of the option strikes.

Have a look at the option chain of Ashoka Leyland Limited as published on NSE –

Option Chain (Equity Derivatives)

Underlying Stock: ASHOKLEY 68.70 As on May 08, 2015 15:11:37 IST

View Options Contracts for: Select Index OR Search for an underlying stock: GO Filter by: Expiry Date 28MAY2015 Futures contracts

CALLS												PUTS										
Chart	OI	Chng in OI	Volume	IV	LTP	Net Chng	Bid Qty	Bid Price	Ask Price	Ask Qty	Strike Price	Bid Qty	Bid Price	Ask Price	Ask Qty	Net Chng	LTP	IV	Volume	Chng in OI	OI	Chart
	-	-	-	-	-	-	-	-	-	-	40.00	-	-	0.05	48,000	-	-	-	-	-	8,000	
	-	-	-	-	-	-	-	-	-	-	42.50	-	-	0.10	12,000	-	-	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	45.00	-	-	0.20	4,000	-	-	-	-	-	-	
	-	-	-	-	-	-	24,000	21.10	21.85	24,000	47.50	-	-	0.20	4,000	-	-	-	-	-	-	
	8,000	-	-	-	-	-	4,000	7.80	19.30	24,000	50.00	12,000	0.05	0.10	12,000	0.05	0.20	81.02	1	4,000	40,000	
	-	-	-	-	-	-	4,000	16.15	16.85	36,000	52.50	16,000	0.05	0.10	16,000	-	-	-	-	-	44,000	
	84,000	4,000	1	-	13.30	-1.60	4,000	13.85	14.35	4,000	55.00	232,000	0.10	0.15	28,000	-0.15	0.15	57.27	15	4,000	276,000	
	-	-	-	-	-	-	4,000	11.45	11.95	4,000	57.50	84,000	0.20	0.25	8,000	-0.25	0.30	55.95	6	8,000	204,000	
	72,000	-	1	67.31	10.05	-1.95	4,000	7.20	9.70	32,000	60.00	124,000	0.40	0.50	96,000	-0.60	0.45	51.13	198	356,000	1,124,000	
	12,000	-4,000	2	-	6.45	1.20	4,000	7.05	7.60	8,000	62.50	36,000	0.70	0.75	16,000	-1.00	0.75	48.01	84	-4,000	728,000	
	524,000	-240,000	221	49.09	5.50	1.90	8,000	5.35	5.45	8,000	65.00	32,000	1.30	1.35	68,000	-1.45	1.30	46.38	366	-8,000	1,436,000	
	1,100,000	-36,000	394	45.72	3.85	1.35	12,000	3.75	3.90	12,000	67.50	4,000	2.20	2.25	20,000	-1.90	2.20	46.83	254	224,000	1,132,000	
	4,572,000	-532,000	1,780	47.04	2.55	0.85	16,000	2.55	2.60	40,000	70.00	8,000	3.40	3.50	16,000	-2.50	3.25	42.86	90	-	1,804,000	
	3,264,000	-68,000	462	46.50	1.65	0.55	76,000	1.60	1.70	52,000	72.50	44,000	4.70	5.10	20,000	-3.40	4.95	44.75	7	-	1,256,000	
	6,988,000	428,000	1,134	47.27	1.05	0.35	108,000	1.00	1.05	16,000	75.00	44,000	6.50	7.10	44,000	-3.45	7.20	52.27	5	-8,000	360,000	
	1,872,000	-	78	49.23	0.70	0.25	48,000	0.60	0.70	76,000	77.50	4,000	8.60	9.20	8,000	-	-	-	-	-	20,000	
	4,748,000	224,000	320	48.92	0.40	0.10	144,000	0.40	0.45	216,000	80.00	4,000	10.00	13.85	4,000	-	-	-	-	-	188,000	
	284,000	16,000	10	50.12	0.25	0.05	72,000	0.20	0.30	52,000	82.50	28,000	13.15	13.80	28,000	-	-	-	-	-	-	
	728,000	20,000	22	50.90	0.15	0.05	84,000	0.15	0.20	380,000	85.00	24,000	15.50	16.15	24,000	-	-	-	-	-	-	
	108,000	-	-	-	-	-	12,000	0.05	0.10	4,000	87.50	12,000	18.00	18.70	12,000	-	-	-	-	-	-	
	760,000	100,000	27	57.69	0.10	0.05	92,000	0.05	0.10	376,000	90.00	-	-	-	-	-	-	-	-	-	-	

Few observations to help you understand the option chain better –

1. The underlying spot value is at Rs.68.7/- (highlighted in blue)
2. The Call options are on to the left side of the option chain

3. The Put options are on to the right side of the option chain
4. The strikes are stacked on an increasing order in the center of the option chain
5. Considering the spot at Rs.68.7, the closest strike is 67.5, hence that would be an ATM option (highlighted in yellow)
6. For Call options – all option strikes lower than ATM options are ITM option, hence they have a pale yellow background
7. For Call options – all option strikes higher than ATM options are OTM options, hence they have a white background
8. For Put Options – all option strikes higher than ATM are ITM options, hence they have a pale yellow background
9. For Put Options – all option strikes lower than ATM are OTM options, hence they have a white background
10. The pale yellow and white background from NSE is just a segregation method to bifurcate the ITM and OTM options. The color scheme is not a standard convention.

Here is the link to check the option chain for **Nifty Options**.

8.4 – The way forward

Having understood the basics of the call and put options both from the buyers and sellers perspective and also having understood the concept of ITM, OTM, and ATM I suppose we are all set to dwell deeper into options.

The next couple of chapters will be dedicated to understand Option Greeks and the kind of impact they have on option premiums. Based on the Option Greeks impact on the premiums, we will figure out a way to select the best possible strike to trade for a given circumstance in the market. Further we will also understand how options are priced by briefly running through the 'Black & Scholes Option Pricing Formula'. The 'Black & Scholes Option Pricing Formula' will help us understand things like – Why Nifty 8200 PE is trading at 131 and not 152 or 102!

I hope you are as excited to learn about all these topics as we are to write about the same. So please stay tuned.

Onwards to Option Greeks now!

Key takeaways from this chapter

1. The intrinsic value of an option is equivalent to the value of money the option buyer makes provided if he were to exercise the contract
2. Intrinsic Value of an option cannot be negative, it is a non zero positive value
3. Intrinsic value of call option = Spot Price – Strike Price
4. Intrinsic value of put option = Strike Price – Spot Price
5. Any option that has an intrinsic value is classified as 'In the Money' (ITM) option
6. Any option that does not have an intrinsic value is classified as 'Out of the Money' (OTM) option
7. If the strike price is almost equal to spot price then the option is considered as 'At the money' (ATM) option
8. All strikes lower than ATM are ITM options (for call options)
9. All strikes higher than ATM are OTM options (for call options)
10. All strikes higher than ATM are ITM options (for Put options)
11. All strikes lower than ATM are OTM options (for Put options)
12. When the intrinsic value is very high, it is called 'Deep ITM' option
13. Likewise when the intrinsic value is the least, it is called 'Deep OTM' option
14. The premiums for ITM options are always higher than the premiums for OTM option
15. The Option chain is a quick visualization to understand which option strike is ITM, OTM, ATM (for both calls and puts) along with other information relevant to options.

The Option Greeks (Delta) Part 1

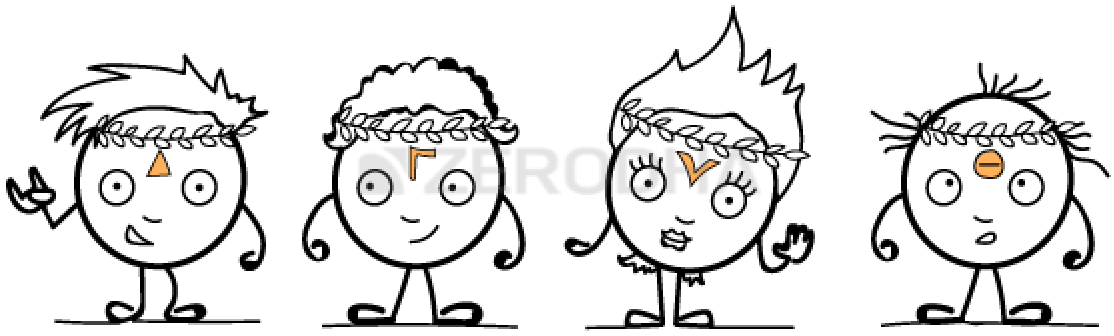
9.1 – Overview

Yesterday I watched the latest bollywood flick 'Piku'. Quite nice I must say. After watching the movie I was casually pondering over what really made me like Piku – was it the overall storyline, or Amitabh Bachchan's brilliant acting, or Deepika Padukone's charming screen presence, or Shoojit Sircar's brilliant direction? Well, I suppose it was a mix of all these factors that made the movie enjoyable.

This also made me realize, there is a remarkable similarity between a bollywood movie and an options trade. Similar to a bollywood movie, for an options trade to be successful in the market there are several forces which need to work in the option trader's favor. These forces are collectively called 'The Option Greeks'. These forces influence an option contract in real time, affecting the premium to either increase or decrease on a minute by minute basis. To make matters complicated, these forces not only influence the premiums directly but also influence each another.

To put this in perspective think about these two bollywood actors – Aamir Khan and Salman Khan. Movie buffs would recognize them as two independent acting forces (similar to option Greeks) of Bollywood. They can independently influence the outcome of the movie they act in (think of the movie as an options premium). However if you put both these guys in a single flick, chances are that they will try to pull one another down while at the same time push themselves up and at the same time try to make the movie a success. Do you see the juggling around here? This may not be a perfect analogy, but I hope it gives you a sense of what I'm trying to convey.

Options Premiums, options Greeks, and the natural demand supply situation of the markets influence each other. Though all these factors work as independent agents, yet they are all intervened with one another. The final outcome of this mixture can be assessed in the option's premium. For an options trader, assessing the variation in premium is most important. He needs to develop a sense for how these factors play out before setting up an option trade.



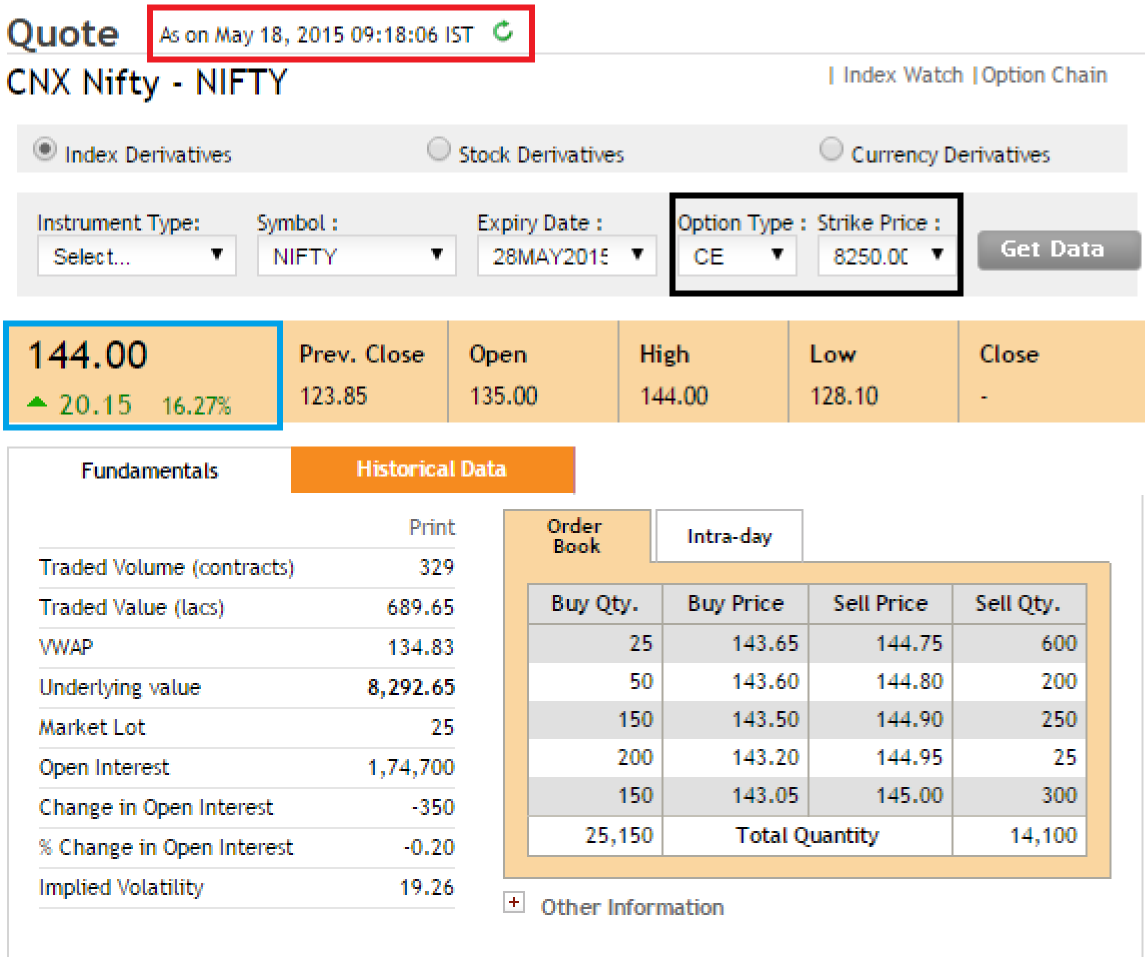
So without much ado, let me introduce the Greeks to you –

1. **Delta** – Measures the rate of change of options premium based on the directional movement of the underlying
2. **Gamma** – Rate of change of delta itself
3. **Vega** – Rate of change of premium based on change in volatility
4. **Theta** – Measures the impact on premium based on time left for expiry

We will discuss these Greeks over the next few chapters. The focus of this chapter is to understand the Delta.

9.2 – Delta of an Option

Notice the following two snapshots here – they belong to Nifty's 8250 CE option. The first snapshot was taken at 09:18 AM when Nifty spot was at 8292.


Quote As on May 18, 2015 09:18:06 IST

CNX Nifty - NIFTY

| Index Watch | Option Chain

Index Derivatives Stock Derivatives Currency Derivatives

Instrument Type: Select... Symbol : NIFTY Expiry Date : 28MAY2015 Option Type : CE Strike Price : 8250.00 Get Data

144.00 ▲ 20.15 16.27%	Prev. Close	Open	High	Low	Close
	123.85	135.00	144.00	128.10	-

Fundamentals Historical Data

Print

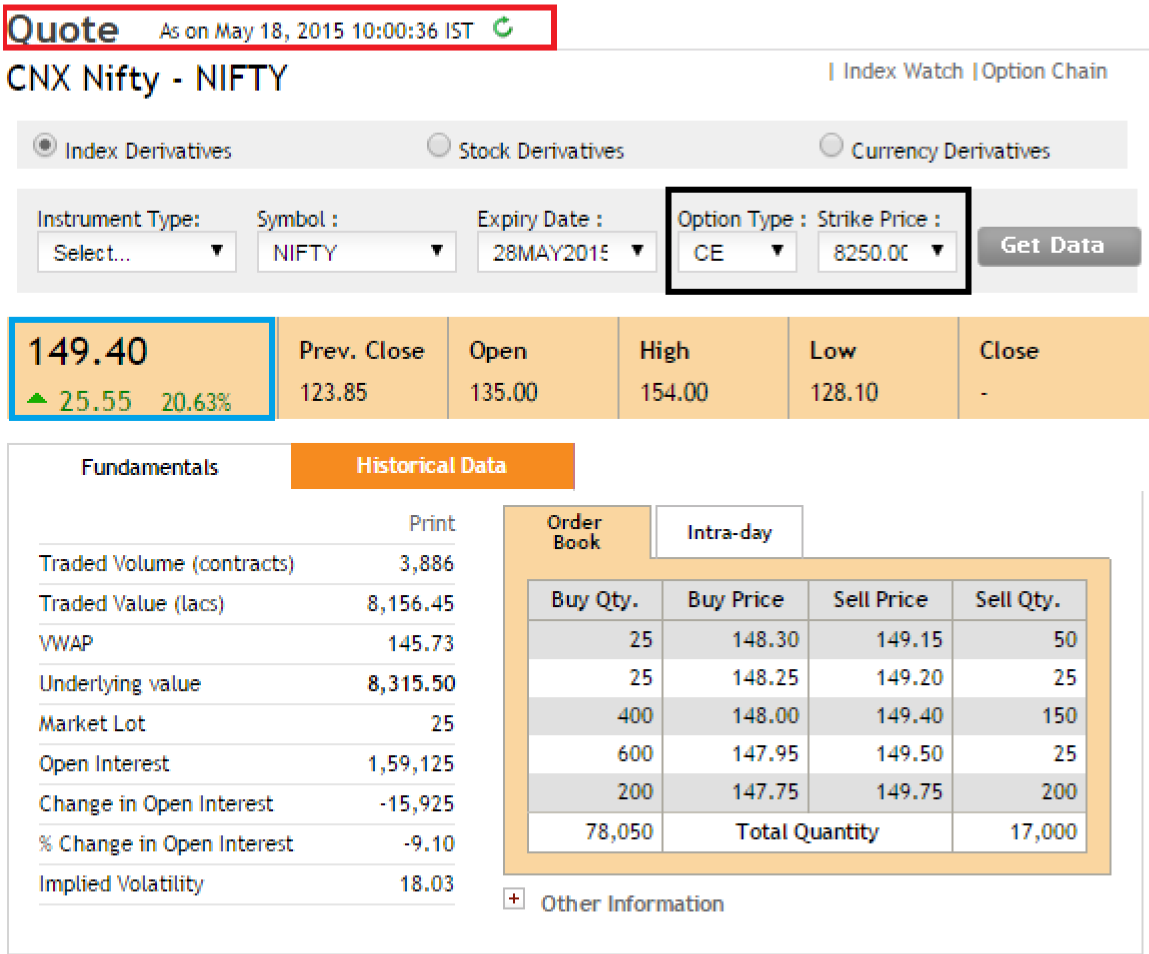
Traded Volume (contracts)	329
Traded Value (lacs)	689.65
VWAP	134.83
Underlying value	8,292.65
Market Lot	25
Open Interest	1,74,700
Change in Open Interest	-350
% Change in Open Interest	-0.20
Implied Volatility	19.26

Order Book Intra-day

Buy Qty.	Buy Price	Sell Price	Sell Qty.
25	143.65	144.75	600
50	143.60	144.80	200
150	143.50	144.90	250
200	143.20	144.95	25
150	143.05	145.00	300
25,150	Total Quantity		14,100

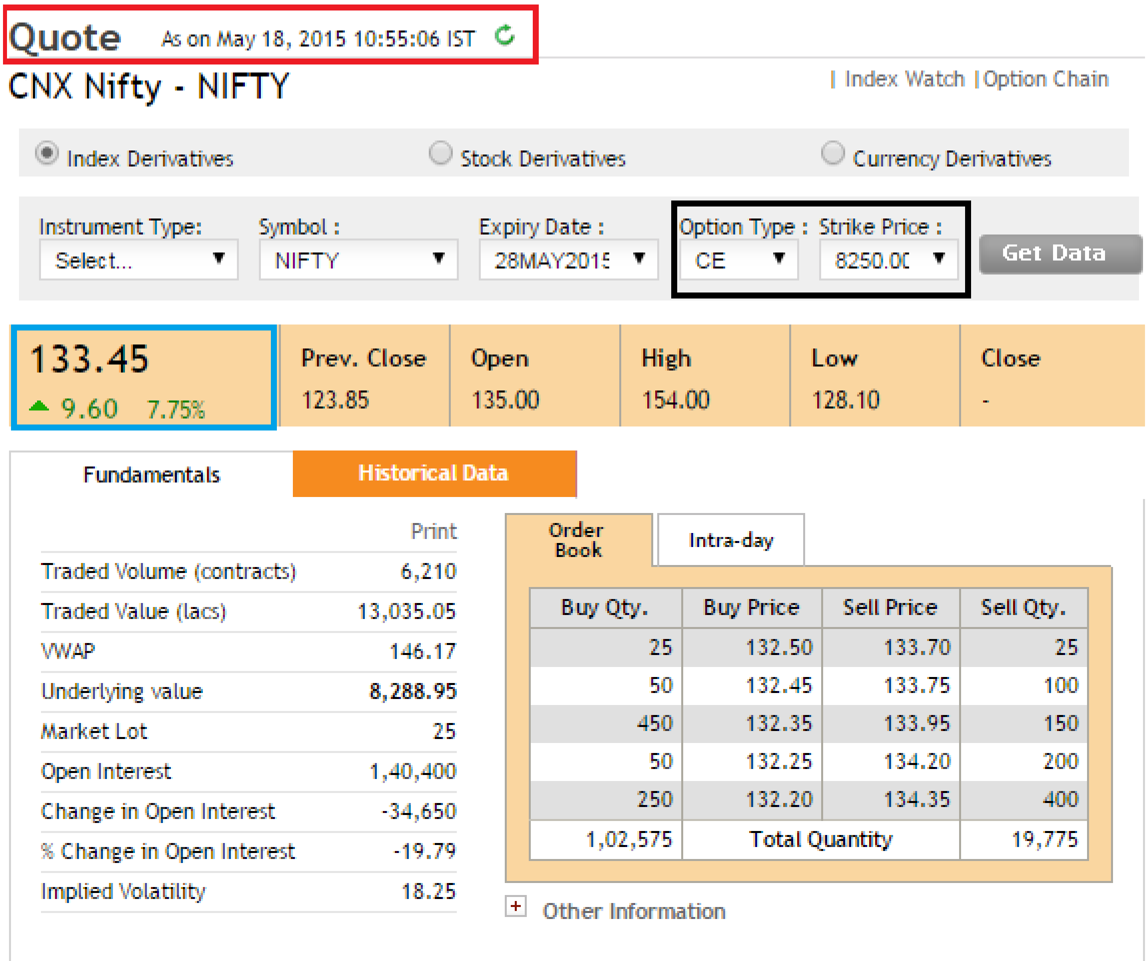
+ Other Information

A little while later…



Now notice the change in premium – at 09:18 AM **when Nifty was at 8292** the call option was trading at 144, however at 10:00 AM **Nifty moved to 8315** and the same call option was trading at 150.

In fact here is another snapshot at 10:55 AM – **Nifty declined to 8288** and so did the option premium (declined to 133).



From the above observations one thing stands out very clear – as and when the value of the spot changes, so does the option premium. More precisely as we already know – the call option premium increases with the increase in the spot value and vice versa.

Keeping this in perspective, imagine this – you have predicted that Nifty will reach 8355 by 3:00 PM today. From the snapshots above we know that the premium will certainly change – but by how much? What is the likely value of the 8250 CE premium if Nifty reaches 8355?

Well, this is exactly where the 'Delta of an Option' comes handy. The Delta measures how an options value changes with respect to the change in the underlying. In simpler terms, the Delta of an option helps us answer questions of this sort – "By how many points will the option premium change for every 1 point change in the underlying?"

Therefore the Option Greek's 'Delta' captures the effect of the directional movement of the market on the Option's premium.

The delta is a number which varies –

1. Between 0 and 1 for a call option, some traders prefer to use the 0 to 100 scale. So the delta value of 0.55 on 0 to 1 scale is equivalent to 55 on the 0 to 100 scale.
2. Between -1 and 0 (-100 to 0) for a put option. So the delta value of -0.4 on the -1 to 0 scale is equivalent to -40 on the -100 to 0 scale
3. We will soon understand why the put option's delta has a negative value associated with it

   At this stage I want to give you an orientation of how this chapter will shape up, please do keep this at the back of your mind as I believe it will help you join the dots better –

1. We will understand how we can use the Delta value for Call Options
2. A quick note on how the Delta values are arrived at
3. Understand how we can use the Delta value for Put Options
4. Delta Characteristics – Delta vs. Spot, Delta Acceleration (continued in next chapter)
5. Option positions in terms of Delta (continued in next chapter)

   So let's hit the road!

9.3 – Delta for a Call Option

We know the delta is a number that ranges between 0 and 1. Assume a call option has a delta of 0.3 or 30 – what does this mean?

Well, as we know the delta measures the rate of change of premium for every unit change in the underlying. So a delta of 0.3 indicates that for every 1 point change in the underlying, the premium is likely change by 0.3 units, or for every 100 point change in the underlying the premium is likely to change by 30 points.

The following example should help you understand this better –

Nifty @ 10:55 AM is at 8288

Option Strike = 8250 Call Option

Premium = 133

Delta of the option = + 0.55

Nifty @ 3:15 PM is expected to reach 8310

What is the likely option premium value at 3:15 PM?

Well, this is fairly easy to calculate. We know the Delta of the option is 0.55, which means for every 1 point change in the underlying the premium is expected to change by 0.55 points.

We are expecting the underlying to change by 22 points (8310 – 8288), hence the premium is supposed to increase by

= 22*0.55

= 12.1

Therefore the new option premium is expected to trade around **145.1** (133+12.1)

Which is the sum of old premium + expected change in premium

Let us pick another case – what if one anticipates a drop in Nifty? What will happen to the premium? Let us figure that out –

Nifty @ 10:55 AM is at 8288

Option Strike = 8250 Call Option

Premium = 133

Delta of the option = 0.55

Nifty @ 3:15 PM is expected to reach 8200

What is the likely premium value at 3:15 PM?

We are expecting Nifty to decline by **– 88** points (8200 – 8288), hence the change in premium will be –

= – 88 * 0.55

= **– 48.4**

Therefore the premium is expected to trade around

= 133 – 48.4

= 84.6 (new premium value)

As you can see from the above two examples, the delta helps us evaluate the premium value based on the directional move in the underlying. This is extremely useful information to have while trading options. For example assume you expect a massive 100 point up move on Nifty, and based on this expectation you decide to buy an option. There are two Call options and you need to decide which one to buy.

Call Option 1 has a delta of 0.05

Call Option 2 has a delta of 0.2

Now the question is, which option will you buy?

Let us do some math to answer this –

Change in underlying = 100 points

Call option 1 Delta = 0.05

Change in premium for call option 1 = 100 * 0.05

= 5

Call option 2 Delta = 0.2

Change in premium for call option 2 = 100 * 0.2

= 20

As you can see the same 100 point move in the underlying has different effects on different options. In this case clearly the trader would be better off buying Call Option 2. This should give you a hint – the delta helps you select the right option strike to trade. But of course there are more dimensions to this, which we will explore soon.

At this stage let me post a very important question – Why is the delta value for a call option bound by 0 and 1? Why can't the call option's delta go beyond 0 and 1?

To help understand this, let us look at 2 scenarios wherein I will purposely keep the delta value above 1 and below 0.

Scenario 1: Delta greater than 1 for a call option

Nifty @ 10:55 AM at 8268

Option Strike = 8250 Call Option

Premium = 133

Delta of the option = 1.5 (purposely keeping it above 1)

Nifty @ 3:15 PM is expected to reach 8310

What is the likely premium value at 3:15 PM?

Change in Nifty = 42 points

Therefore the change in premium (considering the delta is 1.5)

= 1.5*42

= 63

Do you notice that? The answer suggests that for a 42 point change in the underlying, the value of premium is increasing by 63 points! In other words, the option is gaining more value than the underlying itself. Remember the option is a derivative contract, it derives its value from its respective underlying, hence it can never move faster than the underlying.

If the delta is 1 (which is the maximum delta value) it signifies that the option is moving in line with the underlying which is acceptable, but a value higher than 1 does not make sense. For this reason the delta of an option is fixed to a maximum value of 1 or 100.

Let us extend the same logic to figure out why the delta of a call option is lower bound to 0.

Scenario 2: Delta lesser than 0 for a call option

Nifty @ 10:55 AM at 8288

Option Strike = 8300 Call Option

Premium = 9

Delta of the option = – 0.2 (have purposely changed the value to below 0, hence negative delta)

Nifty @ 3:15 PM is expected to reach 8200

What is the likely premium value at 3:15 PM?

Change in Nifty = 88 points (8288 -8200)

Therefore the change in premium (considering the delta is -0.2)

= -0.2*88

= **-17.6**

For a moment we will assume this is true, therefore new premium will be

= -17.6 + 9

= **– 8.6**

As you can see in this case, when the delta of a call option goes below 0, there is a possibility for the premium to go below 0, which is impossible. At this point do recollect the premium irrespective of a call or put can never be negative. Hence for this reason, the delta of a call option is lower bound to zero.

9.4 – Who decides the value of the Delta?

The value of the delta is one of the many outputs from the Black & Scholes option pricing formula. As I have mentioned earlier in this module, the B&S formula takes in a bunch of inputs and gives out a few key outputs. The output includes the option's delta value and other Greeks. After discussing all the Greeks, we will also go through the B&S formula to strengthen our understanding on options. However for now, you need to be aware that the delta and other Greeks are market driven values and are computed by the B&S formula.

However here is a table which will help you identify the approximate delta value for a given option –

Option Type	Approx Delta value (CE)	Approx Delta value (PE)
Deep ITM	Between + 0.8 to + 1	Between – 0.8 to – 1
Slightly ITM	Between + 0.6 to + 1	Between – 0.6 to – 1
ATM	Between + 0.45 to + 0.55	Between – 0.45 to – 0.55
Slightly OTM	Between + 0.45 to + 0.3	Between – 0.45 to -0.3
Deep OTM	Between + 0.3 to + 0	Between – 0.3 to – 0

Of course you can always find out the exact delta of an option by using a B&S option pricing calculator.

9.5 – Delta for a Put Option

Do recollect the Delta of a Put Option ranges from -1 to 0. The negative sign is just to illustrate the fact that when the underlying gains in value, the value of premium goes down. Keeping this in mind, consider the following details –

Parameters	Values
Underlying	Nifty
Strike	8300
Spot value	8268
Premium	128
Delta	-0.55
Expected Nifty Value (Case 1)	8310
Expected Nifty Value (Case 2)	8230

Note – 8268 is a slightly ITM option, hence the delta is around -0.55 (as indicated from the table above).

The objective is to evaluate the new premium value considering the delta value to be **-0.55**. Do pay attention to the calculations made below.

Case 1: Nifty is expected to move to 8310

Expected change = 8310 – 8268

= 42

Delta = – 0.55

= -0.55*42

= -23.1

Current Premium = 128

New Premium = 128 -23.1

= 104.9

Here I'm subtracting the value of delta since I know that the value of a Put option declines when the underlying value increases.

Case 2: Nifty is expected to move to 8230

Expected change = 8268 – 8230

= 38

Delta = – 0.55

= -0.55*38

= -20.9

Current Premium = 128

New Premium = 128 + 20.9

= 148.9

Here I'm adding the value of delta since I know that the value of a Put option gains when the underlying value decreases.

I hope with the above two Illustrations you are now clear on how to use the Put Option's delta value to evaluate the new premium value. Also, I will take the liberty to skip explaining why the Put Option's delta is bound between -1 and 0.

In fact I would encourage the readers to apply the same logic we used while understanding why the call option's delta is bound between 0 and 1, to understand why Put option's delta is bound between -1 and 0.

In the next chapter we will dig deeper into Delta and understand some of its characteristics.

Key takeaways from this chapter

1. Option Greeks are forces that influence the premium of an option
2. Delta is an Option Greek that captures the effect of the direction of the market
3. Call option delta varies between 0 and 1, some traders prefer to use 0 to 100.
4. Put option delta varies between -1 and 0 (-100 to 0)
5. The negative delta value for a Put Option indicates that the option premium and underlying value moves in the opposite direction
6. ATM options have a delta of 0.5
7. ITM option have a delta of close to 1
8. OTM options have a delta of close to 0.

Delta (Part 2)

10.1 – Model Thinking

The previous chapter gave you a sneak peek into the first option Greek – the Delta. Besides discussing the delta, there was another hidden agenda in the previous chapter – to set you on a 'model thinking' path. Let me explain what I mean by this – the previous chapter opened up a new window to evaluate options. The window threw open different option trading perspectives – hopefully you now no longer think about options in a one-dimensional perspective.

For instance going forward if you have view on markets (bullish for example) you **may not** strategize your trade this way – 'My view is bullish, therefore it makes sense to either buy a call option or collect premium by selling a put option'.

Rather you may strategize this way – "My view is bullish as I expect the market to move by 40 points, therefore it makes sense to buy an option which has a delta of 0.5 or more as the option is expected to gain at least 20 points for the given 40 point move in the market".

See the difference between the two thought processes? While the former is a bit naïve and casual, the latter is well defined and quantitative in nature. The expectation of a 20 point move in the option premium was an outcome of a formula that we explored in the previous chapter –

Expected change in option premium = Option Delta * Points change in underlying

The above formula is just one piece in the whole game plan. As and when we discover the other Greeks, the evaluation metric becomes more quantitative and in the process the trade selection becomes more scientifically streamlined. Point is – the thinking going forward will be guided by equations and numbers and 'casual trading thoughts' will have very little scope. I know there are many traders who trade just with a few random thoughts and some may even be successful. However this is not everybody's cup of tea. The odds are better when you put numbers in perspective – and this happens when you develop 'model thinking'.

So please do keep model thinking framework in perspective while analyzing options, as this will help you setup systematic trades.

10.2 – Delta versus spot price

In the previous chapter we looked at the significance of Delta and also understood how one can use delta to evaluate the expected change in premium. Before we proceed any further, here is a quick recap from the previous chapter –

1. Call options has a +ve delta. A Call option with a delta of 0.4 indicates that for every 1 point gain/loss in the underlying the call option premium gains/losses 0.4 points
2. Put options has a –ve delta. A Put option with a delta of -0.4 Indicates that for every 1 point loss/gain in the underlying the put option premium gains/losses 0.4 points
3. OTM options have a delta value between 0 and 0.5, ATM option has a delta of 0.5, and ITM option has a delta between 0.5 and 1.

Let me take cues from the 3rd point here and make some deductions. Assume Nifty Spot is at 8312, strike under consideration is 8400, and option type is CE (Call option, European).

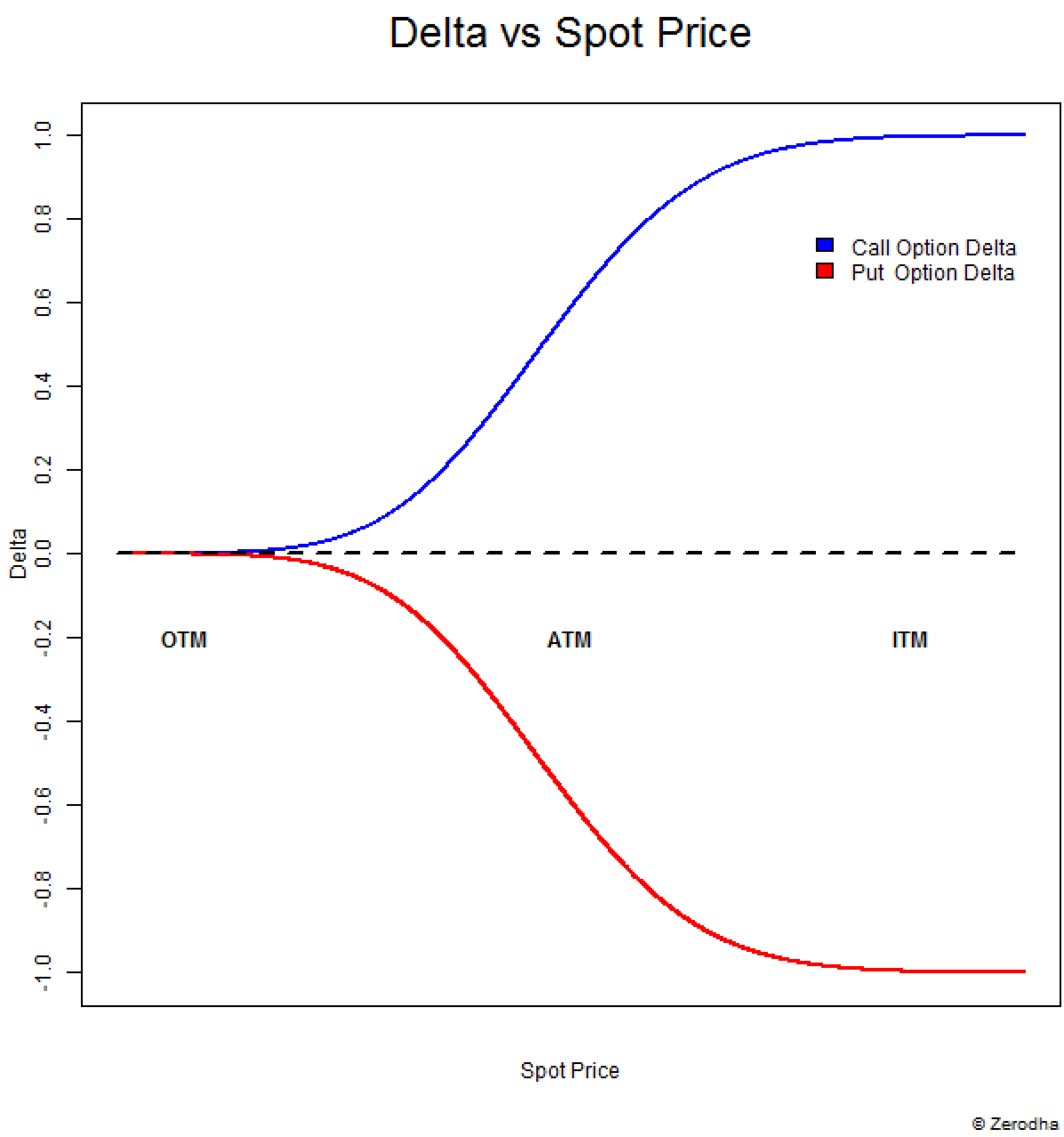
1. What is the approximate Delta value for the 8400 CE when the spot is 8312?
1. Delta should be between 0 and 0.5 as 8400 CE is OTM. Let us assume Delta is 0.4
2. Assume Nifty spot moves from 8312 to 8400, what do you think is the Delta value?
1. Delta should be around 0.5 as the 8400 CE is now an ATM option
3. Further assume Nifty spot moves from 8400 to 8500, what do you think is the Delta value?
1. Delta should be closer to 1 as the 8400 CE is now an ITM option. Let us say 0.8.
4. Finally assume Nifty Spot cracks heavily and drops back to 8300 from 8500, what happens to delta?
1. With the fall in spot, the option has again become an OTM from ITM, hence the value of delta also falls from 0.8 to let us say 0.35.
5. What can you deduce from the above 4 points?
1. Clearly as and when the spot value changes, the moneyness of an option changes, and therefore the delta also changes.

Now this is a very important point here – **the delta changes with changes in the value of spot**. Hence delta is a variable and not really a fixed entity. Therefore if an option has a delta of 0.4, the value is likely to change with the change in the value of the underlying.

Have a look at the chart below – it captures the movement of delta versus the spot price. The chart is a generic one and not specific to any particular option or strike as such. As you can see there are two lines –

1. The blue line captures the behavior of the Call option's delta (varies from 0 to 1)
2. The red line captures the behavior of the Put option's delta (varies from -1 to 0)

Let us understand this better –

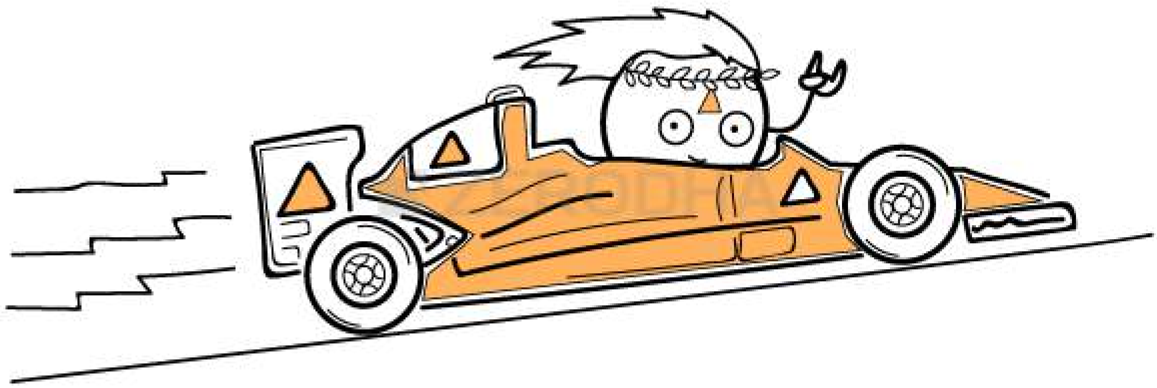


This is a very interesting chart, and to begin with I would suggest you look at only the blue line and ignore the red line completely. The blue line represents the delta of a call option. The graph above captures few interesting characteristics of the delta; let me list them for you (meanwhile keep this point in the back of your mind – as and when the spot price changes, the moneyness of the option also changes) –

1. Look at the X axis – starting from left the moneyness increases as the spot price traverses from OTM to ATM to ITM
2. Look at the delta line (blue line) – as and when the spot price increases so does the delta

3. Notice at OTM the delta is flattish near 0 – this also means irrespective of how much the spot price falls (going from OTM to deep OTM) the option's delta will remain at 0
1. Remember the call option's delta is lower bound by 0
4. When the spot moves from OTM to ATM the delta also starts to pick up (remember the option's moneyness also increases)
1. Notice how the delta of option lies within 0 to 0.5 range for options that are less than ATM
5. At ATM, the delta hits a value of 0.5
6. When the spot moves along from the ATM towards ITM the delta starts to move beyond the 0.5 mark
7. Notice the delta starts to fatten out when it hits a value of 1
1. This also implies that as and when the delta moves beyond ITM to say deep ITM the delta value does not change. It stays at its maximum value of 1.

You can notice similar characteristics for the Put Option's delta (red line).



10.3 – The Delta Acceleration

If you are fairly involved in the options world you may have heard of bizarre stories of how traders double or triple their money by trading OTM option. If you have not heard such stories, let me tell you one – It was 17th May 2009 (Sunday), the election results were declared, the UPA Government got re-elected at the center and Dr.Manmohan Singh came back as the country's Prime Minister to serve his 2nd term. Stock markets likes stability at the center and we all knew that the market would rally the next day i.e. 18th May 2009. The previous day Nifty had closed at 3671.

Zerodha was not born then, we were just a bunch of traders trading our own capital along with a few clients. One of our associates had taken a huge risk few days prior to 17th May – he bought far off options (OTM) worth Rs.200,000/-. A dare devil act this was considering the fact that nobody can really predict the outcome of a general election. Obviously he would benefit if the market rallied, but for the market to rally there were many factors at play. Along with him, we too were very anxious to figure out what would happen. Finally the results were declared and we all knew he would make money on 18th May – but none of us really knew to what extent he would stand to benefit.

18th May 2009, a day that I cannot forget – markets opened at 9:55 AM (that was the market opening time back then), it was a big bang open for market, Nifty immediately hit an upper circuit and the markets froze. Within a matter of few minutes Nifty rallied close to 20% to close the day at 4321! The exchanges decided to close the market at 10:01 AM as it was overheated…and thus it was the shortest working day of my life.

Here is the chart that highlights that day's market move –

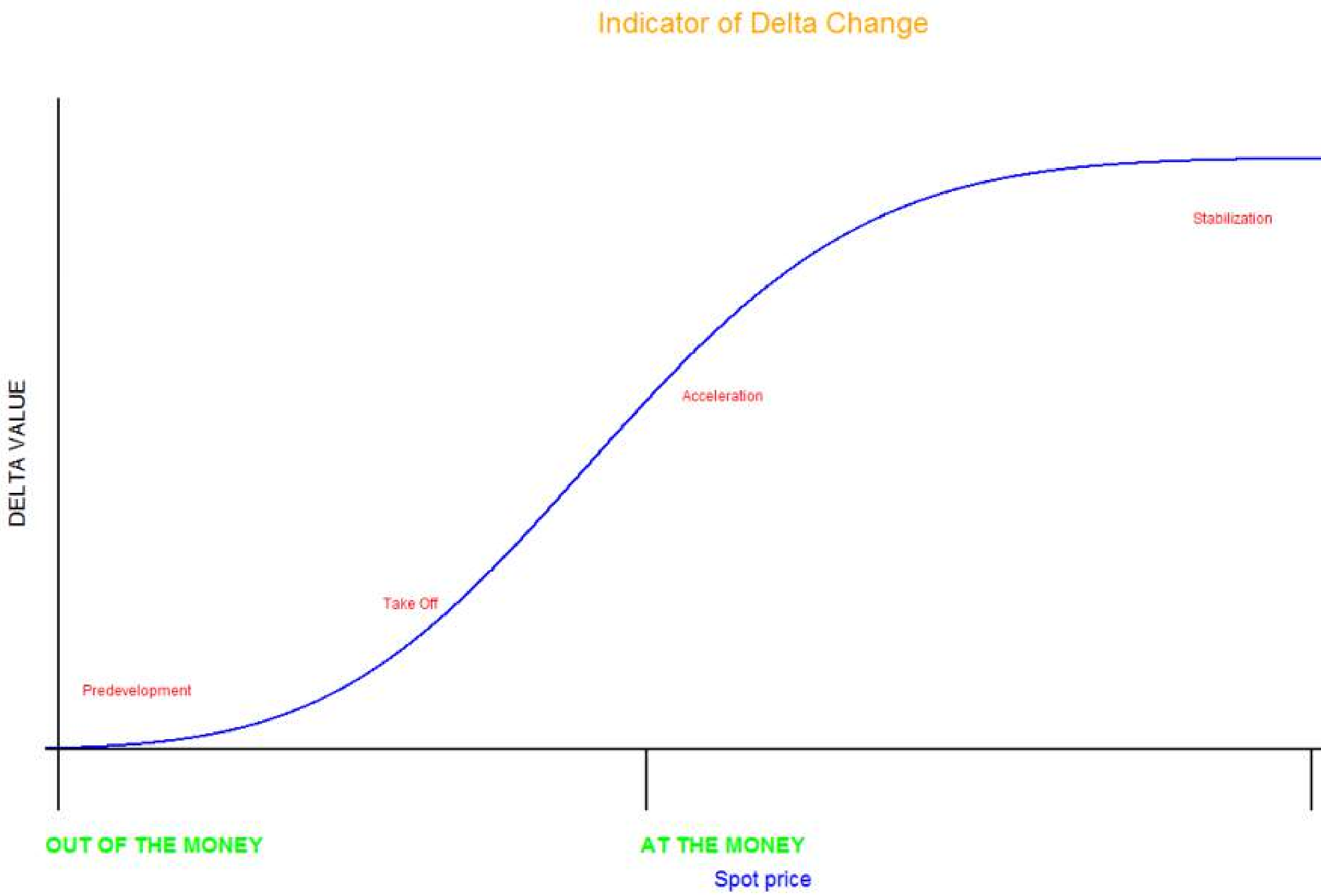
In the whole process our dear associate had made a sweet fortune. At 10:01 AM on that glorious Monday morning, his option were valued at Rs.28,00,000/- a whopping 1300% gain all achieved overnight! This is the kind of trades that almost all traders including me aspire to experience.

Anyway, let me ask you a few questions regarding this story and that will also bring us back to the main topic –

1. Why do you think our associate choose to buy OTM options and not really ATM or ITM options?

2. What would have happened if he had bought an ITM or ATM option instead?

Well the answers to these questions lies in this graph –



This graph talks about the 'Delta Acceleration' – there are 4 delta stages mentioned in the graph, let us look into each one of them.

Before we move ahead with the following discussion some points for you here –

- I would advise you to pay a lot of attention to the following discussion, these are some of the really important points to know and remember
- Do recollect and revise the delta table (option type, approximate delta value etc) from the previous chapter
- Please do bear in mind the delta and premium numbers used here is an intelligent assumption for the sake of this illustration –

Predevelopment – This is the stage when the option is OTM or deep OTM. The delta here is close to 0. The delta will remain close to 0 even when the option moves from deep OTM to OTM. For example when spot is 8400, 8700 Call Option is Deep OTM, which is likely to have a delta of 0.05. Now even if the spot moves from 8400 to let us say 8500, the delta of 8700 Call option will not move much as 8700 CE is still an OTM option. The delta will still be a small non – zero number.

So if the premium for 8700 CE when spot is at 8400 is Rs.12, then when Nifty moves to 8500 (100 point move) the premium is likely to move by 100 * 0.05 = 5 points.

Hence the new premium will be Rs.12 + 5 = Rs.17/-. However the 8700 CE is now considered slightly OTM and not really deep OTM.

Most important to note – the change in premium value in absolute terms maybe small (Rs.5/-) but in percentage terms the Rs.12/- option has changed by 41.6% to Rs.17/-

Conclusion – Deep OTM options tends to put on an impressive percentage however for this to happen the spot has to move by a large value.

Recommendation – avoid buying **deep OTM** options because the deltas are really small and the underlying has to move massively for the option to work in your favor. There is more bang for the buck elsewhere. However for the very same reason selling deep OTM makes sense, but we will evaluate when to sell these options when we take up the Greek 'Theta'.

Take off & Acceleration – This is the stage when the option transitions from OTM to ATM. This is where the maximum bang for the buck lies, and therefore the risk.

Consider this – Nifty spot @ 8400, Strike is 8500 CE, option is slightly OTM, delta is 0.25, Premium is Rs.20/-.

Spot moves from 8400 to 8500 (100 point), to figure out what happens on the premium side, let us do some math –

Change in underlying = 100

Delta for 8500 CE = 0.25

Premium change = 100 * 0.25 = 25

New premium = Rs.20 + 25 = Rs.45/-

Percentage change = 125%

Do you see that? For the same 100 point move slightly OTM options behaves very differently.

Conclusion – The slightly OTM option which usually has a delta value of say 0.2 or 0.3 is more sensitive to changes in the underlying. For any meaningful change in the underlying the percentage change in the slightly OTM options is very impressive. In fact this is exactly how option traders double or triple their money i.e. by buying slightly OTM options when they expect big moves in the underlying. But I would like to remind you that this is just one face of the cube, there are other faces we still need to explore.

Recommendation – Buying slightly OTM option is more expensive than buying deep OTM options, but if you get your act right you stand to make a killing. Whenever you buy options, consider buying slightly OTM options (of course assuming there is plenty of time to expiry, we will talk about this later).

Let us take this forward and see how the ATM option would react for the same 100 point move.

Spot = 8400

Strike = 8400 (ATM)

Premium = Rs.60/-

Change in underlying = 100

Delta for 8400 CE = 0.5

Premium change = 100 * 0.5 = 50

New premium = Rs.60 + 50 = Rs.110/-

Percentage change = 83%

Conclusion – ATM options are more sensitive to changes in the spot when compared to OTM options. Now because the ATM's delta is high the underlying need not really move by a large value. Even if the underlying moves by a small value the option premium changes. However buying ATM options are more expensive when compared to OTM options.

Recommendation – Buy ATM options when you want to play safe. The ATM option will move even if the underlying does not move by a large value. Also as a corollary, do not attempt to sell an ATM option unless you are very sure about what you are doing.

Stabilization – When the option transitions from ATM to ITM and Deep ITM the delta starts to stabilize at 1. As we can see from the graph, the delta starts to flatten out when hits the value of 1. This means the option can be ITM or deep ITM but the delta gets fixed to 1 and would not change in value.

Let us see how this works –

Nifty Spot = 8400

Option 1 = 8300 CE Strike, ITM option, Delta of 0.8, and Premium is Rs.105

Option 2 = 8200 CE Strike, Deep ITM Option, Delta of 1.0, and Premium is Rs.210

Change in underlying = 100 points, hence Nifty moves to 8500.

Given this let us see how the two options behave –

Change in premium for Option 1 = 100 * 0.8 = **80**

New Premium for Option 1 = Rs.105 + 80 = Rs.185/-

Percentage Change = 80/105 = **76.19%**

Change in premium for Option 2 = 100 * 1 = **100**

New Premium for Option 2 = Rs.210 + 100 = Rs.310/-

Percentage Change = 100/210 = **47.6%**

Conclusion – In terms of the absolute change in the number of points, the deep ITM option scores over the slightly ITM option. However in terms of percentage change it is the other way round. Clearly ITM options are more sensitive to the changes in the underlying but certainly most expensive.

Most importantly notice the change in the deep ITM option (delta 1) for a change of 100 points in the underlying there is a change of 100 points in the option premium. **This means to say when you buy a deep ITM option it is as good as buying the underlying itself.** This is because whatever is the change in the underlying, the deep ITM option will experience the same change.

Recommendation – Buy the ITM options when you want to play very safe. When I say safe, I'm contrasting the deep ITM option with deep OTM option. The ITM options have a high delta, which means they are most sensitive to changes in the underlying.

Deep ITM option moves in line with the underlying, this means you can substitute a deep ITM option to a futures contract!

Think about this –

Nifty Spot @ 8400

Nifty Futures = 8409

Strike = 8000 (deep ITM)

Premium = 450

Delta = 1.0

Change in spot = 30 points

New Spot value = 8430

Change in Futures = 8409 + 30 = 8439 à Reflects the entire 30 point change

Change Option Premium = 1*30 = 30

New Option Premium = 30 + 450 = 480 à Reflects the entire 30 point change

So the point is, both futures and Deep ITM options react very similar to the changes in the underlying. Hence you are better off buying a Deep ITM option and therefore lessen your margin burden. However if you opt to do this, you need to constantly make sure that the Deep ITM option continues to remain Deep ITM (in other words make sure the delta is always 1), plus do keep an eye on the liquidity of the contract.

I would suspect that at this stage the information contained in this chapter could be an overdose, especially if you are exploring the Greeks for the first time. I would suggest you take your time to learn this one bit at a time.

There are few more angles we need to explore with respect to the delta, but will do that in the next chapter. However before we conclude this chapter let us summarize the discussion with the help of a table.

This table will help us understand how different options behave differently given a certain change in the underlying.

I've considered Bajaj Auto as the underlying. The price is 2210 and the expectation is a 30 point change in the underlying (which means we are expecting Bajaj Auto to hit 2240). We will also assume there is plenty of time to expiry; hence time is not really a concern.

Moneyness	Strike	Delta	Old Premium	Change in Premium	New Premium	% Change
Deep OTM	2400	0.05	Rs.3/-	30* 0.05 = 1.5	3+1.5 = 4.5	50%
Slightly OTM	2275	0.3	Rs.7/-	30*0.3 = 9	7 +9 = 16	129%
ATM	2210	0.5	Rs.12/-	30*0.5 = 15	12+15 = 27	125%
Slightly ITM	2200	0.7	Rs.22/-	30*0.7 = 21	22+21 = 43	95.45%
Deep ITM	2150	1	Rs.75/-	30*1 = 30	75 + 30 =105	40%

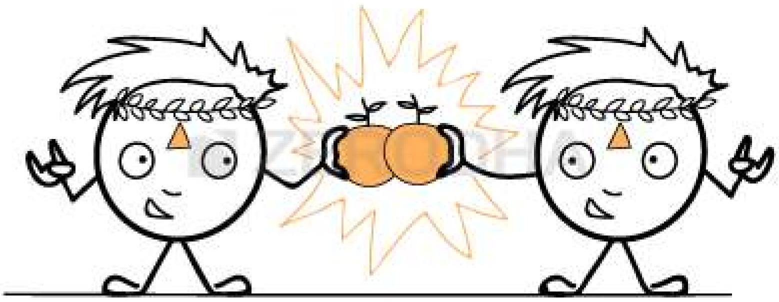
As you can see each option behaves differently for the same move in the underlying.

Before I wrap this chapter – I narrated a story to you earlier in this chapter following which I posted few questions. Perhaps you can now revisit the questions and you will hopefully know the answers .

Key takeaways from this chapter

1. Model Thinking helps in developing a scientifically streamlined approach to trading
2. The Delta changes as and when the spot value changes
3. As the option transitions from OTM to ATM to ITM, so does the delta
4. Delta hits a value of 0.5 for ATM options
5. Delta predevelopment is when the option transitions from Deep OTM to OTM
6. Delta Take off and acceleration is when the option transitions from OTM to ATM
7. Delta stabilization is when the option transitions from ATM to ITM to Deep ITM
8. Buying options in the take off stage tends to give high % return
9. Buying Deep ITM option is as good as buying the underlying.

Delta (Part 3)



11.1 – Add up the Deltas

Here is an interesting characteristic of the Delta – The Deltas can be added up!

Let me explain – we will go back to the Futures contract for a moment. We know for every point change in the underlying's spot value the futures also changes by 1 point. For example if Nifty Spot moves from 8340 to 8350 then the Nifty Futures will also move from 8347 to 8357 (i.e. assuming Nifty Futures is trading at 8347 when the spot is at 8340). If we were to assign a delta value to Futures, clearly the future's delta would be 1 as we know for every 1 point change in the underlying the futures also changes by 1 point.

Now, assume I buy 1 ATM option which has a delta of 0.5, then we know that for every 1 point move in the underlying the option moves by 0.5 points. In other words owning 1 ATM option is as good as holding half futures contract. Given this, if I hold 2 such ATM contracts, then it as good as holding 1 futures contract because the delta of the 2 ATM options i.e. 0.5 and 0.5, which adds up to total delta of 1! In other words the deltas of two or more option contracts can be added to evaluate the total delta of the position.

Let us take up a few case studies to understand this better –

Case 1 – Nifty spot at 8125, trader has 3 different Call option.

Sl No	Contract	Classification	Lots	Delta	Position Delta

1	8000 CE	ITM	1 -Buy	0.7	+ 1 * 0.7 = + 0.7
2	8120 CE	ATM	1 -Buy	0.5	+ 1 * 0.5 = + 0.5
3	8300 CE	Deep OTM	1- Buy	0.05	+ 1 * 0.05 = + 0.05
	Total Delta of positions				**= 0.7 + 0.5 + 0.05 = + 1.25**

Observations –

1. The positive sign next to 1 (in the Position Delta column) indicates 'Long' position
2. The combined positions have a positive delta i.e. +1.25. This means both the underlying and the combined position moves in the same direction
3. For every 1 point change in Nifty, the combined position changes by 1.25 points
4. If Nifty moves by 50 points, the combined position is expected to move by 50 * 1.25 = 62.5 points

Case 2 – Nifty spot at 8125, trader has a combination of both Call and Put options.

Sl No	Contract	Classification	Lots	Delta	Position Delta
1	8000 CE	ITM	1- Buy	0.7	+ 1*0.7 =0.7
2	8300 PE	Deep ITM	1- Buy	**– 1.0**	**+ 1*-1.0 = -1.0**
3	8120 CE	ATM	1- Buy	0.5	+ 1*0.5 = 0.5
4	8300 CE	Deep OTM	1- Buy	0.05	+ 1*0.05 = 0.05
	Total Delta of positions				**0.7 – 1.0 + 0.5 + 0.05 = + 0.25**

Observations –

1. The combined positions have a positive delta i.e. +0.25. This means both the underlying and the combined position move in the same direction
2. With the addition of Deep ITM PE, the overall position delta has reduced, this means the combined position is less sensitive to the directional movement of the market
3. For every 1 point change in Nifty, the combined position changes by 0.25 points
4. If Nifty moves by 50 points, the combined position is expected to move by 50 * 0.25 = 12.5 points
5. Important point to note here – Deltas of the call and puts can be added as long as it belongs to the same underlying.

Case 3 – Nifty spot at 8125, trader has a combination of both Call and Put options. He has 2 lots Put option here.

Sl No	Contract	Classification	Lots	Delta	Position Delta
1	8000 CE	ITM	1- Buy	0.7	+ 1 * 0.7 = + 0.7
2	8300 PE	Deep ITM	2- Buy	-1	+ 2 * (-1.0) = -2.0
3	8120 CE	ATM	1- Buy	0.5	+ 1 * 0.5 = + 0.5
4	8300 CE	Deep OTM	1- Buy	0.05	+ 1 * 0.05 = + 0.05
	Total Delta of positions				**0.7 – 2 + 0.5 + 0.05 = – 0.75**

Observations –

1. The combined positions have a negative delta. This means the underlying and the combined option position move in the opposite direction
2. With an addition of 2 Deep ITM PE, the overall position has turned delta negative, this means the combined position is less sensitive to the directional movement of the market
3. For every 1 point change in Nifty, the combined position changes by – 0.75 points
4. If Nifty moves by 50 points, the position is expected to move by 50 * (- 0.75) = -37.5 points

Case 4 – Nifty spot at 8125, the trader has Calls and Puts of the same strike, same underlying.

Sl No	Contract	Classification	Lots	Delta	Position Delta
1	8100 CE	ATM	1- Buy	0.5	+ 1 * 0.5 = + 0.5
2	8100 PE	ATM	1- Buy	-0.5	+ 1 * (-0.5) = -0.5
		Total Delta of positions			**+ 0.5 – 0.5 = 0**

Observations –

1. The 8100 CE (ATM) has a positive delta of + 0.5
2. The 8100 PE (ATM) has a negative delta of – 0.5
3. The combined position has a delta of 0, which implies that the combined position does not get impacted by any change in the underlying
   1. For example – If Nifty moves by 100 points, the change in the options positions will be 100 * 0 = 0
4. Positions such as this – which have a combined delta of 0 are also called **'Delta Neutral'** positions
5. Delta Neutral positions do not get impacted by any directional change. They behave as if they are insulated to the market movements
6. However Delta neutral positions react to other variables like Volatility and Time. We will discuss this at a later stage.

Case 5 – Nifty spot at 8125, trader has sold a Call Option

Sl No	Contract	Classification	Lots	Delta	Position Delta
1	8100 CE	ATM	1- Sell	0.5	– 1 * 0.5 = – 0.5
2	8100 PE	ATM	1- Buy	-0.5	+ 1 * (-0.5) = – 0.5
		Total Delta of positions			**– 0.5 – 0.5 = – 1.0**

Observations –

1. The negative sign next to 1 (in the Position Delta column) indicates 'short' position

2. As we can see a short call option gives rise to a negative delta – this means the option position and the underlying move in the opposite direction. This is quite intuitive considering the fact that the increase in spot value results in a loss to the call option seller
3. Likewise if you short a PUT option the delta turns positive

1. -1 * (-0.5) = +0.5

Lastly just consider a case wherein the trader has 5 lots long deep ITM option. We know the total delta of such position would + 5 * + 1 = + 5. This means for every 1 point change in the underlying the combined position would change by 5 points in the same direction.

Do note the same can be achieved by shorting 5 deep ITM PUT options –

– 5 * – 1 = + 5

-5 indicate 5 short positions and -1 is the delta of deep ITM Put options.

The above case study discussions should give you a perspective on how to add up the deltas of the individual positions and figure out the overall delta of the positions. This technique of adding up the deltas is very helpful when you have multiple option positions running simultaneously and **you want to identify the overall directional impact on the positions**.

In fact I would strongly recommend you always add the deltas of individual position to get a perspective – this helps you understand the sensitivity and leverage of your overall position.

Also, here is another important point you need to remember –

Delta of ATM option = 0.5

If you have 2 ATM options = delta of the position is 1

So, for every point change in the underlying the overall position also changes by 1 point (as the delta is 1). This means the option mimics the movement of a Futures contract. However, do remember these two options should not be considered as a surrogate for a futures contract. Remember the Futures contract is only affected by the direction of the market, however the options contracts are affected by many other variables besides the direction of the markets.

There could be times when you would want to substitute the options contract instead of futures (mainly from the margins perspective) – but whenever you do so be completely aware of its implications, more on this topic as we proceed.

11.2 – Delta as a probability

Before we wrap up our discussion on Delta, here is another interesting application of Delta. You can use the Delta to gauge the probability of the **option contract to expire in the money**.

Let me explain – when a trader buys an option (irrespective of Calls or Puts), what is that he aspires? For example what do you expect when you buy Nifty 8000 PE when the spot is trading at 8100? (Note 8000 PE is an OTM option here). Clearly we expect the market to fall so that the Put option starts to make money for us.

In fact the trader hopes the spot price falls below the strike price so **that the option transitions from an OTM option to ITM option** – and in the process the premium goes higher and the trader makes money.

The trader can use the delta of an option to figure out the probability of the option to transition from OTM to ITM.

In the example 8000 PE is slightly OTM option; hence its delta must be below 0.5, let us fix it to 0.3 for the sake of this discussion.

Now to figure out the probability of the option to transition from OTM to ITM, simply convert the delta to a percentage number.

When converted to percentage terms, delta of 0.3 is 30%. Hence there is only 30% chance for the 8000 PE to transition into an ITM option.

Interesting right? Now think about this situation – although an arbitrary situation, this in fact is a very real life market situation –

1. 8400 CE is trading at Rs.4/-
2. Spot is trading at 8275
3. There are two day left for expiry – would you buy this option?

   Well, a typical trader would think that this is a low cost trade, after all the premium is just Rs.4/- hence there is nothing much to lose. In fact the trader could even convince himself thinking that if the trade works in his favor, he stands a chance to make a huge profit.

   Fair enough, in fact this is how options work. But let's put on our 'Model Thinking' hat and figure out if this makes sense –

1. 8400 CE is deep OTM call option considering spot is at 8275
2. The delta of this option could be around 0.1
3. Delta suggests that there is only 10% chance for the option to expire ITM
4. Add to this the fact that there are only 2 more days to expiry – the case **against** buying this option becomes stronger!

A prudent trader would never buy this option. However don't you think it makes perfect sense to sell this option and pocket the premium? Think about it – there is just 10% chance for the option to expire ITM or in other words there is 90% chance for the option to expire as an OTM option. With such a huge probability favoring the seller, one should go ahead and take the trade with conviction!

In the same line – what would be the delta of an ITM option? Close to 1 right? So this means there is a very high probability for an already ITM option to expire as ITM. In other words the probability of an ITM option expiring OTM is very low, so beware while shorting/writing ITM options as the odds are already against you!

Remember smart trading is all about taking trades wherein the odds favor you, and to know if the odds favor you, you certainly need to know your numbers and don your 'Model Thinking' hat.

And with this I hope you have developed a fair understanding on the very first Option Greek – The delta.

The Gamma beckons us now.

Key takeaways from this chapter

1. The delta is additive in nature
2. The delta of a futures contract is always 1
3. Two ATM option is equivalent to owning 1 futures contract
4. The options contract is not really a surrogate for the futures contract
5. The delta of an option is also the probability for the option to expire ITM

Gamma (Part 1)

12.1 – The other side of the mountain

How many of you remember your high school calculus? Does the word differentiation and integration ring a bell? The word 'Derivatives' meant something else to all of us back then – it simply referred to solving lengthy differentiation and integration problems.

Let me attempt to refresh your memory – the idea here is to just drive a certain point across and not really get into the technicalities of solving a calculus problem. Please note, the following discussion is very relevant to options, so please do read on.

Consider this –

A car is set into motion; it starts from 0 kms travels for 10 minutes and reaches the 3^{rd} kilometer mark. From the 3^{rd} kilometer mark, the car travels for another 5 minutes and reaches the 7^{th} kilometer mark.

Let us focus and note what really happens between the **3^{rd} and 7^{th} kilometer**, –

1. Let 'x' = distance, and 'dx' the change in distance
2. Change in distance i.e. 'dx', is 4 (7 – 3)
3. Let 't' = time, and 'dt' the change in time
4. Change in time i.e. 'dt', is 5 (15 – 10)

If we divide **dx over dt** i.e. change in distance over change in time we get 'Velocity' (V)!

V = dx / dt

= 4/5

This means the car is travelling 4Kms for every 5 Minutes. Here the velocity is being expressed in Kms travelled per minute, clearly this is not a convention we use in our day to day conversation as we are used to express speed or velocity in Kms travelled per hour (KMPH).

We can convert 4/5 to KMPH by making a simple mathematical adjustment –

5 minutes when expressed in hours equals 5/60 hours, plugging this back in the above equation

= 4 / (5/ 60)

= (4*60)/5

= 48 Kmph

Hence the car is moving at a velocity of 48 kmph (kilometers per hour).

Do remember Velocity is **change in distance travelled divided over change in time**. In the calculus world, the Speed or Velocity is called the '**1^{st} order derivative**' of distance travelled.

Now, let us take this example forward – In the 1^{st} leg of the journey the car reached the 7^{th} Kilometer after 15 minutes. Further assume in the 2^{nd} leg of journey, starting from the 7^{th} kilometer mark the car travels for another 5 minutes and reaches the 15^{th} kilometer mark.

We know the velocity of the car in the first leg was 48 kmph, and we can easily calculate the velocity for the 2^{nd} leg of the journey as 96 kmph (here dx = 8 and dt = 5).

It is quite obvious that the car travelled twice as fast in the 2^{nd} leg of the journey.

Let us call the change in velocity as 'dv'. Change in velocity as we know is also called 'Acceleration'.

We know the change in velocity is

= 96KMPH – 48 KMPH

= 48 KMPH /??

The above answer suggests that the change in velocity is 48 KMPH…. but over what? Confusing right?

Let me explain –

*** The following explanation may seem like a digression from the main topic about Gamma, but it is not, so please read on, if not for anything it will refresh your high school physics* **

When you want to buy a new car, the first thing the sales guy tells you is something like this – “the car is really fast as it can accelerate 0 to 60 in 5 seconds”. Essentially he is telling you that the car can change velocity from 0 KMPH (from the state of complete rest) to 60 KMPH in 5 seconds. Change in velocity here is 60KMPH (60 – 0) **over 5 seconds**.

Likewise in the above example we know the change in velocity is 48KMPH but over what? Unless we answer “over what” part, we would not know what the acceleration really is.

To find out the acceleration in this particular case, we can make some assumptions –

1. Acceleration is constant
2. We can ignore the 7^{th} kilometer mark for time being – hence we consider the fact that the car was at 3^{rd}kilometer mark at the 10^{th} minute and it reached the 15^{th} kilometer mark at the 20^{th} minute

Using the above information, we can further deduce more information (in the calculus world, these are called the ‘initial conditions’).

- Velocity @ the 10^{th} minute (or 3^{rd} kilometer mark) = 0 KMPS. This is called the initial velocity
- Time lapsed @ the 3^{rd} kilometer mark = 10 minutes
- Acceleration is constant between the 3^{rd} and 15^{th} kilometer mark
- Time at 15^{th} kilometer mark = 20 minutes
- Velocity @ 20^{th} minute (or 15^{th} kilometer marks) is called ‘Final Velocity”
- While we know the initial velocity was 0 kmph, we do not know the final velocity
- Total distance travelled = 15 – 3 = 12 kms
- Total driving time = 20 -10 = 10 minutes
- Average speed (velocity) = 12/10 = 1.2 kmps per minute or in terms of hours it would be 72 kmph

Now think about this, we know –

- Initial velocity = 0 kmph
- Average velocity = 72 kmph
- Final velocity =??

By reverse engineering we know the final velocity should be 144 Kmph as the average of 0 and 144 is 72.

Further we know acceleration is calculated as = Final Velocity / time (provided acceleration is constant).

Hence the acceleration is –

= 144 kmph / 10 minutes

10 minutes when converted to hours is (10/60) hours, plugging this back in the above equation

= 144 kmph / (10/60) hour

= 864 Kilometers **per hour.**

This means the car is gaining a speed of 864 kilometers every hour, and if a salesman is selling you this car, he would say the car can accelerate 0 to 72kmph in 5 secs (I'll let you do this math).

We simplified this problem a great deal by making one assumption – acceleration is constant. However in reality acceleration is not constant, you accelerate at different speeds for obvious reasons. Generally speaking, to calculate such problems **involving change in one variable due to the change in another variable** one would have to dig into derivative calculus, more precisely one needs to use the concept of 'differential equations'.

Now just think about this for a moment –

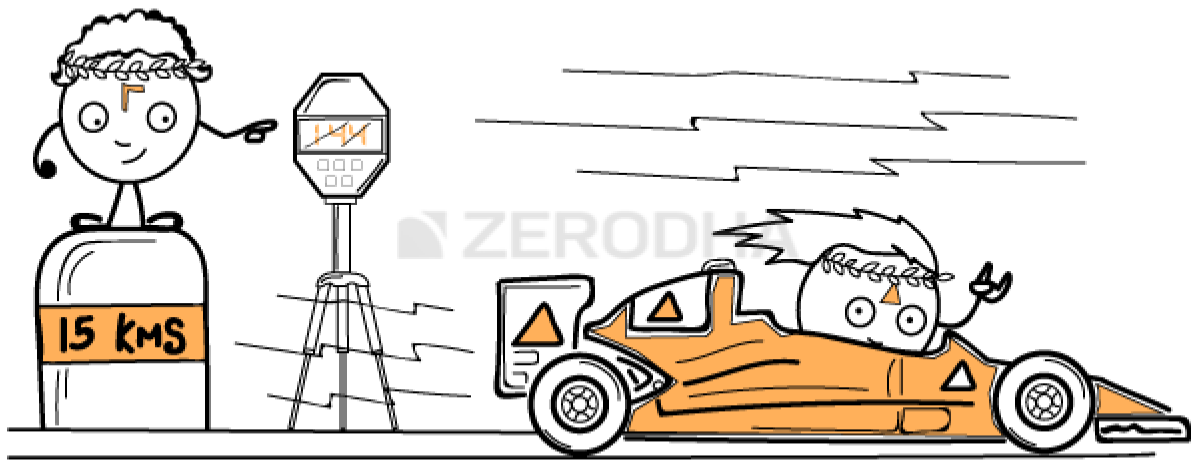
We know change in distance travelled (position) = Velocity, this is also called the 1st order derivative of distance position.

Change in Velocity = Acceleration

Acceleration = Change in Velocity over time, which is in turn the change in position over time.

Hence it is apt to call Acceleration as the 2nd order derivative of the position or the 1st derivative of Velocity!

Keep this point about the 1st order derivative and 2nd order derivative in perspective as we now proceed to understand the Gamma.



12.2 – Drawing Parallels

Over the last few chapters we understood how Delta of an option works. Delta as we know represents the change in premium for the given change in the underlying price.

For example if the Nifty spot value is 8000, then we know the 8200 CE option is OTM, hence its delta could be a value between 0 and 0.5. Let us fix this to 0.2 for the sake of this discussion.

Assume Nifty spot jumps 300 points in a single day, this means the 8200 CE is no longer an OTM option, rather it becomes slightly ITM option and therefore by virtue of this jump in spot value, the delta of 8200 CE will no longer be 0.2, it would be somewhere between 0.5 and 1.0, let us assume 0.8.

With this change in underlying, one thing is very clear – **the delta itself changes**. Meaning delta is a variable, whose value changes based on the changes in the underlying and the premium! If you notice, Delta is very similar to velocity whose value changes with change in time and the distance travelled.

The Gamma of an option measures this change in delta for the given change in the underlying. In other words Gamma of an option helps us answer this question – "For a given change in the underlying, what will be the corresponding change in the delta of the option?"

Now, let us re-plug the velocity and acceleration example and draw some parallels to Delta and Gamma.

1st order Derivative

- Change in distance travelled (position) with respect to change in time is captured by velocity, and velocity is called the 1st order derivative of position

- Change in premium with respect to change in underlying is captured by delta, and hence delta is called the 1st order derivative of the premium

2nd order Derivative

- Change in velocity with respect to change in time is captured by acceleration, and acceleration is called the 2nd order derivative of position
- Change in delta is with respect to change in the underlying value is captured by Gamma, hence Gamma is called the 2nd order derivative of the premium

As you can imagine, calculating the values of Delta and Gamma (and in fact all other Option Greeks) involves number crunching and heavy use of calculus (differential equations and stochastic calculus).

Here is a trivia for you – as we know, derivatives are called derivatives because the derivative contracts derives its value based on the value of its respective underlying.

This value that the derivatives contracts derive from its respective underlying is measured using the application of "Derivatives" as a mathematical concept, hence

the reason why Futures & Options are referred to as 'Derivatives' .

You may be interested to know there is a parallel trading universe out there where traders apply derivative calculus to find trading opportunities day in and day out. In the trading world, such traders are generally called 'Quants', quite a fancy nomenclature I must say. Quantitative trading is what really exists on the other side of this mountain called 'Markets'.

From my experience, understanding the 2nd order derivative such as Gamma is not an easy task, although we will try and simplify it as much as possible in the subsequent chapters.

Key takeaways from this chapter

1. Financial derivatives are called Financial derivatives because of its dependence on calculus and differential equations (generally called Derivatives)
2. Delta of an option is a variable and changes for every change in the underlying and premium
3. Gamma captures the rate of change of delta, it helps us get an answer for a question such as "What is the expected value of delta for a given change in underlying"
4. Delta is the 1st order derivative of premium
5. Gamma is the 2nd order derivative of premium

Gamma (Part 2)

13.1 – The Curvature

We now know for a fact that the Delta of an option is a variable, as it constantly changes its value relative to the change in the underlying. Let me repost the graph of the delta's movement here –

If you look at the blue line representing the delta of a call option, it is quite clear that it traverses between 0 and 1 or maybe from 1 to 0 as the situation would demand. Similar observations can be made on the red line representing the put option's delta (except the value changes between 0 to -1). This graph reemphasizes what we already know i.e the delta is a variable and it changes all the time. Given this, the question that one needs to answer is –

1. I know the delta changes, but why should I care about it?
2. If the change in delta really matters, how do I estimate the likely change in delta?

We will talk about the 2nd question first as I'm reasonably certain the answer to the first question will reveal itself as we progress through this chapter.

As introduced in the previous chapter, 'The Gamma' (2nd order derivative of premium) also referred to as **the curvature of the option** gives the rate at which the option's delta changes as the underlying changes. The gamma is usually expressed in deltas gained or lost per one point change in the underlying – with the delta increasing by the amount of the gamma when the underlying rises and falling by the amount of the gamma when the underlying falls.

For example consider this –

- Nifty Spot = 8326
- Strike = 8400
- Option type = CE
- Moneyness of Option = Slightly OTM
- Premium = Rs.26/-
- Delta = 0.3
- Gamma = 0.0025
- Change in Spot = 70 points
- New Spot price = 8326 + 70 = 8396
- New Premium =??
- New Delta =??
- New moneyness =??

Let's figure this out –

- Change in Premium = Delta * change in spot i.e 0.3 * 70 = 21
- New premium = 21 + 26 = 47
- Rate of change of delta = 0.0025 units for every 1 point change in underlying
- Change in delta = Gamma * Change in underlying i.e 0.0025*70 = 0.175
- **New Delta = Old Delta + Change in Delta i.e 0.3 + 0.175 = 0.475**

- New Moneyness = ATM

  When Nifty moves from 8326 to 8396, the 8400 CE premium changed from Rs.26 to Rs.47, and along with this the Delta changed from 0.3 to 0.475.

  Notice with the change of 70 points, the option transitions from slightly OTM to ATM option. Which means the option's delta has to change from 0.3 to somewhere close to 0.5. This is exactly what's happening here.

  Further let us assume Nifty moves up another 70 points from 8396; let us see what happens with the 8400 CE option –

- Old spot = 8396
- New spot value = 8396 + 70 = 8466
- Old Premium = 47
- Old Delta = 0.475
- Change in Premium = 0.475 * 70 = 33.25
- New Premium = 47 + 33.25 = 80.25
- New moneyness = ITM (hence delta should be higher than 0.5)
- Change in delta =0.0025 * 70 = 0.175
- New Delta = 0.475 + 0.175 = **0.65**

  Let's take this forward a little further, now assume Nifty falls by 50 points, let us see what happens with the 8400 CE option –

- Old spot = 8466
- New spot value = 8466 – 50 = 8416
- Old Premium = 80.25
- Old Delta = 0.65
- Change in Premium = 0.65 *(50) = – 32.5
- New Premium = 80.25 – 32. 5 = **47.75**
- New moneyness = slightly ITM (hence delta should be higher than 0.5)
- Change in delta = 0.0025 * (50) = **– 0.125**
- New Delta = 0.65 – 0.125 = **0.525**

  Notice how well the delta transitions and adheres to the delta value rules we discussed in the earlier chapters. Also, you may wonder why the Gamma value is kept constant in the above examples. Well, in reality the Gamma also changes with the change in the underlying. This change in Gamma due to changes in underlying is captured by 3rd derivative of underlying called "Speed" or "Gamma of Gamma" or "**D**gamma**D**spot". For all practical purposes, it is not necessary to get into the discussion of Speed, unless you are mathematically inclined or you work for an Investment Bank where the trading book risk can run into several $ Millions.

Unlike the delta, the Gamma is always a positive number for both Call and Put Option. Therefore when a trader is long options (both Calls and Puts) the trader is considered 'Long Gamma' and when he is short options (both calls and puts) he is considered 'Short Gamma'.

For example consider this – The Gamma of an ATM Put option is 0.004, if the underlying moves 10 points, what do you think the new delta is?

Before you proceed I would suggest you spend few minutes to think about the solution for the above.

Here is the solution – Since we are talking about an ATM Put option, the Delta must be around – 0.5. Remember Put options have a –ve Delta. Gamma as you notice is a positive number i.e +0.004. The underlying moves by 10 points without specifying the direction, so let us figure out what happens in both cases.

Case 1 – Underlying moves up by 10 points

- Delta = – 0.5
- Gamma = 0.004
- Change in underlying = 10 points
- Change in Delta = Gamma * Change in underlying = 0.004 * 10 = 0.04
- New Delta = We know the Put option loses delta when underlying increases, hence – 0.5 + 0.04 = **– 0.46**

Case 2 – Underlying goes down by 10 points

- Delta = – 0.5
- Gamma = 0.004
- Change in underlying = – 10 points
- Change in Delta = Gamma * Change in underlying = 0.004 * – 10 = – 0.04
- New Delta = We know the Put option gains delta when underlying goes down, hence – 0.5 + (-0.04) = **– 0.54**

Now, here is trick question for you – In the earlier chapters, we had discussed that the Delta of the Futures contract in always 1, so what do you think the gamma of the Futures contract is? Please leave your answers in the comment box below :).

13.2 – Estimating Risk using Gamma

I know there are many traders who define their risk limits while trading. Here is what I mean by a risk limit – for example the trader may have a capital of Rs.300,000/- in his trading account. Margin required for each Nifty Futures is approximately Rs.16,500/-. Do note you can use Zerodha's **SPAN calculator** to figure out the margin required for any F&O contract. So considering the margin and the M2M margin required, the trader may decide at any point he may not want to exceed holding more than **5 Nifty Futures contracts**, thus defining his risk limits, this seems fair enough and works really well while trading futures.

But does the same logic work while trading options? Let's figure out if it is the right way to think about risk while trading options.

Here is a situation –

- Number of lots traded = 10 lots (Note – 10 lots of ATM contracts with delta of 0.5 each is equivalent to 5 Futures contract)
- Option = 8400 CE
- Spot = 8405
- Delta = 0.5
- Gamma = 0.005
- Position = Short

The trader is short 10 lots of Nifty 8400 Call Option; this means the trader is within his risk boundary. Recall the discussion we had in the Delta chapter about adding up the delta. We can essentially add up the deltas to get the overall delta of the position. Also each delta of 1 represents 1 lot of the underlying. So we will keep this in perspective and we can figure out the overall position's delta.

- Delta = 0.5
- Number of lots = 10
- Position Delta = 10 * 0.5 = **5**

So from the overall delta perspective the trader is within his risk boundary of trading not more than 5 Futures lots. Also, do note since the trader is short options, he is essentially **short gamma**.

The position's delta of 5 indicates that the trader's position will move 5 points for every 1 point movement in the underlying.

Now, assume Nifty moves 70 points against him and the trader continues to hold his position, hoping for a recovery. The trader is obviously under the impression that he is holding 10 lots of options which is within his risk appetite…

Let's do some forensics to figure out behind the scenes changes –

- Delta = 0.5
- Gamma = 0.005
- Change in underlying = 70 points
- Change in Delta = Gamma * change in underlying = 0.005 * 70 = 0.35
- New Delta = 0.5 + 0.35 = **0.85**

- New Position Delta = 0.85*10 = **8.5**

  Do you see the problem here? Although the trader has defined his risk limit of 5 lots, thanks to a high Gamma value, he has overshot his risk limit and now holds positions equivalent to 8.5 lots, way beyond his perceived risk limit. An inexperienced trader can be caught unaware of this and still be under the impression that he is well under his risk radar. But in reality his risk exposure is getting higher.

Now since the delta is 8.5, his overall position is expected to move 8.5 points for every 1 point change in the underlying. For a moment assume the trader is long on the call option instead of being short – obviously he would enjoy the situation here as the market is moving in his favor. Besides the favorable movement in the market, his positions is getting 'Longer' since the 'long gamma' tends to add up the deltas, and therefore the delta tends to get bigger, which means the rate of change on premium with respect to change in underlying is faster.

Suggest you read that again in small bits if you found it confusing.

But since the trader is short, he is essentially short gamma…this means when the position moves against him (as in the market moves up while he is short) the deltas add up (thanks to gamma) and therefore at every stage of market increase, the delta and gamma gang up against the short option trader, making his position riskier way beyond what the plain eyes can see. Perhaps this is the reason why they say – shorting options carry huge amount of risk. In fact you can be more precise and say "shorting options carries the risk of being short gamma".

Note – By no means I'm suggesting that you should not short options. In fact a successful trader employs both short and long positions as the situation demands. I'm only suggesting that when you short options you need to be aware of the Greeks and what they can do to your positions.

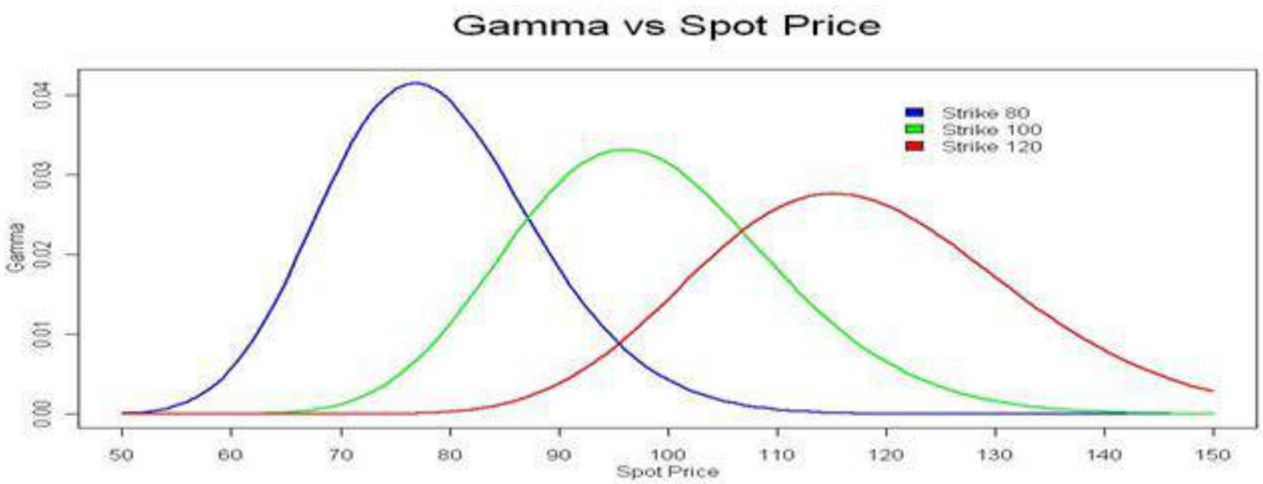
Also, I'd strongly suggest you avoid shorting option contracts which has a large Gamma.

This leads us to another interesting topic – what is considered as 'large gamma'.

13.3 – Gamma movement

Earlier in the chapter we briefly discussed that the Gamma changes with respect to change in the underlying. This change in Gamma is captured by the 3rd order derivative called 'Speed'. I won't get into discussing 'Speed' for reasons stated earlier. However we need to know the behavior of Gamma movement so that we can avoid initiating trades with high Gamma. Of course there are other advantages of knowing the behavior of Gamma, we will talk about this at a later stage in this module. But for now we will look into how the Gamma behaves with respect to changes in the underlying.

Have a look at the chart below,



The chart above has 3 different CE strike prices – 80, 100, and 120 and their respective Gamma movement. For example the blue line represents the Gamma of the 80 CE strike price. I would suggest you look at each graph individually to avoid confusion. In fact for sake of simplicity I will only talk about the 80 CE strike option, represented by the blue line.

Let us assume the spot price is at 80, thus making the 80 strike ATM. Keeping this in perspective we can observe the following from the above chart –

1. Since the strike under consideration is 80 CE, the option attains ATM status when the spot price equals 80
2. Strike values below 80 (65, 70, 75 etc) are ITM and values above 80 (85, 90, 95 etx) are OTM options.
3. Notice the gamma value is low for OTM Options (80 and above). This explains why the premium for OTM options don't change much in terms of absolute point terms,

however in % terms the change is higher. For example – the premium of an OTM option can change from Rs.2 to Rs.2.5, while absolute change in is just 50 paisa, the % change is 25%.

4. The gamma peaks when the option hits ATM status. This implies that the rate of change of delta is highest when the option is ATM. In other words, ATM options are most sensitive to the changes in the underlying

1. Also, since ATM options have highest Gamma – **avoid shorting ATM options**

5. The gamma value is also low for ITM options (80 and below). Hence for a certain change in the underlying, the rate of change of delta for an ITM option is much lesser compared to ATM option. However do remember the ITM option inherently has a high delta. So while ITM delta reacts slowly to the change in underlying (due to low gamma) the change in premium is high (due to high base value of delta).

6. You can observe similar Gamma behavior for other strikes i.e 100, and 120. In fact the reason to show different strikes is to showcase the fact that the gamma behaves in the same way for all options strikes

   Just in case you found the above discussion bit overwhelming, here are 3 simple points that you can take home –

- Delta changes rapidly for ATM option
- Delta changes slowly for OTM and ITM options
- Never short ATM or ITM option with a hope that they will expire worthless upon expiry
- OTM options are great candidates for short trades assuming you intend to hold these short trades upto expiry wherein you expect the option to expire worthless

13.4 – Quick note on Greek interactions

One of the keys to successful options trading is to understand how the individual option Greeks behave under various circumstances. Now besides understanding the individual Greek behavior, one also needs to understand how these individual option Greeks react with each other.

So far we have considered only the premium change with respect to the changes in the spot price. We have not yet discussed time and volatility. Think about the markets and the real time changes that happen. Everything changes – time, volatility, and the underlying price. So an option trader should be in a position to understand these changes and its overall impact on the option premium.

You will fully appreciate this only when you understand the cross interactions of the option Greeks. Typical Greek cross interactions would be – gamma versus time, gamma versus volatility, volatility vs time, time vs delta etc.

Finally all your understanding of the Greeks boils down to a few critical decision making factors such as –

1. For the given market circumstances which is the best strike to trade?
2. What is your expectation of the premium of that particular strike – would it increase or decrease? Hence would you be a buyer or a seller in that option?
3. If you plan to buy an option – is there a realistic chance for the premium to increase?
4. If you plan to short an option – is it really safe to do so? Are you able to see risk beyond what the naked eyes can spot?

The answers to all these questions will evolve once you fully understand individual Greeks and their cross interactions.

Given this, here is how this module will develop going further –

1. So far we have understood Delta and Gamma
2. Over the next few chapters we will understand Theta and Vega
3. When we introduce Vega (change in premium with respect to change in volatility) – we will digress slightly to understand volatility based stoploss
4. Introduce Greek cross interactions – Gamma vs time, Gamma vs spot, Theta vs Vega, Vega vs Spot etc
5. Overview of Black and Scholes option pricing formula
6. Option calculator

So as you see, we have miles to walk before we sleep .

Key takeaways from this chapter

1. Gamma measures the rate of change of delta
2. Gamma is always a positive number for both Calls and Puts
3. Large Gamma can translate to large gamma risk (directional risk)
4. When you buy options (Calls or Puts) you are long Gamma
5. When you short options (Calls or Puts) you are short Gamma
6. Avoid shorting options which have large gamma
7. Delta changes rapidly for ATM option
8. Delta changes slowly for OTM and ITM options

Special thanks to our good friend Prakash Lekkala for providing the Greek graphs in this and other chapters.

Theta

14.1 – Time is money

Remember the adage "Time is money", it seems like this adage about time is highly relevant when it comes to options trading. Forget all the Greek talk for now, we shall go back to understand one basic concept concerning time. Assume you have enrolled for a competitive exam, you are inherently a bright candidate and have the capability to clear the exam, however if you do not give it sufficient time and brush up the concepts, you are likely to flunk the exam – so given this what is the likelihood that you will pass this exam? Well, it depends on how much time you spend to prepare for the exam right? Let's keep this in perspective and figure out the likelihood of passing the exam against the time spent preparing for the exam.

Number of days for preparation	Likelihood of passing
30 days	Very high
20 days	High
15 days	Moderate
10 days	Low
5 days	Very low
1 day	Ultra low

Quite obviously higher the number of days for preparation, the higher is the likelihood of passing the exam. Keeping the same logic in mind, think about the following situation – Nifty Spot is 8500, you buy a Nifty 8700 Call option – what is the likelihood of this call option to expire In the Money (ITM)? Let me rephrase this question in the following way –

- Given Nifty is at 8500 today, what is the likelihood of Nifty moving 200 points over the next 30 days and therefore 8700 CE expiring ITM?
- The chance for Nifty to move 200 points over next 30 days is quite high, hence the likelihood of option expiring ITM upon expiry is **very high**

- What if there are only 15 days to expiry?
- An expectation that Nifty will move 200 points over the next 15 days is reasonable, hence the likelihood of option expiring ITM upon expiry is **high** (notice it is not very high, but just high).

- What if there are only 5 days to expiry?
- Well, 5 days, 200 points, not really sure hence the likelihood of 8700 CE expiring in the money is **low**

- What if there was only 1 day to expiry?
- The probability of Nifty to move 200 points in 1 day is quite low, hence I would be reasonably certain that the option will not expire in the money, therefore the chance is **ultra low.**

Is there anything that we can infer from the above? Clearly, the more time for expiry the likelihood for the option to expire In the Money (ITM) is higher. Now keep this point in the back of your mind as we now shift our focus on the 'Option Seller'. We know an option seller sells/writes an option and receives the premium for it. When he sells an option he is very well aware that he carries an unlimited risk and limited reward potential. The reward is limited to the extent of the premium he receives. He gets to keep his reward (premium) **fully** only if the option expires worthless. Now, think about this – if he is selling an option **early in the month** he very clearly knows the following –

1. He knows he carries unlimited risk and limited reward potential
2. He also knows that by virtue of time, there is a chance for the option he is selling to transition into ITM option, which means he will not get to retain his reward (premium received)

In fact at any given point, thanks to 'time', there is always a chance for the option to expiry in the money (although this chance gets lower and lower as time progresses towards the expiry date). Given this, an option seller would not want to sell options at all right? After all why would you want to sell options when you very well know that simply because of time there is scope for the option you are selling to expire in the money. Clearly time in the option sellers context acts as a risk. Now, what if the option buyer in order to entice the option seller to sell options offers to compensate for the 'time risk' that he (option seller) assumes? In such a case it probably makes sense to evaluate the time risk versus the compensation and take a call right? In fact this is what happens in real world options trading. Whenever you pay a premium for options, you are indeed paying towards –

1. Time Risk
2. Intrinsic value of options.

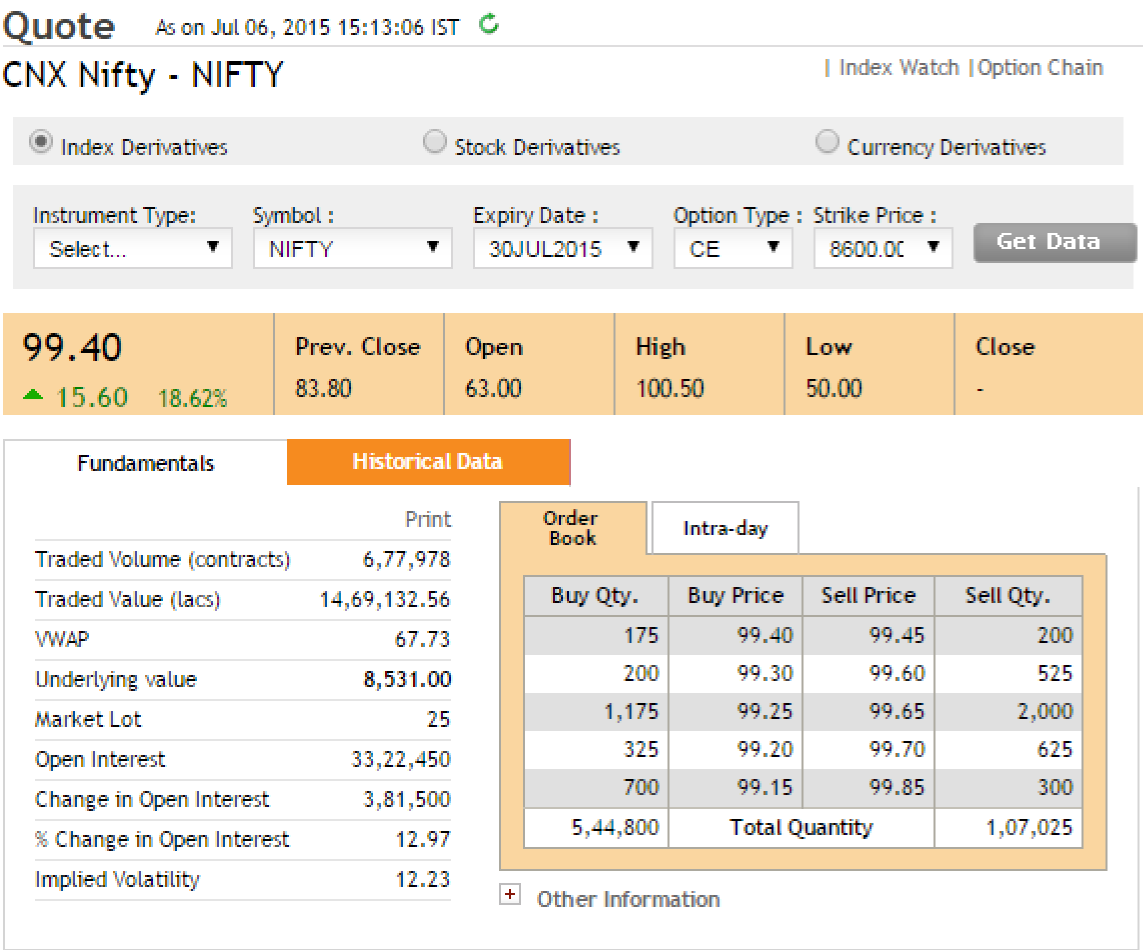
   In other words – **Premium = Time value + Intrinsic Value** Recall earlier in this module we defined 'Intrinsic Value' as the money you are to receive, if you were to exercise your option today. Just to refresh your memory, let us calculate the intrinsic value for the following options assuming Nifty is at 8423 –

1. 8350 CE
2. 8450 CE
3. 8400 PE
4. 8450 PE

   We know the intrinsic value is **always a positive value or zero and can never be below zero**. If the value turns out to be negative, then the intrinsic value is considered zero. We know for Call options the intrinsic value is "**Spot Price – Strike Price**" and for Put options it is "**Strike Price – Spot Price**". Hence the intrinsic values for the above options are as follows –

1. 8350 CE = 8423 – 8350 = +73
2. 8450 CE = 8423 – 8450 = -ve value hence 0
3. 8400 PE = 8400 – 8423 = -ve value hence 0
4. 8450 PE = 8450 – 8423 = + 27

   So given that we know how to calculate the intrinsic value of an option, let us attempt to decompose the premium and extract the time value and intrinsic value. Have a look at the following snapshot –



Quote As on Jul 06, 2015 15:13:06 IST

CNX Nifty - NIFTY

| Index Watch | Option Chain

Index Derivatives Stock Derivatives Currency Derivatives

Instrument Type:	Symbol :	Expiry Date :	Option Type :	Strike Price :
Select...	NIFTY	30JUL2015	CE	8600.0C

Get Data

99.40	Prev. Close	Open	High	Low	Close
15.60 18.62%	83.80	63.00	100.50	50.00	-

Fundamentals | Historical Data

Print

Traded Volume (contracts)	6,77,978
Traded Value (lacs)	14,69,132.56
VWAP	67.73
Underlying value	8,531.00
Market Lot	25
Open Interest	33,22,450
Change in Open Interest	3,81,500
% Change in Open Interest	12.97
Implied Volatility	12.23

Order Book | Intra-day

Buy Qty.	Buy Price	Sell Price	Sell Qty.
175	99.40	99.45	200
200	99.30	99.60	525
1,175	99.25	99.65	2,000
325	99.20	99.70	625
700	99.15	99.85	300
5,44,800	Total Quantity		1,07,025

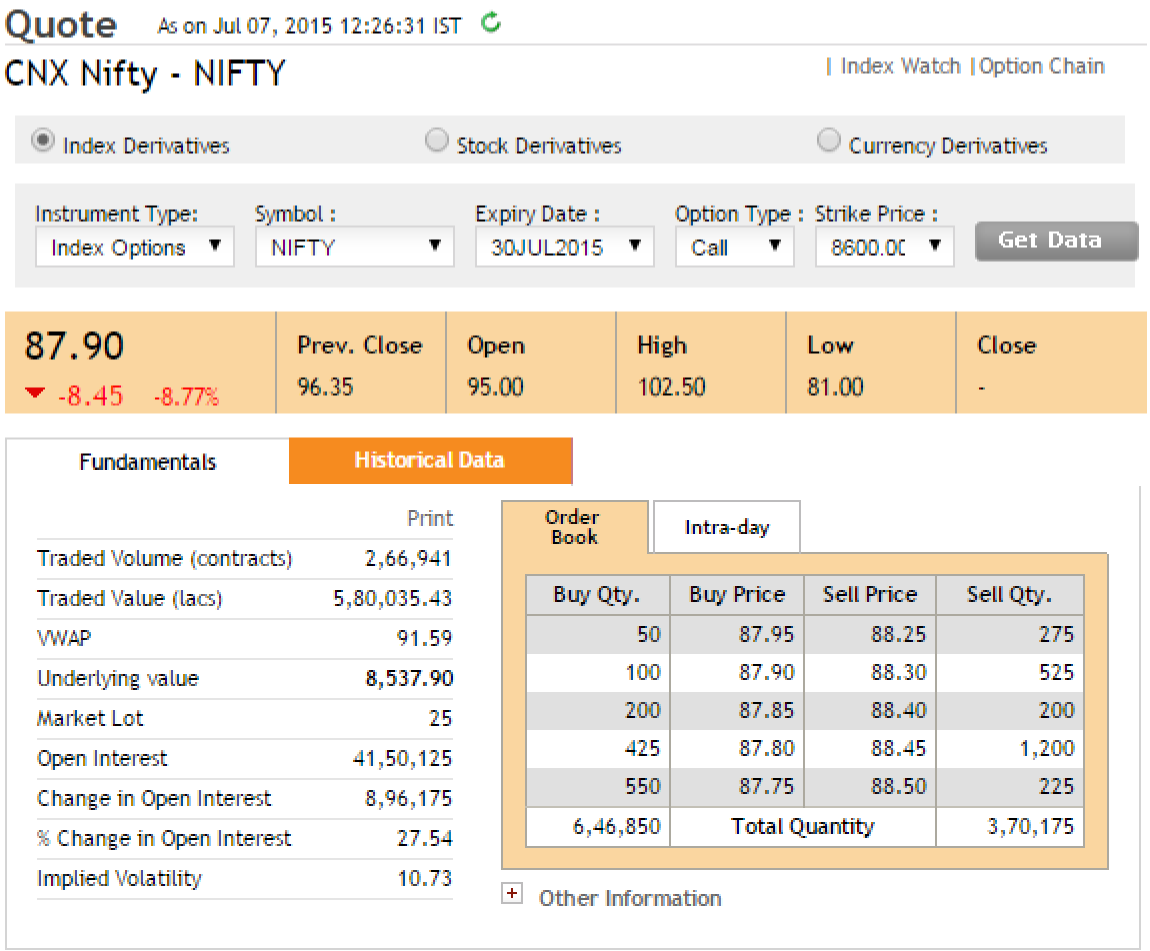
Other Information

Details to note are as follows –

- Spot Value = 8531
- Strike = 8600 CE
- Status = OTM
- Premium = 99.4
- Today's date = 6th July 2015
- Expiry = 30th July 2015

Intrinsic value of a call option – Spot Price – Strike Price i.e 8531 – 8600 = 0 (since it's a negative value) We know – Premium = Time value + Intrinsic value 99.4 = Time Value + 0 This implies Time value = 99.4! Do you see that? The market is willing to pay a premium of Rs.99.4/- for an option that has zero intrinsic value but ample

time value! Recall **time is money** Here is snapshot of the same contract that I took the next day i.e 7th July –



Quote As on Jul 07, 2015 12:26:31 IST

CNX Nifty - NIFTY

| Index Watch | Option Chain

Index Derivatives   Stock Derivatives   Currency Derivatives

Instrument Type: Index Options | Symbol : NIFTY | Expiry Date : 30JUL2015 | Option Type : Call | Strike Price : 8600.00 | Get Data

87.90	Prev. Close	Open	High	Low	Close
-8.45 -8.77%	96.35	95.00	102.50	81.00	-

Fundamentals | Historical Data

Print

Traded Volume (contracts)	2,66,941
Traded Value (lacs)	5,80,035.43
VWAP	91.59
Underlying value	8,537.90
Market Lot	25
Open Interest	41,50,125
Change in Open Interest	8,96,175
% Change in Open Interest	27.54
Implied Volatility	10.73

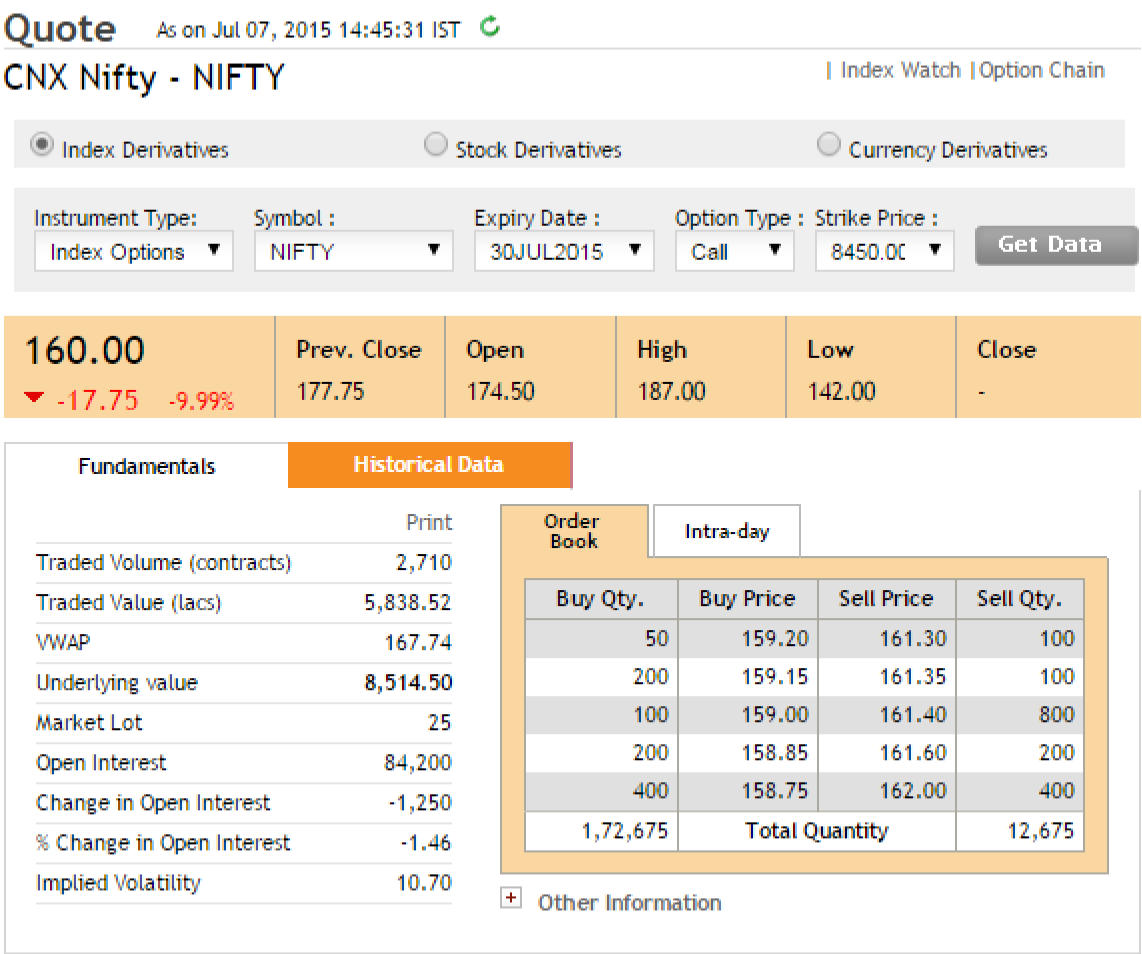
Order Book | Intra-day

Buy Qty.	Buy Price	Sell Price	Sell Qty.
50	87.95	88.25	275
100	87.90	88.30	525
200	87.85	88.40	200
425	87.80	88.45	1,200
550	87.75	88.50	225
6,46,850	Total Quantity		3,70,175

Other Information

Notice the underlying value has gone up slightly (8538) but the option premium has decreased quite a bit! Let's decompose the premium into its intrinsic value and time value – Spot Price – Strike Price i.e 8538 – 8600 = 0 (since it's a negative value) We know – Premium = Time value + Intrinsic value 87.9 = Time Value + 0 This implies Time value = 87.9! Notice the overnight drop in premium value? We will soon understand why this happened. Note – In this example, the drop in premium value is 99.4 minus 87.9 = 11.5. This drop is attributable to drop in **volatility and time**. We will talk about volatility in the next chapter. For the sake of argument, if both volatility and spot were constant, the drop in premium would be completely attributable to the passage of time. I would suspect this drop would be around Rs.5

or so and not really Rs.11.5/-. Let us take another example –



Quote As on Jul 07, 2015 14:45:31 IST

CNX Nifty - NIFTY | Index Watch | Option Chain

Index Derivatives | Stock Derivatives | Currency Derivatives

Instrument Type:	Symbol :	Expiry Date :	Option Type :	Strike Price :	
Index Options	NIFTY	30JUL2015	Call	8450.00	Get Data

160.00 -17.75 -9.99%	Prev. Close	Open	High	Low	Close
	177.75	174.50	187.00	142.00	-

Fundamentals | Historical Data

Print

Traded Volume (contracts)	2,710
Traded Value (lacs)	5,838.52
VWAP	167.74
Underlying value	8,514.50
Market Lot	25
Open Interest	84,200
Change in Open Interest	-1,250
% Change in Open Interest	-1.46
Implied Volatility	10.70

Order Book | Intra-day

Buy Qty.	Buy Price	Sell Price	Sell Qty.
50	159.20	161.30	100
200	159.15	161.35	100
100	159.00	161.40	800
200	158.85	161.60	200
400	158.75	162.00	400
1,72,675	Total Quantity		12,675

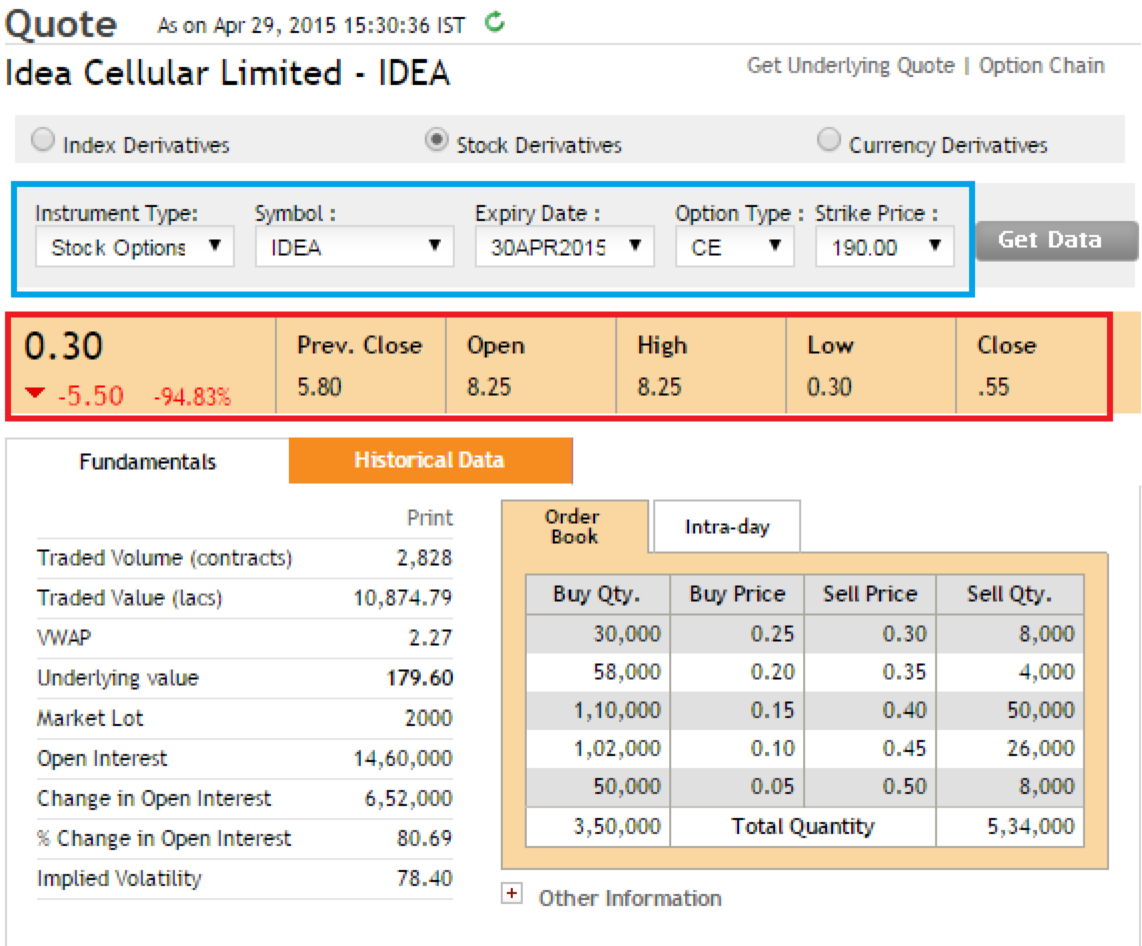
Other Information

- Spot Value = 8514.5
- Strike = 8450 CE
- Status = ITM
- Premium = 160
- Today's date = 7th July 2015
- Expiry = 30th July 2015

Intrinsic value of call option – Spot Price – Strike Price i.e 8514.5 – 8450 = 64.5 We know – Premium = Time value + Intrinsic value 160 = Time Value + 64.5 This implies the Time value = 160 – 64.5 = 95.5 Hence out of the total premium of Rs.160, traders are paying 64.5 towards intrinsic value and 95.5 towards the time value. You can repeat the calculation for all options (both calls and puts) and decompose the premium into the Time value and intrinsic value.

14.2 – Movement of time

Time as we know moves in one direction. Keep the expiry date as the target time and think about the movement of time. Quite obviously as time progresses, the number of days for expiry gets lesser and lesser. Given this let me ask you this question – With roughly 18 trading days to expiry, traders are willing to pay as much as Rs.100/- towards time value, will they do the same if time to expiry was just 5 days? Obviously they would not right? With lesser time to expiry, traders will pay a much lesser value towards time. In fact here is a snap shot that I took from the earlier months –



Quote As on Apr 29, 2015 15:30:36 IST

Idea Cellular Limited - IDEA

Get Underlying Quote | Option Chain

Index Derivatives | Stock Derivatives | Currency Derivatives

Instrument Type:	Symbol :	Expiry Date :	Option Type :	Strike Price :
Stock Options	IDEA	30APR2015	CE	190.00

Get Data

0.30 -5.50 -94.83%	Prev. Close	Open	High	Low	Close
	5.80	8.25	8.25	0.30	.55

Fundamentals | Historical Data

Print

Traded Volume (contracts)	2,828
Traded Value (lacs)	10,874.79
VWAP	2.27
Underlying value	179.60
Market Lot	2000
Open Interest	14,60,000
Change in Open Interest	6,52,000
% Change in Open Interest	80.69
Implied Volatility	78.40

Order Book | Intra-day

Buy Qty.	Buy Price	Sell Price	Sell Qty.
30,000	0.25	0.30	8,000
58,000	0.20	0.35	4,000
1,10,000	0.15	0.40	50,000
1,02,000	0.10	0.45	26,000
50,000	0.05	0.50	8,000
3,50,000	Total Quantity		5,34,000

Other Information

- Date = 29th April
- Expiry Date = 30th April
- Time to expiry = 1 day
- Strike = 190
- Spot = 179.6
- Premium = 30 Paisa
- Intrinsic Value = 179.6 – 190 = 0 since it's a negative value
- Hence time value should be 30 paisa which equals the premium

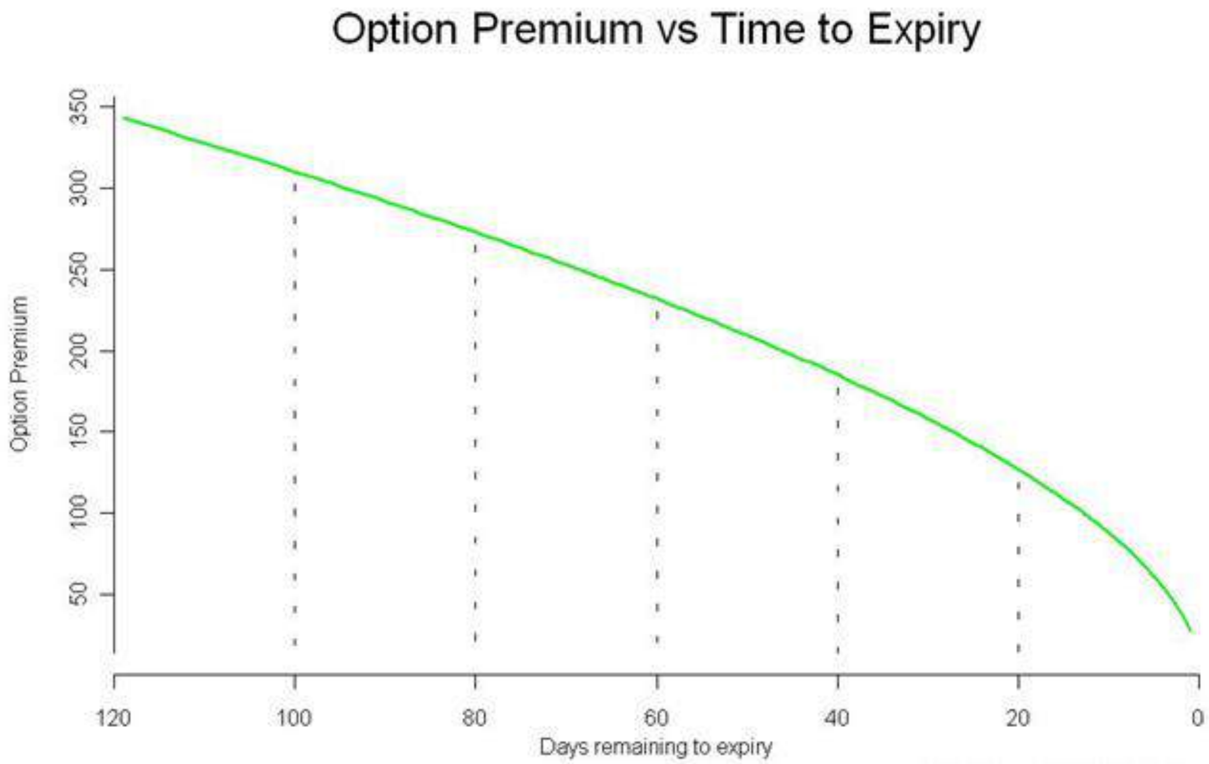
With 1 day to expiry, traders are willing to pay a time value of just 30 paisa. However, if the time to expiry was 20 days or more the time value would probably be Rs.5 or Rs.8/-. The point that I'm trying to make here is this – with every passing day, as we get closer to the expiry day, the time to expiry becomes lesser and lesser. This means the option buyers will pay lesser and lesser towards time value. So if the option buyer pays Rs.10 as the time value today, tomorrow he would probably pay

Rs.9.5/- as the time value. This leads us to a very important conclusion – "**All other things being equal, an option is a depreciating asset. The option's premium erodes daily and this is attributable to the passage of time**". Now the next logical question is – by how much would the premium decrease on a daily basis owing to the passage of time? Well, Theta the 3rd Option Greek helps us answer this

question.

14.3 – Theta

All options – both Calls and Puts lose value as the expiration approaches. The Theta or **time decay factor**is the rate at which an option loses value as time passes. Theta is expressed in points lost per day when all other conditions remain the same. Time runs in one direction, hence theta is always a positive number, however to remind traders it's a loss in options value it is sometimes written as a negative number. A Theta of -0.5 indicates that the option premium will lose -0.5 points for every day that passes by. For example, if an option is trading at Rs.2.75/- with theta of -0.05 then it will trade at Rs.2.70/- the following day (provided other things are kept constant). A long option (option buyer) will always have a negative theta meaning all else equal, the option buyer will lose money on a day by day basis. A short option (option seller) will have a positive theta. Theta is a friendly Greek to the option seller. Remember the objective of the option seller is to retain the premium. Given that options loses value on a daily basis, the option seller can benefit by retaining the premium to the extent it loses value owing to time. For example if an option writer has sold options at Rs.54, with theta of 0.75, all else equal, the same option is likely to trade at – =0.75 * 3 = 2.25 = 54 – 2.25 = 51.75 Hence the seller can choose to close the option position on T+ 3 day by buying it back at Rs.51.75/- and profiting Rs.2.25 …and this is attributable to theta! Have a look at the graph below –



This is the graph of how premium erodes as time to expiry approaches. This is also called the **'Time Decay'**graph. We can observe the following from the graph –

1. At the start of the series – when there are many days for expiry the option does not lose much value. For example when there were 120 days to expiry the option was trading at 350, however when there was 100 days to expiry, the option was trading at 300. Hence the effect of theta is **low**
2. As we approach the expiry of the series – the effect of theta is **high**. Notice when there was 20 days to expiry the option was trading around 150, but when we approach towards expiry the drop in premium seems to accelerate (option value drops below 50).

   So if you are selling options at the start of the series – you have the advantage of pocketing a large premium value (as the time value is very high) but do remember the fall in premium happens at a low rate. You can sell options closer to the expiry – you will get a lower premium but the drop in premium is high, which is advantageous to the options seller. Theta is a relatively straightforward and easy Greek to understand. We will revisit theta again when we will discuss cross dependencies of Greeks. But for now, if you have understood all that's being discussed here you are good to go. We shall now move forward to understand the last and the most interesting Greek – Vega!

Key takeaways from this chapter

1. Option sellers are always compensated for the time risk
2. Premium = Intrinsic Value + Time Value
3. All else equal, options lose money on a daily basis owing to Theta
4. Time moves in a single direction hence Theta is a positive number
5. Theta is a friendly Greek to option sellers
6. When you short naked options at the start of the series you can pocket a large time value but the fall in premium owing to time is low
7. When you short option close to expiry the premium is low (thanks to time value) but the fall in premium is rapid

Volatility Basics

15.1 – Background

Having understood Delta, Gamma, and Theta we are now at all set to explore one of the most interesting Option Greeks – The Vega. Vega, as most of you might have guessed is the rate of change of option premium with respect to change in volatility. But the question is – What is volatility? I have asked this question to quite a few traders and the most common answer is "Volatility is the up down movement of the stock market". If you have a similar opinion on volatility, then it is about time we

fixed that .

So here is the agenda, I suppose this topic will spill over a few chapters –

1. We will understand what volatility really means
2. Understand how to measure volatility
3. Practical Application of volatility
4. Understand different types of volatility
5. Understand Vega

So let's get started.

15.2 – Moneyball

Have you watched this Hollywood movie called 'Moneyball'? It's a real life story Billy Beane – manager of a base ball team in US. The movie is about Billy Beane and his young colleague, and how they leverage the power of statistics to identify relatively low profile but extremely talented baseball players. A method that was unheard of during his time, and a method that proved to be both innovative and disruptive.

You can watch the trailer of Moneyball here.

I love this movie, not just for Brad Pitt, but for the message it drives across on topics related to life and business. I will not get into the details now, however let me draw some inspiration from the Moneyball method, to help explain volatility :).

The discussion below may appear unrelated to stock markets, but please don't get discouraged. I can assure you that it is relevant and helps you relate better to the term 'Volatility'.

Consider 2 batsmen and the number of runs they have scored over 6 consecutive matches –

Match	Billy	Mike
1	20	45
2	23	13
3	21	18
4	24	12
5	19	26
6	23	19

You are the captain of the team, and you need to choose either Billy or Mike for the 7th match. The batsman should be dependable – in the sense that the batsman you choose should be in a position to score at least 20 runs. Whom would you choose? From my experience I have noticed that people approach this problem in one of the two ways –

1. Calculate the total score (also called '**Sigma**') of both the batsman – pick the batsman with the highest score for next game. Or..
2. Calculate the average (also called '**Mean**') number of scores per game – pick the batsman with better average.

Let us calculate the same and see what numbers we get –

- Billy's Sigma = 20 + 23 + 21 + 24 + 19 + 23 = 130
- Mike's Sigma = 45 + 13 + 18 + 12 + 26 + 19 = 133

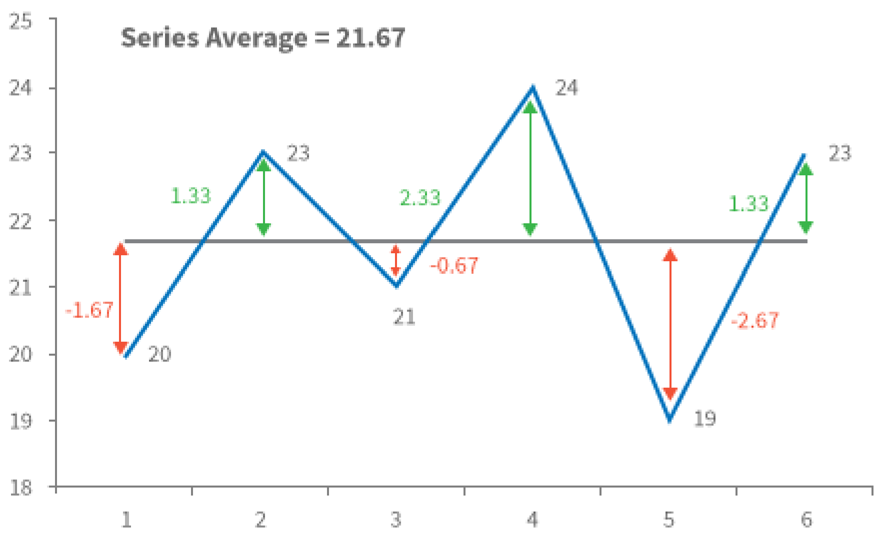
So based on the sigma you are likely to select Mike. Let us calculate the mean or average for both the players and figure out who stands better –

- Billy = 130/6 = 21.67
- Mike = 133/6 = 22.16

So it seems from both the mean and sigma perspective, Mike deserves to be selected. But let us not conclude that yet. Remember the idea is to select a player who can score at least 20 runs and with the information that we have now (mean and sigma) there is no way we can conclude who can score at least 20 runs. Therefore, let's do some further investigation.

To begin with, for each match played we will calculate the deviation from the mean. For example, we know Billy's mean is 21.67 and in his first match Billy scored 20 runs. Therefore deviation from mean form the 1st match is 20 – 21.67 = **– 1.67**. In other words, he scored 1.67 runs lesser than his average score. For the 2nd match it was 23 – 21.67 = **+1.33,** meaning he scored 1.33 runs more than his average score.

Here is the diagram representing the same (for Billy) –



The middle black line represents the average score of Billy, and the double arrowed vertical line represents the the deviation from mean, for each of the match played. We will now go ahead and calculate another variable called 'Variance'.

Variance is simply the '**sum of the squares of the deviation divided by the total number of observations'**. This may sound scary, but its not. We know the total number of observations in this case happens to be equivalent to the total number of matches played, hence 6.

So variance can be calculated as –

Variance = [(-1.67) ^2 + (1.33) ^2 + (-0.67) ^2 + (+2.33) ^2 + (-2.67) ^2 + (1.33) ^2] / 6
= 19.33 / 6
= 3.22

Further we will define another variable called '**Standard Deviation**' **(SD)** which is calculated as –

std deviation = √ variance

So standard deviation for Billy is –
= SQRT (3.22)
= 1.79

Likewise Mike's standard deviation works out to be 11.18.

Lets stack up all the numbers (or statistics) here –

Statistics	Billy	Mike
Sigma	130	133
Mean	21.6	22.16
SD	1.79	11.18

We know what 'Mean' and 'Sigma' signifies, but what about the SD? Standard Deviation simply generalizes and represents the deviation from the average.

Here is the text book definition of SD "*In statistics, the **standard deviation** (SD, also represented by the Greek letter sigma, σ) is a measure that is used to quantify the amount of variation or dispersion of a set of data values*".

Please don't get confused between the two sigma's – the total is also called sigma represented by the Greek symbol ∑ and standard deviation is also sometimes referred to as sigma represented by the Greek symbol *σ.*

One way to use SD is to make a projection on how many runs Billy and Mike are likely to score in the next match. To get this projected score, you simply need to add and subtract the SD from their average.

Player	Lower Estimate	Upper Estimate
Billy	21.6 – 1.79 = 19.81	21.6 + 1.79 = 23.39

Mike	22.16 – 11.18 = 10.98	22.16 + 11.18 = 33.34

These numbers suggest that in the upcoming 7th match Billy is likely to get a score anywhere in between 19.81 and 23.39 while Mike stands to score anywhere between 10.98 and 33.34. Because Mike has a wide range, it is difficult to figure out if he is going to score at least 20 runs. He can either score 10 or 34 or anything in between.

However Billy seems to be more consistent. His range is smaller, which means he will neither be a big hitter nor a lousy player. He is expected to be a consistent and is likely to score anywhere between 19 and 23. In other words – selecting Mike over Billy for the 7th match can be **risky**.

Going back to our original question, which player do you think is more likely to score at least 20 runs? By now, the answer must be clear; it has to be Billy. Billy is consistent and less risky compared to Mike.

So in principal, we assessed the riskiness of these players by using "**Standard Deviation**". Hence 'Standard Deviation' must represent '**Risk**'. In the stock market world, we define 'Volatility' as the riskiness of the stock or an index. Volatility is a % number as measured by **standard deviation**.

I've picked the definition of Volatility from Investopedia for you – *"A statistical measure of the dispersion of returns for a given security or market index. Volatility can either be measured by using the standard deviation or variance between returns from that same security or market index. Commonly higher the standard deviation, higher is the risk*".

Going by the above definition, if Infosys and TCS have volatility of 25% and 45% respectively, then clearly Infosys has less risky price movements when compared to TCS.

15.3 – Some food for thought

Before I wrap this chapter, let's do some prediction –
Today's Date = 15th July 2015
Nifty Spot = 8547
Nifty Volatility = 16.5%
TCS Spot = 2585
TCS Volatility = 27%

Given this information, can you predict the likely range within which Nifty and TCS will trade 1 year from now?
Of course we can, let us put the numbers to good use –

Asset	Lower Estimate	Upper Estimate
Nifty	8547 – (16.5% * 8547) = 7136	8547 + (16.5% * 8547) = 9957
TCS	2585 – (27% * 2585) = 1887	2585 + (27% * 2585) = 3282

So the above calculations suggest that in the next 1 year, given Nifty's volatility, Nifty is likely to trade anywhere between **7136 and 9957** with all values in between having varying probability of occurrence. This means to say on 15th July 2016 the probability of Nifty to be around 7500 could be 25%, while 8600 could be around 40%.

This leads us to a very interesting platform –

1. We estimated the range for Nifty for 1 year; similarly can we estimate the range Nifty is likely to trade over the next few days or the range within which Nifty is likely to trade upto the series expiry?
1. If we can do this, then we will be in a better position to identify options that are likely to expire worthless, meaning we could sell them today and pocket the premiums.
2. We figured the range in which Nifty is likely to trade in the next 1 year as 7136 and 9957 – but how sure are we? Is there any degree of confidence while expressing this range?

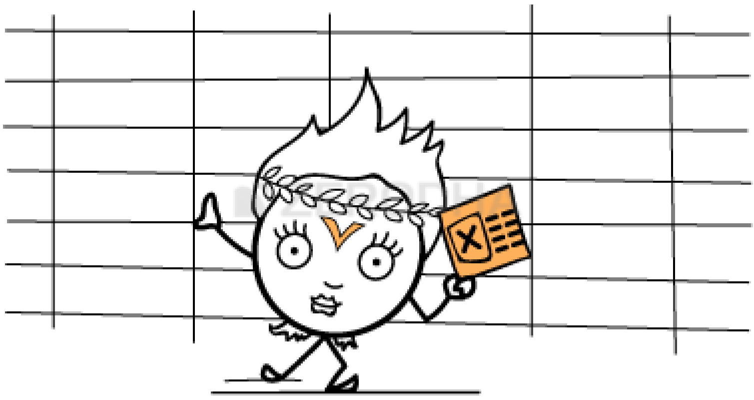
3. How do we calculate Volatility? I know we discussed the same earlier in the chapter, but is there an easier way? Hint – we could use MS Excel!
4. We calculated Nifty's range estimating its volatility as 16.5% , what if the volatility changes?

   Over the next few chapters we will answer all these questions and more!

Key takeaways from this chapter

1. Vega measures the rate of change of premium with respect to change in volatility
2. Volatility is not just the up down movement of markets
3. Volatility is a measure of risk
4. Volatility is estimated by standard deviation
5. Standard Deviation is the square root of variance
6. We can estimate the range of the stock price given its volatility
7. Larger the range of a stock, higher is its volatility aka risk.

Volatility Calculation (Historical)



16.1 – Calculating Volatility on Excel

In the previous chapter, we introduced the concept of standard deviation and how it can be used to evaluate 'Risk or Volatility' of a stock. Before we move any further on this topic I would like to discuss how one can calculate volatility. Volatility data is not easily available, hence its always good to know how to calculate the same yourself.

Of course in the previous chapter we looked into this calculation (recall the Billy & Mike example), we outlined the steps as follows –

1. Calculate the average
2. Calculate the deviation – Subtract the average from the actual observation
3. Square and add up all deviations – this is called variance
4. Calculate the square root of variance – this is called standard deviation

The purpose of doing this in the previous chapter was to show you the mechanics behind the standard deviation calculation. In my opinion it is important to know what really goes beyond a formula, it only enhances your insights. In this chapter however, we will figure out an easier way to calculate standard deviation or the volatility of a given stock using MS Excel. MS Excel uses the exact same steps we outlined above, just that it happens at a click of a button.

I'll give you the border steps involved first and then elaborate on each step –

1. Download the historical data of closing prices

2. Calculate the daily returns
3. Use the STDEV function

So let us get to work straight away.

Step 1 – Download the historical closing prices

You can do this from any data source that you have. Some of the free and reliable data sources are NSE India website and Yahoo Finance.

I will take the data from NSE India for now. At this point I must tell you that NSE's website is quite resourceful, and in terms of information provided, I guess NSE's website is one of the best stock exchange websites in the world.

Anyway, in this chapter let us calculate Wipro's volatility. To download the historical closing prices, visit – http://www.nseindia.com/products/content/equities/equities/equities.htm and click on historical data and select the search option.

Here is a snapshot where I have highlighted the search option –

Historical Data

Historical Data

Daily historical end of the day security price-volume information and deliverable positions data. Download to csv facility available.

Security-wise Price/Volume Archives

This section provides information about the historical price volume and deliverable data a security over a period of time. Search ›

Security-wise High/low Archives.

Use this archive to retrieve or track the security-wise Monthly, yearly, 52 week and "All Time" high/ low information pertaining to securities. Search ›

Monthly Reports Archives

Information collated at end of the month provides an insight into the securities that were most actively traded, business growth, percentage contribution of securities and members to turnover and stocks, advancing and declining stocks.

View Monthly Reports ›

Business Growth in CM Segment View ›

Most Active Securities Monthly and Yearly View ›

Monthly Advancing and Declining Stocks View ›

Contribution in % Share of Top 'N' Securities / Members View ›

Archives of Monthly Reports ›

Monthly Settlement Statistics View ›

Once you hit search, a set of fields open up, filling them up is quite self explanatory – just fill in the required details and hit 'Get Data'. Do make sure you get the data for the last 1 year. The dates that I have selected here is from 22nd July 2014 to 21st July 2015.

Once you hit 'get data', NSE's website will query your request and fetch you the required data. At this point you should see the following screen –

Security-wise Archives (Equities)

Full Download

Get historical data for:

Security-wise Price volume & Deliverable position data ▼ Enter symbol: WIPRO Select series : ALL ▼

Period: For past: (please select: ▼ OR Select a Time Period: 22-07-2014 To 21-07-2015 Get Data

Data for WIPRO - ALL from Jul 22, 2014 to Jul 21, 2015

Download file in csv format

Symbol	Series	Date	Prev Close	Open Price	High Price	Low Price	Last Price	Close Price	VWAP	Total Traded Quantity	Turnover ₹ in Lacs	No. of Trades	Deliverable Qty	% Dly Qt to Traded Qty
WIPRO	EQ	22-Jul-2014	544.95	544.15	561.00	542.60	560.10	558.75	554.55	18,66,096	10,348.52	31,941	10,94,353	58.64
WIPRO	EQ	23-Jul-2014	558.75	559.50	572.70	554.40	570.50	570.90	566.62	22,32,380	12,649.14	41,016	11,24,826	50.39
WIPRO	EQ	24-Jul-2014	570.90	574.00	580.00	561.60	575.45	576.85	572.77	30,01,899	17,194.10	44,857	16,01,742	53.36
WIPRO	EQ	25-Jul-2014	576.85	530.00	555.00	530.00	551.40	551.05	547.33	70,92,507	38,819.30	1,48,292	38,54,535	54.35
WIPRO	EQ	28-Jul-2014	551.05	552.15	558.80	545.00	555.90	557.05	552.39	16,82,719	9,295.13	47,884	9,30,326	55.29
WIPRO	EQ	30-Jul-2014	557.05	556.90	557.10	549.00	550.90	550.75	551.99	19,58,288	10,809.53	47,827	14,41,312	73.60
WIPRO	EQ	31-Jul-2014	550.75	550.05	551.00	541.05	545.50	544.40	544.27	35,68,621	19,423.02	67,226	28,59,022	80.12
WIPRO	EQ	01-Aug-2014	544.40	544.00	546.15	535.00	536.00	536.00	537.26	17,17,523	9,227.63	32,893	12,25,765	71.37

Once you get this, click on 'Download file in CSV format' (highlighted in the green box), and that's it.

You now have the required data on Excel. Of course along with the closing prices, you have tons of other information as well. I usually like to delete all the other unwanted data and stick to just the date and closing price. This makes the sheet look clutter free and crisp.

Here is a snapshot of how my excel sheet looks at this stage –

	A	B	C
1	Date	Close Price	
2	22-Jul-14	558.75	
3	23-Jul-14	570.9	
4	24-Jul-14	576.85	
5	25-Jul-14	551.05	
6	28-Jul-14	557.05	
7	30-Jul-14	550.75	
8	31-Jul-14	544.4	
9	1-Aug-14	536	
10	4-Aug-14	548.65	
11	5-Aug-14	549.55	
12	6-Aug-14	551.4	

Do note, I have deleted all the unnecessary information. I have retained just the date and closing prices.

Step 2 – Calculate Daily Returns

We know that the daily returns can be calculated as –

Return = (Ending Price / Beginning Price) – 1

However for all practical purposes and ease of calculation, this equation can be approximated to:

Return = LN (Ending Price / Beginning Price), where LN denotes Logarithm to Base 'e', note this is also called 'Log Returns'.

Here is a snap shot showing you how I've calculated the daily log returns of WIPRO –

	A	B	C	D	E
1	Date	Close Price	Daily Rt		
2	22-Jul-14	558.75			
3	23-Jul-14	570.9	=LN(B3/B2)		
4	24-Jul-14	576.85	1.04%		
5	25-Jul-14	551.05	-4.58%		
6	28-Jul-14	557.05	1.08%		
7	30-Jul-14	550.75	-1.14%		
8	31-Jul-14	544.4	-1.16%		
9	1-Aug-14	536	-1.56%		
10	4-Aug-14	548.65	2.33%		
11	5-Aug-14	549.55	0.16%		
12	6-Aug-14	551.4	0.34%		
13	7-Aug-14	552.65	0.23%		

I have used the Excel function 'LN' to calculate the long returns.

Step 3 – Use the STDEV Function

Once the daily returns are calculated, you can use an excel function called 'STDEV' to calculate the standard deviation of daily returns, which if you realize is the daily Volatility of WIPRO.

Note – In order to use the STDEV function all you need to do is this –

1. Take the cursor an empty cell
2. Press '='
3. Follow the = sign by the function syntax i.e STDEV and open a bracket, hence the empty cell would look like =STEDEV(
4. After the open bracket, select all the daily return data points and close the bracket
5. Press enter

Here is the snapshot which shows the same –

	A	B	C	D	E	F	G
1	Date	Close Price	Daily Rt				
2	22-Jul-14	558.75					
3	23-Jul-14	570.9	2.15%				
4	24-Jul-14	576.85	1.04%				
5	25-Jul-14	551.05	-4.58%		Daily Volatility	=STDEV(C3:C245)	
6	28-Jul-14	557.05	1.08%				
7	30-Jul-14	550.75	-1.14%				
8	31-Jul-14	544.4	-1.16%				
9	1-Aug-14	536	-1.56%				
10	4-Aug-14	548.65	2.33%				

Once this is done, Excel will instantly calculate the daily standard deviation aka volatility of WIPRO for you. I get the answer as 0.0147 which when converted to a percentage reads as 1.47%.

This means the daily volatility of WIPRO is 1.47% !

The value we have calculated is WIPRO's daily volatility, but what about its annual volatility?

Now here is a very important convention you will have to remember – in order to convert the daily volatility to annual volatility just multiply the daily volatility number with the square root of time.

Likewise to convert the annual volatility to daily volatility, divide the annual volatility by square root of time.

So in this case we have calculated the daily volatility, and we now need WIPRO's annual volatility. We will calculate the same here –

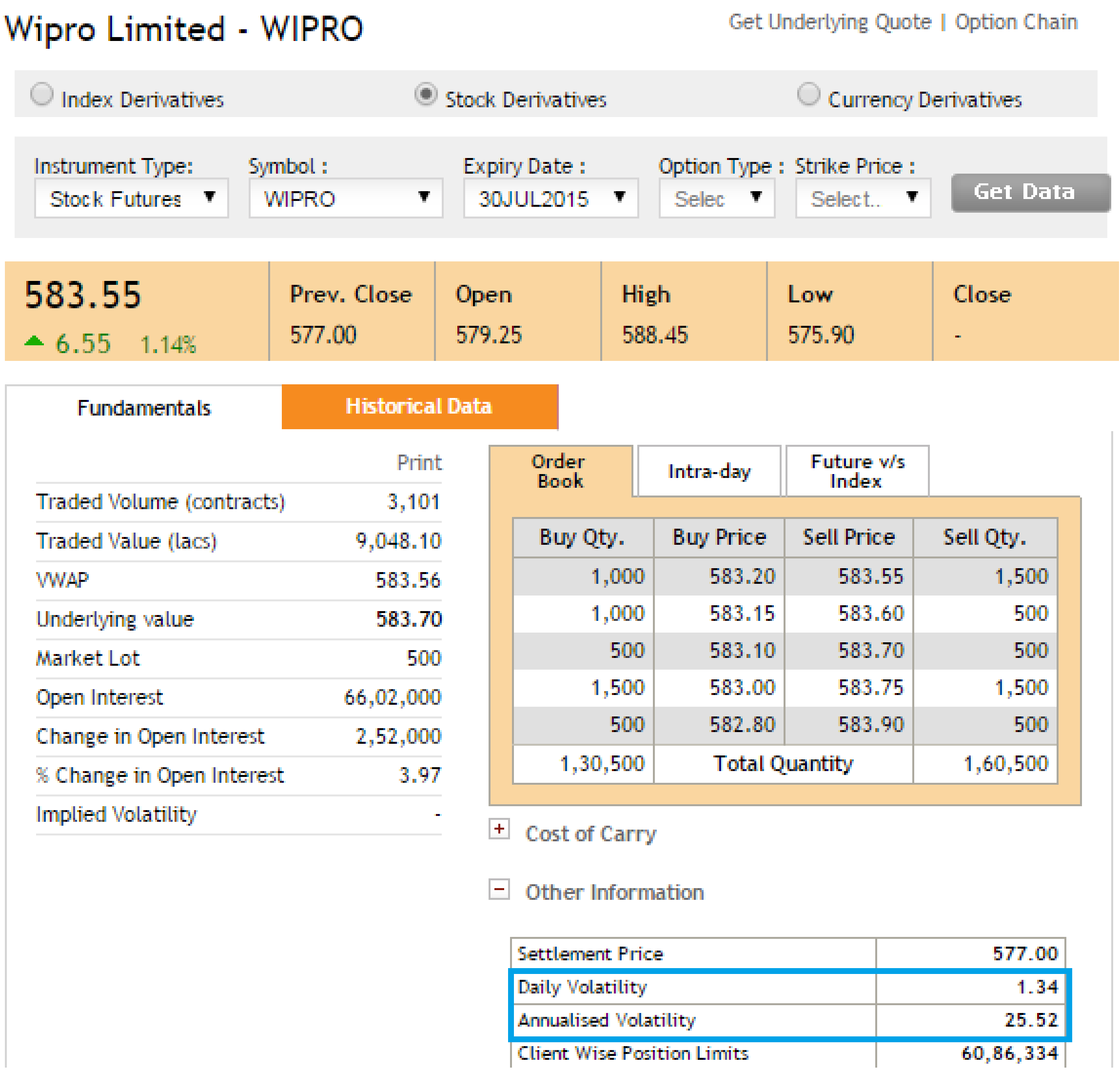
- Daily Volatility = 1.47%
- Time = 365
- Annual Volatility = 1.47% * SQRT (365)
- = 28.08%

In fact I have calculated the same on excel, have a look at the image below –

	A	B	C	D	E	F	G
1	**Date**	**Close Price**	**Daily Rt**				
2	22-Jul-14	558.75					
3	23-Jul-14	570.9	2.15%				
4	24-Jul-14	576.85	1.04%				
5	25-Jul-14	551.05	-4.58%		Daily Volatility	1.47%	
6	28-Jul-14	557.05	1.08%		Annual Volatility	=F5*SQRT(365)	
7	30-Jul-14	550.75	-1.14%				
8	31-Jul-14	544.4	-1.16%				
9	1-Aug-14	536	-1.56%				
10	4-Aug-14	548.65	2.33%				
11	5-Aug-14	549.55	0.16%				
12	6-Aug-14	551.4	0.34%				
13	7-Aug-14	552.65	0.23%				
14	8-Aug-14	548.05	-0.84%				
15	11-Aug-14	542.95	-0.93%				

So with this, we know WIPRO's daily volatility is 1.47% and its annual volatility is about 28%.

Lets double check these numbers with what the NSE has published on their website. NSE publishes these numbers only for F&O stocks and not other stocks. Here is the snapshot of the same –



Our calculation is pretty much close to what NSE has calculated – as per NSE's calculation Wipro's daily volatility is about 1.34% and Annualized Volatility is about 25.5%.

So why is there a slight difference between our calculation and NSE's? – One possible reason could be that we are using spot price while NSE is using Futures price. However I really don't want to get into investigating why this slight difference exists. The agenda here is to know how to calculate the volatility of the security given its daily returns.

Before we wrap up this chapter, let us just do one more calculation. Assume we directly get the annual volatility of WIPRO as 25.5%, how do we figure out its daily volatility?

Like I mentioned earlier, to convert annual volatility to daily volatility you simply have to divide the annual volatility by the square root of time, hence in this particular case –

= 25.5% / SQRT (365)

= 1.34%

So far we have understood what volatility is and how to calculate the same. In the next chapter we will understand the practical application of volatility.

Do remember we are still in the process of understanding volatility; however the final objective is to understand the option greek Vega and that really means. So please do not lose sight of our end objective.

Please **click here** to download the excel sheet.

Key takeaways from this chapter

1. Standard Deviation represents volatility, which in turn represents risk
2. We can use NSE website to get the daily closing prices of securities
3. Daily return can be calculated as log returns
4. Log function in excel is LN
5. Daily return formula = LN (Today's Value / Yesterday's Value) expressed as a percentage
6. Excel function to calculate volatility is STDEV
7. Standard Deviation of daily return is equivalent of daily volatility
8. To convert daily volatility to annual volatility multiply the daily volatility by the square root of time
9. Likewise to convert annual volatility to daily volatility, divide the annual volatility by the square root of time

Volatility & Normal Distribution

17.1 – Background

In the earlier chapter we had this discussion about the range within which Nifty is likely to trade given that we know its annualized volatility. We arrived at an upper and lower end range for Nifty and even concluded that Nifty is likely to trade within the calculated range.

Fair enough, but how sure are we about this? Is there a possibility that Nifty would trade outside this range? If yes, what is the probability that it will trade outside the range and what is the probability that Nifty will trade within the range? If there is an outside range, then what are its values?

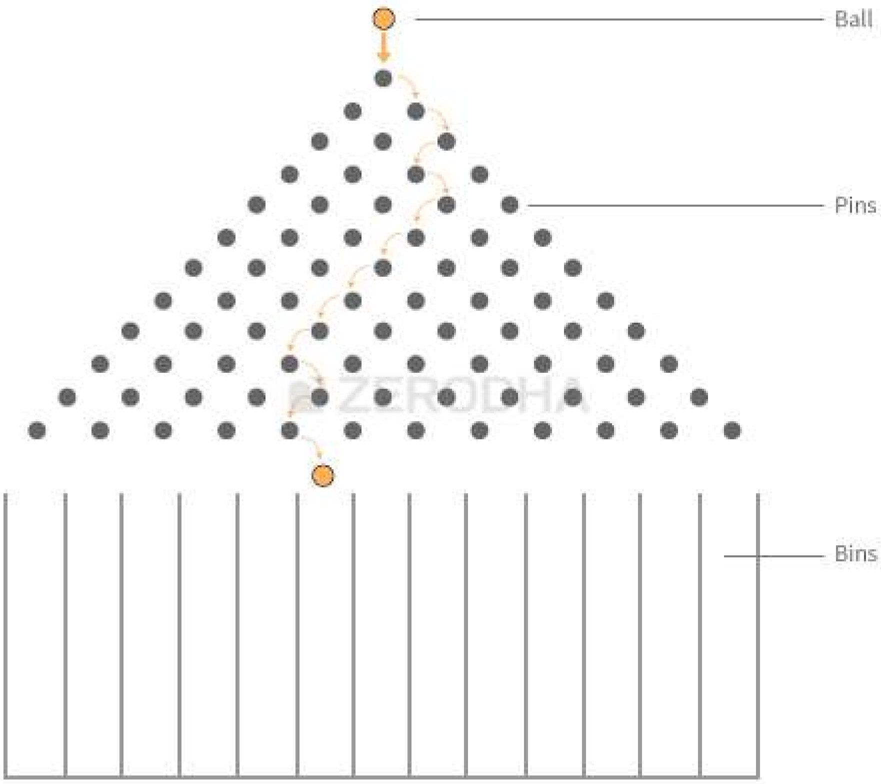
Finding answers to these questions are very important for several reasons. If not for anything it will lay down a very basic foundation to a quantitative approach to markets, which is very different from the regular fundamental and technical analysis thought process.

So let us dig a bit deeper and get our answers.

17.2 – Random Walk

The discussion we are about to have is extremely important and highly relevant to the topic at hand, and of course very interesting as well.

Have a look at the image below –



What you see is called a 'Galton Board'. A Galton Board has pins stuck to a board. Collecting bins are placed right below these pins.

The idea is to drop a small ball from above the pins. Moment you drop the ball, it encounters the first pin after which the ball can either turn left or turn right before it encounters another pin. The same procedure repeats until the ball trickles down and falls into one of the bins below.

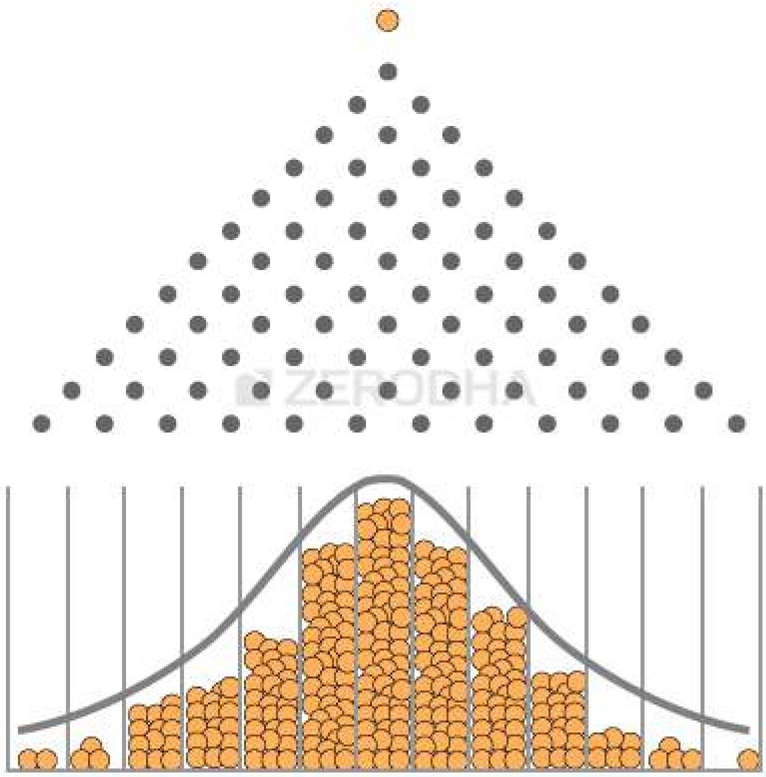
Do note, once you drop the ball from top, you cannot do anything to artificially control the path that the ball takes before it finally rests in one of the bins. The path that the ball takes is completely natural and is not predefined or controlled. For this particular reason, the path that the ball takes is called the '**Random Walk**'.

Now, can you imagine what would happen if you were to drop several such balls one after the other? Obviously each ball will take a random walk before it falls into one of the bins. However what do you think about the distribution of these balls in the bins?.

- Will they all fall in the same bin? or
- Will they all get distributed equally across the bins? or
- Will they randomly fall across the various bins?

I'm sure people not familiar with this experiment would be tempted to think that the balls would fall randomly across various bins and does not really follow any particular pattern. But this does not happen, there seems to be an order here.

Have a look at the image below –



It appears that when you drop several balls on the Galton Board, with each ball taking a random walk, they all get distributed in a particular way –

- Most of the balls tend to fall in the central bin
- As you move further away from the central bin (either to the left or right), there are fewer balls
- The bins at extreme ends have very few balls

A distribution of this sort is called the "**Normal Distribution**". You may have heard of the bell curve from your school days, bell curve is nothing but the normal distribution. Now here is the best part, irrespective of how many times you repeat this experiment, the balls always get distributed to form a normal distribution.

This is a very popular experiment called the Galton Board experiment; I would strongly recommend you to watch this beautiful video to understand this discussion better –

So why do you think we are discussing the Galton Board experiment and the Normal Distribution?

Well many things in real life follow this natural order. For example –

- Gather a bunch of adults and measure their weights – segregate the weights across bins (call them the weight bins) like 40kgs to 50kgs, 50kgs to 60kgs, 60kgs to 70kgs etc. Count the number of people across each bin and you end up getting a normal distribution

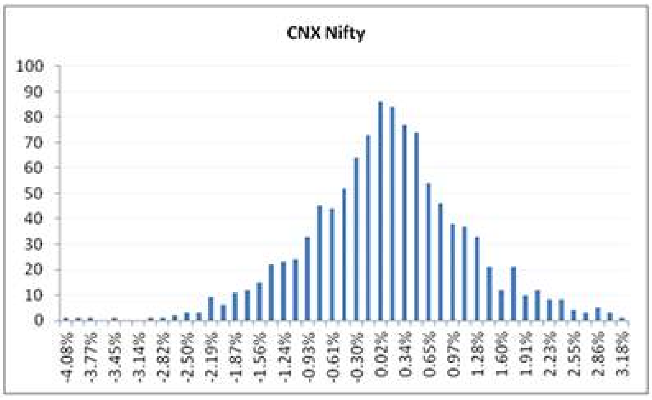
- Conduct the same experiment with people's height and you will end up getting a normal distribution
- You will get a Normal Distribution with people's shoe size
- Weight of fruits, vegetables
- Commute time on a given route
- Lifetime of batteries

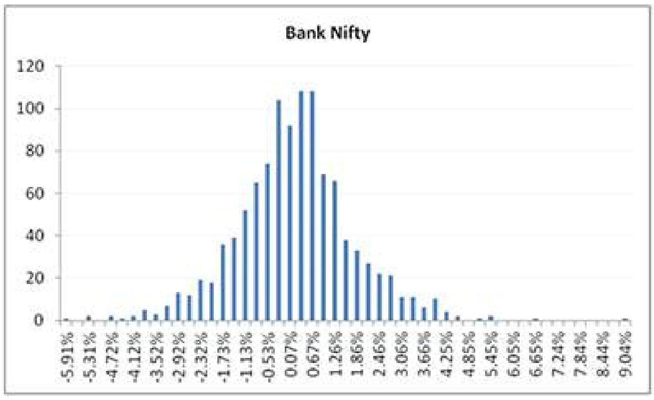
This list can go on and on, however I would like to draw your attention to one more interesting variable that follows the normal distribution – the daily returns of a stock!

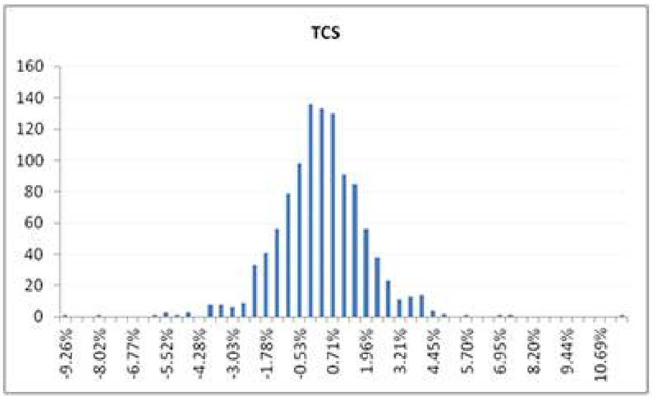
The daily returns of a stock or an index cannot be predicted – meaning if you were to ask me what will be return on TCS tomorrow I will not be able to tell you, this is more like the random walk that the ball takes. However if I collect the daily returns of the stock for a certain period and see the distribution of these returns – I get to see a normal distribution aka the bell curve!

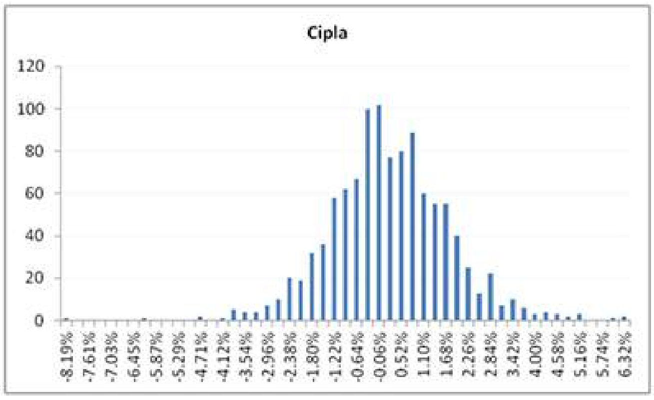
To drive this point across I have plotted the distribution of the daily returns of the following stocks/indices –

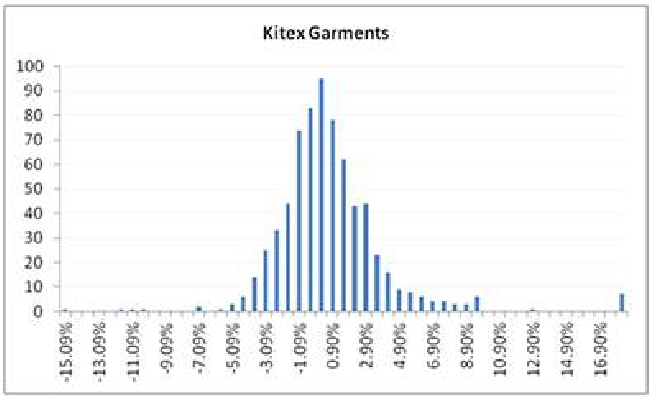
- Nifty (index)
- Bank Nifty (index)
- TCS (large cap)
- Cipla (large cap)
- Kitex Garments (small cap)
- Astral Poly (small cap)

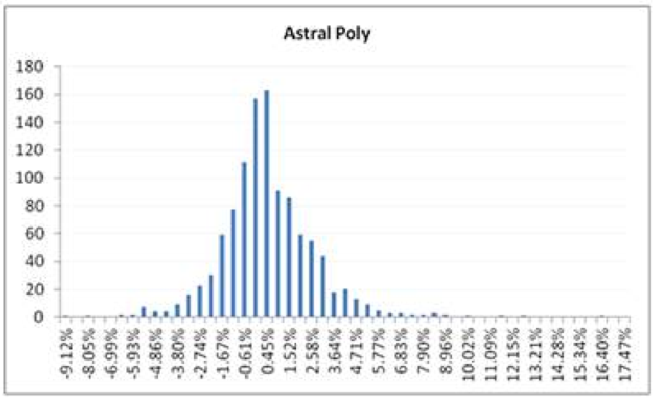






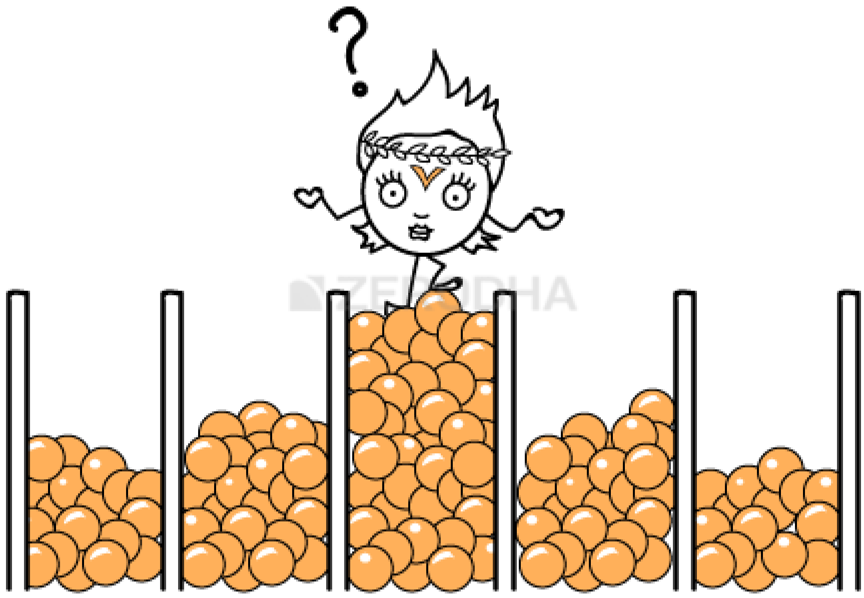






As you can see the daily returns of the stocks and indices clearly follow a normal distribution.

Fair enough, but I guess by now you would be curious to know why is this important and how is it connected to Volatility? Bear with me for a little longer and you will know why I'm talking about this.



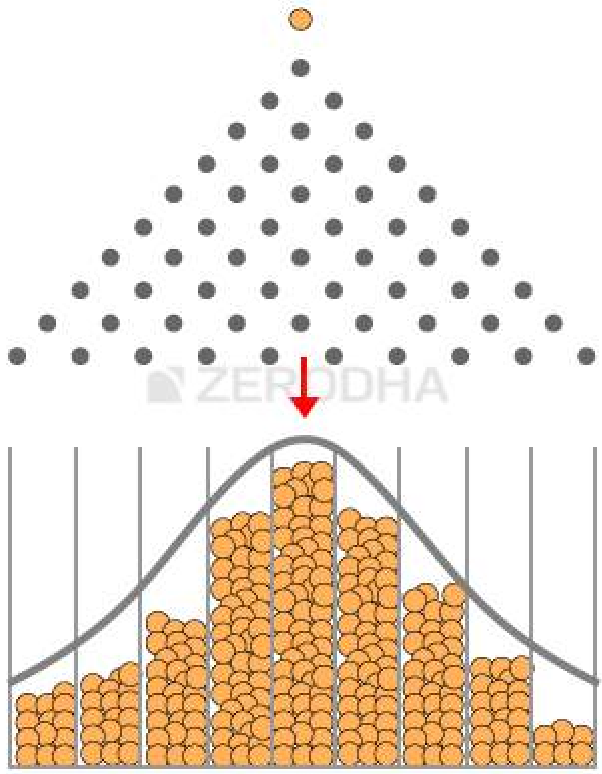
17.3 – Normal Distribution

I think the following discussion could be a bit overwhelming for a person exploring the concept of normal distribution for the first time. So here is what I will do – I will explain the concept of normal distribution, relate this concept to the Galton board experiment, and then extrapolate it to the stock markets. I hope this will help you grasp the gist better.

So besides the Normal Distribution there are other distributions across which data can be distributed. Different data sets are distributed in different statistical ways. Some of the other data distribution patterns are – binomial distribution, uniform distribution, poisson distribution, chi square distribution etc. However the normal distribution pattern is probably the most well understood and researched distribution amongst the other distributions.

The normal distribution has a set of characteristics that helps us develop insights into the data set. The normal distribution curve can be fully described by two numbers – the distribution's mean (average) and standard deviation.

The mean is the central value where maximum values are concentrated. This is the average value of the distribution. For instance, in the Galton board experiment the mean is that bin which has the maximum numbers of balls in it.



So if I were to number the bins (starting from the left) as 1, 2, 3…all the way upto 9 (right most), then the 5th bin (marked by a red arrow) is the 'average' bin. Keeping the average bin as a reference, the data is spread out on either sides of this average reference value. The way the data is spread out (dispersion as it is called) is quantified by the standard deviation (recollect this also happens to be the volatility in the stock market context).

Here is something you need to know – when someone says 'Standard Deviation (SD)' by default they are referring to the 1st SD. Likewise there is 2nd standard deviation (2SD), 3rd standard deviation (SD) etc. So when I say SD, I'm referring to just the standard deviation value, 2SD would refer to 2 times the SD value, 3 SD would refer to 3 times the SD value so on and so forth.

For example assume in case of the Galton Board experiment the SD is 1 and average is 5. Then,

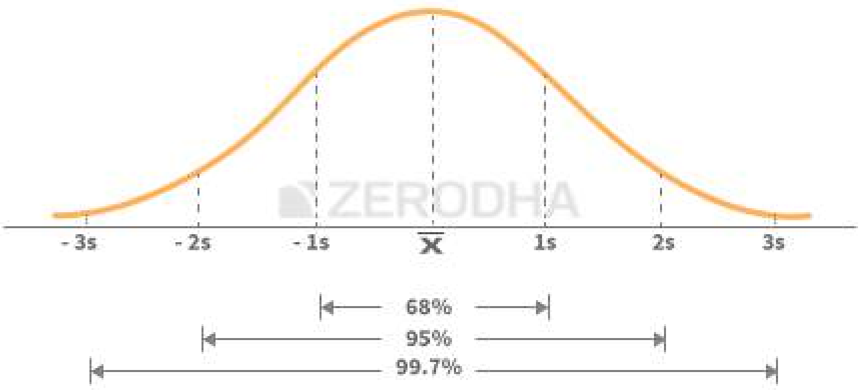
- 1 SD would encompass bins between 4th bin (5 – 1) and 6th bin (5 + 1). This is 1 bin to the left and 1 bin to the right of the average bin
- 2 SD would encompass bins between 3rd bin (5 – 2*1) and 7th bin (5 + 2*1)
- 3 SD would encompass bins between 2nd bin (5 – 3*1) and 8th bin (5 + 3*1)

Now keeping the above in perspective, here is the general theory around the normal distribution which you should know –

- Within the 1st standard deviation one can observe 68% of the data

- Within the 2nd standard deviation one can observe 95% of the data
- Within the 3rd standard deviation one can observe 99.7% of the data

The following image should help you visualize the above –



Applying this to the Galton board experiment –

- Within the 1st standard deviation i.e between 4th and 6th bin we can observe that 68% of balls are collected
- Within the 2nd standard deviation i.e between 3rd and 7th bin we can observe that 95% of balls are collected
- Within the 3rd standard deviation i.e between 2nd and 8th bin we can observe that 99.7% of balls are collected

Keeping the above in perspective, let us assume you are about to drop a ball on the Galton board and before doing so we both engage in a conversation –

You – I'm about to drop a ball, can you guess which bin the ball will fall into?

Me – No, I cannot as each ball takes a random walk. However, I can predict the range of bins in which it may fall

You – Can you predict the range?

Me – Most probably the ball will fall between the 4th and the 6th bin

You – Well, how sure are you about this?

Me – I'm 68% confident that it would fall anywhere between the 4th and the 6th bin

You – Well, 68% is a bit low on accuracy, can you estimate the range with a greater accuracy?

Me – Sure, I can. The ball is likely to fall between the 3rd and 7th bin, and I'm 95% sure about this. If you want an even higher accuracy then I'd say that the ball is likely to fall between the 2nd and 8th bin and I'm 99.5% sure about this

You – Nice, does that mean there is no chance for the ball to fall in either the 1st or 10th bin?

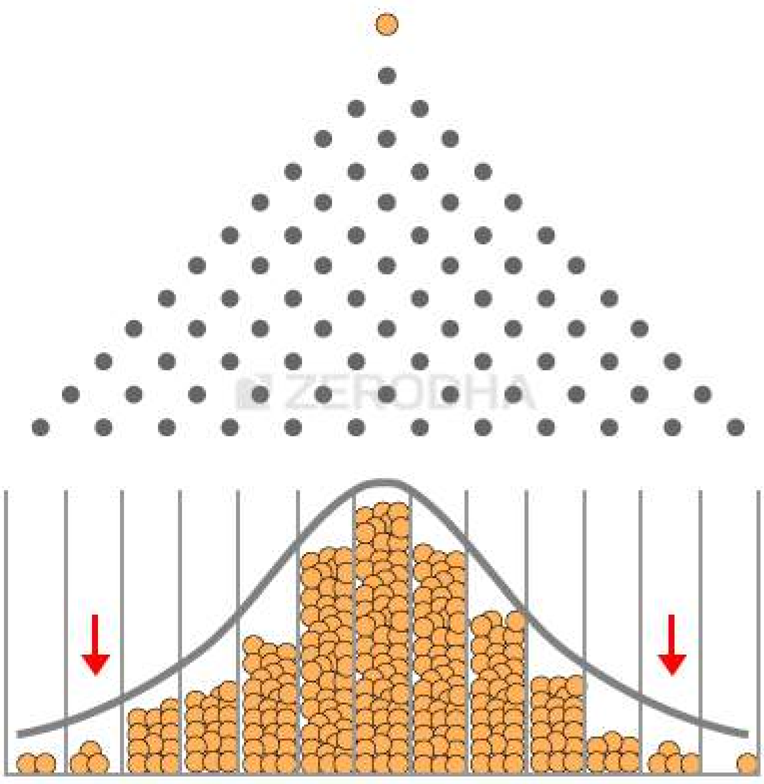
Me – Well, there is certainly a chance for the ball to fall in one of the bins outside the 3rd SD bins but the chance is very low

You – How low?

Me – The chance is as low as spotting a '**Black Swan**' in a river. Probability wise, the chance is less than 0.5%

You – Tell me more about the Black Swan

Me – Black Swan 'events' as they are called, are events (like the ball falling in 1st or 10th bin) that have a low probability of occurrence. But one should be aware that black swan events have a non-zero probability and it can certainly occur – when and how is hard to predict. In the picture below you can see the occurrence of a black swan event –

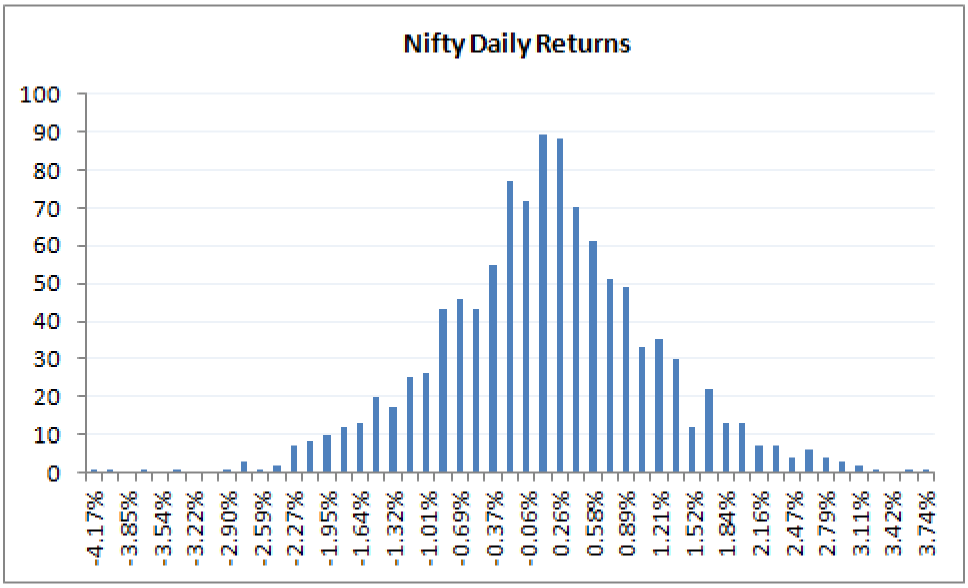


In the above picture there are so many balls that are dropped, but only a handful of them collect at the extreme ends.

17.4 – Normal Distribution and stock returns

Hopefully the above discussion should have given you a quick introduction to the normal distribution. The reason why we are talking about normal distribution is that the daily returns of the stock/indices also form a bell curve or a normal distribution. This implies that if we know the mean and standard deviation of the stock return, then we can develop a greater insight into the behavior of the stock's returns or its dispersion. For sake of this discussion, let us take up the case of Nifty and do some analysis.

To begin with, here is the distribution of Nifty's daily returns is –



As we can see the daily returns are clearly distributed normally. I've calculated the average and standard deviation for this distribution (in case you are wondering how to calculate the same, please do refer to the previous chapter). Remember to calculate these values we need to calculate the log daily returns.

- Daily Average / Mean = 0.04%
- Daily Standard Deviation / Volatility = 1.046%
- Current market price of Nifty = 8337

Do note, an average of 0.04% indicates that the daily returns of nifty are centered at 0.04%. Now keeping this information in perspective let us calculate the following things –

- The range within which Nifty is likely to trade in the next 1 year
- The range within which Nifty is likely to trade over the next 30 days.

For both the above calculations, we will use 1 and 2 standard deviation meaning with 68% and 95% confidence.

Solution 1 – (Nifty's range for next 1 year)

Average = 0.04%
SD = 1.046%

Let us convert this to annualized numbers –

Average = 0.04*252 = 9.66%
SD = 1.046% * Sqrt (252) = 16.61%

So with 68% confidence I can say that the value of Nifty is likely to be in the range of –

= Average + 1 SD (Upper Range) and Average – 1 SD (Lower Range)
= 9.66% + 16.61% = **26.66%**
= 9.66% – 16.61% = **-6.95%**

Note these % are log percentages (as we have calculated this on log daily returns), so we need to convert these back to regular %, we can do that directly and get the range value (w.r.t to Nifty's CMP of 8337) –

Upper Range
= 8337 *exponential (26.66%)
= **10841**

And for lower range –

= 8337 * exponential (-6.95%)
= **7777**

The above calculation suggests that Nifty is likely to trade somewhere between 7777 and 10841. How confident I am about this? – Well as you know I'm 68% confident about this.

Let us increase the confidence level to 95% or the 2nd standard deviation and check what values we get –

Average + 2 SD (Upper Range) and Average – 2 SD (Lower Range)
= 9.66% + 2* 16.61% = **42.87%**
= 9.66% – 2* 16.61% = **-23.56%**

Hence the range works out to –

Upper Range
= 8337 *exponential (42.87%)
= **12800**

And for lower range –

= 8337 * exponential (-23.56%)
= **6587**

The above calculation suggests that with 95% confidence Nifty is likely to trade anywhere in the range of 6587 and 12800 over the next one year. Also as you can notice when we want higher accuracy, the range becomes much larger.

I would suggest you do the same exercise for 99.7% confidence or with 3SD and figure out what kind of range numbers you get.

Now, assume you do the range calculation of Nifty at 3SD level and get the lower range value of Nifty as 5000 (I'm just quoting this as a place holder number here), does this mean Nifty cannot go below 5000? Well it certainly can but the chance of going below 5000 is low, and if it really does go below 5000 then it can be termed as a black swan event. You can extend the same argument to the upper end range as well.

Solution 2 – (Nifty's range for next 30 days)

We know the daily mean and SD –

Average = 0.04%
SD = 1.046%

Since we are interested in calculating the range for next 30 days, we need to convert the same for the desired time period –

Average = 0.04% * 30 = 1.15%
SD = 1.046% * sqrt (30) = 5.73%

So with 68% confidence I can say that, the value of Nifty over the next 30 days is likely to be in the range of –

= Average + 1 SD (Upper Range) and Average – 1 SD (Lower Range)
= 1.15% + 5.73% = **6.88%**
= 1.15% – 5.73% = **– 4.58%**

Note these % are log percentages, so we need to convert them back to regular %, we can do that directly and get the range value (w.r.t to Nifty's CMP of 8337) –

= 8337 *exponential (6.88%)
= **8930**

And for lower range –

= 8337 * exponential (-4.58%)
= **7963**

The above calculation suggests that with 68% confidence level I can estimate Nifty to trade somewhere between 8930 and 7963 over the next 30 days.

Let us increase the confidence level to 95% or the 2nd standard deviation and check what values we get –

Average + 2 SD (Upper Range) and Average – 2 SD (Lower Range)
= 1.15% + 2* 5.73% = 12.61%
= 1.15% – 2* 5.73% = -10.31%

Hence the range works out to –

= 8337 *exponential (12.61%)
= **9457** (Upper Range)

And for lower range –

= 8337 * exponential (-10.31%)
= **7520**

I hope the above calculations are clear to you. You can also **download** the MS excel that I've used to make these calculations.

Of course you may have a very valid point at this stage – normal distribution is fine, but how do I get to use the information to trade? I guess as such this chapter is quite long enough to accommodate more concepts. Hence we will move the application part to the next chapter. In the next chapter we will explore the applications of standard deviation (volatility) and its relevance to trading. We will discuss two important topics in the next chapter (1) How to select strikes that can be sold/written using normal distribution and (2) How to set up stoploss using volatility.

Of course, do remember eventually the idea is to discuss Vega and its effect on options premium.

Key takeaways from this chapter

1. The daily returns of the stock is a random walk, highly difficult to predict
2. The returns of the stock is normally distributed or rather close to normal distribution
3. In a normal distribution the data is centered around the mean and the dispersion is measured by the standard deviation
4. Within 1 SD we can observe 68% of the data
5. Within 2 SD we can observe 95% of the data
6. Within 3 SD we can observe 99.5% of the data

7. Events occurring outside the 3rd standard deviation are referred to as Black Swan events
8. Using the SD values we can calculate the upper and lower value of stocks/indices

Volatility Applications

18.1 – Striking it right

The last couple of chapters have given a basic understanding on volatility, standard deviation, normal distribution etc. We will now use this information for few practical trading applications. At this stage I would like to discuss two such applications –

1. Selecting the right strike to short/write
2. Calculating the stoploss for a trade

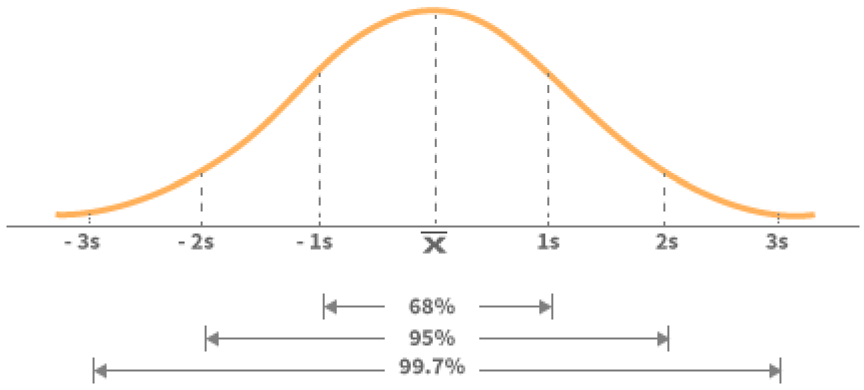
However at a much later stage (in a different module altogether) we will explore the applications under a different topic – 'Relative value Arbitrage (Pair Trading) and Volatility Arbitrage'. For now we will stick to trading options and futures.

So let's get started.

One of the key challenges an option writer always faces is to select the right strike so that he can write that option, collect the premium, and not really be worried about the possibility of the spot moving against him. Of course, the worry of spot moving against the option writer will always exist, however a diligent trader can minimize this.

Normal Distribution helps the trader minimize this worry and increase his confidence while writing options.

Let's have a quick recap –



The bell curve above suggests that with reference to the mean (average) value –

1. 68% of the data is clustered around mean within the 1st SD, in other words there is a 68% chance that the data lies within the 1st SD
2. 95% of the data is clustered around mean within the 2nd SD, in other words there is a 95% chance that the data lies within the 2nd SD
3. 99.7% of the data is clustered around mean within the 3rd SD, in other words there is a 99.7% chance that the data lies within the 3rd SD

Since we know that Nifty's daily returns are normally distributed, the above set of properties is applicable to Nifty. So what does it mean?

This means, if we know Nifty's mean and SD then we can pretty much make an 'educated guess' about the range within which Nifty is likely to trade over the selected time frame. Take this for example –

- Date = 11th August 2015
- Number of days for expiry = 16
- Nifty current market price = 8462
- Daily Average Return = 0.04%
- Annualized Return = 14.8%
- Daily SD = 0.89%
- Annualized SD = 17.04%

Given this I would now like to identify the range within which Nifty will trade until expiry i.e 16 days from now –

16 day SD = Daily SD *SQRT (16)
= 0.89% * SQRT (16)
= **3.567%**

16 day average = Daily Avg * 16
= 0.04% * 16 = **0.65%**

These numbers will help us calculate the upper and lower range within which Nifty is likely to trade over the next 16 days –

Upper Range = 16 day Average + 16 day SD

= 0.65% + 3.567%

= 4.215%, to get the upper range number –

= 8462 * (1+4.215%)

= **8818**

Lower Range = 16 day Average – 16 day SD

= 0.65% – 3.567%

= 2.920% to get the lower range number –

= 8462 * (1 – 2.920%)

= **8214**

The calculation suggests that Nifty is likely to trade anywhere in the region of **8214 to 8818.** How sure are we about this, well we know that there is a 68% probability for this calculation to work in our favor. In other words there is 32% chance for Nifty to trade outside 8214 and 8818 range. This also means all strikes outside the calculated range 'may' go worthless.

Hence –

- You can sell all call options above 8818 and collect the premiums because they are likely to expire worthless
- You can sell all put options below 8214 and collect the premiums because they are likely to expire worthless

Alternatively if you were thinking of buying Call options above 8818 or Put options below 8214 you may want to think twice, as you now know that there is a very little chance for these options to expire in the money, hence it makes sense to avoid buying these strikes.

Here is the snapshot of all Nifty Call option strikes above 8818 that you can choose to write (short) and collect premiums –

CALLS											
Chart	OI	Chng in OI	Volume	IV	LTP	Net Chng	Bid Qty	Bid Price	Ask Price	Ask Qty	Strike Price
	4,911,450	-326,550	457,884	13.21	11.90	-3.70	200	11.85	12.00	75	8800.00
	341,550	7,025	4,628	13.13	7.45	-2.95	50	7.05	7.65	25	8850.00
	2,715,900	93,900	246,413	13.25	4.85	-1.70	75	4.85	4.90	12,150	8900.00
	64,200	-2,150	981	13.77	3.65	-0.35	25	3.25	4.20	475	8950.00
	3,846,350	-62,000	232,387	13.99	2.45	-0.70	3,825	2.45	2.50	13,800	9000.00
	2,100	25	27	14.23	1.65	-1.35	25	0.65	2.90	3,900	9050.00
	808,025	-9,275	23,663	15.00	1.45	-0.25	850	1.45	1.55	1,000	9100.00
	2,525	-75	80	16.10	1.50	-0.10	8,000	0.15	2.00	1,500	9150.00
	627,175	60,500	10,179	16.70	1.25	-	8,500	1.25	1.30	400	9200.00
	-	-	-	-	-	-	16,000	0.10	-	-	9250.00
	368,650	29,475	8,245	18.14	1.00	0.15	1,700	0.95	1.00	8,975	9300.00
	-	-	-	-	-	-	15,000	0.05	-	-	9350.00
	140,900	-2,775	1,895	19.48	0.80	0.25	1,000	0.60	0.80	6,625	9400.00
	-	-	-	-	-	-	10,000	0.05	-	-	9450.00
	302,475	55,925	6,155	21.42	0.85	0.35	5,325	0.85	0.90	3,000	9500.00
	-	-	-	-	-	-	10,000	0.05	-	-	9550.00
	10,575	-	-	-	0.40	-	100	0.35	0.55	600	9600.00
	-	-	-	-	-	-	10,000	0.05	-	-	9650.00
	4,875	500	29	21.55	0.20	-0.35	100	0.20	0.40	150	9700.00

If I were to personally select a strike today it would be either 8850 or 8900 or probably both and collect Rs.7.45 and Rs.4.85 in premium respectively. The reason to select these strikes is simple – I see an acceptable balance between risk (1 SD away) and reward (7.45 or 4.85 per lot).

I'm certain many of you may have this thought – if I were to write the 8850 Call option and collect Rs.7.45 as premium, it does not really translate to any meaningful amount. After all, at Rs.7.45 per lot it translates to –

= 7.45 * 25 (lot size)

= Rs.186.25

Well, this is exactly where many traders miss the plot. I know many who think about the gains or loss in terms of absolute value and not really in terms of return on investment.

Think about it, margin amount required to take this trade is roughly Rs.12,000/-. If you are not sure about the margin requirement then I would suggest you use Zerodha's **margin calculator**.

The premium amount of Rs.186.25/- on a margin deposit of Rs.12,000/- works out to a return of 1.55%, which by any stretch on imagination is not a bad return, especially for a 16 day holding period! If you can consistently achieve this every month, then we are talking about a return of over 18% annualized just by means of option writing.

I personally use this strategy to write options and I'd like to share some of my thoughts regarding this –

Put Options – I don't like to short PUT options for the simple reason that panic spreads faster than greed. If there is panic in the market, the fall in market can be much quicker than you can imagine. Hence even before you can realize the OTM option that you have written can soon become ATM or ITM. Therefore it is better to avoid than regret.

Call Options – You inverse the above point and you will understand why writing call options are better than writing put options. For example in the Nifty example above, for the 8900 CE to become ATM or ITM Nifty has to move 438 points over 16 days. For this to happen, there has to be excess greed in the market…and like I said earlier a 438 up move takes a bit longer than 438 down move. Therefore my preference to short only call options.

Strike identification – I do the whole exercise of identifying the strike (SD, mean calculation, converting the same w.r.t to number days to expiry, selecting appropriate strike only the week before expiry and not before that. The timing here is deliberate

Timing – I prefer to short options only on the last Friday before the expiry week. For example given the August 2015 series expiry is on 27th, I'd short the call option only on 21st August around the closing. Why do I do this? This is to mainly ensure that theta works in my favor. Remember the 'time decay' graph we discussed in the theta chapter? The graph makes it amply evident that theta kicks in full force as we approach expiry.

Premium Collected – Because I write call options very close to expiry, the premiums are invariably low. The premium that I collect is around Rs.5 or 6 on Nifty Index, translating to about 1.0% return. But then I find the trade quite comforting for two reasons – (1) For the trade to work against me Nifty has to move 1 SD over 4 days, something that does not happen frequently (2) Theta works in my favor, the premiums erode much faster during the last week of expiry favoring the option seller

Why bother ? – Most of you may have this thought that the premiums are so low, why should I even bother? Honestly I too had this thought initially; however over time I have realized that trades with the following characteristics makes sense to me –

- Visibility on risk and reward – both should be quantifiable
- If a trade is profitable today then I should be able to replicate the same again tomorrow
- Consistency in finding the opportunities

- Assessment of worst case scenarios

  This strategy ticks well on all counts above, hence my preference.

SD consideration – When I'm writing options 3-4 days before expiry I prefer to write 1 SD away, however for whatever reason when I'm writing the option much earlier then I prefer to go 2 SD away. Remember higher the SD consideration, higher is the confidence level but lower is the premium that you can collect. Also, as a thumb rule I never write options when there is more than 15 days for expiry.

Events – I avoid writing options whenever there are important market events such as monetary policy, policy decision, corporate announcement etc. This is because the markets tend to react sharply to events and therefore a good chance of getting caught on the wrong side. Hence it is better safe than sorry.

Black Swan – I'm completely aware that despite all the precaution, markets can move against me and I could get caught on the wrong side. The price you pay for getting caught on the wrong side, especially for this trade is huge. Imagine you collect 5 or 6 points as premium but if you are caught on the wrong side you end up paying 15 or 20 points or more. So all the small profits you made over 9 to 10 months is given away in 1 month. In fact the legendary Satyajit Das in his highly insightful book "Traders, Guns, and Money" talks about option writing as "eating like a hen but shitting like an elephant'.

The only way to make sure you minimize the impact of a black swan event is to be completely aware that it can occur anytime after you write the option. So here is my advice to you in case you decide to adopt this strategy – track the markets and gauge the market sentiment all along. The moment you sense things are going wrong be quick to exit the trade.

Success Ratio – Option writing keeps you on the edge of the seat. There are times when you feel that markets are going against you (fear of black swan creeps in) but only to cool off eventually. When you write options such roller coaster feelings are bound to emerge. The worst part is that during this roller coaster ride you may be forced to believe that the market is going against you (false signal) and hence you get out of a potentially profitable trade.

In fact there is a very thin line between a false signal and an actual black swan event. The way to overcome this is by developing conviction in your trades. Unfortunately I cannot teach you conviction; you will have to develop that on your own J. However your conviction improves as and when you do more of these trades (and all trades should be backed by sound reasoning and not blind guesses).

Also, I personally get out of the trade when the option transitions from OTM to ATM.

Expenses – The key to these trades is to keep your expense to bear minimum so that you can retain maximum profits for yourself. The expenses include brokerage and applicable charges. If you short 1 lot of Nifty options and collect Rs.7 as premium then you will have to let go few points as expense. If you are trading with Zerodha, your expense will be around 1.95 for 1 lot. The higher the number of lots the lesser is your expense. So if I were trading 10 lots (with Zerodha) instead of 1, my expense drastically comes down to 0.3 points. You can use Zerodha's **brokerage calculator** to get the details.

The cost varies broker to broker so please do make sure your broker is not greedy by charging you ridiculous brokerage fees. Even better, if you are not with Zerodha,

it is about time you **join us** and become a part of our beautiful family

Capital Allocation – An obvious question you might have at this stage – how much money do I deploy to this trade? Do I risk all my capital or only a certain %? If it's a %, then how much would it be? There is no straight forward answer to this; hence I'll take this opportunity to share my asset allocation technique.

I'm a complete believer in equities as an asset class, so this rules out investment in Gold, Fixed Deposit, and Real Estate for me. 100% of my capital (savings) is invested in equity and equity based products. However it is advisable for any individual to diversify capital across multiple asset classes.

So within Equity, here is how I split my money –

- 35% of my money is invested in equity based mutual funds via SIP (systematic investment plan) route. I have further divided this across 4 funds.
- 40% of my capital in an equity portfolio of about 12 stocks. I consider both mutual funds and equity portfolio as long term investments (5 years and beyond).
- 25% is earmarked for short term strategies.

The short term strategies include a bunch of trading strategies such as –

- Momentum based swing trades (futures)
- Overnight futures/options/stock trades
- Intraday trades
- Option writing

I make sure that I do not expose more than 35% of the 25% capital for any particular strategy. Just to make it more clear, assume I have Rs.500,000/- as my capital, here is how I would split my money –

- 35% of Rs.500,000/- i.e Rs.175,000/- goes to Mutual Funds
- 40% of Rs.500,000/- i.e Rs.200,000/- goes to equity portfolio
- 25% of Rs.500,000/- i.e Rs.125,000/- goes to short term trading
- 35% of Rs.125,000/- i.e Rs.43,750/- is the maximum I would allocate per trade

- Hence I will not short more than 4 lots of options
- 43,750/- is about 8.75% of the overall capital of Rs.500,000/-

So this self mandated rule ensures that I do not expose more than 9% of my over all capital to any particular short term strategies including option writing.

Instruments – I prefer running this strategy on liquid stocks and indices. Besides Nifty and Bank Nifty I run this strategy on SBI, Infosys, Reliance, Tata Steel, Tata Motors, and TCS. I rarely venture outside this list.

So here is what I would suggest you do. Run the exercise of calculating the SD and mean for Nifty, Bank Nifty on the morning of August 21st (5 to 7 days before expiry). Identify strikes that are 1 SD away from the market price and write them virtually. Wait till the expiry and experience how this trade goes. If you have the bandwidth you can run this across all the stocks that I've mentioned. Do this diligently for few expiries before you can deploy capital.

Lastly, as a standard disclaimer I have to mention this – the thoughts expressed above suits my risk reward temperament, which could be very different from yours. Everything that I mentioned here comes from my own personal trading experience, these are not standard practices.

I would suggest you note these points, understand your own risk-reward temperament, and calibrate your strategy. Hopefully the pointers here should help you develop that orientation.

This is quite contradicting to this chapter but I have to recommend you to read Nassim Nicholas Taleb's "Fooled by Randomness" at this point. The book makes you question and rethink everything that you do in markets (and life in general). I think just being completely aware of what Taleb writes in his book along with the actions you take in markets puts you in a completely different orbit.

18.2 – Volatility based stoploss

The discussion here is a digression from Options, in fact this would have been more apt in the futures trading module, but I think we are at the right stage to discuss this topic.

The first thing you need to identify before you initiate any trade is to identify the stop-loss (SL) price for the trade. As you know, the SL is a price point beyond which you will not take any further losses. For example, if you buy Nifty futures at 8300, you may identify 8200 as your stop-loss level; you will be risking 100 points on this particular trade. The moment Nifty falls below 8200, you exit the trade taking the loss. The question however is – how to identify the appropriate stop-loss level?

One standard approach used by many traders is to keep a standard pre-fixed percentage stop-loss. For example one could have a 2% stop-loss on every trade. So if you are to buy a stock at Rs.500, then your stop-loss price is Rs.490 and you risk Rs.10 (2% of Rs.500) on this trade. The problem with this approach lies in the rigidity of the practice. It does not account for the daily noise / volatility of the stock. For example the nature of the stock could be such that it could swing about 2-3% on a daily basis. As a result you could be right about the direction of the trade but could still hit a 'stop-loss'. More often than not, you would regret keeping such tight stops.

An alternate and effective method to identify a stop-loss price is by estimating the stock's volatility. Volatility accounts for the daily 'expected' fluctuation in the stock price. The advantage with this approach is that the daily noise of the stock is factored in. Volatility stop is strategic as it allows us to place a stop at the price point which is outside the normal expected volatility of the stock. Therefore a volatility SL gives us the required logical exit in case the trade goes against us.

Let's understand the implementation of the volatility based SL with an example.

This is the chart of Airtel forming a bullish harami, people familiar with the pattern would immediately recognize this is an opportunity to go long on the stock, keeping the low of the previous day (also coinciding with a support) as the stoploss. The target would be the immediate resistance – both S&R points are marked with a blue line. Assume you expect the trade to materialize over the next 5 trading sessions. The trade details are as follows –

- Long @ 395
- Stop-loss @ 385

- Target @ 417
- Risk = 395 – 385 = 10 or about 2.5% below entry price
- Reward = 417 – 385 = 32 or about 8.1% above entry price
- Reward to Risk Ratio = 32/10 = 3.2 meaning for every 1 point risk, the expected reward is 3.2 point

This sounds like a good trade from a risk to reward perspective. In fact I personally consider any short term trade that has a Reward to Risk Ratio of 1.5 as a good trade. However everything hinges upon the fact that the stoploss of 385 is sensible.

Let us make some calculations and dig a little deeper to figure out if this makes sense –

Step 1: Estimate the daily volatility of Airtel. I've done the math and the daily volatility works out to 1.8%

Step 2: Convert the daily volatility into the volatility of the time period we are interested in. To do this, we multiply the daily volatility by the square root of time. In our example, our expected holding period is 5 days, hence the 5 day volatility is equal to 1.8%*Sqrt(5). This works out to be about 4.01%.

Step 3. Calculate the stop-loss price by subtracting 4.01% (5 day volatility) from the expected entry price. 395 – (4.01% of 395) = 379. The calculation above indicates that Airtel can swing from 395 to 379 very easily over the next 5 days. This also means, a stoploss of 385 can be easily knocked down. So the SL for this trade has be a price point below 379, lets say 375, which is 20 points below the entry price of 395.

Step 4 : With the new SL, the RRR works out to 1.6 (32/20), which still seems ok to me. Hence I would be happy to initiate the trade.

Note : In case our expected holding period is 10 days, then the 10 day volatility would be 1.6*sqrt(10) so on and so forth.

Pre-fixed percentage stop-loss does not factor in the daily fluctuation of the stock prices. There is a very good chance that the trader places a premature stop-loss, well within the noise levels of the stock. This invariably leads to triggering the stop-loss first and then the target.

Volatility based stop-loss takes into account all the daily expected fluctuation in the stock prices. Hence if we use a stocks volatility to place our stop-loss, then we would be factoring in the noise component and in turn placing a more relevant stop loss.

Key takeaways from this chapter

- You can use SD to identify strikes that you can write

- Avoid shorting PUT options
- Strikes 1 SD away offers 68% flexibility, if you need higher flexibility you could opt for 2SD
- Higher the SD, higher is the range, and lower is the premium collected
- Allocate capital based on your belief in asset classes. It is always advisable to invest across asset classes
- It always makes sense to place SL based on daily volatility of the stock

Vega

19.1 – Volatility Types

The last few chapters have laid a foundation of sorts to help us understand Volatility better. We now know what it means, how to calculate the same, and use the volatility information for building trading strategies. It is now time to steer back to the main topic – Option Greek and in particular the 4th Option Greek "Vega". Before we start digging deeper into Vega, we have to discuss one important topic – Quentin

Tarantino .

I'm huge fan of Quentin Tarantino and his movies. For people not familiar with Quentin Tarantino let me tell you, he is one of the most talented directors in Hollywood. He is the man behind super cult flicks such as Pulp Fiction, Kill Bill, Reservoir Dogs, Django Unchained etc. If you've not watched his movies, I'd suggest you do, you may just love these movies as much as I do.

It is a known fact that when Quentin Tarantino directs a movie, he keeps all the production details under wraps until the movies trailer hits the market. Only after the trailer is out people get to know the name of movie, star cast details, brief story line, movie location etc. However, this is not the case with the movie he is directing these days, titled "The Hateful Eight", due to be released in December 2015. Somehow everything about 'The Hateful Eight' – the star cast, storyline, location etc is leaked, hence people already know what to expect from Tarantino. Now given that most of the information about the movie is already known, there are wild speculations about the box office success of his upcoming movie.

We could do some analysis on this –

1. **Past movies** – We know almost all of Tarantino's previous movies were successful. Based on his past directorial performance we can be reasonably certain that 'The Hateful Eight' is likely to be a box office hit
2. **Movie Analyst's forecast** – There are these professional Hollywood movie analysts, who understand the business of cinema very well. Some of these analysts are forecasting that 'The Hateful Eight' may not do well (unlike his previous flicks) as most of the details pertaining to the movie is already, failing to enthuse the audience
3. **Social Media** – If you look at the discussions on 'The Hateful Eight' on social media sites such as Twitter and Facebook, you'd realize that a lot of people are indeed

excited about the movie, despite knowing what to expect from the movie. Going by the reactions on Social Media, 'The Hateful Eight' is likely to be a hit.

4. **The actual outcome** – Irrespective of what really is being expected, once the movie is released we would know if the movie is a hit or a flop. Of course this is the final verdict for which we have to wait till the movie is released.

   Tracking the eventual fate of the movie is not really our concern, although I'm

   certainly going to watch the movie .

   Given this, you may be wondering why we are even discussing Quentin Tarantino in a chapter concerning Options and Volatility! Well this is just my attempt (hopefully not lame) to explain the different types of volatility that exist – Historical Volatility, Forecasted Volatility, and Implied Volatility. So let's get going.

   Historical Volatility is similar to us judging the box office success of 'The Hateful Eight' based on Tarantino's past directorial ventures. In the stock market world, we take the past closing prices of the stock/index and calculate the historical volatility. Do recall, we discussed the technique of calculating the historical volatility in Chapter 16. Historical volatility is very easy to calculate and helps us with most of the day to day requirements – for instance historical volatility can 'somewhat' be used in the options calculator to get a 'quick and dirty' option price (more on this in the subsequent chapters).

   Forecasted Volatility is similar to the movie analyst attempting to forecast the fate of 'The Hateful Eight'. In the stock market world, analysts forecast the volatility. Forecasting the volatility refers to the act of predicting the volatility over the desired time frame.

   However, why would you need to predict the volatility? Well, there are many option strategies, the profitability of which solely depends on your expectation of volatility. If you have a view of volatility – for example you expect volatility to increase by 12.34% over the next 7 trading sessions, then you can set up option strategies which can profit this view, provided the view is right.

   Also, at this stage you should realize – to make money in the stock markets it is NOT necessary to have a view on the direction on the markets. The view can be on volatility as well. Most of the professional options traders trade based on volatility and not really the market direction. I have to mention this – many traders find forecasting volatility is far more efficient than forecasting market direction.

   Now clearly having a mathematical/statistical model to predict volatility is much better than arbitrarily declaring "I think the volatility is going to shoot up". There are a few good statistical models such as 'Generalized AutoRegressive Conditional Heteroskedasticity (GARCH) Process'. I know it sounds spooky, but that's what it's called. There are several GARCH processes to forecast volatility, if you are venturing into this arena, I can straightaway tell you that GARCH (1,1) or GARCH (1,2) are better suited processes for forecasting volatility.

Implied Volatility (IV) is like the people's perception on social media. It does not matter what the historical data suggests or what the movie analyst is forecasting about 'The Hateful Eight'. People seem to be excited about the movie, and that is an indicator of how the movie is likely to fare. Likewise the implied volatility represents the market participant's expectation on volatility. So on one hand we have the historical and forecasted volatility, both of which are sort of 'manufactured' while on the other hand we have implied volatility which is in a sense 'consensual'. Implied volatility can be thought of as consensus volatility arrived amongst all the market participants with respect to the expected amount of underlying price fluctuation over the remaining life of an option. Implied volatility is reflected in the price of the premium.

For this reason amongst the three different types of volatility, the IV is usually more valued.

You may have heard or noticed India VIX on NSE website, India VIX is the official 'Implied Volatility' index that one can track. India VIX is computed based on a mathematical formula, here is a **whitepaper** which explains how India VIX is calculated –

If you find the computation a bit overwhelming, then here is a quick wrap on what you need to know about India VIX (*I have reproduced some of these points from the NSE's whitepaper*) –

1. NSE computes India VIX based on the order book of Nifty Options
2. The best bid-ask rates for near month and next-month Nifty options contracts are used for computation of India VIX
3. India VIX indicates the investor's perception of the market's volatility in the near term (next 30 calendar days)
4. Higher the India VIX values, higher the expected volatility and vice-versa
5. When the markets are highly volatile, market tends to move steeply and during such time the volatility index tends to rise
6. Volatility index declines when the markets become less volatile. Volatility indices such as India VIX are sometimes also referred to as the 'Fear Index', because as the volatility index rises, one should become careful, as the markets can move steeply into any direction. Investors use volatility indices to gauge the market volatility and make their investment decisions
7. Volatility Index is different from a market index like NIFTY. NIFTY measures the direction of the market and is computed using the price movement of the underlying stocks whereas India VIX measures the expected volatility and is

computed using the order book of the underlying NIFTY options. While Nifty is a number, India VIX is denoted as an annualized percentage

Further, NSE publishes the implied volatility for various strike prices for all the options that get traded. You can track these implied volatilities by checking the option chain. For example here is the option chain of Cipla, with all the IV's marked out.

Option Chain (Equity Derivatives)

Underlying Stock: **CIPLA 667.75** As on Aug 28, 2015 11:41:39 IST

View Options Contracts for: Select Index OR Search for an underlying stock: GO Filter by: Expiry Date 24SEP2015 Futures contracts

CALLS												PUTS										
Chart	OI	Chng in OI	Volume	IV	LTP	Net Chng	Bid Qty	Bid Price	Ask Price	Ask Qty	Strike Price	Bid Qty	Bid Price	Ask Price	Ask Qty	Net Chng	LTP	IV	Volume	Chng in OI	OI	Chart
	-	-	-	-	-	-	-	-	-	-	420.00	-	-	1.00	500	-	-	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	440.00	-	-	1.00	500	-	-	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	460.00	-	-	1.00	500	-	-	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	480.00	-	-	1.00	500	-	-	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	500.00	-	-	1.00	500	-	-	-	-	-	-	
	-	-	-	-	-	-	3,500	144.65	152.05	3,500	520.00	-	-	6.95	500	-	-	-	-	-	1,000	
	-	-	-	-	-	-	3,500	126.25	132.90	3,500	540.00	10,000	0.35	2.65	10,500	-	-	-	-	-	5,000	
	-	-	-	-	-	-	3,500	107.65	113.40	3,500	560.00	10,500	0.40	2.95	10,500	-	-	-	-	-	-	
	-	-	-	-	-	-	5,500	88.65	96.10	5,500	580.00	3,000	2.80	3.75	17,000	-3.35	2.50	39.40	9	-	13,500	
	2,500	-	1	52.80	83.35	13.65	3,500	64.85	76.40	500	600.00	4,500	4.75	5.05	6,000	-1.50	4.95	39.53	86	20,000	56,500	
	11,000	-	1	44.29	64.00	8.00	3,000	50.05	59.60	3,500	620.00	2,000	8.20	8.65	7,000	-1.85	8.50	38.89	123	-4,500	49,000	
	61,000	-	4	31.71	42.50	1.00	2,500	43.10	45.15	10,000	640.00	500	13.55	13.75	500	-2.70	13.25	38.26	140	16,500	47,000	
	73,500	-1,500	124	34.08	31.45	1.90	1,000	31.30	31.85	500	660.00	500	21.00	21.45	3,500	-3.40	20.75	37.23	114	18,500	60,500	
	149,000	81,500	377	35.18	21.80	0.80	500	21.45	21.95	1,000	680.00	1,000	30.70	31.30	1,000	-4.00	31.00	37.61	32	2,500	25,000	
	275,000	36,500	478	34.78	14.50	0.25	500	14.20	14.65	3,500	700.00	7,500	41.40	46.45	13,000	-3.85	43.65	38.24	3	-	40,000	
	93,000	16,000	109	35.34	9.45	0.20	3,000	9.00	9.35	1,000	720.00	7,000	55.25	60.10	6,500	-	-	-	-	-	16,000	
	141,500	34,000	132	35.67	5.90	-0.40	1,000	5.70	6.10	10,000	740.00	1,000	59.50	83.30	1,000	-	-	-	-	-	6,000	
	73,500	2,000	19	36.07	3.60	-0.70	3,000	3.40	3.65	5,000	760.00	500	88.35	93.70	500	-	-	-	-	-	90,500	
	13,500	-	2	36.08	2.05	-1.70	4,500	2.05	3.45	12,000	780.00	3,500	106.95	113.40	3,000	-	-	-	-	-	-	
	22,000	3,000	9	39.37	1.75	-0.45	500	1.55	2.65	10,000	800.00	1,000	109.25	134.05	2,000	-	-	-	-	-	1,000	
	5,500	-	-	-	-	-	500	1.35	2.15	10,000	820.00	2,000	144.75	152.20	2,000	-	-	-	-	-	-	
	4,000	-	2	47.26	1.65	-	500	0.60	2.30	10,000	840.00	-	-	-	-	-	-	-	-	-	-	
Total	925,000																				411,000	Total

The Implied Volatilities can be calculated using a standard options calculator. We will discuss more about calculating IV, and using IV for setting up trades in the subsequent chapters. For now we will now move over to understand Vega.

Realized Volatility is pretty much similar to the eventual outcome of the movie, which we would get to know only after the movie is released. Likewise the realized volatility is looking back in time and figuring out the actual volatility that occurred during the expiry series. Realized volatility matters especially if you want to compare today's implied volatility with respect to the historical implied volatility. We will explore this angle in detail when we take up "Option Trading Strategies".

19.2 – Vega

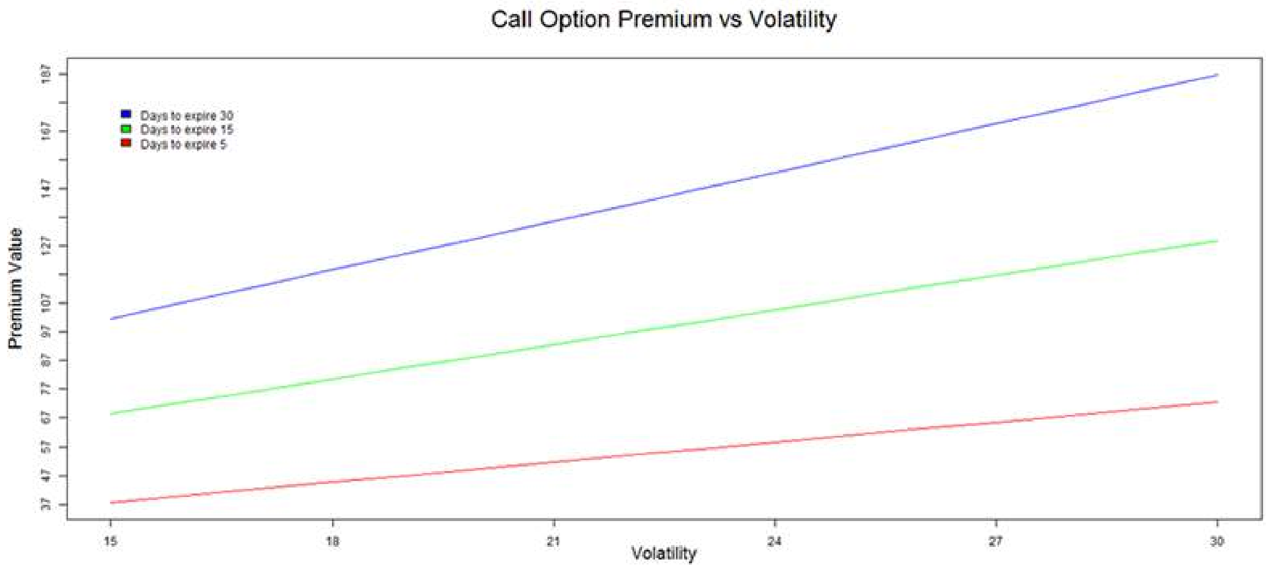
Have you noticed this – whenever there are heavy winds and thunderstorms, the electrical voltage in your house starts fluctuating violently, and with the increase in voltage fluctuations, there is a chance of a voltage surge and therefore the electronic equipments at house may get damaged.

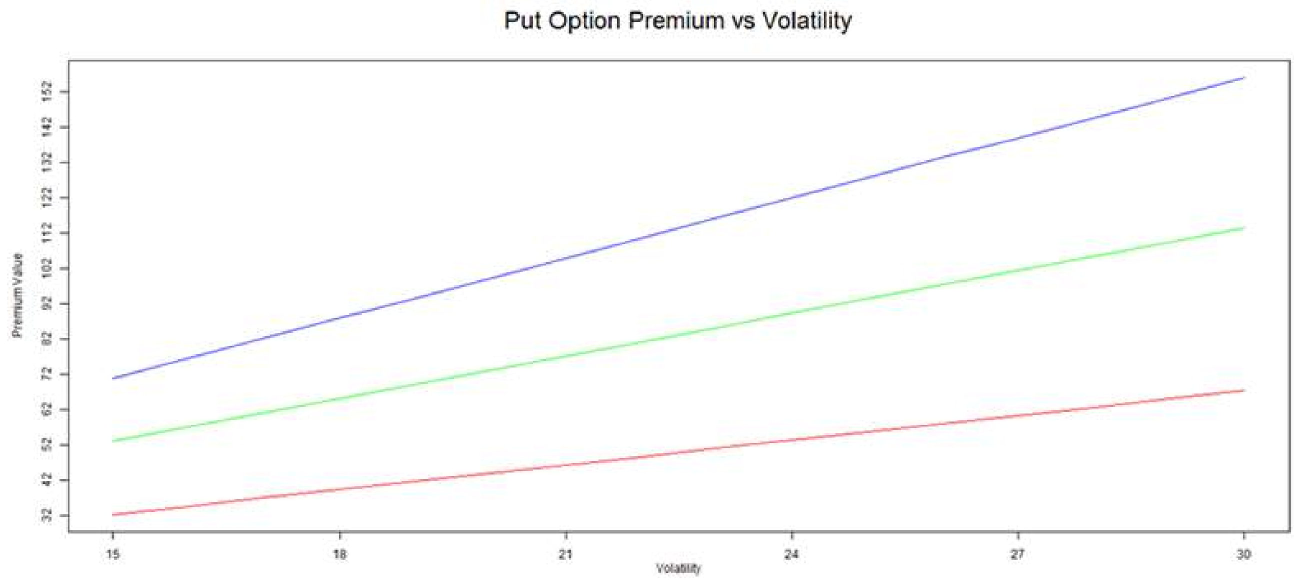
Similarly, when volatility increases, the stock/index price starts swinging heavily. To put this in perspective, imagine a stock is trading at Rs.100, with increase in volatility, the stock can start moving anywhere between 90 and 110. So when the stock hits 90, all PUT option writers start sweating as the Put options now stand a good chance of expiring in the money. Similarly, when the stock hits 110, all CALL option writers would start panicking as all the Call options now stand a good chance of expiring in the money.

Therefore irrespective of Calls or Puts when volatility increases, the option premiums have a higher chance to expire in the money. Now, think about this – imagine you want to write 500 CE options when the spot is trading at 475 and 10 days to expire. Clearly there is no intrinsic value but there is some time value. Hence assume the option is trading at Rs.20. Would you mind writing the option? You may write the options and pocket the premium of Rs.20/- I suppose. However, what if the volatility over the 10 day period is likely to increase – maybe election results or corporate results are scheduled at the same time. Will you still go ahead and write the option for Rs.20? Maybe not, as you know with the increase in volatility, the option can easily expire 'in the money' hence you may lose all the premium money you have collected. If all option writers start fearing the volatility, then what would compel them to write options? Clearly, a higher premium amount would. Therefore instead of Rs.20, if the premium was 30 or 40, you may just think about writing the option I suppose.

In fact this is exactly what goes on when volatility increases (or is expected to increase) – option writers start fearing that they could be caught writing options that can potentially transition to 'in the money'. But nonetheless, fear too can be overcome for a price, hence option writers expect higher premiums for writing options, and therefore the premiums of call and put options go up when volatility is expected to increase.

The graphs below emphasize the same point –





X axis represents Volatility (in %) and Y axis represents the premium value in Rupees. Clearly, as we can see, when the volatility increases, the premiums also increase. This holds true for both call and put options. The graphs here go a bit further, it shows you the behavior of option premium with respect to change in volatility and the number of days to expiry.

Have a look at the first chart (CE), the blue line represents the change in premium with respect to change in volatility when there is 30 days left for expiry, likewise the green and red line represents the change in premium with respect to change in volatility when there is 15 days left and 5 days left for expiry respectively.

Keeping this in perspective, here are a few observations (observations are common for both Call and Put options) –

1. Referring to the Blue line – when there are 30 days left for expiry (start of the series) and the volatility increases from 15% to 30%, the premium increases from 97 to 190, representing about 95.5% change in premium
2. Referring to the Green line – when there are 15 days left for expiry (mid series) and the volatility increases from 15% to 30%, the premium increases from 67 to 100, representing about 50% change in premium
3. Referring to the Red line – when there are 5 days left for expiry (towards the end of series) and the volatility increases from 15% to 30%, the premium increases from 38 to 56, representing about 47% change in premium

Keeping the above observations in perspective, we can make few deductions –

1. The graphs above considers a 100% increase of volatility from 15% to 30% and its effect on the premiums. The idea is to capture and understand the behavior of increase in volatility with respect to premium and time. Please be aware that observations hold true even if the volatility moves by smaller amounts like maybe 20% or 30%, its just that the respective move in the premium will be proportional
2. The effect of Increase in volatility is maximum when there are more days to expiry – this means if you are at the start of series, and the volatility is high then you know premiums are plum. Maybe a good idea to write these options and collect the premiums – invariably when volatility cools off, the premiums also cool off and you could pocket the differential in premium
3. When there are few days to expiry and the volatility shoots up the premiums also goes up, but not as much as it would when there are more days left for expiry. So if you are a wondering why your long options are not working favorably in a highly volatile environment, make sure you look at the time to expiry

So at this point one thing is clear – with increase in volatility, the premiums increase, but the question is 'by how much?'. This is exactly what the Vega tells us.

The Vega of an option measures the rate of change of option's value (premium) with every percentage change in volatility. Since options gain value with increase in volatility, the vega is a positive number, for both calls and puts. For example – if the option has a vega of 0.15, then for each % change in volatility, the option will gain or lose 0.15 in its theoretical value.

19.3 – Taking things forward

It is now perhaps time to revisit the path this module on Option Trading has taken and will take going forward (over the next few chapters).

We started with the basic understanding of the options structure and then proceeded to understand the Call and Put options from both the buyer and sellers perspective. We then moved forward to understand the moneyness of options and few basic technicalities with respect to options.

We further understood option Greeks such as the Delta, Gamma, Theta, and Vega along with a mini series of Normal Distribution and Volatility.

At this stage, our understanding on Greeks is one dimensional. For example we know that as and when the market moves the option premiums move owing to delta. But in reality, there are several factors that works simultaneously – on one hand we can have the markets moving heavily, at the same time volatility could be going crazy, liquidity of the options getting sucked in and out, and all of this while the clock keeps ticking. In fact this is exactly what happens on an everyday basis in markets. This can be a bit overwhelming for newbie traders. It can be so overwhelming that they quickly rebrand the markets as 'Casino'. So the next time you hear someone say such a thing about the markets, make sure you point them

to Varsity .

Anyway, the point that I wanted to make is that all these Greeks manifest itself on the premiums and therefore the premiums vary on a second by second basis. So it becomes extremely important for the trader to fully understand these 'inter Greek' interactions of sorts. This is exactly what we will do in the next chapter. We will also have a basic understanding of the Black & Scholes options pricing formula and how to use the same.

19.4 – Flavors of Inter Greek Interactions

(The following article was featured in **Business Line** dated 31st August 2015)

Here is something that happened very recently. By now everyone remotely connected with the stock market would know that on 24th August 2015, the Indian markets declined close to 5.92% making it one of the worse single day declines in the history of Indian stock markets. None of the front line stocks survived the onslaught and they all declined by 8-10%. Panic days such as these are a common occurrence in the equity markets.

However something unusual happened in the options markets on 24th August 2015, here are some data points from that day –

Nifty declined by 4.92% or about 490 points –

India VIX shot up by 64% –

But Call option Premiums shot up!

CALLS												PUTS										
Chart	OI	Chng in OI	Volume	IV	LTP	Net Chng	Bid Qty	Bid Price	Ask Price	Ask Qty	Strike Price	Bid Qty	Bid Price	Ask Price	Ask Qty	Net Chng	LTP	IV	Volume	Chng in OI	OI	Chart
	649,550	589,000	78,489	41.16	124.00	-384.05	25	120.00	122.80	225	7800.00	29,750	125.00	131.75	100	122.75	125.00	46.99	1,358,733	429,375	2,705,650	
	54,525	54,525	4,695	38.65	93.00	-626.70	100	87.00	97.45	25	7850.00	25	141.00	156.00	50	130.15	131.65	40.11	34,541	55,575	65,800	
	1,731,975	1,699,700	400,842	37.01	68.20	-340.35	500	68.15	70.95	25	7900.00	25	169.50	171.90	500	165.00	168.35	42.77	1,419,535	-843,325	2,450,450	
	230,100	230,100	33,125	36.39	50.00	-595.70	450	48.00	54.00	25	7950.00	200	196.55	210.00	50	191.60	196.00	40.95	68,931	-45,700	97,450	
	2,979,675	2,380,600	1,307,486	35.64	35.10	-279.40	175	35.90	36.00	25	8000.00	975	232.70	237.70	500	226.30	232.70	41.41	1,229,357	-1,993,950	2,519,975	
	227,375	227,325	103,476	35.64	25.00	-206.35	500	25.10	27.40	100	8050.00	400	272.15	277.40	50	264.40	272.95	42.37	33,911	-37,250	128,750	
	2,575,900	2,349,500	1,580,769	36.66	19.00	-194.85	50	17.50	19.00	1,250	8100.00	1,950	314.00	319.00	500	301.70	314.05	42.77	548,461	-1,510,975	1,509,500	
	281,575	279,575	130,309	37.35	14.00	-151.85	4,750	14.00	17.95	75	8150.00	50	360.00	375.60	175	357.80	375.50	53.37	37,710	-275,275	314,675	
	2,082,550	1,290,650	1,312,397	38.60	10.90	-120.15	8,175	10.00	10.90	125	8200.00	50	406.00	414.75	250	386.25	414.25	51.82	409,501	-2,586,900	2,838,225	
	358,250	-140,100	132,788	40.23	8.90	-84.05	100	7.55	8.90	600	8250.00	750	451.40	476.20	100	423.05	463.50	55.63	45,496	-458,850	379,325	
	3,013,450	572,175	1,018,877	41.18	6.80	-59.75	1,050	6.80	6.95	600	8300.00	1,000	505.00	510.85	25	446.60	506.90	55.36	259,504	-1,795,350	3,000,750	
	691,975	-263,075	131,965	43.65	6.25	-36.55	425	6.25	6.85	975	8350.00	400	538.00	679.10	2,000	451.75	545.75	49.86	18,306	-65,100	215,425	
	4,566,500	409,500	769,050	45.63	5.50	-23.00	625	5.20	5.50	1,575	8400.00	25	598.15	601.00	150	478.85	598.15	55.68	103,542	-563,175	1,320,825	
	447,450	-321,625	67,768	47.18	4.65	-12.65	250	4.55	5.00	1,500	8450.00	25	637.65	660.00	25	489.40	650.00	60.91	3,056	-24,150	69,825	
	4,400,150	-1,167,125	538,360	48.37	3.80	-7.25	3,075	3.80	3.90	900	8500.00	25	692.00	702.30	1,250	501.30	702.25	66.45	48,626	-371,025	1,140,300	
	493,825	-207,200	37,824	51.91	4.15	-2.35	125	3.85	4.15	400	8550.00	25	740.00	758.35	25	509.75	760.00	76.49	3,980	-50,425	99,800	
	4,457,925	-1,129,725	180,365	52.69	3.30	-0.85	9,125	3.25	3.30	2,350	8600.00	75	792.55	800.00	50	506.45	796.60	67.47	14,005	-149,725	629,275	
	510,450	-88,250	9,539	55.09	3.20	0.25	500	3.15	3.50	6,900	8650.00	100	814.00	985.95	25	512.00	850.00	74.43	63	-1,000	13,225	
	3,222,450	-843,875	85,100	56.56	2.80	0.55	725	2.80	3.00	8,175	8700.00	25	893.65	913.25	500	511.30	901.45	79.20	3,538	-41,800	182,450	
	285,500	-47,025	8,403	59.71	3.00	0.90	4,000	2.75	3.50	5,000	8750.00	25	881.00	1,086.95	2,000	445.20	870.70	-	21	-300	1,350	
	3,873,075	-524,150	80,703	60.28	2.40	0.90	550	2.10	2.50	600	8800.00	25	991.65	1,003.85	25	508.85	1,000.00	84.07	2,689	-32,125	208,425	
	322,525	-13,800	5,361	64.10	2.80	0.95	1,500	2.35	2.95	1,000	8850.00	1,000	631.50	-	-	-	598.50	-	-	-	1,550	
	2,055,700	-245,275	92,181	66.22	2.70	1.30	1,300	2.50	2.70	3,575	8900.00	500	681.50	1,100.00	25	498.85	1,095.00	83.85	444	-6,375	107,675	
	49,050	-725	278	67.72	2.45	0.95	1,000	2.05	2.45	150	8950.00	1,000	731.00	-	-	-	419.00	-	-	-	225	
	2,827,775	-334,950	45,123	69.89	2.40	1.15	475	2.05	2.35	75	9000.00	25	1,189.40	1,194.00	25	505.65	1,193.90	87.97	2,463	-11,100	506,825	
	2,125	-75	605	72.63	2.50	2.00	1,050	0.55	2.00	50	9050.00	1,000	827.25	-	-	-	-	-	-	-	-	
	506,125	-30,350	4,898	73.25	2.10	1.15	4,000	2.00	2.20	500	9100.00	25	1,075.00	1,444.85	2,000	497.95	1,287.20	79.10	92	-600	88,750	
	2,500	-	2	75.05	2.00	1.40	1,850	1.00	2.00	1,475	9150.00	1,000	923.15	-	-	-	-	-	-	-	-	
	462,650	-39,400	3,531	75.16	1.60	0.60	4,400	1.60	1.80	1,150	9200.00	1,000	1,250.50	-	-	377.30	1,276.40	-	153	-2,775	45,650	
	-	-	601	68.04	0.50	-86.10	1,000	0.40	-	-	9250.00	1,000	1,023.10	-	-	-	-	-	-	-	-	
	297,000	-7,850	898	72.43	0.70	0.05	900	0.60	1.95	800	9300.00	1,000	1,073.20	1,652.65	2,000	465.85	1,457.85	-	34	-275	56,600	

Traders familiar with options would know that the call option premiums decline when market declines. In fact most of the call option premiums (strikes below 8600) did decline in value but option strikes above 8650 behaved differently – their premium as opposed to the general expectation did not decline, rather increased by 50-80%. This move has perplexed many traders, with many of the traders attributing this move to random theories such as rate rigging, market manipulation, technological inefficiency, liquidity issues etc. But I suspect any of this is true; in fact this can be explained based on the option theory logic.

We know that option premiums are influenced by sensitivity factors aka the Option Greeks. Delta as we know captures the sensitivity of options premium with respect to the movement of the underlying. Here is a quick recap – if the Delta of a particular call option is 0.75, then for every 1 point increase/decrease in the underlying the premium is expected to increase/decrease by 0.75 points. On 24th August, Nifty declined by 490 points, so all call options which had 'noticeable Delta' (like 0.2, 0.3, 0.6 etc) declined. Typically 'in the money' options (as on 24th Aug, all strike below 8600) tend to have noticeable Delta, therefore all their premiums declined with the decline in the underlying.

'Out of the money' options usually have a very low delta like 0.1 or lower. This means, irrespective of the move in the underlying the moment in the option premium will be very restrictive. As on August 24th, all options above 8600 were 'out of the money' options with low delta values. Hence irrespective of the massive fall in the market, these call options did not lose much premium value.

The above explains why certain call options did not lose value, but why did the premiums go up? The answer to this is lies in Vega – the option Greek which captures the sensitivity of market volatility on options premiums.

With increase in volatility, the Vega of an option increases (irrespective of calls and puts), and with increase in Vega, the option premium tends to increase. On 24th August the volatility of Indian markets shot up by 64%. This increase in volatility was totally unexpected by the market participants. With the increase in volatility, the Vega of all options increases, thereby their respective premiums also increased. The effect of Vega is particularly high for 'Out of the money' options. So on one hand the low delta value of 'out of the money' call options prevented the option premiums from declining while on the other hand, high Vega value increased the option premium for these out of the money options.

Hence on 24th August 2015 we got to witness the unusual – call option premium increasing 50 – 80% on a day when markets crashed 5.92%.

Key takeaways from this chapter

1. Historical Volatility is measured by the closing prices of the stock/index
2. Forecasted Volatility is forecasted by volatility forecasting models
3. Implied Volatility represents the market participants expectation of volatility
4. India VIX represents the implied volatility over the next 30 days period
5. Vega measures the rate of change of premium with respect to change in volatility
6. All options increase in premium when volatility increases
7. The effect of volatility is highest when there are more days left for expiry

Greek Interactions

20.1 – Volatility Smile

We had briefly looked at inter Greek interactions in the previous chapter and how they manifest themselves on the options premium. This is an area we need to explore in more detail, as it will help us select the right strikes to trade. However before we do that we will touch upon two topics related to volatility called 'Volatility Smile' and 'Volatility Cone'.

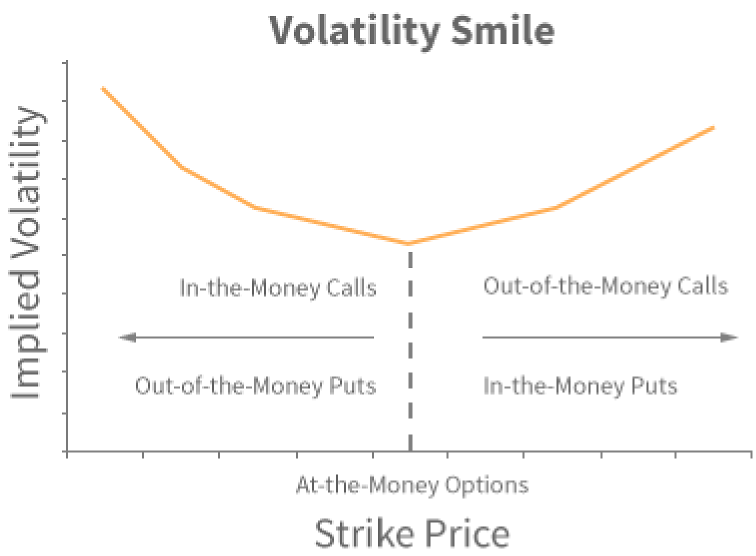
Volatility Smile is an interesting concept, something that I consider 'good to know' kind of concept. For this reason I will just touch upon this and not really dig deeper into it.

Theoretically speaking, all options of the same underlying, expiring on the same expiry day should display similar 'Implied Volatilities' (IV). However in reality this does not happen.

Have a look at this image –

	CALLS											PUTS										
Chart	OI	Chng in OI	Volume	IV	LTP	Net Chng	Bid Qty	Bid Price	Ask Price	Ask Qty	Strike Price	Bid Qty	Bid Price	Ask Price	Ask Qty	Net Chng	LTP	IV	Volume	Chng in OI	OI	Chart
	-	-	-	-	-	-	-	-	-	-	180.00	7,000	1.10	1.20	12,000	0.50	1.15	69.74	44	18,000	31,000	
	-	-	-	-	-	-	-	-	-	-	185.00	5,000	1.45	1.55	8,000	0.70	1.50	67.69	5	4,000	7,000	
	-	-	-	-	-	-	1,000	34.05	41.00	1,000	190.00	11,000	1.90	1.95	5,000	0.90	2.00	66.22	148	-5,000	225,000	
	2,000	-	-	-	-	-	1,000	27.55	44.85	1,000	195.00	27,000	2.40	4.45	120,000	0.60	2.45	63.18	24	-	13,000	
	9,000	7,000	8	53.81	29.00	-8.00	1,000	27.65	29.50	3,000	200.00	4,000	3.25	3.35	21,000	1.25	3.30	62.72	852	188,000	620,000	
	5,000	-	-	-	-	-	1,000	21.00	29.05	2,000	205.00	19,000	4.20	4.30	15,000	1.60	4.30	61.44	301	-3,000	99,000	
	32,000	12,000	19	54.78	21.50	-6.90	15,000	20.35	22.85	16,000	210.00	6,000	5.45	5.55	16,000	1.95	5.50	60.02	936	147,000	774,000	
	1,000	-	-	-	-	-	15,000	15.15	21.00	15,000	215.00	4,000	7.00	7.10	19,000	2.55	7.10	59.14	804	31,000	215,000	
	73,000	43,000	87	51.57	15.10	-4.40	11,000	14.40	15.15	4,000	220.00	17,000	8.75	8.90	12,000	2.90	8.75	58.30	2,224	201,000	1,522,000	
	99,000	93,000	142	51.53	11.90	-3.65	12,000	11.75	12.20	8,000	225.00	3,000	10.90	11.05	7,000	3.60	11.00	56.93	563	48,000	399,000	
	962,000	448,000	2,078	51.18	9.70	-3.05	10,000	9.55	9.70	10,000	230.00	2,000	13.45	13.65	9,000	4.00	13.50	57.15	1,130	-101,000	996,000	
	347,000	-103,000	820	51.78	7.65	-2.60	19,000	7.55	7.70	5,000	235.00	1,000	16.40	16.70	5,000	4.70	16.65	54.86	187	-29,000	267,000	
	2,088,000	279,000	2,491	52.04	6.00	-2.20	17,000	5.95	6.05	13,000	240.00	3,000	19.70	20.05	11,000	5.15	19.80	57.19	415	-162,000	822,000	
	621,000	49,000	618	51.80	4.65	-1.85	3,000	4.60	4.75	15,000	245.00	17,000	22.15	23.60	10,000	5.75	23.55	57.48	94	-23,000	421,000	
	3,101,000	-97,000	2,277	52.36	3.60	-1.60	4,000	3.55	3.60	10,000	250.00	2,000	27.10	27.80	8,000	5.30	27.25	56.98	151	-37,000	880,000	
	695,000	10,000	410	52.53	2.75	-1.30	13,000	2.70	2.80	20,000	255.00	1,000	31.15	32.20	9,000	8.80	33.35	69.77	13	-9,000	96,000	
	3,207,000	-136,000	1,647	53.25	2.10	-1.00	24,000	2.05	2.10	2,000	260.00	1,000	35.45	36.00	1,000	8.50	36.00	57.27	17	-7,000	311,000	
	518,000	-22,000	224	53.67	1.60	-0.80	1,000	1.60	1.65	15,000	265.00	3,000	38.00	41.60	7,000	12.95	44.00	85.69	1	-	17,000	
	2,299,000	-70,000	1,031	53.94	1.20	-0.65	28,000	1.20	1.25	72,000	270.00	2,000	44.50	45.20	4,000	6.55	45.65	68.76	8	-3,000	505,000	
	602,000	-6,000	121	55.61	1.00	-0.45	1,000	0.95	1.00	8,000	275.00	2,000	48.40	50.75	6,000	9.60	49.60	64.45	2	-2,000	26,000	
	2,633,000	-101,000	995	55.88	0.75	-0.40	79,000	0.70	0.75	1,000	280.00	1,000	52.65	54.70	3,000	7.15	55.15	74.12	4	-1,000	286,000	
	388,000	32,000	103	56.90	0.60	-0.35	10,000	0.55	0.60	5,000	285.00	-	-	-	-	-	-	-	-	-	31,000	
	1,005,000	-125,000	301	58.29	0.50	-0.25	86,000	0.45	0.55	111,000	290.00	4,000	62.60	64.95	5,000	6.15	64.00	70.67	2	-1,000	110,000	
	128,000	11,000	36	59.18	0.40	-0.20	14,000	0.35	0.45	27,000	295.00	4,000	67.15	70.15	4,000	-	-	-	-	-	-	
	2,387,000	-5,000	300	62.23	0.40	-0.10	235,000	0.35	0.40	314,000	300.00	4,000	71.90	-	-	4.95	71.35	-	2	2,000	93,000	
	42,000	-9,000	15	60.59	0.25	-0.05	23,000	0.20	0.30	13,000	305.00	-	-	-	-	-	-	-	-	-	1,000	
	330,000	4,000	36	63.34	0.25	-0.10	71,000	0.20	0.25	10,000	310.00	-	-	-	-	-	-	-	-	-	24,000	
	29,000	-7,000	8	61.54	0.15	-0.10	10,000	0.15	0.20	38,000	315.00	3,000	85.95	90.55	3,000	-	-	-	-	-	-	
	218,000	4,000	28	66.54	0.20	-	7,000	0.15	0.20	69,000	320.00	-	-	-	-	-	-	-	-	-	10,000	

This is the option chain of SBI as of 4th September 2015. SBI is trading around 225, hence the 225 strike becomes 'At the money' option, and the same is highlighted with a blue band. The two green bands highlight the implied volatilities of all the other strikes. Notice this – as you go away from the ATM option (for both Calls and Puts) the implied volatilities increase, in fact further you move from ATM, the higher is the IV. You can notice this pattern across all the different stocks/indices. Further you will also observe that the implied volatility of the ATM option is the lowest. If you plot a graph of all the options strikes versus their respective implied volatility you will get to see a graph similar to the one below –



The graph appears like a pleasing smile; hence the name 'Volatility Smile'

20.2 – Volatility Cone

(*All the graphs in this chapter and in this section on Volatility Cone has been authored by Prakash Lekkala*)

So far we have not touched upon an option strategy called 'Bull Call Spread', but for the sake of this discussion I will make an assumption that you are familiar with this strategy.

For an options trader, implied volatility of the options greatly affects the profitability. Consider this – you are bullish on stock and want to initiate an option strategy such as a Bull Call Spread. If you initiate the trade when the implied volatility of options is high, then you will have to incur high upfront costs and lower profitability potential. However if you initiate the position when the option implied volatility is low, your trading position will incur lower costs and higher potential profit.

For instance as of today, Nifty is trading at 7789. Suppose the current implied volatility of option positions is 20%, then a 7800 CE and 8000 CE bull call spread would cost 72 with a potential profit of 128. However if the implied volatility is 35% instead of 20%, the same position would cost 82 with potential profit of 118. Notice with higher volatility a bull call spread not only costs higher but the profitability greatly reduces.

So the point is for option traders , it becomes extremely crucial to assess the level of volatility in order to time the trade accordingly. Another problem an option trader has to deal with is, the selection of the underlying and the strike (particularly true if your strategies are volatility based).

For example – Nifty ATM options currently have an IV of ~25%, whereas SBI ATM options have an IV of ~52%, given this should you choose to trade Nifty options because IV is low or should you go with SBI options?

This is where the Volatility cone comes handy – it addresses these sorts of questions for Option traders. Volatility Cone helps the trader to evaluate the costliness of an option i.e. identify options which are trading costly/cheap. The good news is, you can do it not only across different strikes of a security but also across different securities as well.

Let's figure out how to use the Volatility Cone.

Below is a Nifty chart for the last 15 months. The vertical lines mark the expiry dates of the derivative contracts, and the boxes prior to the vertical lines mark the price movement of Nifty 10 days prior to expiry.

If you calculate the Nifty's realized volatility in each of the boxes, you will get the following table –

Expiry Date	Annualized realized volatility
Jun-14	41%
Jul-14	38%
Aug-14	33%
Sep-14	28%

Oct-14	28%
Nov-14	41%
Dec-14	26%
Jan-15	22%
Feb-15	56%
Mar-15	19%
Apr-15	13%
May-15	34%
Jun-15	17%
Jul-15	41%
Aug-15	21%

From the above table we can observe that Nifty's realized volatility has ranged from a maximum of 56% (Feb 2015) to a minimum of 13% (April 2015).

We can also calculate mean and variance of the realized volatility, as shown below –

Particulars	Details
Maximum Volatility	56%

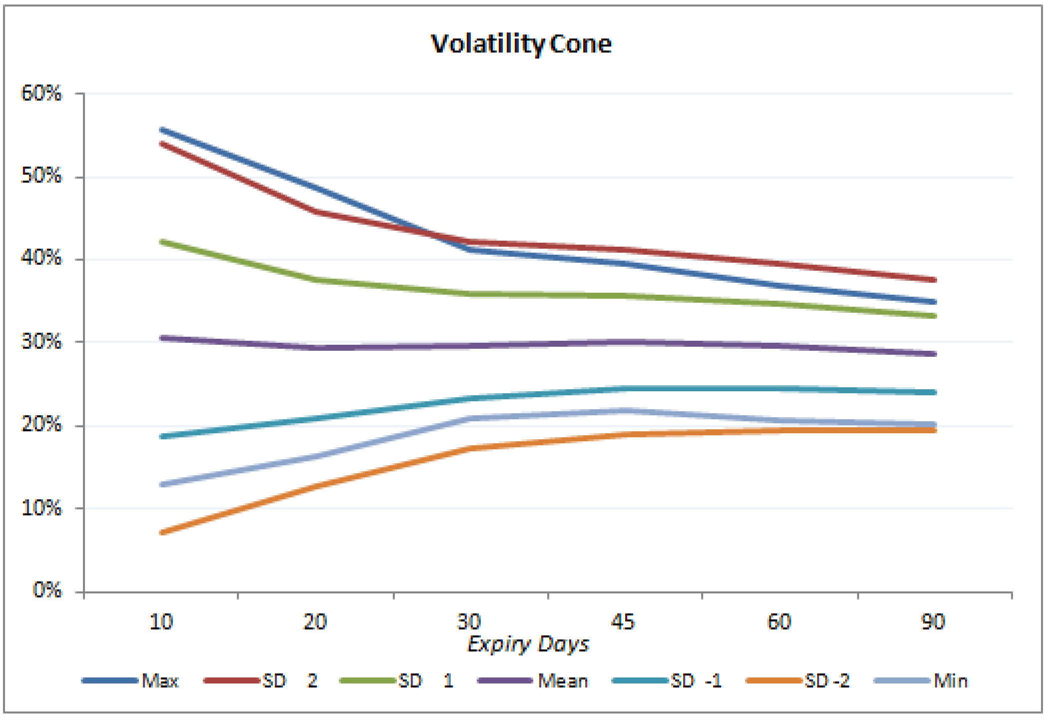
+2 Standard Deviation (SD)	54%
+1 Standard Deviation (SD)	42%
Mean/ Average Volatility	31%
-1 Standard Deviation (SD)	19%
-2 Standard Deviation (SD)	7%
Minimum Volatility	13%

If we repeat this exercise for 10, 20, 30, 45, 60 & 90 day windows, we would get a table as follows –

Days to Expiry	10	20	30	45	60	90
Max	56%	49%	41%	40%	37%	35%
+2 SD	54%	46%	42%	41%	40%	38%
+1 SD	42%	38%	36%	36%	35%	33%
Mean/Average	30%	29%	30%	30%	30%	29%
-1 SD	19%	21%	23%	24%	24%	24%
-2 SD	7%	13%	17%	19%	19%	19%

Min	13%	16%	21%	22%	21%	20%

The graphical representation of the table above would look like a cone as shown below, hence the name 'Volatility Cone' –

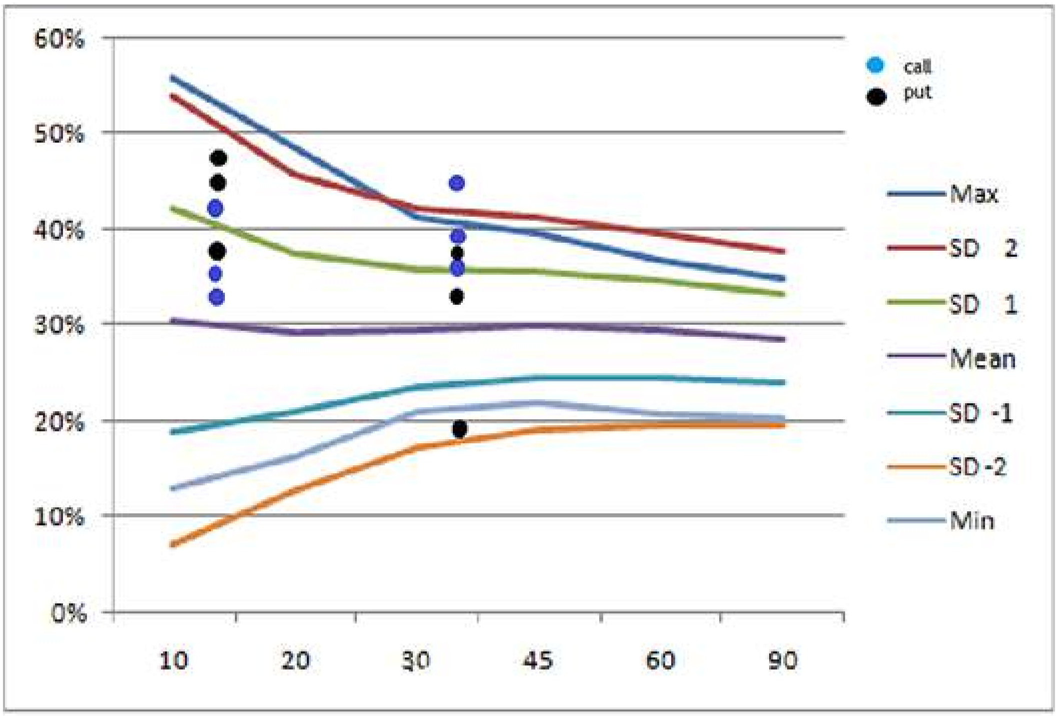


The way to read the graph would be to first identify the 'Number of days to Expiry' and then look at all the data points that are plotted right above it. For example if the number of days to expiry is 30, then observe the data points (representing realized volatility) right above it to figure out the 'Minimum, -2SD, -1 SD, Average implied volatility etc'. Also, do bear in mind; the 'Volatility Cone' is a graphical representation on the 'historical realized volatility'.

Now that we have built the volatility cone, we can plot the current day's implied volatility on it. The graph below shows the plot of Nifty's near month (September 2015) and next month (October 2015) implied volatility on the volatility cone.

Each dot represents the implied volatility for an option contract – blue are for call options and black for put options.

For example starting from left, look at the first set of dots – there are 3 blue and black dots. Each dot represents an implied volatility of an option contract – so the first blue dot from bottom could be the implied volatility of 7800 CE, above that it could be the implied volatility of 8000 CE and above that it could be the implied volatility of 8100 PE etc.



Do note the first set of dots (starting form left) represent near month options (September 2015) and are plotted at 12 on x-axis, i.e. these options will expire 12 days from today. The next set of dots is for middle month (October 2015) plotted at 43, i.e. these options will expire 43 days from today.

Interpretation

Look at the 2nd set of dots from left. We can notice a blue dot above the +2SD line (top most line, colored in maroon) for middle month option. Suppose this dot is for option 8200 CE, expiring 29-Oct-2015, then it means that today 8200 CE is experiencing an implied volatility, which is higher (by +2SD) than the volatility experienced in this stock whenever there are "43 days to expiry" over the last 15 months [remember we have considered data for 15 months]. Therefore this option has a high IV, hence the premiums would be high and one can consider designing a trade to short the 'volatility' with an expectation that the volatility will cool off.

Similarly a black dot near -2 SD line on the graph, is for a Put option. It suggests that, this particular put option has very low IV, hence low premium and therefore it could be trading cheap. One can consider designing a trade so as to buy this put option.

A trader can plot volatility cone for stocks and overlap it with the option's current IV. In a sense, the volatility cone helps us develop an insight about the state of current implied volatility with respect to the past realized volatility.

Those options which are close to + 2SD line are trading costly and options near -2 SD line are considered to be trading cheap. Trader can design trades to take advantage of 'mispriced' IV. In general, try to short options which are costlier and go long on options which are trading cheap.

Please note: Use the plot only for options which are liquid.

With this discussion on Volatility Smile and Volatility Cone, hopefully our understanding on Volatility has come to a solid ground.

20.3 – Gamma vs Time

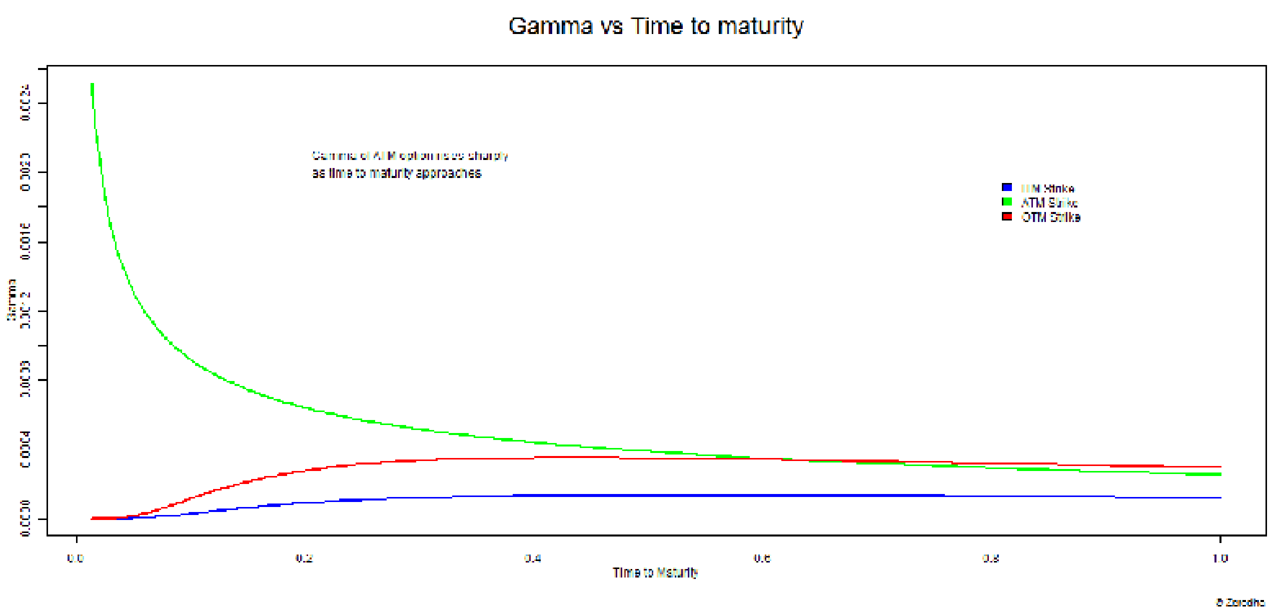
Over the next two sections let us focus our attention to inter greek interactions.

Let us now focus a bit on greek interactions, and to begin with we will look into the behavior of Gamma with respect to time. Here are a few points that will help refresh your memory on Gamma –

- Gamma measures the rate of change of delta
- Gamma is always a positive number for both Calls and Puts
- Large Gamma can translate to large gamma risk (directional risk)
- When you buy options (Calls or Puts) you are long Gamma
- When you short options (Calls or Puts) you are short Gamma
- Avoid shorting options which have a large gamma

The last point says – avoid shorting options which have a large gamma. Fair enough, however imagine this – you are at a stage where you plan to short an option which has a small gamma value. The idea being you short the low gamma option and hold the position till expiry so that you get to keep the entire option premium. The question however is, how do we ensure the gamma is likely to remain low throughout the life of the trade?

The answer to this lies in understanding the behavior of Gamma versus time to expiry/maturity. Have a look at the graph below –



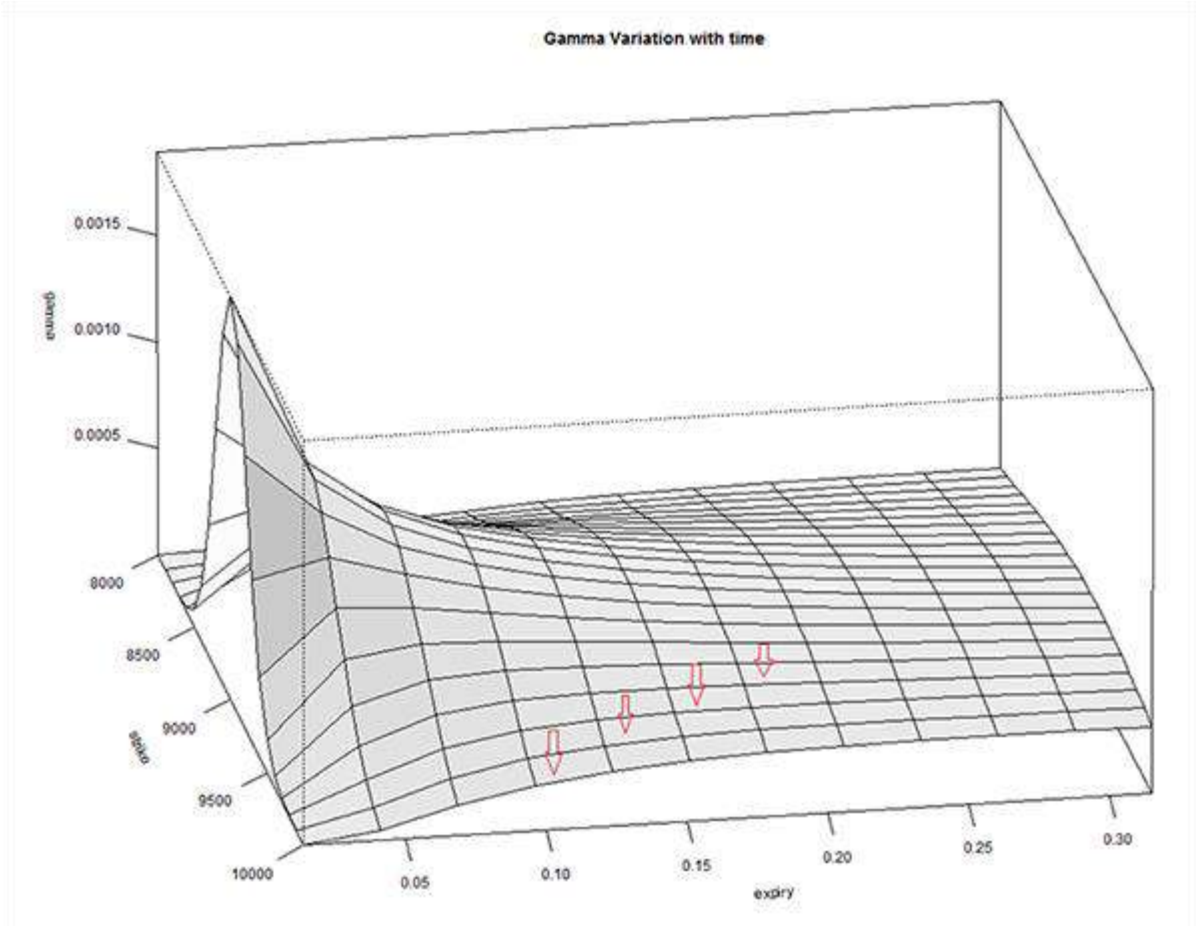
The graph above shows how the gamma of ITM, ATM, and OTM options behave as the 'time to expiry' starts to reduce. The Y axis represents gamma and the X axis represents time to expiry. However unlike other graphs, don't look at the X – axis from left to right, instead look at the X axis from right to left. At extreme right, the value reads 1, which suggests that there is ample time to expiry. The value at the left end reads 0, meaning there is no time to expiry. The time lapse between 1 and 0 can be thought of as any time period – 30 days to expiry, 60 days to expiry, or 365 days to expiry. Irrespective of the time to expiry, the behavior of gamma remains the same.

The graph above drives across these points –

- When there is ample time to expiry, all three options ITM, ATM, OTM have low Gamma values. ITM option's Gamma tends to be lower compared to ATM or OTM options
- The gamma values for all three strikes (ATM, OTM, ITM) remain fairly constant till they are half way through the expiry
- ITM and OTM options race towards zero gamma as we approach expiry
- The gamma value of ATM options shoot up drastically as we approach expiry

From these points it is quite clear that, you really do not want to be shorting "ATM" options, especially close to expiry as ATM Gamma tends to be very high.

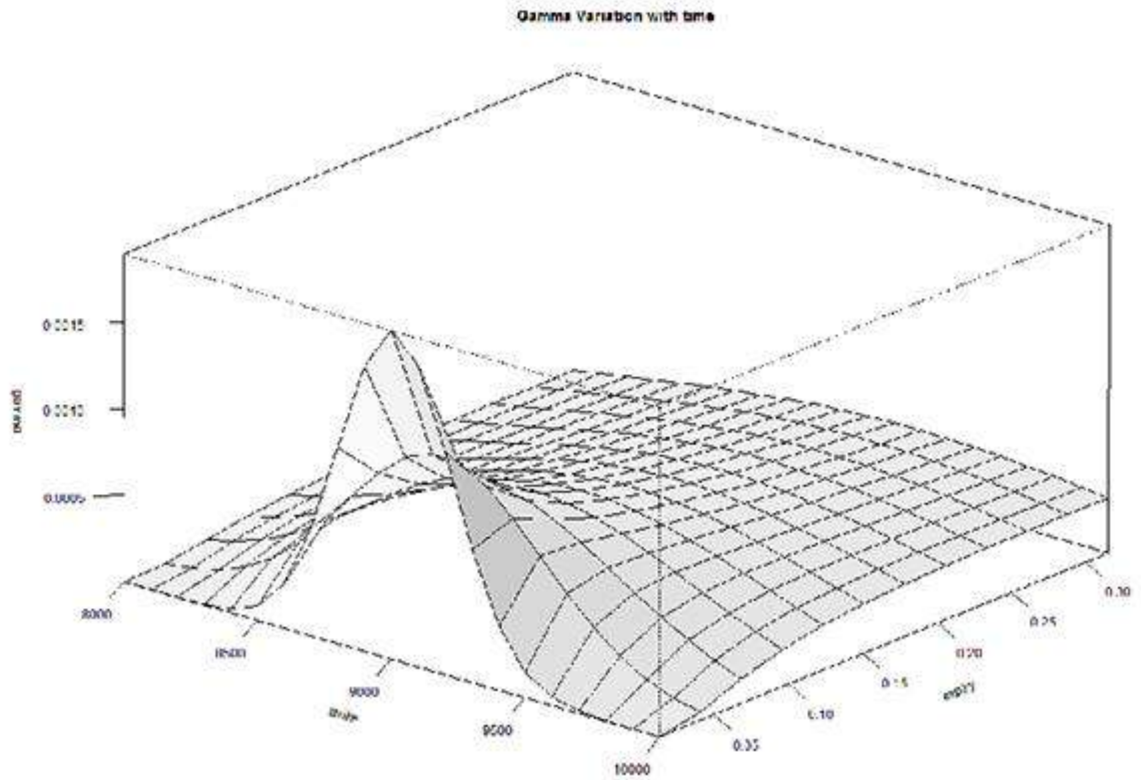
In fact if you realize we are simultaneously talking about 3 variables here – Gamma, Time to expiry, and Option strike. Hence visualizing the change in one variable with respect to change in another makes sense. Have a look at the image below –



The graph above is called a 'Surface Plot', this is quite useful to observe the behavior of 3 or more variables. The X-axis contains 'Time to Expiry' and the 'Y axis' contains the gamma value. There is another axis which contains 'Strike'.

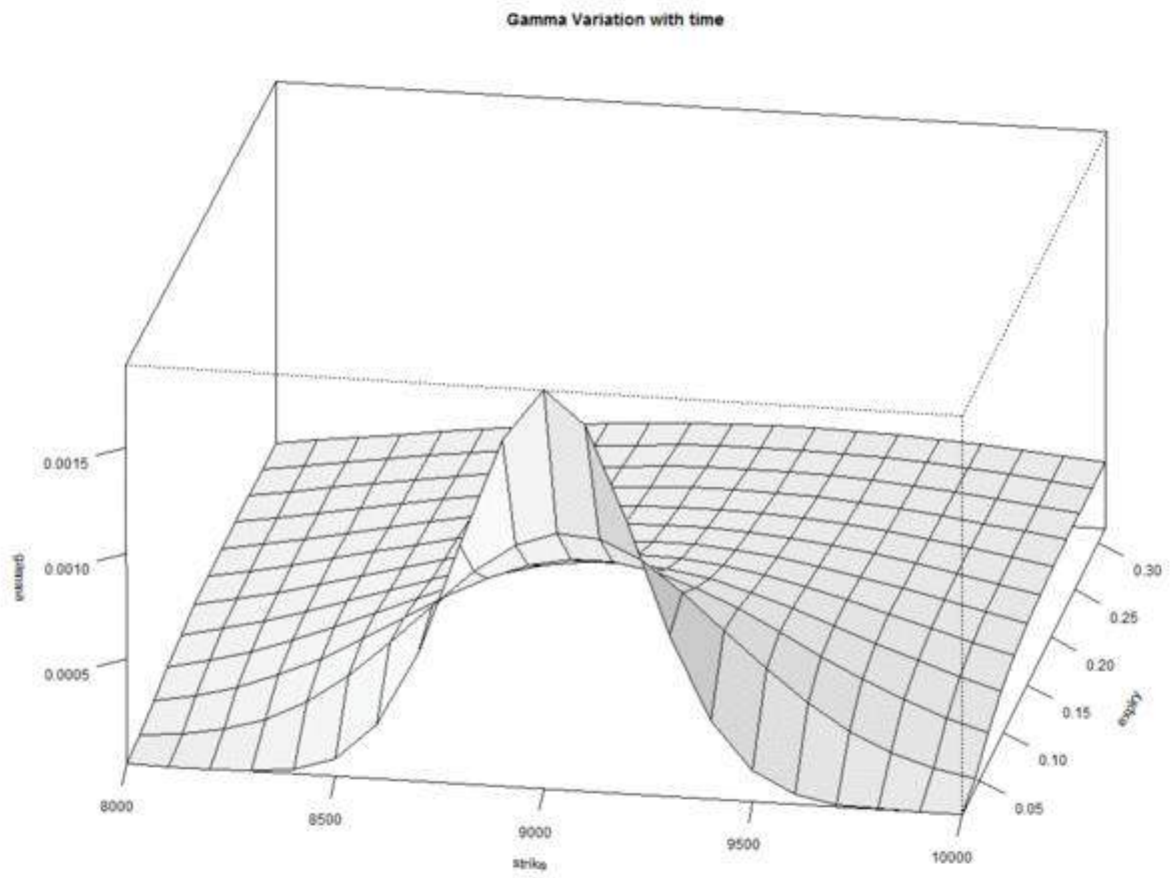
There are a few red arrows plotted on the surface plot. These arrows are placed to indicate that each line that the arrow is pointing to, refers to different strikes. The outermost line (on either side) indicates OTM and ITM strikes, and the line at the center corresponds to ATM option. From these lines it is very clear that as we approach expiry, the gamma values of all strikes except ATM tends to move towards zero. The ATM and few strikes around ATM have non zero gamma values. In fact Gamma is highest for the line at the center – which represents ATM option.

We can look at it from the perspective of the strike price –



This is the same graph but shown from a different angle, keeping the strike in perspective. As we can see, the gamma of ATM options shoot up while the Gamma of other option strikes don't.

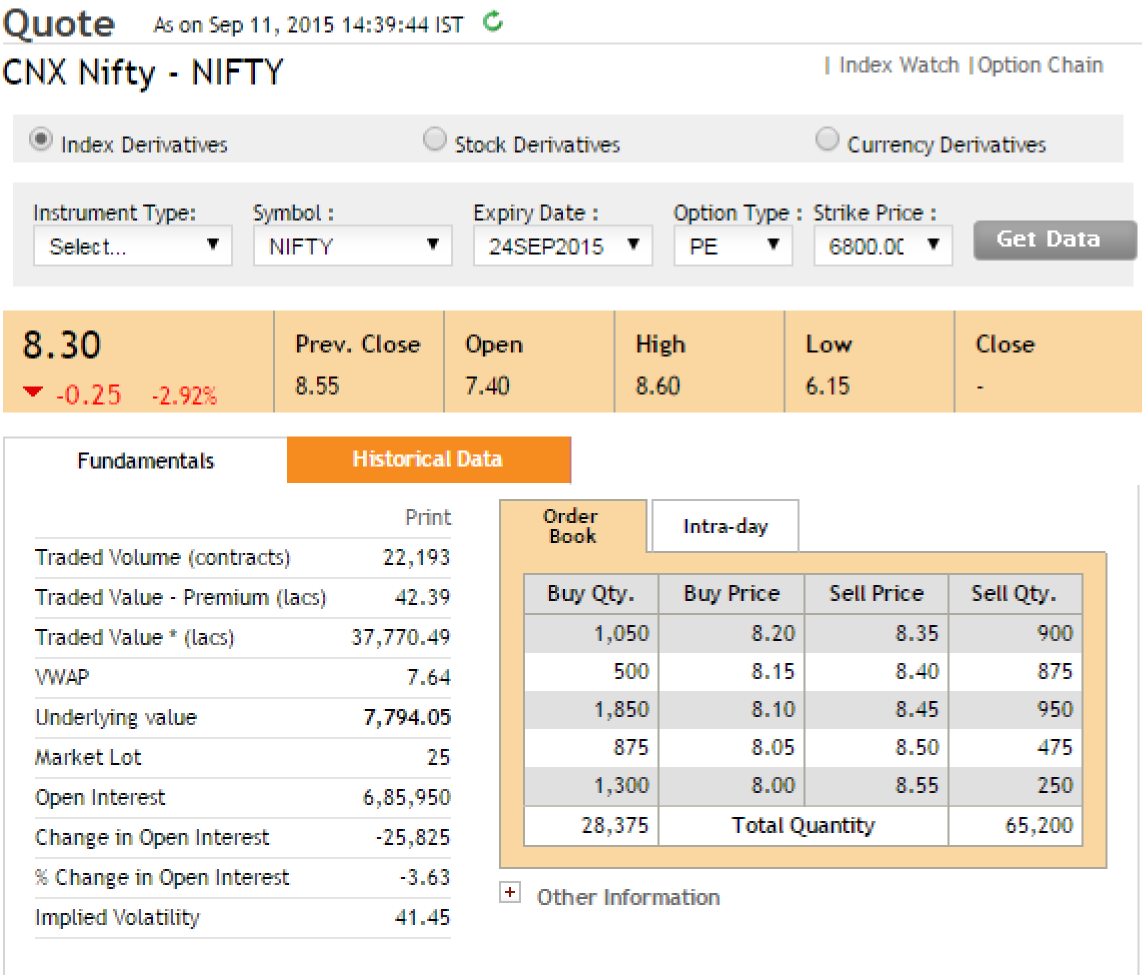
In fact here is a 3D rendering of Gamma versus Strike versus Time to Expiry. The graph below is a GIF, in case it refuses to render properly, please do click on it to see it in action.



Hopefully the animated version of the surface plot gives you a sense of how gamma, strikes, and time to expiry behave in tandem.

20.4 – Delta versus implied volatility

These are interesting times for options traders, have a look at the image below –



Quote As on Sep 11, 2015 14:39:44 IST

CNX Nifty - NIFTY

| Index Watch | Option Chain

Index Derivatives   Stock Derivatives   Currency Derivatives

Instrument Type:	Symbol :	Expiry Date :	Option Type :	Strike Price :	
Select...	NIFTY	24SEP2015	PE	6800.0(	Get Data

8.30	Prev. Close	Open	High	Low	Close
-0.25 -2.92%	8.55	7.40	8.60	6.15	-

Fundamentals | Historical Data

Print

Traded Volume (contracts)	22,193
Traded Value - Premium (lacs)	42.39
Traded Value * (lacs)	37,770.49
VWAP	7.64
Underlying value	7,794.05
Market Lot	25
Open Interest	6,85,950
Change in Open Interest	-25,825
% Change in Open Interest	-3.63
Implied Volatility	41.45

Order Book | Intra-day

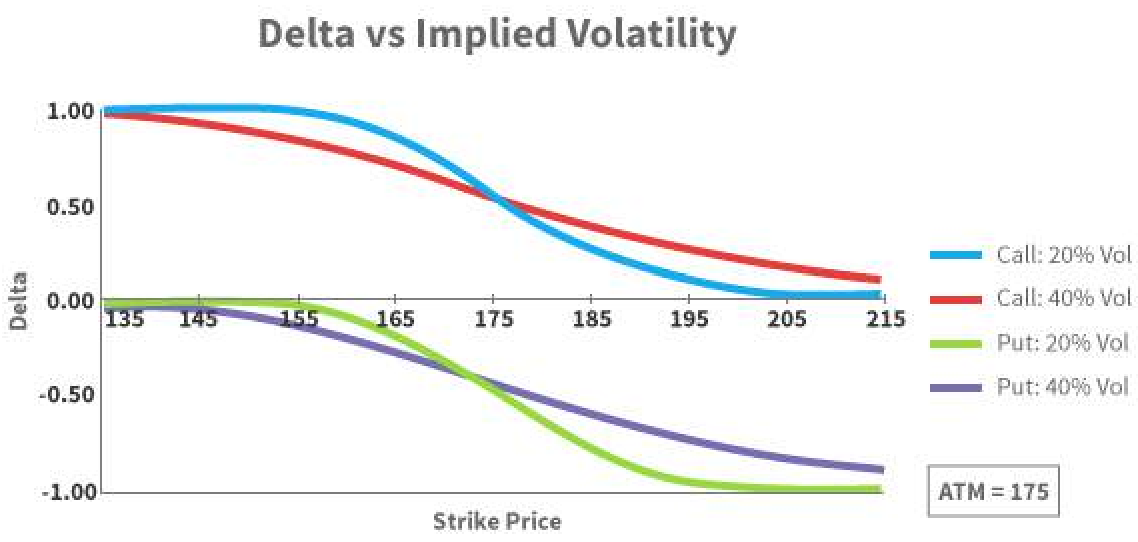
Buy Qty.	Buy Price	Sell Price	Sell Qty.
1,050	8.20	8.35	900
500	8.15	8.40	875
1,850	8.10	8.45	950
875	8.05	8.50	475
1,300	8.00	8.55	250
28,375	Total Quantity		65,200

Other Information

The snapshot was taken on 11th September when Nifty was trading at 7,794. The snapshot is that of 6800 PE which is currently trading at Rs.8.3/-.

Figure this, 6800 is a good 1100 points way from the current Nifty level of 7794. The fact that 6800 PE is trading at 5.5 implies there are a bunch of traders who expect the market to move 1100 points lower within 11 trading sessions (do note there are also 2 trading holidays from now to expiry).

Given the odds of Nifty moving 1100 (14% lower from present level) in 11 trading sessions are low, why is the 6800 PE trading at 8.3? Is there something else driving the options prices higher besides pure expectations? Well, the following graph may just have the answer for you –



The graph represents the movement of Delta with respect to strike price. Here is what you need to know about the graph above –

- The blue line represents the delta of a call option, when the implied volatility is 20%
- The red line represents the delta of a call option, when the implied volatility is 40%
- The green line represents the delta of a Put option, when the implied volatility is 20%
- The purple line represents the delta of a Put option, when the implied volatility is 40%
- The call option Delta varies from 0 to 1
- The Put option Delta varies from 0 to -1
- Assume the current stock price is 175, hence 175 becomes ATM option

With the above points in mind, let us now understand how these deltas behave –

- Starting from left – observe the blue line (CE delta when IV is 20%), considering 175 is the ATM option, strikes such as 135, 145 etc are all Deep ITM. Clearly Deep ITM options have a delta of 1
- When IV is low (20%), the delta gets flattened at the ends (deep OTM and ITM options). This implies that the rate at which Delta moves (further implying the rate at which the option premium moves) is low. In other words deep ITM options tends to behave exactly like a futures contract (when volatility is low) and OTM option prices will be close to zero.
- You can observe similar behavior for Put option with low volatility (observe the green line)
- Look at the red line (delta of CE when volatility is 40%) – we can notice that the end (ITM/OTM) is not flattened, in fact the line appears to be more reactive to underlying price movement. In other words, the rate at which the option's premium change

with respect to change in underlying is high, when volatility is high. In other words, a large range of options around ATM are sensitive to spot price changes, when volatility is high.

- Similar observation can be made for the Put options when volatility is high (purple line)
- Interestingly when the volatility is low (look at the blue and green line) the delta of OTM options goes to almost zero. However when the volatility is high, the delta of OTM never really goes to zero and it maintains a small non zero value.

Now, going back to the initial thought – why is the 6800 PE, which is 1100 points away trading at Rs.8.3/-?

Well that's because 6800 PE is a deep OTM option, and as the delta graph above suggests, when the volatility is high (see image below), deep OTM options have non zero delta value.

I would suggest you draw your attention to the Delta versus IV graph and in particular look at the Call Option delta when implied volatility is high (maroon line). As we can see the delta does not really collapse to zero (like the blue line – CE delta when IV is low). This should explain why the premium is not really low. Further add to this the fact that there is sufficient time value, the OTM option tends to have a 'respectable' premium.

Download the Volatility Cone excel.

Key takeaways from this chapter

1. Volatility smile helps you visualize the fact that the OTM options usually have high IVs
2. With the help of a 'Volatility Cone' you can visualize today's implied volatility with respect to past realized volatility
3. Gamma is high for ATM option especially towards the end of expiry
4. Gamma for ITM and OTM options goes to zero when we approach expiry
5. Delta has an effect on lower range of options around ATM when IV is low and its influence increases when volatility is high.
6. When the volatility is high, the far OTM options do tend to have a non zero delta value

Greek Calculator

21.1 – Background

So far in this module we have discussed all the important Option Greeks and their applications. It is now time to understand how to calculate these Greeks using the Black & Scholes (BS) Options pricing calculator. The BS options pricing calculator is based on the Black and Scholes options pricing model, which was first published by Fisher Black and Myron Scholes (hence the name Black & Scholes) in 1973, however Robert C Merton developed the model and brought in a full mathematical understanding to the pricing formula.

This particular pricing model is highly revered in the financial market, so much so that both Robert C Merton and Myron Scholes received the 1997 Noble Prize for Economic Sciences. The B&S options pricing model involves mathematical concepts such as partial differential equations, normal distribution, stochastic processes etc. The objective in this module is not to take you through the math in B&S model; in fact you could look at this video from Khan Academy for the same –

My objective is to take you through the practical application of the Black & Scholes options pricing formula.

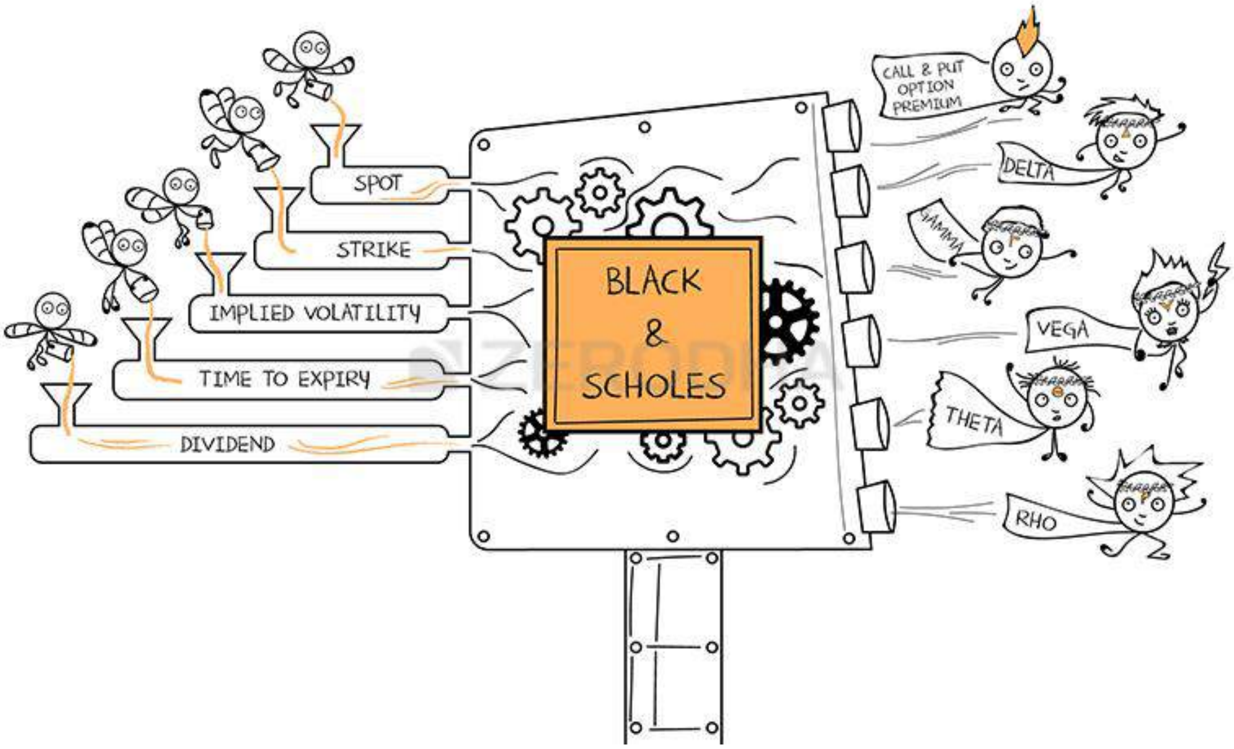
21.2 – Overview of the model

Think of the BS calculator as a black box, which takes in a bunch of inputs and gives out a bunch of outputs. The inputs required are mostly market data of the options contract and the outputs are the Option Greeks.

The framework for the pricing model works like this:

1. We input the model with Spot price, Strike price, Interest rate, Implied volatility, Dividend, and Number of days to expiry
2. The pricing model churns out the required mathematical calculation and gives out a bunch of outputs
3. The output includes all the Option Greeks and the theoretical price of the call and put option for the strike selected

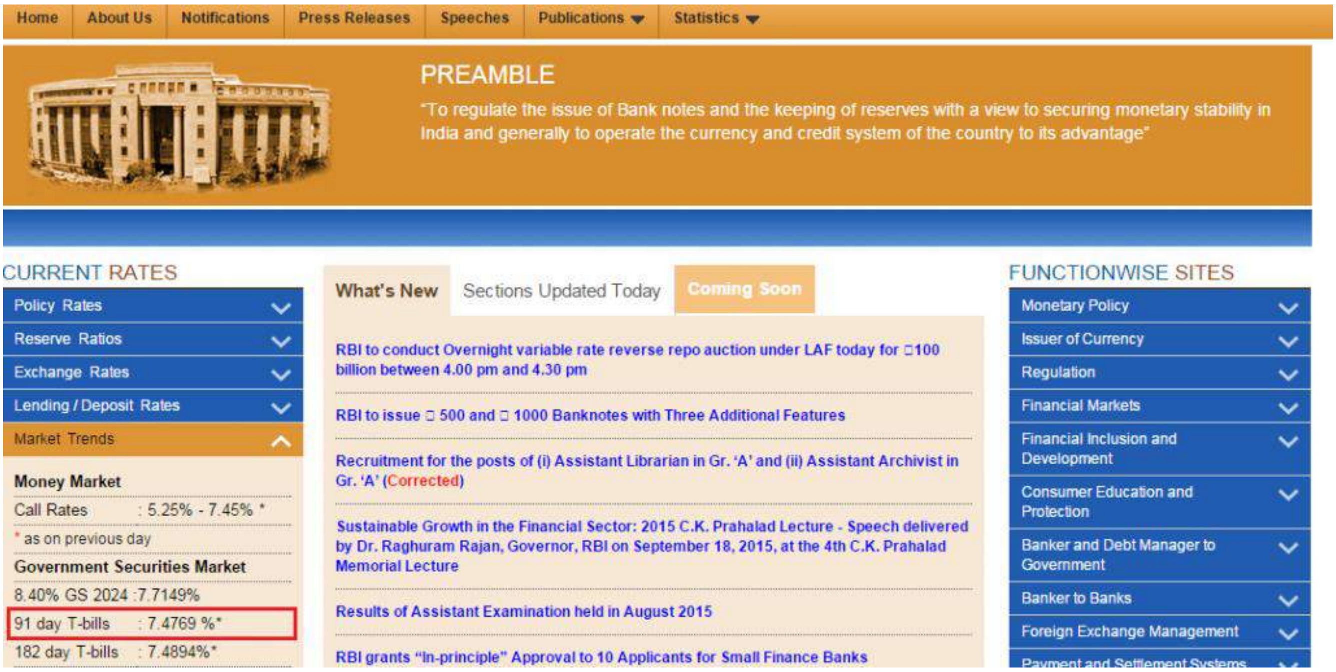
The illustration below gives the schema of a typical options calculator:



On the input side:

Spot price – This is the spot price at which the underlying is trading. Note we can even replace the spot price with the futures price. We use the futures price when the option contract is based on futures as its underlying. Usually the commodity and in some cases the currency options are based on futures. For equity option contacts always use the spot price.

Interest Rate – This is risk free rate prevailing in the economy. Use the RBI 91 day Treasury bill rate for this purpose. You can get the rate from the RBI website, RBI has made it available on their landing page, as highlighted below.



As of September 2015 the prevailing rate is 7.4769% per annum.

Dividend – This is the dividend per share expected in the stock, provided the stock goes ex dividend within the expiry period. For example, assume today is 11th September and you wish to calculate the Option Greeks for the ICICI Bank option contract. Assume ICICI Bank is going ex dividend on 18th Sept with a dividend of Rs.4. The expiry for the September series is 24th September 2015, hence the dividend would be Rs.4. in this case.

Number of days to expiry – This the number of calendar days left to expiry

Volatility – This is where you need to enter the option's implied volatility. You can always look at the option chain provided by NSE to extract the implied volatility data. For example, here is the snap shot of ICICI Bank's 280 CE, and as we can see, the IV for this contract is 43.55%.

Option Chain (Equity Derivatives)

Underlying Stock: **ICICIBANK 272.70** As on Sep 23, 2015 15:07:27 IST

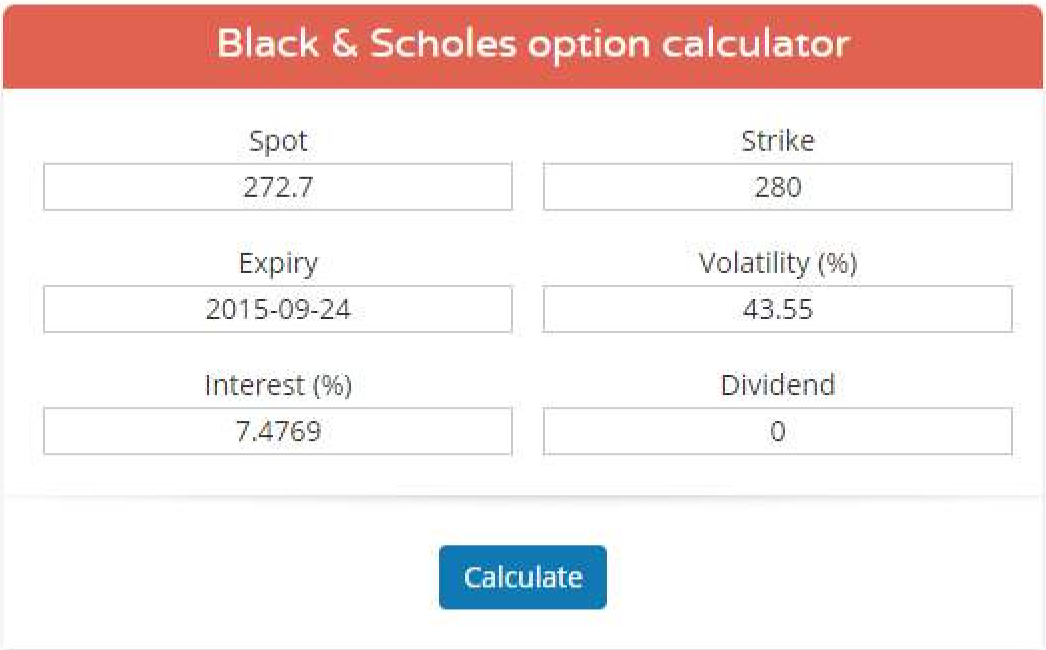
View Options Contracts for: Select Index OR Search for an underlying stock: GO Filter by: Expiry Date 24SEP2015 Futures contracts

CALLS												PUTS										
Chart	OI	Chng in OI	Volume	IV	LTP	Net Chng	Bid Qty	Bid Price	Ask Price	Ask Qty	Strike Price	Bid Qty	Bid Price	Ask Price	Ask Qty	Net Chng	LTP	IV	Volume	Chng in OI	OI	Chart
	-	-	-	-	-	-	-	-	-	-	190.00	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,000	63.05	-	-	200.00	-	-	1.25	8,000	-	-	-	-	-	13,000	
	-	-	-	-	-	-	6,000	61.10	64.05	6,000	210.00	-	-	0.35	4,000	-	-	-	-	-	36,000	
	11,000	-	-	-	-	-	2,000	51.15	52.75	1,000	220.00	-	-	0.05	24,000	-	-	-	-	-	237,000	
	9,000	1,000	1	-	41.15	2.50	6,000	41.25	45.50	2,000	230.00	8,000	0.05	0.10	25,000	-	0.05	136.45	23	-20,000	292,000	
	20,000	-	-	-	-	-	1,000	31.15	36.40	1,000	240.00	-	-	0.05	14,000	-0.05	0.05	105.89	32	-10,000	441,000	
	83,000	-10,000	32	129.79	23.65	2.95	1,000	22.15	22.65	1,000	250.00	33,000	0.10	0.15	1,000	-0.25	0.10	83.88	174	-21,000	764,000	
	264,000	-45,000	166	60.10	12.60	2.50	1,000	12.60	12.90	1,000	260.00	26,000	0.35	0.40	5,000	-0.55	0.40	68.66	1,276	90,000	646,000	
	456,000	-116,000	2,103	40.94	4.35	0.75	1,000	4.00	4.25	2,000	270.00	16,000	1.50	1.60	4,000	-2.15	1.55	51.11	1,486	-8,000	694,000	
	1,359,000	-118,000	1,179	43.55	0.40	-0.40	22,000	0.35	0.40	17,000	280.00	1,000	7.30	7.80	1,000	-2.85	7.45	49.00	200	-37,000	393,000	
	1,320,000	-157,000	321	61.40	0.10	-0.15	75,000	0.05	0.10	1,000	290.00	1,000	16.95	17.50	1,000	-2.55	16.80	-	61	-50,000	239,000	
	2,085,000	-45,000	308	80.39	0.05	-0.05	29,000	0.05	0.10	380,000	300.00	6,000	26.60	27.40	1,000	-1.80	27.50	161.47	19	-15,000	141,000	
	735,000	4,000	103	103.87	0.05	-	-	-	0.05	21,000	310.00	4,000	35.80	37.65	1,000	4.00	38.00	-	44	-32,000	70,000	
	662,000	-5,000	31	125.96	0.05	-	-	-	0.05	23,000	320.00	7,000	45.85	48.45	4,000	7.50	49.00	241.40	21	-11,000	57,000	
	556,000	-13,000	28	146.91	0.05	-0.05	-	-	0.05	18,000	330.00	5,000	55.05	66.95	2,000	-	-	-	-	-	65,000	
	114,000	-1,000	1	166.86	0.05	-	-	-	0.05	11,000	340.00	3,000	65.55	68.60	10,000	7.40	68.90	300.02	3	-3,000	21,000	
	92,000	-	-	-	-	-	-	-	0.05	30,000	350.00	1,000	46.00	112.80	1,000	-	-	-	-	-	7,000	
	8,000	-	1	204.26	0.05	-	-	-	0.05	29,000	360.00	-	-	120.95	2,000	-1.50	86.00	-	1	-1,000	17,000	
	-	-	-	-	-	-	-	-	0.05	30,000	370.00	-	-	-	-	-	-	-	-	-	-	
	1,000	-	-	-	-	-	-	-	0.05	2,000	380.00	-	-	-	-	-	-	-	-	-	1,000	
	-	-	-	-	-	-	-	-	0.05	30,000	390.00	-	-	-	-	-	-	-	-	-	-	
	1,000	-	-	-	-	-	-	-	0.05	30,000	400.00	-	-	-	-	-	-	-	-	-	2,000	
	-	-	-	-	-	-	-	-	0.10	30,000	410.00	-	-	-	-	-	-	-	-	-	-	

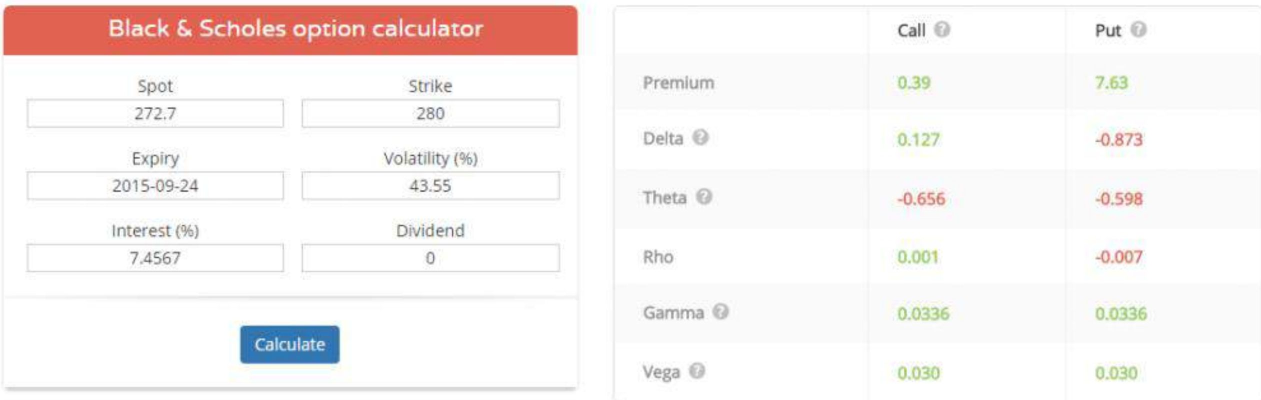
Let us use this information to calculate the option Greeks for ICICI 280 CE.

- Spot Price = 272.7
- Interest Rate = 7.4769%
- Dividend = 0
- Number of days to expiry = 1 (today is 23rd September, and expiry is on 24th September)
- Volatility = 43.55%

Once we have this information, we need to feed this into a standard Black & Scholes Options calculator. We do have this calculator on our website – https://zerodha.com/tools/black-scholes , you can use the same to calculate the Greeks.



Once you enter the relevant data in the calculator and click on 'calculate', the calculator displays the Option Greeks –



On the output side, notice the following –

- The premium of 280 CE and 280 PE is calculated. This is the theoretical option price as per the B&S options calculator. Ideally this should match with the current option price in the market
- Below the premium values, all the Options Greeks are listed.

I'm assuming that by now you are fairly familiar with what each of the Greeks convey, and the application of the same.

One last note on option calculators – the option calculator is mainly used to calculate the Option Greeks and the theoretical option price. Sometimes small difference arises owing to variations in input assumptions. Hence for this reason, it is good to have room for the inevitable modeling errors. However by and large, the option calculator is fairly accurate.

21.3 – Put Call Parity

While we are discussing the topic on Option pricing, it perhaps makes sense to discuss 'Put Call Parity' (PCP). PCP is a simple mathematical equation which states –

Put Value + Spot Price = Present value of strike (invested to maturity) + Call Value.

The equation above holds true assuming –

1. Both the Put and Call are ATM options
2. The options are European
3. They both expire at the same time
4. The options are held till expiry

For people who are not familiar with the concept of Present value, I would suggest you read through this – http://zerodha.com/varsity/chapter/dcf-primer/ (section 14.3).

Assuming you are familiar with the concept of Present value, we can restate the above equation as –

$P + S = Ke^{(-rt)} + C$

Where, $Ke^{(-rt)}$ represents the present value of strike, with K being the strike itself. In mathematical terms, strike K is getting discounted continuously at rate of 'r' over time't'

Also, do realize if you hold the present value of the strike and hold the same to maturity, you will get the value of strike itself, hence the above can be further restated as –

Put Option + Spot Price = Strike + Call options

So why should the equality hold? To help you understand this better think about two traders, Trader A and Trader B.

- Trader A holds ATM Put option and 1 share of the underlying stock (left hand side of PCP equation)
- Trader B holds a Call option and cash amount equivalent to the strike (right hand side of PCP equation)

This being the case, as per the PCP the amount of money both traders make (assuming they hold till expiry) should be the same. Let us put some numbers to evaluate the equation –

Underlying = Infosys
Strike = 1200
Spot = 1200

Trader A holds = 1200 PE + 1 share of Infy at 1200
Trader B holds = 1200 CE + Cash equivalent to strike i.e 1200

Assume upon expiry Infosys expires at 1100, what do you think happens?

Trader A's Put option becomes profitable and he makes Rs.100 however he loses 100 on the stock that he holds, hence his net pay off is 100 + 1100 = 1200.

Trader B's Call option becomes worthless, hence the option's value goes to 0, however he has cash equivalent to 1200, hence his account value is 0 + 1200 = 1200.

Let's take another example, assume Infy hits 1350 upon expiry, lets see what happens to the accounts of both the trader's.

Trader A = Put goes to zero, stock goes to 1350/-
Trader B = Call value goes to 150 + 1200 in cash = 1350/-

So clearly, irrespective of where the stock expires, the equations hold true, meaning both trader A and trader B end up making the same amount of money.

All good, but how would you use the PCP to develop a trading strategy? Well, for that you will have to wait for the next module which is dedicated to "Option Strategies" J. Before we start the next module on Option Strategies, we have 2 more chapters to go in this module.

Key takeaways from this chapter

1. The options calculator is based on the Black & Scholes model
2. The Black & Scholes model is used to estimate the option's theoretical price along with the option's Greek
3. The interest rate in the B&S calculator refers to the risk free rate as available on the RBI site
4. The implied volatility can be fetched from the option chain from the NSE website
5. The put call parity states that the payoff from a put option plus the spot equals the payoff from call option plus the strike.

Re-introducing Call & Put Options

22.1 – Why now?

I suppose this chapter's title may confuse you. After rigorously going through the options concept over the last 21 chapters, why are we now going back to "Call & Put Options" again? In fact we started the module by discussing the Call & Put options, so why all over again?

Well, this is because I personally believe that there are two learning levels in options – before discovering option Greeks and after discovering the option Greeks. Now that we have spent time learning Option Greeks, perhaps it is time to take a fresh look at the basics of the call and put options, keeping the option Greeks in perspective.

Let's have a quick high-level recap –

1. You buy a Call option when you expect the underlying price to increase (you are out rightly bullish)
2. You sell a Call option when you expect the underlying price not to increase (you expect the market to either stay flat or go down but certainly not up)

3. You buy a Put option when you expect the underlying price to decrease (you are out rightly bearish)
4. You sell a Put option when you expect the underlying price not to decrease (you expect the market to stay flat or go up but certainly not down)

   Of course the initial few chapters gave us an understanding on the call and put option basics, but the agenda now is to understand the basics of call and put options keeping both volatility and time in perspective. So let's get started.

22.2 – Effect of Volatility

We know that one needs to buy a Call Option when he/she expects the underlying asset to move higher. Fair enough, for a moment let us assume that Nifty is expected to go up by a certain percent, given this would you buy a Call option if –

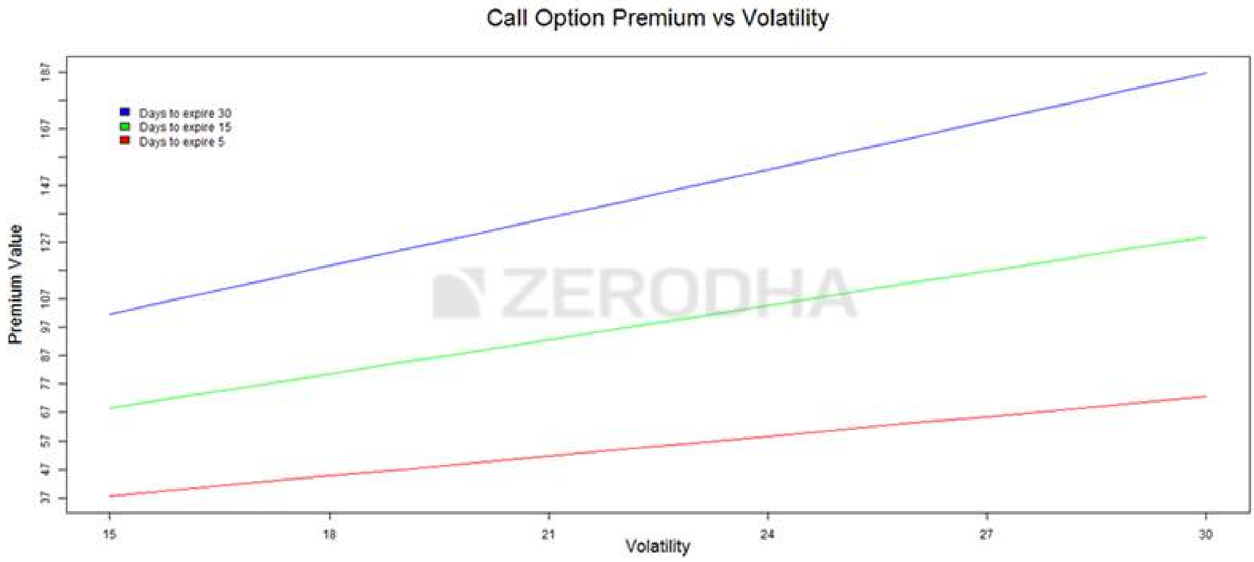
1. The volatility is expected to go down while Nifty is expected to go up?
2. What would you do if the time to expiry is just 2 days away?
3. What would you do if the time to expiry is more than 15 days away?
4. Which strike would you choose to trade in the above two cases – OTM, ATM, or ITM and why would you choose the same?

These questions clearly demonstrate the fact that buying a call option (or put option) is not really a straightforward task. There is a certain degree of ground work required before you buy an option. The ground work mainly revolves around assessment of volatility, time to expiry, and of course the directional movement of the market itself.

I will not talk about the assessment of market direction here; this is something you will have to figure out yourself based on theories such as technical analysis, quantitative analysis, or any other technique that you deem suitable.

For instance you could use technical analysis to identify that Nifty is likely to move up by 2-3% over the next few days. Having established this, what would you do? Would you buy an ATM option or ITM option? Given the fact that Nifty will move up by 2-3% over the next 2 days, which strike gives you maximum bang for the buck? This is the angle I would like to discuss in this chapter.

Let's start by looking at the following graph, if you recollect we discussed this in the chapter on Vega –

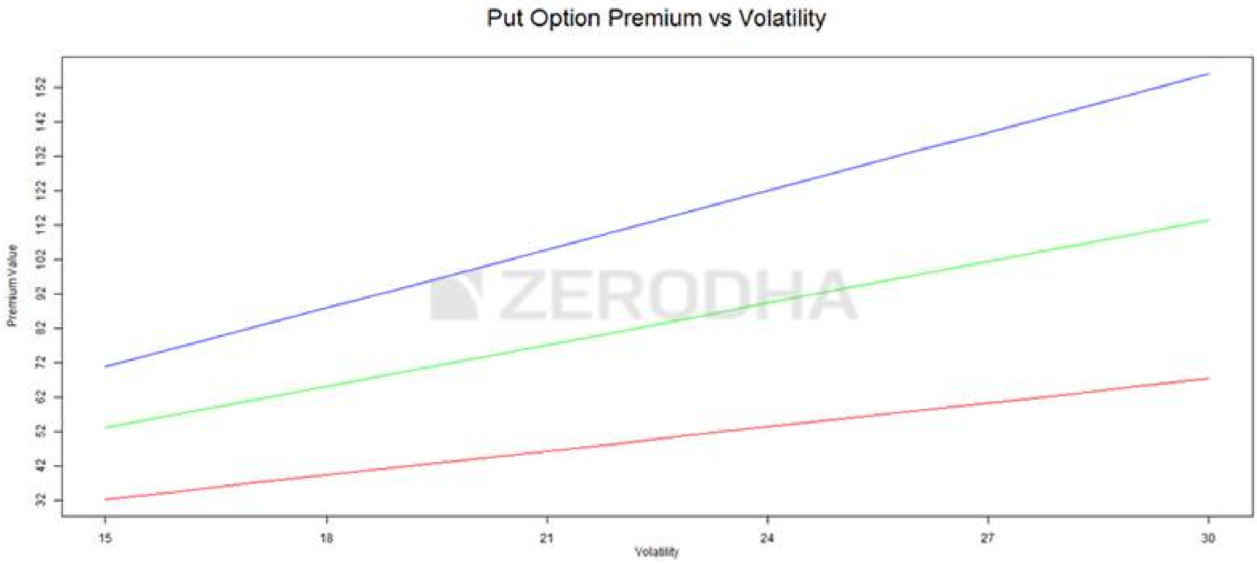


The graph above depicts how a call option premium behaves with respect to increase in volatility across different 'time to expiry' time frames. For example the blue line shows how the call option premium behaves when there are 30 days to expiry, green for 15 days to expiry, and red for 5 days to expiry.

With help of the graph above, we can arrive at a few practical conclusions which we can incorporate while buying/selling call options

1. Regardless of time to expiry, the premium always increases with increase in volatility and the premium decreases with decrease in volatility
2. For volatility to work in favor of a long call option one should time buying a call option when volatility is expected to increase and avoid buying call option when volatility is expected to decrease
3. For volatility to work in favor of a short call option, one should time selling a call option when volatility is expected to fall and avoid selling a call option when the volatility is expected to increase

Here is the graph of the put option premium versus volatility –



This graph is very similar to the graph of call premium versus volatility – therefore the same set of conclusions hold true for put options as well.

These conclusions make one thing clear – buy options when you expect volatility to increase and short options when you expect the volatility to decrease. Now the next obvious question is – which strike to choose when you decide to buy or sell options? This is where the assessment of time to expiry comes into play.

22.3 – Effect of Time

Let us just assume that the volatility is expected to increase along with increase in the underlying prices. Clearly buying a call option makes sense. However the more important aspect is to identify the right strike to buy. Infact when you wish to buy an option it is important to analyze how far away we are with respect to market expiry. Selection of strike depends on the time to expiry.

Do note – understanding the chart below may seem a bit confusing in the beginning, but it is not. So don't get disheartened if you don't get it the first time you read, just give it another shot ϑ

Before we proceed we need to get a grip on the timelines first. A typical F&O series has about 30 days before expiry (barring February series). To help you understand better, I have divided the series into 2 halves – the first half refers to the first 15 days of the series and the 2nd half refers to the last 15 days of the F&O series. Please do keep this in perspective while reading through below.

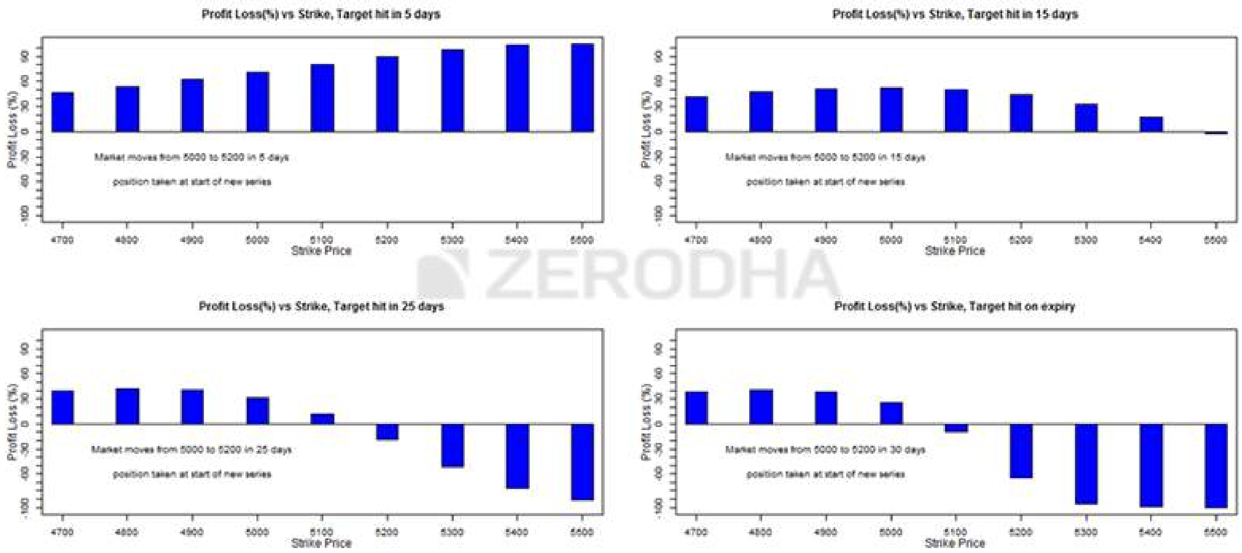
Have a look at the image below; it contains 4 bar charts representing the profitability of different strikes. The chart assumes –

1. The stock is at 5000 in the spot market, hence strike 5000 is ATM

2. The trade is executed at some point in the 1st half of the series i.e between the start of the F&O series and 15th of the month
3. We expect the stock to move 4% i.e from 5000 to 5200

   Given the above, the chart tries to investigate which strike would be the most profitable given the target of 4% is achieved within –

1. 5 days of trade initiation
2. 15 days of trade initiation
3. 25 days of trade initiation
4. On expiry day



So let us start from the **first chart** on the left top. This chart shows the profitability of different call option strikes given that the trade is executed in the first half of the F&O series. The target is expected to be achieved within 5 days of trade execution.

Here is a classic example – today is 7th Oct, Infosys results are on 12th Oct, and you are bullish on the results. You want to buy a call option with an intention of squaring it off 5 days from now, which strike would you choose?

From the chart it is clear – when there is ample time to expiry (remember we are at some point in the 1st half of the series), and the stock moves in the expected direction, then all strikes tend to make money. However, the strikes that make maximum money are (far) OTM options. As we can notice from the chart, maximum money is made by 5400 and 5500 strike.

Conclusion – When we are in the 1st half of the expiry series, and you expect the target to be achieved quickly (say over few days) buy OTM options. In fact I would suggest you buy 2 or 3 strikes away from ATM and not beyond that.

Look at the **2nd chart (top right)** – here the assumption is that the trade is executed in the 1st half the series, the stock is expected to move by 4%, but the target is expected to be achieved in 15 days. Except for the time frame (target to be achieved) everything else remains the same. Notice how the profitability changes, clearly buying far OTM option does not makes sense. In fact you may even lose money when you buy these OTM options (look at the profitability of 5500 strike).

Conclusion – When we in the 1st half of the expiry series, and you expect the target to be achieved over 15 days, it makes sense to buy ATM or slightly OTM options. I would not recommend buying options that are more than 1 strike away from ATM. One should certainly avoid buying far OTM options.

In the **3rd chart (bottom left)** the trade is executed in the 1st half the series and target expectation (4% move) remains the same but the target time frame is different. Here the target is expected to be achieved 25 days from the time of trade execution. Clearly as we can see OTM options are not worth buying. In most of the cases one ends up losing money with OTM options. Instead what makes sense is buying ITM options.

Also, at this stage I have to mention this – people end up buying OTM options simply because the premiums are lower. Do not fall for this, the low premium of OTM options creates an illusion that you won't lose much, but in reality there is a very high probability for you to lose all the money, albeit small amounts. This is especially true in cases where the market moves but not at the right speed. For example the market may move 4% but if this move is spread across 15 days, then it does not make sense holding far OTM options. However, far OTM options make money when the movement in the market is swift – for example a 4% move within 1 or say 2 days. This is when far OTM options moves smartly.

Conclusion – When we are at the start of the expiry series, and you expect the target to be achieved over 25 days, it makes sense to buy ITM options. One should certainly avoid buying ATM or OTM options.

The **last chart (bottom right)** is quite similar to the 3rd chart, except that you expect the target to be achieved on the day of the expiry (over very close to expiry).
The **conclusion** is simple – under such a scenario all option strikes, except ITM lose money. Traders should avoid buying ATM or OTM options.

Let us look at another set of charts – the idea here is to figure out which strikes to choose given that the trade is executed in the 2nd half of the series i.e at any point from 15th of the month till the expiry. Do bear in mind the effect of time decay accelerates in this period; hence as we are moving closer to expiry the dynamic of options change.

The 4 charts below help us identify the right strike for different time frames during which the target is achieved. Of course we do this while keeping theta in perspective.

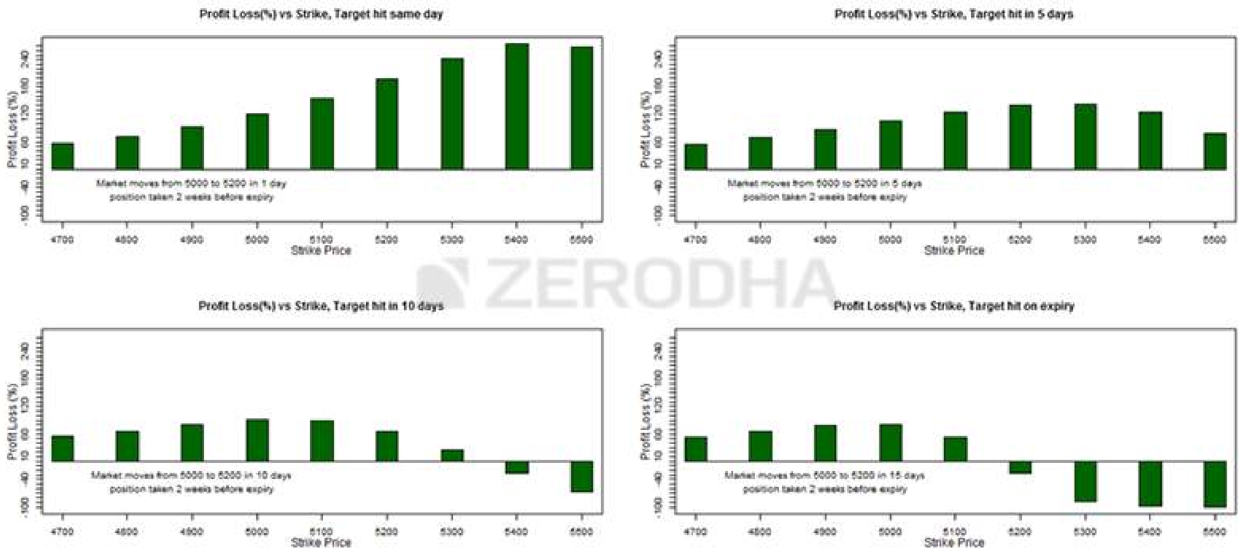


Chart 1 (top left) evaluates the profitability of different strikes wherein the trade is executed in the 2nd half of the series and the target is achieved the same day of trade initiation. News driven option trade such as buying an option owing to a corporate announcement is a classic example. Buying an index option based on the monetary policy decision by RBI is another example. Clearly as we can see from the chart all strikes tend to make money when the target is achieved the same day, however the maximum impact would be on (far) OTM options.

Do recall the discussion we had earlier – when market moves swiftly (like 4% in 1 day), the best strikes to trade are always far OTM.

Conclusion – When you expect the target to be achieved the same day (irrespective of time to expiry) buy far OTM options. I would suggest you buy 2 or 3 strikes away from ATM options and not beyond that. There is no point buying ITM or ATM options.

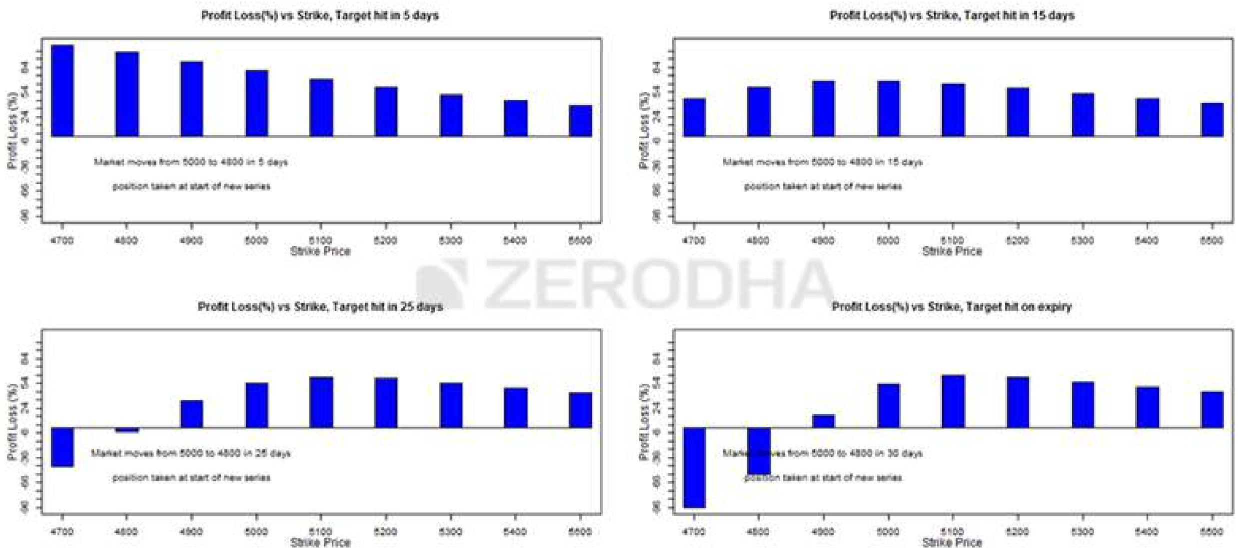
Chart 2 (top right) evaluates the profitability of different strikes wherein the trade is executed in the 2nd half of the series and the target is achieved within 5 days of trade initiation. Notice how the profitability of far OTM options diminishes. In the above case (chart 1) the target is expected to be achieved in 1 day therefore buying (far) OTM options made sense, but here the target is achieved in 5 days, and because the trade is kept open for 5 days especially during the 2nd half of the series, the impact of theta is higher. Hence it just does not make sense risking with far OTM options. The safest bet under such a scenario is strikes which are slightly OTM.

Conclusion – When you are in the 2nd half of the series, and you expect the target to be achieved around 5 days from the time of trade execution buy strikes that are slightly OTM. I would suggest you buy 1 strike away from ATM options and not beyond that.

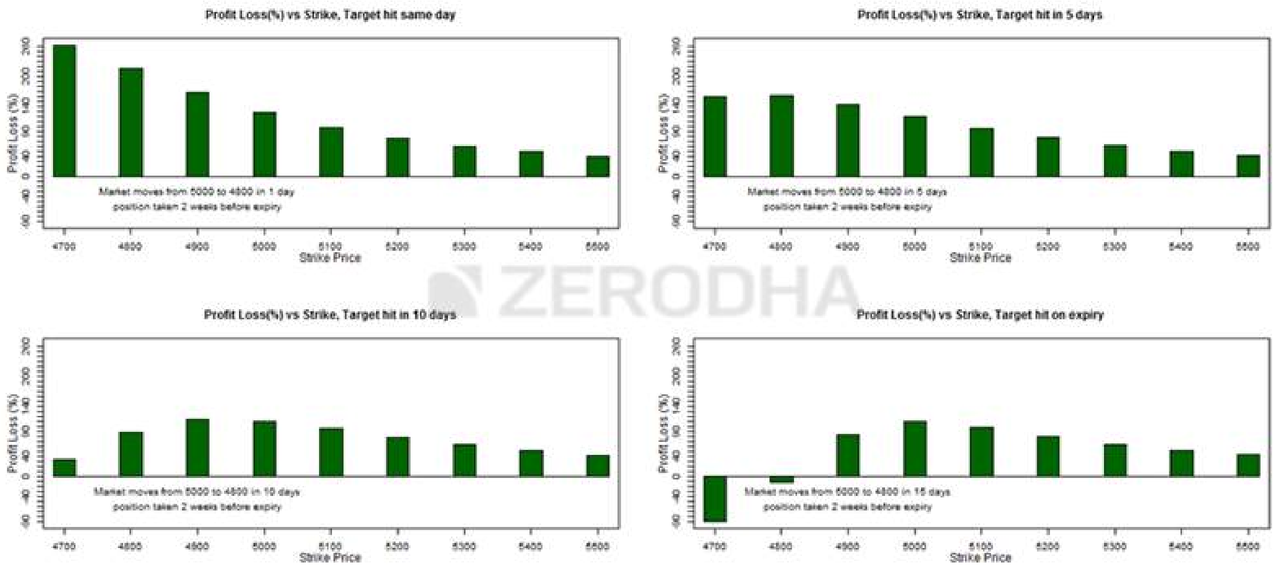
Chart 3 (bottom right) and Chart 4 (bottom left) – both these charts are similar expect in chart 3 the target is achieved 10 days from the trade initiation and in chart 4, the target is expected to be achieved on the day of the expiry. I suppose the difference in terms of number of days won't be much, hence I would treat them to be quite similar. From both these charts we can reach 1 **conclusion** – far OTM options tend to lose money when the target is expected to be achieved close to expiry. In fact when the target is achieved closer to the expiry, the heavier the far OTM options bleed. The only strikes that make money are ATM or slightly ITM option.

While the discussions we have had so far are with respect to buying a call option, similar observations can be made for PUT options as well. Here are two charts that help us understand which strikes to buy under various situations –

These charts help us understand which strikes to trade when the trade is initiated in the first half of the series, and the target is achieved under different time frames.



While these charts help us understand which strikes to trade when is the trade is executed in the 2nd half of the series and the target is achieved under different time frames.



If you go through the charts carefully you will realize that the conclusions for the Call options holds true for the Put options as well. Given this we can generalize the best practices for buying options –

Position Initiation	Target Expectation	Best strike to trade
1st half of the series	5 days from initiation	Far OTM (2 strikes away from ATM)
1st half of the series	15 days from initiation	ATM or slightly OTM (1 strike away from ATM)
1st half of the series	25 days from initiation	Slightly ITM options
1st half of the series	On expiry day	ITM
2nd half of the series	Same day	Far OTM (2 or 3 strikes away from ATM)
2nd half of the series	5 days from initiation	Slightly OTM (1 strike away from ATM)
2nd half of the series	10 days from initiation	Slightly ITM or ATM

2nd half of the series	On expiry day	ITM

So the next time you intend to buy a naked Call or Put option, make sure you map the period (either 1st half or 2nd half of the series) and the time frame during which the target is expected to be achieved. Once you do this, with the help of the table above you will know which strikes to trade and more importantly you will know which strikes to avoid buying.

With this, we are now at the verge of completion of this module. In the next chapter I would like to discuss some of the simple trades that I initiated over the last few days and also share my trade rationale behind each trade. Hopefully the case studies that I will present in the next chapter will give you a perspective on the general thought process behind simple option trades.

Key takeaways from this chapter

1. Volatility plays a crucial role in your decision to buy options
2. In general buy options when you expect the volatility to go higher
3. Sell options when you expect the volatility to decrease
4. Besides volatility the time to expiry and the time frame during which the target is expected to be achieved also matters

Case studies – wrapping it all up!

23.1 – Case studies

We are now at the very end of this module and I hope the module has given you a fair idea on understanding options. I've mentioned this earlier in the module, at this point I feel compelled to reiterate the same – options, unlike futures is not a straight forward instrument to understand. Options are multi dimensional instruments primarily because it has many market forces acting on it **simultaneously**, and this makes options a very difficult instrument to deal with. From my experience I've realized the only way to understand options is by regularly trading them, based on options theory logic.

To help you get started I would like to discuss few **simple** option trades executed successfully. Now here is the best part, these trades are executed by Zerodha Varsity readers over the last 2 months. I believe these are trades inspired by reading through the contents of Zerodha Varsity, or at least this is what I was told.

Either ways I'm happy because each of these trades has a logic backed by a mutli disciplinary approach. So in that sense it is very gratifying, and it certainly makes a perfect end to this module on Options Theory.

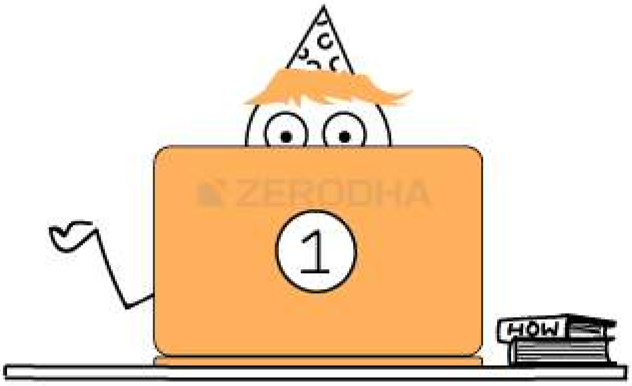
Do note the traders were kind enough to oblige to my request to discuss their trades here, however upon their request I will refrain from identifying them.

Here are the 4 trades that I will discuss –

1. CEAT India – Directional trade, inspired by Technical Analysis logic
2. Nifty – Delta neutral, leveraging the effect of Vega
3. Infosys – Delta neutral, leveraging the effect of Vega
4. Infosys – Directional trade, common sense fundamental approach

For each trade I will discuss what I like about it and what could have been better. Do note, all the snapshots presented here are taken by the traders themselves, I just specified the format in which I need these snapshots.

So, let's get started.



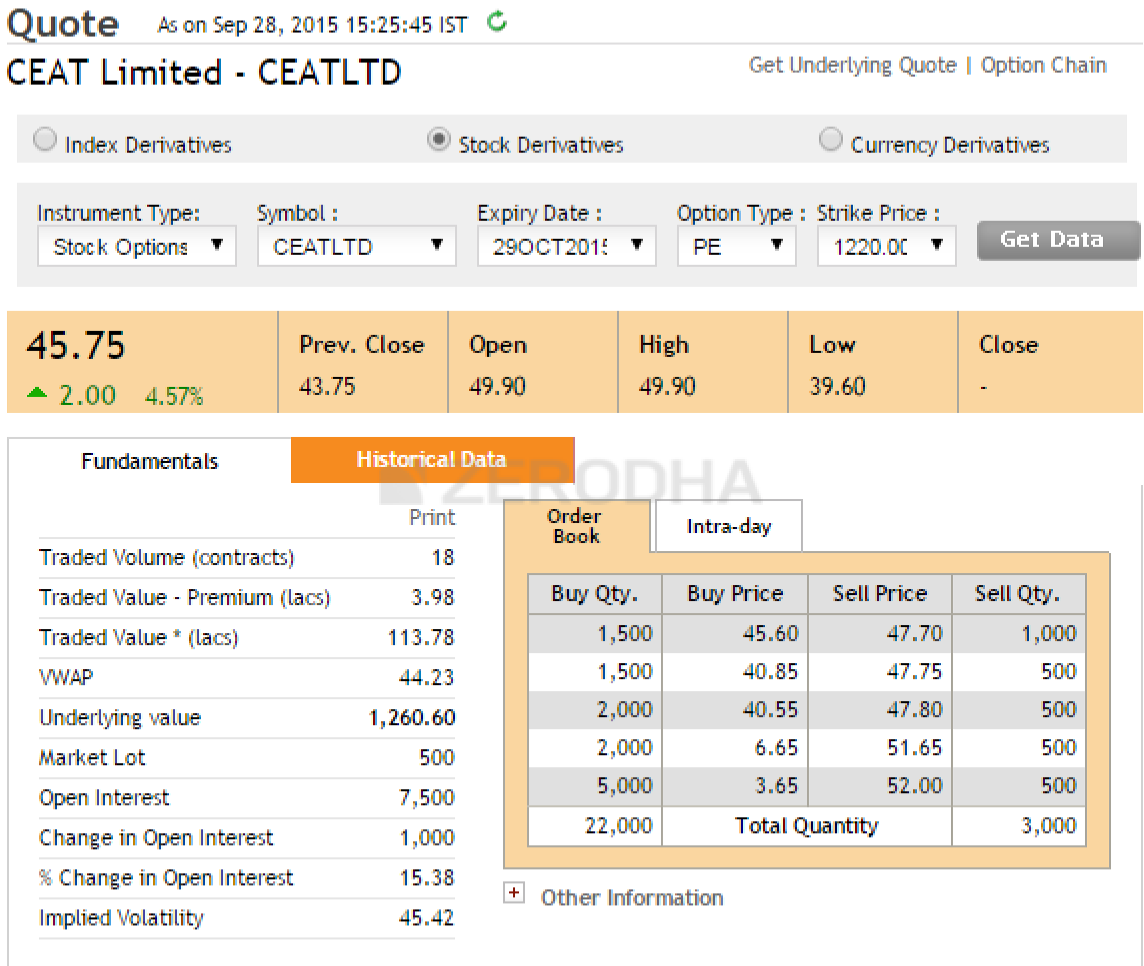
23.2 – CEAT India

The trade was executed by a 27 year old 'Options newbie'. Apparently this was his first options trade ever.

Here is his logic for the trade: CEAT Ltd was trading around Rs.1260/- per share. Clearly the stock has been in a good up trend. However he believed the rally would not continue as there was some sort of exhaustion in the rally.

My thinking is that he was encouraged to believe so by looking at the last few candles, clearly the last three day's trading range was diminishing.

To put thoughts into action, he bought the 1220 (OTM) Put options by paying a premium of Rs.45.75/- per lot. The trade was executed on 28th September and expiry for the contract was on October 29th. Here is the snapshot of the same –


Quote As on Sep 28, 2015 15:25:45 IST

CEAT Limited - CEATLTD

Get Underlying Quote | Option Chain

Index Derivatives Stock Derivatives Currency Derivatives

Instrument Type:	Symbol :	Expiry Date :	Option Type :	Strike Price :	
Stock Options	CEATLTD	29OCT2015	PE	1220.00	Get Data

45.75	Prev. Close	Open	High	Low	Close
2.00 4.57%	43.75	49.90	49.90	39.60	-

Fundamentals | Historical Data

Print

Traded Volume (contracts)	18
Traded Value - Premium (lacs)	3.98
Traded Value * (lacs)	113.78
VWAP	44.23
Underlying value	1,260.60
Market Lot	500
Open Interest	7,500
Change in Open Interest	1,000
% Change in Open Interest	15.38
Implied Volatility	45.42

Order Book | Intra-day

Buy Qty.	Buy Price	Sell Price	Sell Qty.
1,500	45.60	47.70	1,000
1,500	40.85	47.75	500
2,000	40.55	47.80	500
2,000	6.65	51.65	500
5,000	3.65	52.00	500
22,000	Total Quantity		3,000

Other Information

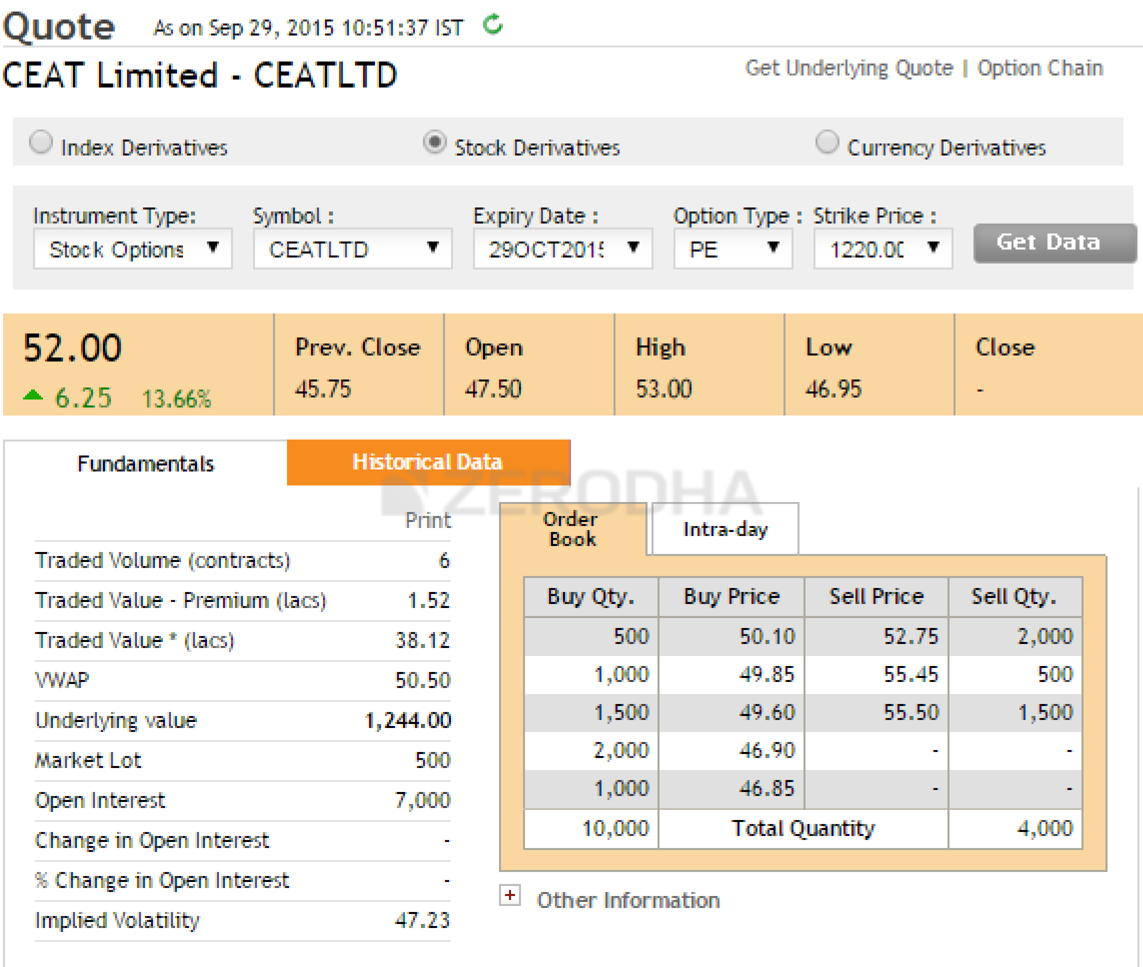
I asked the trader few questions to understand this better –

1. Why did you choose to trade options and not short futures?
1. Shorting futures would be risky, especially in this case as reversals could be sharp and MTM in case of sharp reversals would be painful
2. When there is so much time to expiry, why did I choose to trade a slightly OTM option and not really far OTM option?
1. This is because of liquidity. Stock options are not really liquid, hence sticking to strikes around ATM is a good idea
3. What about stoploss?
1. The plan is to square off the trade if CEAT makes a new high. In other words a new high on CEAT indicates that the uptrend is still intact, and therefore my contrarian short call was flawed
4. What about target?
1. Since the stock is in a good up trend, the idea is to book profits as soon as it's deemed suitable. Reversals can be sharp, so no point holding on to short trades. In fact it would not be a bad idea to reverse the trade and buy a call option.
5. What about holding period?

1. The trade is a play on appreciation in premium value. So I will certainly not look at holding this to expiry. Given that there is ample time to expiry, a small dip in stock price will lead to a decent appreciation in premium.

   Note – the QnA is reproduced in my own words, the idea here is to produce the gist and not the exact word to word conversation.

So after he bought CEAT PE, this is what happened the very next day –



Stock price declined to 1244, and the premium appreciated to 52/-. He was right when he said "since there is ample time to expiry, a small dip in the stock price will lead to a good increase in option premium". He was happy with 7/- in profits (per lot) and hence he decided to close the trade.

Looking back I guess this was probably a good move.

Anyway, I guess this is not bad for a first time, overnight options trade.

My thoughts on this trade – Firstly I need to appreciate this trader's clarity of thought, more so considering this was his first options trade. If I were to set up a trade on this, I would have done this slightly differently.

1. From the chart perspective the thought process was clear – exhaustion in the rally. Given this belief I would prefer selling call options instead of buying them. Why would I do this? – Well, exhaustion does not necessarily translate to correction in stock prices. More often than not, the stock would enter a side way movement making it attractive to option sellers
2. I would select strikes based on the normal distribution calculation as explained earlier in this module (needless to say, one had to keep liquidity in perspective as well)
3. I would have executed the trade (selling calls) in the 2nd half of the series to benefit from time decay

   Personally I do not prefer naked directional trades as they do not give me a visibility on risk and reward. However the only time when I initiate a naked long call option (based on technical analysis) trade is when I observe a flag formation –

1. Stock should have rallied (prior trend) at least 5-10%
2. Should have started correcting (3% or so) on low volumes – indicates profit booking by week hands

   I find this a good setup to buy call options.

23.3 – RBI News play (Nifty Options)

This is a trade in Nifty Index options based on RBI's monetary policy announcement. The trade was executed by a Varsity reader from Delhi. I considered this trade structured and well designed.

Here is the background for this trade.

Reserve Bank of India (RBI) was expected to announce their monetary policy on 29th September. While it is hard for anyone to guess what kind of decision RBI would take, the general expectation in the market was that RBI would slash the repo rates by 25 basis points. For people not familiar with monetary policy and repo rates, I would suggest you read this –

http://zerodha.com/varsity/chapter/key-events-and-their-impact-on-markets/

RBI's monetary policy is one of the most eagerly awaited events by the market participants as it tends to have a major impact on market's direction.

Here are few empirical market observations this trader has noted in the backdrop market events –

1. The market does not really move in any particular direction, especially 2 – 3 days prior to the announcement. He find this applicable to stocks as well – ex : quarterly results
2. Before the event/announcement market's volatility invariably shoots up
3. Because the volatility shoots up, the option premiums (for both CE and PE) also shoot up

While, I cannot vouch for his first observations, the 2nd and 3rd observation does make sense.

So in the backdrop of RBI's policy announcement, ample time value, and increased volatility (see image below) he decided to write options on 28th of September.

Nifty was somewhere around 7780, hence the strike 7800 was the ATM option. The 7800 CE was trading at 203 and the 7800 PE was trading at 176, both of which he wrote and collected a combined premium of Rs.379/-.

Here is the option chain showing the option prices.

CALLS												PUTS										
Chart	OI	Chng in OI	Volume	IV	LTP	Net Chng	Bid Qty	Bid Price	Ask Price	Ask Qty	Strike Price	Bid Qty	Bid Price	Ask Price	Ask Qty	Net Chng	LTP	IV	Volume	Chng in OI	OI	Chart
	-	-	-	-	-	-	25	601.05	758.95	25	7150.00	25	19.00	29.95	100	-91.15	29.85	26.39	4	100	200	
	74,875	5,350	542	-	653.00	-60.00	125	650.85	655.45	25	7200.00	200	34.15	34.45	5,550	2.90	34.45	26.03	55,784	198,025	1,205,375	
	-	-	-	-	-	-	25	501.05	678.95	25	7250.00	25	38.55	41.00	100	6.45	40.95	25.93	212	1,475	3,175	
	70,300	17,600	915	12.73	559.80	-63.00	400	563.35	565.35	25	7300.00	75	46.15	46.70	25	4.70	46.65	25.50	73,928	146,575	1,257,775	
	-	-	-	-	-	-	25	421.05	588.95	25	7350.00	25	52.60	55.95	300	9.35	53.35	25.12	65	525	550	
	103,525	14,500	1,118	17.18	479.10	-56.95	50	480.30	482.00	150	7400.00	2,325	61.55	61.95	25	6.65	61.95	24.89	87,722	230,125	3,237,450	
	200	-	-	-	458.00	-	25	351.15	498.85	25	7450.00	25	69.75	74.35	200	6.40	71.00	24.57	177	675	2,800	
	699,800	25,950	4,189	19.11	406.00	-51.00	25	402.45	405.90	25	7500.00	25	81.50	82.05	25	9.40	82.05	24.37	191,577	485,200	3,703,075	
	200	-	-	-	418.00	-	25	301.15	418.95	25	7550.00	150	89.80	95.90	200	9.85	93.45	24.04	621	3,850	8,500	
	542,325	14,325	5,862	18.89	329.25	-49.15	25	327.65	332.60	25	7600.00	25	106.10	107.00	1,800	13.40	106.85	23.79	212,984	90,575	2,483,550	
	200	-	2	18.96	295.10	27.10	25	279.35	497.80	25	7650.00	25	118.20	122.30	25	17.70	121.70	23.53	2,276	15,700	20,900	
	865,250	33,825	14,975	18.99	262.65	-41.70	50	261.00	262.70	50	7700.00	25	136.75	138.35	25	18.95	138.00	23.26	210,343	19,625	1,987,950	
	4,025	1,100	286	18.71	229.80	-35.05	25	231.30	260.45	125	7750.00	50	152.10	159.00	25	22.20	155.00	22.88	2,872	16,000	27,950	
	1,506,325	215,550	94,528	18.88	203.00	-35.40	125	202.00	203.00	4,650	7800.00	50	175.05	175.60	175	25.95	175.60	22.71	200,052	346,575	3,603,000	
	30,200	11,375	3,337	18.86	176.90	-28.85	25	174.00	176.95	100	7850.00	125	189.95	196.00	25	28.75	195.00	22.20	5,810	5,200	19,425	
	1,706,200	403,625	207,609	18.41	149.20	-28.95	125	148.55	149.20	7,850	7900.00	1,375	219.20	220.00	1,500	32.75	219.20	22.01	145,245	95,675	1,353,125	
	22,550	12,900	2,865	18.09	125.00	-28.20	50	124.85	125.00	25	7950.00	400	237.85	252.95	25	35.30	241.95	21.44	541	3,375	7,575	
	2,874,425	515,175	304,831	17.75	103.00	-24.15	375	102.90	103.00	200	8000.00	25	270.60	271.35	100	39.65	271.00	21.34	58,185	5,075	1,317,000	
	47,125	27,350	4,321	17.65	85.50	-21.75	200	82.10	86.80	100	8050.00	25	282.65	313.95	50	41.10	300.00	21.02	8	75	350	
	2,303,125	416,575	337,764	17.28	68.10	-18.00	1,600	68.10	68.85	50	8100.00	25	333.15	336.00	250	44.95	333.00	20.94	10,964	-4,900	771,775	
	31,000	20,200	2,564	17.09	54.40	-14.55	25	54.40	56.25	25	8150.00	25	347.35	626.35	25	-	310.00	12.49	3	25	950	
	3,244,925	596,550	245,193	16.99	43.40	-11.40	1,025	43.00	43.40	1,100	8200.00	25	404.30	408.75	25	53.05	405.00	20.86	6,201	10,550	882,775	
	24,050	21,150	2,754	16.95	34.50	-7.55	25	32.00	34.50	300	8250.00	25	425.35	489.95	25	20.00	450.00	21.78	5	125	400	
	3,393,175	651,600	189,161	16.73	26.20	-8.60	3,850	26.20	26.90	200	8300.00	50	483.80	487.70	25	55.10	485.30	21.10	2,752	12,275	649,050	
	4,725	1,350	345	17.07	21.95	-4.20	75	19.00	25.00	75	8350.00	25	478.65	580.25	50	75.00	496.00	14.65	1	25	125	
	2,038,500	353,150	171,103	16.68	15.65	-5.40	125	15.65	16.00	500	8400.00	125	570.15	574.80	25	56.85	570.40	21.38	1,262	17,850	372,700	

I had a discussion with him to understand his plan of action; I'm reproducing the same (in my own words) for your understanding –

1. Why are you shorting 7800 CE and 7800 PE?

1. Since there was ample time to expiry and increased volatility, I believe that the options are expensive, and premiums are higher than usual. I expect the volatility to

decrease eventually and therefore the premiums to decrease as well. This would give me an opportunity to buyback both the options at a lower price

2. Why did you choose to short ATM option?

1. There is a high probability that I would place market orders at the time of exit, given this I want to ensure that the loss due to impact cost is minimized. ATM options have lesser impact cost, therefore it was a natural choice.

3. For how long do you plan to hold the trade?

1. Volatility usually drops as we approach the announcement time. From empirical observation I believe that the best time to square of these kinds of trade would be minutes before the announcement. RBI is expected to make the announcement around 11:00 AM on September29th; hence I plan to square off the trade by 10:50 AM.

4. What kind of profits do you expect for this trade?

1. I expect around 10 – 15 points profits per lot for this trade.

5. What is you stop loss for this trade?

1. Since the trade is a play on volatility, its best to place SL based on Volatility and not really on the option premiums. Besides this trade comes with a predefined 'time based stoploss' – remember no matter what happens, the idea is to get out minutes before RBI makes the announcement.

So with these thoughts, he initiated the trade. To be honest, I was more confident about the success of this trade compared to the previous trade on CEAT. To a large extent I attribute the success of CEAT trade to luck, but this one seemed like a more rational set up.

Anyway, as per plan the next day he did manage to close the trade minutes before RBI could make the policy announcement.

Here is the screenshot of the options chain –

					CALLS											PUTS						
Chart	OI	Chng in OI	Volume	IV	LTP	Net Chng	Bid Qty	Bid Price	Ask Price	Ask Qty	Strike Price	Bid Qty	Bid Price	Ask Price	Ask Qty	Net Chng	LTP	IV	Volume	Chng in OI	OI	Chart
	-	-	-	-	-	-	25	509.25	787.75	25	7150.00	300	25.05	42.85	150	18.50	48.35	-	75	1,750	1,950	
	77,575	2,700	205	-	637.75	-10.50	25	635.75	642.45	25	7200.00	100	34.85	35.10	725	-0.05	35.00	26.30	101,009	387,075	1,592,450	
	-	-	-	-	-	-	25	430.20	851.75	25	7250.00	50	40.35	51.55	25	2.75	43.10	27.05	1,069	21,300	24,475	
	70,875	575	860	-	550.70	-6.10	25	552.50	557.05	25	7300.00	525	47.45	47.70	175	0.45	47.50	25.77	93,643	220,150	1,477,925	
	-	-	-	-	-	-	1,000	327.25	634.60	1,000	7350.00	200	41.65	71.85	200	16.60	70.55	28.73	152	1,950	2,500	
	98,825	-4,700	2,406	-	472.20	-3.45	25	469.85	475.10	50	7400.00	50	63.55	63.75	75	1.10	63.70	-	137,519	336,700	3,574,150	
	200	-	4	-	372.60	-85.40	1,000	262.90	573.70	1,000	7450.00	250	62.40	81.65	150	-	72.35	25.42	216	600	3,400	
	845,975	146,175	17,940	-	393.25	-5.20	75	391.25	393.75	50	7500.00	125	84.20	84.50	100	1.65	84.65	24.67	205,869	367,350	4,070,425	
	725	525	72	17.79	364.05	-53.95	200	341.20	365.85	150	7550.00	50	95.55	96.60	225	1.65	95.60	24.52	1,627	11,700	20,200	
	587,475	45,150	16,796	17.81	319.60	-5.65	425	319.80	320.70	125	7600.00	25	109.50	109.90	200	1.75	109.75	-	123,213	298,350	2,781,900	
	3,875	3,675	227	-	281.30	-13.80	400	278.85	288.05	25	7650.00	675	121.65	124.25	25	-0.10	122.85	24.00	2,353	14,175	35,075	
	1,130,450	265,200	75,302	17.88	251.95	-6.80	125	251.90	252.75	100	7700.00	3,100	141.40	141.60	100	2.25	141.40	-	142,371	272,575	2,260,525	
	28,200	24,175	2,910	18.28	219.00	-9.45	25	218.85	224.45	400	7750.00	25	155.85	158.05	675	1.25	159.20	-	2,742	15,150	43,100	
	1,810,500	304,175	136,377	-	191.20	-7.25	300	191.20	191.70	25	7800.00	75	178.70	179.15	175	1.60	178.75	23.04	83,098	-121,350	3,481,650	
	49,250	19,050	2,427	17.77	164.45	-6.95	275	164.35	166.20	200	7850.00	25	196.05	202.25	25	6.75	205.00	-	1,273	11,525	30,950	
	2,379,375	673,175	198,353	17.46	137.95	-7.60	200	138.05	138.40	325	7900.00	50	222.50	224.00	50	2.15	223.85	-	36,234	-31,700	1,321,425	
	41,950	19,400	2,471	17.16	115.90	-7.05	425	114.60	115.90	25	7950.00	100	245.25	254.80	25	-10.75	236.65	21.74	153	2,250	9,825	
	3,571,575	697,150	297,373	17.04	95.00	-5.90	150	94.70	95.00	350	8000.00	50	277.05	278.50	50	4.85	279.85	22.10	17,688	-53,550	1,263,450	
	55,550	8,425	2,845	16.77	76.45	-6.55	600	77.05	77.70	25	8050.00	100	280.70	319.65	50	-2.20	297.80	-	5	-	350	
	2,731,125	428,000	174,489	-	62.00	-4.65	425	61.80	62.00	650	8100.00	50	341.05	343.25	50	3.45	343.10	-	4,599	-10,800	760,975	
	40,300	9,300	1,061	17.04	50.45	-3.45	400	49.80	51.10	25	8150.00	100	296.60	559.85	125	-	-	-	-	-	950	
	3,687,550	442,625	177,176	16.51	39.10	-3.25	225	39.10	39.30	350	8200.00	150	412.75	416.70	50	2.90	415.15	22.43	2,296	-9,375	873,400	
	26,400	2,350	1,359	-	30.00	-3.45	1,000	27.15	33.25	1,000	8250.00	1,000	361.15	579.60	50	-	-	-	-	-	400	
	3,735,700	342,525	152,047	-	24.20	-2.00	350	24.15	24.35	50	8300.00	25	497.40	501.75	25	10.15	502.60	-	1,119	7,925	656,975	
	5,675	950	61	-	12.60	-8.70	25	14.15	21.50	25	8350.00	25	450.15	698.95	50	75.00	571.00	-	1	-	125	
	2,037,900	-600	82,947	-	14.45	-1.30	575	14.30	14.45	1,075	8400.00	150	584.35	587.65	25	8.65	586.25	24.28	786	-950	371,750	

As expected the volatility dropped and both the options lost some value. The 7800 CE was trading at 191 and the 7800 PE was trading at 178. The combined premium value was at 369, and he did manage to make a quick 10 point profit per lot on this trade. Not too bad for an overnight trade I suppose.

Just to give you a perspective – this is what happened immediately after the news hit the market.

My thoughts on this trade – In general I do subscribe to the theory of volatility movement and shorting options before major market events. However such trades are to be executed couple of days before the event and not 1 day before.

Let me take this opportunity to clear one misconception with respect to the news/announcement based option trades. Many traders I know usually set up the opposite trade i.e buy both Call and Put option before major events. This strategy is also called the "Long Straddle". The thought process with a long straddle is straight forward – after the announcement the market is bound to move, based on the direction of the market movement either Call or Put options will make money. Given this the idea is simple – hold the option which is making money and square off the option that is making a loss. While this may seem like a perfectly logical and intuitive trade, what people usually miss out is the impact of volatility.

When the news hits the market, the market would certainly move. For example if the news is good, the Call options will definitely move. **However more often than not the speed at which the Put option premium will lose value is faster than the speed at which the call option premium would gain value**. Hence you will end up losing more money on the Put option and make less money on Call option. For this reasons I believe selling options before an event to be more meaningful.

23.4 – Infosys Q2 Results

This trade is very similar to the previous RBI trade but better executed. The trade was executed by another Delhiite.

Infosys was expected to announce their Q2 results on 12th October. The idea was simple – news drives volatility up, so short options with an expectation that you can buy it back when the volatility cools off. The trade was well planned and the position was initiated on 8th Oct – 4 days prior to the event.

Infosys was trading close to Rs.1142/- per share, so he decided to go ahead with the 1140 strike (ATM).

Here is the snapshot at the time of initiating the trade –

Option Chain (Equity Derivatives)

Underlying Stock: **INFY 1142.60** As on Oct 08, 2015 10:36:06 IST

View Options Contracts for: Select Index | OR | Search for an underlying stock: | GO | Filter by: Expiry Date 29OCT2015 | Futures contracts

CALLS												PUTS										
Chart	OI	Chng in OI	Volume	IV	LTP	Net Chng	Bid Qty	Bid Price	Ask Price	Ask Qty	Strike Price	Bid Qty	Bid Price	Ask Price	Ask Qty	Net Chng	LTP	IV	Volume	Chng in OI	OI	Chart
	-	-	-	-	-	-	1,250	273.00	-	-	760.00	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,250	252.50	-	-	780.00	-	-	-	-	-	-	-	-	-	-	
	3,500	-	-	-	-	-	1,500	233.00	-	-	800.00	3,250	0.05	1.95	250	-	-	-	-	-	250	
	-	-	-	-	-	-	1,500	213.00	-	-	820.00	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,500	193.00	-	-	840.00	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,500	173.00	-	-	860.00	-	-	3.00	250	-	-	-	-	-	-	
	-	-	-	-	-	-	1,500	153.50	-	-	880.00	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,500	233.80	243.25	1,500	900.00	1,000	2.00	3.00	2,250	-	-	-	-	-	15,250	
	-	-	-	-	-	-	1,500	214.55	223.90	1,500	920.00	3,500	1.15	4.85	3,000	-	-	-	-	-	750	
	-	-	-	-	-	-	1,500	195.80	206.30	1,500	940.00	500	2.50	4.45	3,000	-	-	-	-	-	10,000	
	5,250	-	-	-	-	-	1,500	175.55	-	-	960.00	250	3.50	3.85	1,750	-0.40	3.70	50.35	8	250	46,250	
	750	-	-	-	-	-	2,250	59.00	-	-	980.00	500	4.90	5.10	1,250	-1.30	5.10	49.11	43	2,000	28,000	
	13,500	-	-	-	-	-	2,250	142.25	-	-	1000.00	20,750	6.90	7.15	3,250	-0.95	7.15	48.75	366	6,000	228,250	
	12,500	-	-	-	-	-	2,250	124.50	-	-	1020.00	250	9.35	9.70	3,000	-1.70	9.60	48.51	93	2,000	56,000	
	2,750	-	-	-	-	-	4,500	105.50	114.45	500	1040.00	250	12.70	12.90	500	-2.30	12.95	47.66	348	28,250	233,500	
	8,500	-	-	-	-	-	5,250	91.00	99.15	3,000	1060.00	750	17.05	17.35	500	-3.35	17.00	47.59	139	-	209,500	
	7,250	250	2	41.28	87.50	11.50	4,250	80.05	85.10	5,500	1080.00	750	22.75	23.10	500	-3.75	22.85	47.59	110	6,250	90,250	
	113,750	-10,250	91	38.38	70.10	3.55	3,000	69.15	71.70	4,750	1100.00	500	29.75	30.00	2,500	-4.25	29.75	47.91	586	3,000	292,250	
	192,250	-	165	39.94	59.05	3.05	250	58.45	59.05	750	1120.00	250	37.85	38.15	750	-5.35	37.95	47.96	325	1,750	379,250	
	602,500	52,750	1,103	40.26	48.00	3.55	750	47.70	48.20	250	1140.00	2,250	46.95	47.45	250	-5.40	47.00	48.00	823	67,250	497,500	
	255,000	35,500	609	41.18	39.95	3.15	1,500	39.60	40.00	750	1160.00	2,750	58.40	59.80	250	-6.00	58.40	49.13	36	-250	121,250	
	173,750	20,250	263	41.85	33.00	2.60	250	32.50	32.80	750	1180.00	4,000	70.85	74.45	5,000	-6.35	70.50	49.29	5	-	47,000	
	1,021,250	57,500	1,170	42.88	26.90	1.65	250	26.70	26.95	750	1200.00	500	84.50	86.40	4,000	-6.00	85.00	51.66	6	-500	40,000	
	382,500	3,250	150	43.46	21.35	1.25	1,500	21.25	21.70	3,000	1220.00	4,500	94.85	105.55	1,750	-	-	-	-	-	750	
	195,750	19,750	308	43.65	16.50	0.15	750	16.60	16.80	250	1240.00	4,250	108.75	127.55	2,000	-	-	-	-	-	500	
	222,500	7,000	203	43.99	13.10	0.30	750	12.90	13.10	1,000	1260.00	-	-	-	-	-	-	-	-	-	500	
	130,750	16,000	152	44.37	10.00	-0.10	1,750	10.00	10.25	250	1280.00	2,500	144.00	-	-	-	-	-	-	-	250	
	500,250	26,250	539	44.67	7.85	-0.30	2,000	7.80	8.15	6,000	1300.00	500	68.00	167.35	500	-	-	-	-	-	11,250	
	75,000	9,000	70	45.06	6.10	-0.15	1,750	5.95	6.20	500	1320.00	1,500	178.25	190.00	1,500	-	-	-	-	-	-	
	49,750	2,000	23	45.56	5.00	0.15	750	4.60	4.85	750	1340.00	2,250	194.65	-	-	-	-	-	-	-	250	
	33,250	4,250	46	45.93	3.50	-0.50	1,500	3.55	3.70	250	1360.00	1,500	215.80	225.35	1,500	-	-	-	-	-	250	
	64,000	4,000	21	46.44	3.00	-0.30	1,500	2.65	2.85	2,250	1380.00	750	233.80	243.95	750	-	-	-	-	-	-	
Total	4,066,250																				2,309,000	Total

On 8th October around 10:35 AM the 1140 CE was trading at 48/- and the implied volatility was at 40.26%. The 1140 PE was trading at 47/- and the implied volatility was at 48%. The combined premium received was 95 per lot.

I repeated the same set of question (asked during the earlier RBI trade) and the answers received were very similar. For this reason I will skip posting the question and answer extract here.

Going back to Infosys's Q2 results, the market's expectation was that Infosys would announce fairly decent set of number. In fact the numbers were better than expected, here are the details –

"For the July-September quarter, Infosys posted a net profit of $519 million, compared with $511 million in the year-ago period. Revenue jumped 8.7 % to $2.39 billion. On a sequential basis, revenue grew 6%, comfortably eclipsing market expectations of 4-4.5% growth.

In rupee terms, net profit rose 9.8% to Rs.3398 crore on revenue of Rs. 15,635 crore, which was up 17.2% from last year". *Source: Economic Times.*

The announcement came in around 9:18 AM, 3 minutes after the market opened, and this trader did manage to close the trade around the same time.

Here is the snapshot –

Option Chain (Equity Derivatives)

Underlying Stock: INFY 1187.15 As on Oct 12, 2015 09:21:04 IST

View Options Contracts for: Select Index OR Search for an underlying stock: GO Filter by: Expiry Date 29OCT2015 Futures contracts

CALLS												PUTS										
Chart	OI	Chng in OI	Volume	IV	LTP	Net Chng	Bid Qty	Bid Price	Ask Price	Ask Qty	Strike Price	Bid Qty	Bid Price	Ask Price	Ask Qty	Net Chng	LTP	IV	Volume	Chng in OI	OI	Chart
	3,500	-	-	-	-	-	1,250	245.50	-	-	800.00	4,000	0.20	-	-	-	-	-	-	-	500	
	-	-	-	-	-	-	1,000	241.00	-	-	820.00	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,250	221.00	-	-	840.00	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,000	201.00	-	-	860.00	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,250	181.00	-	-	880.00	-	-	3.00	1,250	-	-	-	-	-	-	
	750	-	-	-	-	-	1,500	140.00	-	-	900.00	1,000	1.20	1.30	8,500	-1.35	1.25	64.84	175	-2,750	389,250	
	250	-	-	-	-	-	1,250	159.05	-	-	920.00	250	1.15	1.30	2,750	-1.70	1.15	61.87	13	-500	5,500	
	-	-	-	-	-	-	1,500	127.60	-	-	940.00	750	1.35	1.45	250	-1.70	1.40	59.07	39	-1,000	23,250	
	5,250	-	-	-	-	-	1,500	107.00	-	-	960.00	250	1.50	1.75	500	-2.15	1.75	55.73	39	1,750	69,750	
	750	-	-	-	-	-	1,500	87.00	-	-	980.00	250	1.80	1.95	500	-2.70	1.90	52.26	73	1,000	62,250	
	13,250	-	-	-	-	-	250	178.60	196.90	250	1000.00	1,500	2.30	2.50	4,250	-3.60	2.35	50.59	717	23,500	675,250	
	12,500	-	-	-	-	-	1,750	51.00	-	-	1020.00	250	2.65	2.85	1,250	-5.00	2.60	47.90	210	5,000	131,250	
	3,250	-	-	-	-	-	1,250	24.00	-	-	1040.00	1,250	3.65	3.90	500	-6.20	3.75	46.26	744	-17,250	426,000	
	8,750	-	1	-	125.40	7.20	250	131.05	199.00	500	1060.00	250	4.90	5.35	750	-7.85	5.35	43.50	1,219	-6,750	960,000	
	9,250	1,750	10	-	111.05	4.15	2,500	112.10	121.80	500	1080.00	750	6.70	7.00	5,250	-10.95	7.00	43.24	561	-7,000	266,500	
	157,250	-500	95	-	96.90	7.10	250	95.10	97.55	250	1100.00	250	9.95	10.15	250	-14.20	10.00	42.59	2,384	107,000	1,054,000	
	336,250	-5,750	66	24.09	81.45	5.45	250	78.45	81.30	250	1120.00	1,000	13.90	13.95	250	-17.40	13.90	41.30	1,082	41,000	614,500	
	1,012,500	-27,750	607	28.18	55.00	-10.65	250	53.50	57.35	250	1140.00	500	20.00	20.40	750	-19.00	20.35	40.44	1,748	20,750	846,500	
	775,250	-49,250	1,256	29.97	46.05	-8.90	250	44.55	45.95	250	1160.00	500	26.65	27.50	500	-21.50	27.50	40.48	1,382	10,000	360,750	
	446,500	5,500	1,149	30.65	32.00	-13.80	250	31.80	33.65	250	1180.00	500	33.10	33.35	250	-25.80	33.30	40.36	722	46,500	105,500	
	2,635,000	71,250	6,776	31.26	26.10	-11.45	500	25.15	26.10	250	1200.00	500	43.05	44.00	2,000	-27.30	43.75	40.86	1,122	99,750	167,500	
	823,000	23,500	1,567	31.60	18.10	-11.10	250	18.00	18.70	1,250	1220.00	1,000	55.20	56.50	1,250	-45.20	54.70	40.58	42	3,500	5,250	
	1,285,500	-26,750	2,212	32.54	14.20	-8.75	250	13.70	14.10	250	1240.00	500	59.40	71.20	750	-58.75	65.85	45.36	2	-	750	
	633,000	-6,000	1,817	33.10	9.70	-8.40	500	9.55	9.80	750	1260.00	750	60.15	114.05	750	-	-	-	-	-	750	
	397,000	14,500	909	33.83	7.00	-7.00	500	7.00	7.65	1,250	1280.00	250	45.05	231.95	250	-	-	-	-	-	500	
	1,259,000	77,250	2,422	35.31	6.10	-4.55	3,000	6.00	6.25	1,000	1300.00	250	78.05	-	-	-26.85	118.15	51.87	15	1,500	13,000	
	216,500	11,750	446	34.90	4.40	-3.80	1,500	4.25	4.50	250	1320.00	-	-	-	-	-	-	-	-	-	-	
	165,000	44,250	476	36.41	4.00	-2.10	2,250	3.70	4.25	1,750	1340.00	-	-	-	-	-	-	-	-	-	250	
	516,750	6,250	791	37.95	3.00	-1.95	250	2.90	3.00	2,750	1360.00	-	-	288.00	250	-	-	-	-	-	250	
	181,500	14,250	268	37.37	1.80	-1.75	1,000	1.75	1.90	250	1380.00	-	-	-	-	-	-	-	-	-	-	
Total	10,897,500																				6,179,000	Total

The 1140 CE was trading at 55/- and the implied volatility had dropped to 28%. The 1140 PE was trading at 20/- and the implied volatility had dropped to 40%.

Do pay attention to this – the speed at which the call option shot up was lesser than the speed at which the Put option dropped its value. The combined premium was 75 per lot, and he made a 20 point profit per lot.

My thoughts on this trade – I do believe this trader comes with some experience; it is quite evident with the trade's structure. If I were to execute this trade I would probably do something very similar.

23.5 – Infosys Q2 aftermath (fundamentals based)

This trade was executed by a fellow Bangalorean. I know him personally. He comes with impressive fundamental analysis skills. He has now started experimenting with options with the intention of identifying option trading opportunities backed by his fundamental analysis skills. It would certainly be interesting to track his story going forward.

Here is the background to the trade –

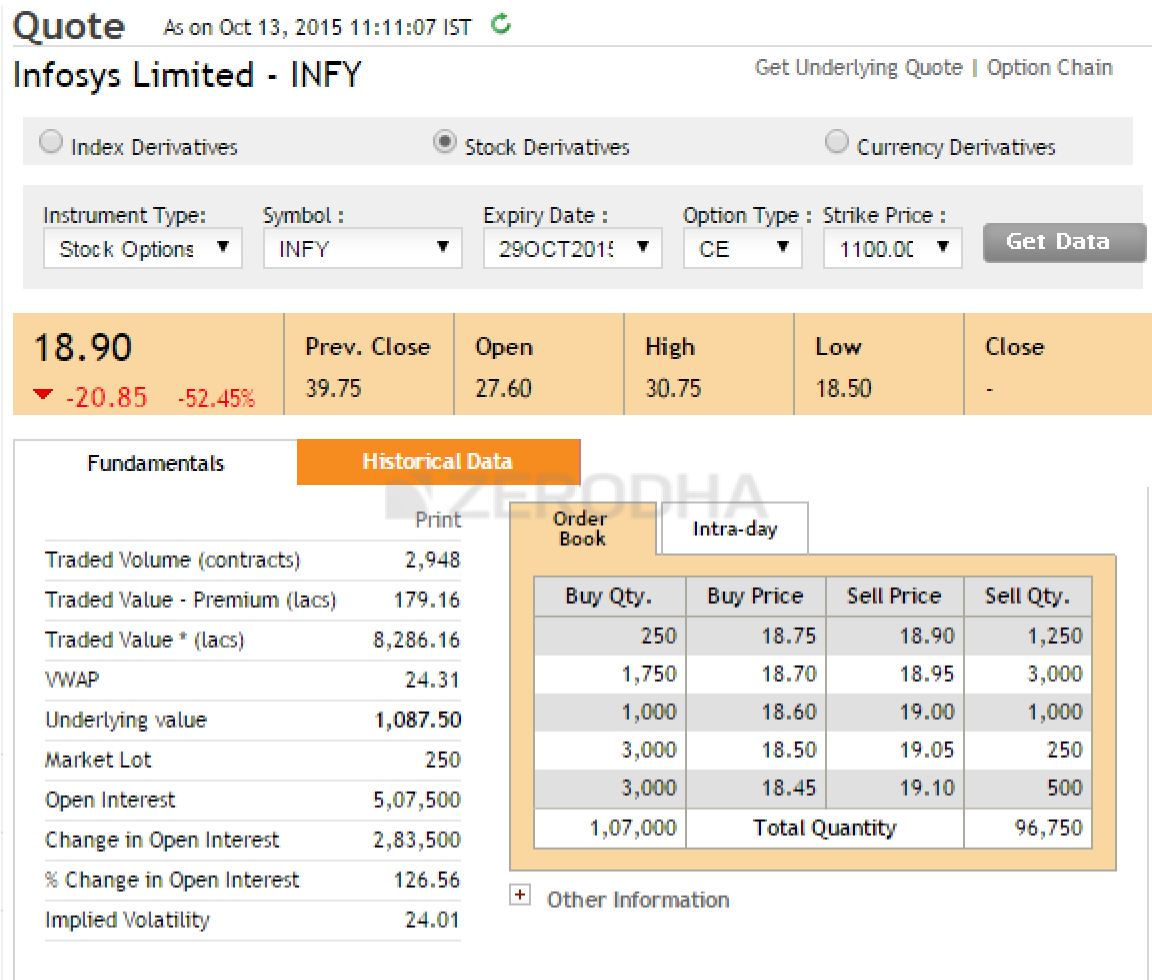
Infosys had just announced an extremely good set of numbers but the stock was down 5% or so on 12th Oct and about 1% on 13th Oct.

Upon further research, he realize that the stock was down because Infosys cut down their revenue guidance. Slashing down the revenue guidance is a very realistic assessment of business, and he believed that the market had already factored this. However the stock going down by 6% was not really the kind of reaction you would expect even after markets factoring in the news.

He believed that the market participants had clearly over reacted to guidance value, so much so that the market failed to see through the positive side of the results.

His belief – if you simultaneously present the markets good news and bad news, market always reacts to bad news first. This was exactly what was going on in Infosys.

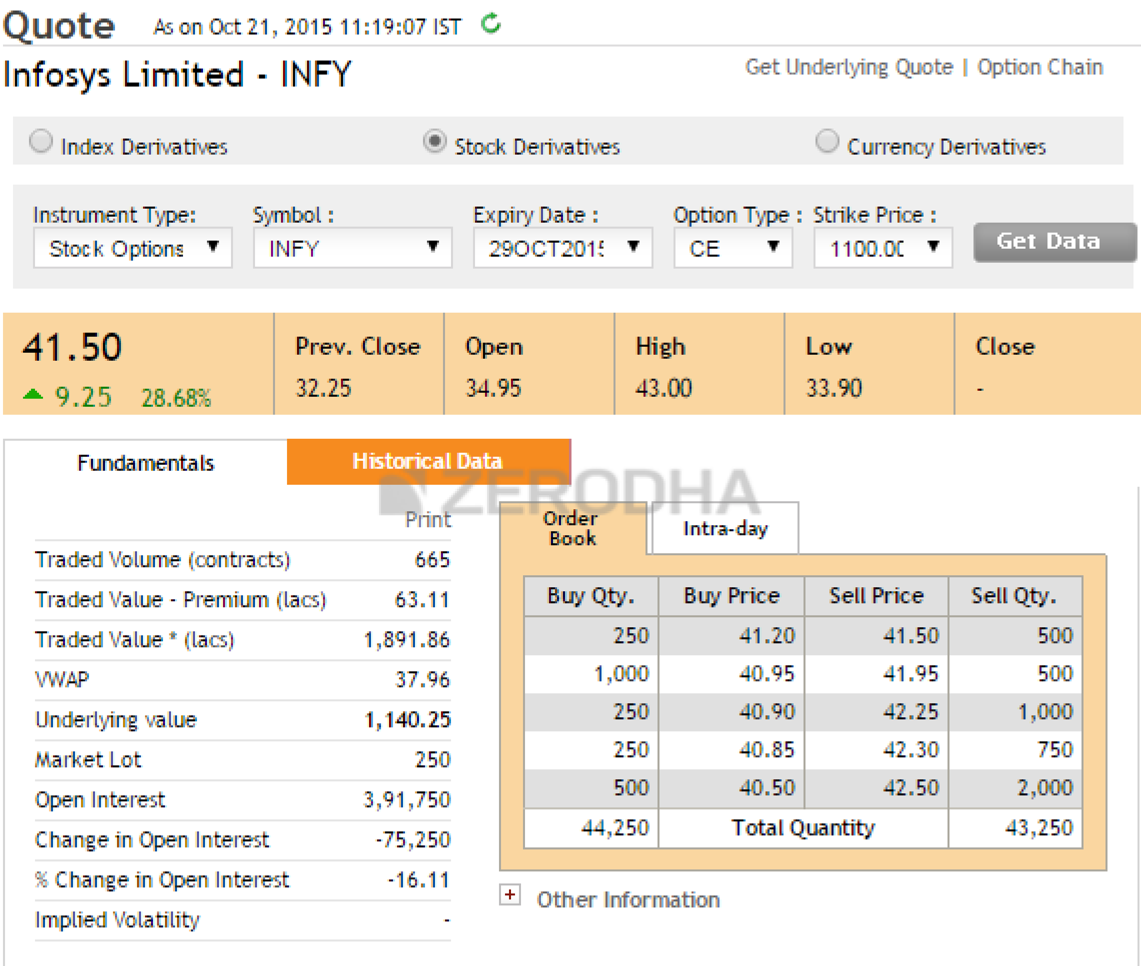
He decided to go long on a call option with an expectation that the market will eventually wake up and react to the Q2 results.



He decided to buy Infosys's 1100 CE at 18.9/- which was slightly OTM. He planned to hold the trade till the 1100 strike transforms to ITM. He was prepared to risk Rs.8.9/- on this trade, which meant that if the premium dropped to Rs.10, he would be getting out of the trade taking a loss.

After executing the trade, the stock did bounce back and he got an opportunity to close the trade on 21st Oct.

Here is the snapshot –


Quote As on Oct 21, 2015 11:19:07 IST

Infosys Limited - INFY

Get Underlying Quote | Option Chain

Index Derivatives Stock Derivatives Currency Derivatives

Instrument Type: Stock Options | Symbol : INFY | Expiry Date : 29OCT2015 | Option Type : CE | Strike Price : 1100.00 | Get Data

41.50	Prev. Close	Open	High	Low	Close
▲ 9.25 28.68%	32.25	34.95	43.00	33.90	-

Fundamentals | Historical Data

Print

Traded Volume (contracts)	665
Traded Value - Premium (lacs)	63.11
Traded Value * (lacs)	1,891.86
VWAP	37.96
Underlying value	1,140.25
Market Lot	250
Open Interest	3,91,750
Change in Open Interest	-75,250
% Change in Open Interest	-16.11
Implied Volatility	-

Order Book | Intra-day

Buy Qty.	Buy Price	Sell Price	Sell Qty.
250	41.20	41.50	500
1,000	40.95	41.95	500
250	40.90	42.25	1,000
250	40.85	42.30	750
500	40.50	42.50	2,000
44,250	Total Quantity		43,250

Other Information

He more than doubled his money on this trade. Must have been a sweet trade for him

Do realize the entire logic for the trade was developed using simple understanding of financial statements, business fundamentals, and options theory.

My thoughts on this trade – Personally I would not be very uncomfortable initiating naked trades. Besides in this particular while the entry was backed by logic, the exit, and stoploss weren't. Also, since there was ample time to expiry the trader could have risked with slightly more OTM options.

And with this my friends, we are at the end of this module on Options Theory!

I hope you found this material useful and I really hope this makes a positive impact on your options trading techniques.

Good luck.

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Option Strategies

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TABLE OF CONTENTS

CHAPTER 1

Orientation

1.1 – Setting the context

Before we start this module on Option Strategy, I would like to share with you a Behavioral Finance article I read couple of years ago. The article was titled "Why winning is addictive".

Here is the article, authored by B.Venkatesh (a regular columnist for HBL) –

"To buy and bet on a lottery ticket – a game that you typically avoid because you understand the odds of winning the jackpot is really low. However, if you do win the ticket, you will be most likely tempted to buy a lottery ticket regularly thereafter!

We exhibit similar behavior when it comes to our investments as well. What drives such behavior? As humans, our life is governed by anticipation. So, looking forward to winning a lottery is exciting and so is realizing that expectation.

Research in neuroscience has however shown that anticipating a win is more exciting than actual winning! Nevertheless, once you experience the excitement of winning a lottery you feel the need to indulge. That is, your brain compels you to buy a lottery ticket, even though you are aware of the odds of winning the second one.

This happens because we tend to use more of reflexive brain than reflective brain. The reflective brain performs calculation that helps you analyze and think. The reflexive brain helps you feel and is more intuitive. When you feel an urge to buy a lottery ticket, it is your reflexive brain that is pushing you to do so. Your reflective brain is likely to tell you that the odds of winning the jackpot for the second time are low!

Now consider trading in equity options. You know that buying calls and puts has its risk, as options often expire worthless. Yet we may choose to buy them regularly, especially if we have already experienced large gains from such investments, for it is the reflexive brain in action. With trading options there is another factor at play. We know that options carry the risk of losing capital when our view on the underlying stock or the index turns wrong.

The fact that we can lose money makes our experience of winning against such odds even more exciting! This is not so much true of lottery because a lottery is a game of chance while investments, we believe, require some degree of skill"

You maybe be wondering, why I chose to post the above article right at the beginning of this module. Well, this article echoes some of my own thoughts; in fact it goes a step further to put things in the behavioral finance context. From the many interactions that I've have had with both experienced and aspiring options traders, one point is quite common - most options traders treat options trading as a 'hit or miss" kind of a trade. There is always a sense of amusement when one initiates an option trade, many don't realize how fatal this naïve amusement can be.

Traders buy options (month after month) with a hope they would double their investment. Trading options with such a mindset is a perfect recipe for a P&L disaster. The bottom line is this – if you aspire to trade options, you need to do it the right way and follow the right approach. Else you can be rest assured the gambling attitude will eventually consume your entire trading capital and you will end up having a short, self destructive option trading career.

I do have to mention this now - the common phrase that goes like this (w.r.t options) “limited risk, unlimited profit potential” is a silent P&L killer. Newbie traders are disillusioned by this ‘theoretically correct’ but practically disastrous fact and thereby end up blowing up their books, slowly and steadily. Hence I do believe that trading options blindly without a strategy is a “dangerous but irresistible pass time” (courtesy - Pink Floyd).

I don’t intend to scare you with this note; I’m only trying to set the context here. With the previous module on Options Theory, I’m sure you would have realized that unlike other topics in the markets, the science involved in Options is heavy duty. It can be quite overwhelming, but you will have to trust me here – the only way to understand and master options trading is by structuring your learning path with a good judicious mix of theory and practice.

In this module, I will attempt to give you a good overview of what you really need to know about some of the popular options strategies. Like always, I will try and stick to the practical aspect and ignore the unwanted (and confusing) theory part.

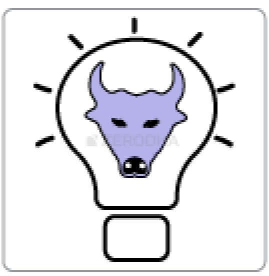
As far as I'm aware, there are close to 475 options strategies out there in the public domain and I'm sure at least another 100 odd strategies are hidden in the proprietary books of brokers, bankers, and traders. Given this should you know all these strategies put up in the public domain?

Answer is a simple no.

1.2 – What should you know?

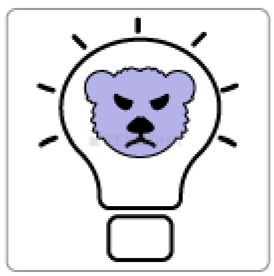
You only need to know a handful of strategies but you need to know them really well. Once you know these strategies all you need to do is analyze the current state of markets (or the stock) and map it with the right option strategy from your strategy quiver.

Keeping this in perspective we will discuss certain strategies.



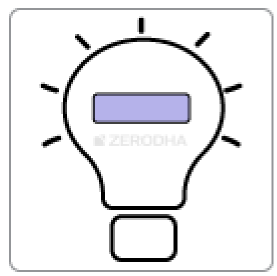
Bullish Strategies

1. Bull Call Spread
2. Bull Put Spread
3. Call Ratio Back Spread
4. Bear Call Ladder
5. Call Butterfly
6. Synthetic Call
7. Straps



Bearish Spreads

1. Bear Call Spread
2. Bear Put Spread
3. Bull Put Ladder
4. Put Ratio Back spread
5. Strip
6. Synthetic Put



Neutral Strategies

1. Long & Short Straddles
2. Long & Short Strangles
3. Long & Short Iron Condor
4. Long & Short Butterfly
5. Box

Besides discussing the above strategies I also intend to discuss –

1. Max Pain for option writing – (some key observations and practical aspects)
2. Volatility Arbitrage employing Dynamic Delta hedging

The plan is to discuss one option strategy per chapter so that there is ample clarity about the strategy, without any mix up or confusion. This means to say we will have roughly about 20 chapters in this module, although I suppose each chapter would not be too lengthy. For each of the strategy I will discuss the background, implementation, payoff, breakeven, and perhaps the right strikes to use considering the time to expiry. I also intend to share a working excel model which would come handy if you intent to employ the strategy.

Do note, while I will discuss all these strategies keeping the Nifty Index as reference, you can use the same for any stock options.

Now here is the most important thing I want you to be aware of – do not expect a holy grail in this module. None of the strategies that we discuss here in the module is sure shot money making machine; in fact nothing is in the markets. The objective here in this module is to ensure that we discuss few basic but important strategies, if you deploy them right you can make money.

Think about this way – if you have a nice car and drive it properly, you can use it to commute and ensure comfort of yourself and your family. However if you are rash with the car, then it can be dangerous to you and everyone else around you.

Likewise these strategies make money if you use it right; if you don't then they can create a hole in your P&L. My job here is to help you understand these strategies (help you learn how to drive the car) and I will also attempt to explain the best condition under which you can use these strategies. But making sure it works for you is in your control, this really depends on your discipline and reading of markets. Having said this, I'm reasonably certain your application of strategies will improve as and when you spend more 'quality' time in the markets.

So starting from the next chapter we focus on the Bullish strategies with the 'Bull Call Spread' making its debut.

Stay tuned.

CHAPTER 2

Bull Call Spread

2.1 – Background

The spread strategies are some of the simplest option strategies that a trader can implement. Spreads are multi leg strategies involving 2 or more options. When I say multi leg strategies, it implies the strategy requires 2 or more option transactions.

Spread strategy such as the 'Bull Call Spread' is best implemented when your outlook on the stock/index is 'moderate' and not really 'aggressive'. For example the outlook on a particular stock could be 'moderately bullish' or 'moderately bearish'.

Some of the typical scenarios where your outlook can turn 'moderately bullish' are outlined as below –

Fundamental perspective - Reliance Industries is expected to make its Q3 quarterly results announcement. From the management's Q2 quarterly guidance you know that the Q3 results are expected to be better than both Q2 and Q3 of last year. However you do not know by how many basis points the results will be better. This is clearly the missing part of the puzzle.

Given this you expect the stock price to react positively to the result announcement. However because the guidance was laid out in Q2 the market could have kind of factored in the news. This leads you to think that the stock can go up, but with a limited upside.

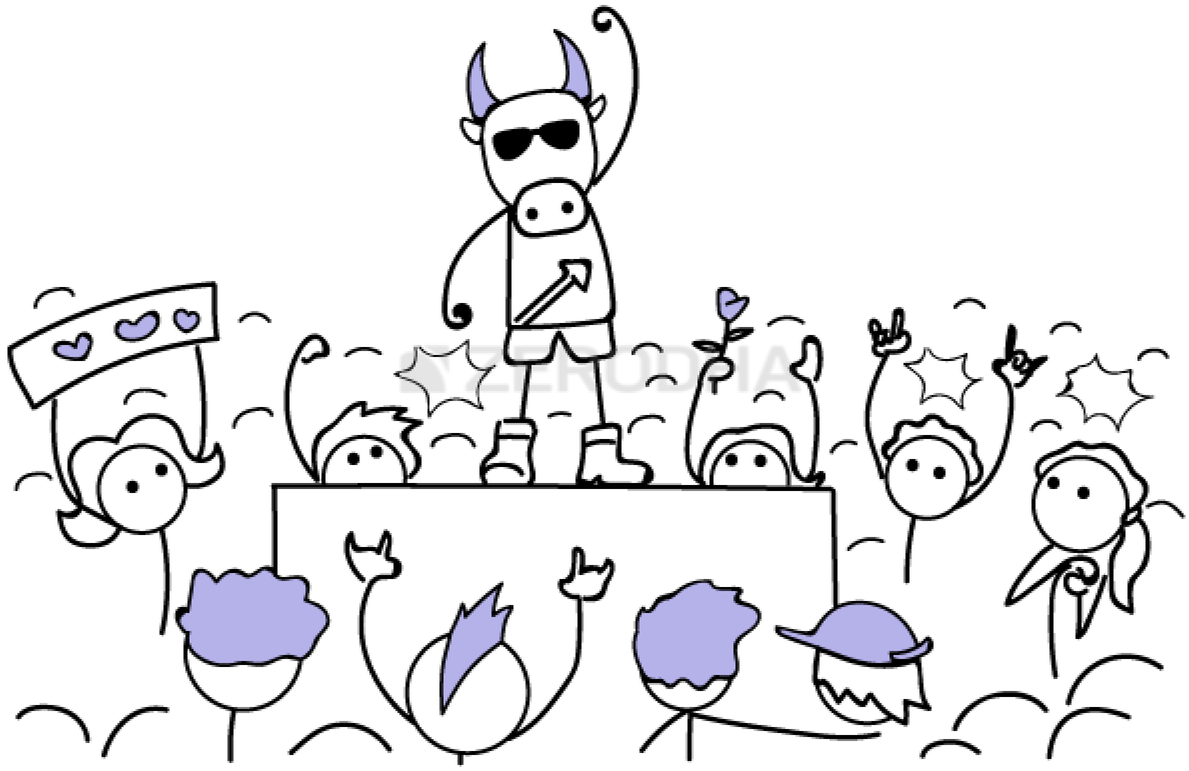
Technical Perspective – The stock that you are tracking has been in the down trend for a while, so much so that it is at a 52 week low, testing the 200 day moving average, and also near a multi-year support. Given all this there is a high probability that the stock could stage a relief rally. However you are not completely bullish as whatever said and done the stock is still in a downtrend.

Quantitative Perspective – The stock is consistently trading between the 1st standard deviation both ways (+1 SD & -1 SD), exhibiting a consistent mean reverting behavior. However there has been a sudden decline in the stock price, so much so that the stock price is now at the 2nd standard deviation. There is no fundamental reason backing the stock price decline, hence there is a good chance that the stock price could revert to mean. This makes you bullish on the stock, but the fact that it there is a chance that it could spend more time near the 2nd SD before reverting to mean caps your bullish outlook on the stock.

The point here is – your perspective could be developed from any theory (fundamental, technical, or quantitative) and you could find yourself in a 'moderately bullish' stance. In fact this is true for a 'moderately bearish' stance as well. In such a situation you can simply invoke a spread strategy wherein you can set up option positions in such a way that

1. You protect yourself on the downside (in case you are proved wrong)
2. The amount of profit that you make is also predefined (capped)
3. As a trade off (for capping your profits) you get to participate in the market for a lesser cost

The 3rd point could be a little confusing at this stage; you will get clarity on it as we proceed.



2.2 – Strategy notes

Amongst all the spread strategies, the bull call spread is one the most popular one. The strategy comes handy when you have a moderately bullish view on the stock/index.

The bull call spread is a two leg spread strategy traditionally involving ATM and OTM options. However you can create the bull call spread using other strikes as well.

To implement the bull call spread –

1. Buy 1 ATM call option (leg 1)
2. Sell 1 OTM call option (leg 2)

When you do this ensure –

1. All strikes belong to the same underlying
2. Belong to the same expiry series

3. Each leg involves the same number of options

For example –

Date – 23rd November 2015

Outlook – Moderately bullish (expect the market to go higher but the expiry around the corner could limit the upside)

Nifty Spot – 7846

ATM – 7800 CE, premium – Rs.79/-

OTM – 7900 CE, premium – Rs.25/-

Bull Call Spread, trade set up -

1. Buy 7800 CE by paying 79 towards the premium. Since money is going out of my account this is a debit transaction
2. Sell 7900 CE and receive 25 as premium. Since I receive money, this is a credit transaction
3. The net cash flow is the difference between the debit and credit i.e 79 – 25 = **54**.

Generally speaking in a bull call spread there is always a 'net debit', hence the bull call spread is also called referred to as a 'debit bull spread'.

After we initiate the trade, the market can move in any direction and expiry at any level. Therefore let us take up a few scenarios to get a sense of what would happen to the bull call spread for different levels of expiry.

Scenario 1 - Market expires at 7700 (below the lower strike price i.e ATM option)

The value of the call options would depend upon its intrinsic value. If you recall from the previous module, the intrinsic value of a call option upon expiry is –

Max [0, Spot-Strike]

In case of 7800 CE, the intrinsic value would be –

Max [0, 7700 – 7800]

= Max [0, -100]

= 0

Since the 7800 (ATM) call option has 0 intrinsic value we would lose the entire premium paid i.e Rs.79/-

The 7900 CE option also has 0 intrinsic value, but since we have sold/written this option we get to retain the premium of Rs.25.

So our net payoff from this would be –

-79 + 25

= **54**

Do note, this is also the **net debit** of the overall strategy.

Scenario 2 - Market expires at 7800 (at the lower strike price i.e the ATM option)

I will skip the math here, but you need to know that both 7800 and 7900 would have 0 intrinsic value, therefore the net loss would be 54.

Scenario 3 - Market expires at 7900 (at the higher strike price, i.e the OTM option)

The intrinsic value of the 7800 CE would be –

Max [0, Spot-Strike]

= Max [0, 7900 – 7800]

= 100

Since we are long on this option by paying a premium of 79, we would make a profit of –

100 -79

= 21

The intrinsic value of 7900 CE would be 0, therefore we get to retain the premium Rs.25/-

Net profit would be 21 + 25 = **46**

Scenario 4 - Market expires at 8000 (above the higher strike price, i.e the OTM option)

Both the options would have a positive intrinsic value

7800 CE would have an intrinsic value of 200, and the 7900 CE would have an intrinsic value of 100.

On the 7800 CE we would make 200 – 79 = 121 in profit

And on the 7900 CE we would lose 100 – 25 = 75

The overall profit would be

121 – 75

= **46**

To summarize –

Market Expiry	LS – IV	HS – IV	Net pay off
7700	0	0	(54)
7800	0	0	(54)
7900	100	0	+46
8000	200	100	+46

From this, 2 things should be clear to you –

1. Irrespective of the down move in the market, the loss is restricted to Rs.54, the maximum loss also happens to be the '**net debit**' of the strategy

2. The maximum profit is capped to 46. This also happens to be the difference between the spread and strategy's net debit

We can define the '**Spread**' as -

Spread = Difference between the higher and lower strike price

We can calculate the overall profitability of the strategy for any given expiry value. Here is screenshot of the calculations that I made on the excel sheet –

Market Expiry	LS - IV	PP	LS Payoff	HS - IV	PR	HS Payoff	Strategy Payoff
7000	0	-79	-79	0	25	25	-54
7100	0	-79	-79	0	25	25	-54
7200	0	-79	-79	0	25	25	-54
7300	0	-79	-79	0	25	25	-54
7400	0	-79	-79	0	25	25	-54
7500	0	-79	-79	0	25	25	-54
7600	0	-79	-79	0	25	25	-54
7700	0	-79	-79	0	25	25	-54
7800	0	-79	-79	0	25	25	-54
7900	100	-79	21	0	25	25	46
8000	200	-79	121	100	25	-75	46
8100	300	-79	221	200	25	-175	46
8200	400	-79	321	300	25	-275	46
8300	500	-79	421	400	25	-375	46
8400	600	-79	521	500	25	-475	46
8500	700	-79	621	600	25	-575	46

- *LS – IV - Lower Strike - Intrinsic value (7800 CE, ATM)*
- *PP – Premium Paid*
- *LS Payoff – Lower Strike Payoff*
- *HS-IV – Higher strike - Intrinsic Value (7900 CE, OTM)*
- *PR – Premium Received*
- *HS Payoff – Higher Strike Payoff*

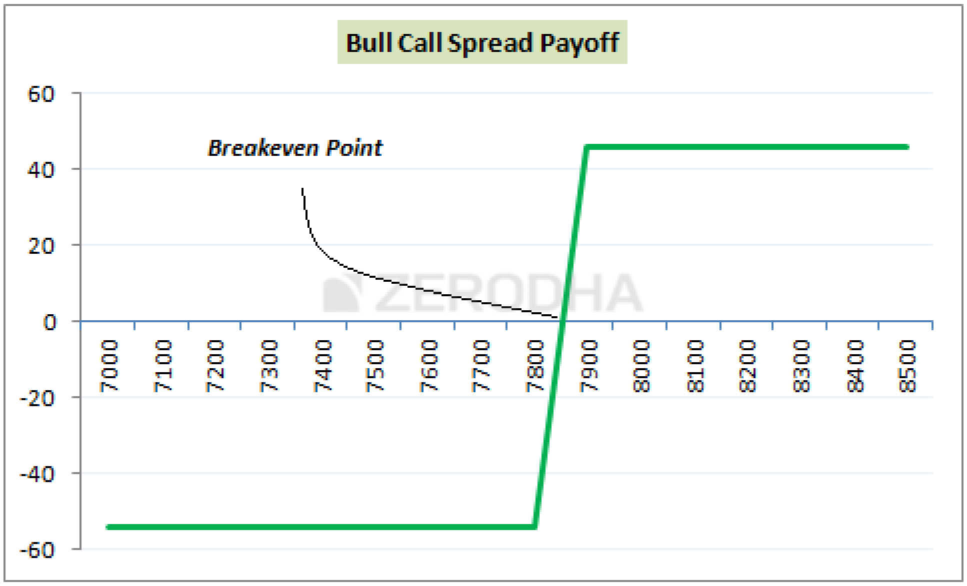
As you can notice, the loss is restricted to Rs.54, and the profit is capped to 46. Given this,we can generalize the Bull Call Spread to identify the Max loss and Max profit levels as -

Bull Call Spread Max loss = Net Debit of the Strategy

Net Debit = Premium Paid for lower strike – Premium Received for higher strike

Bull Call Spread Max Profit = Spread – Net Debit

This is how the pay off diagram of the Bull Call Spread looks like –



There are three important points to note from the payoff diagram –

1. The strategy makes a loss in Nifty expires below 7800. However the loss is restricted to Rs.54.
2. The breakeven point (where the strategy neither make a profit or loss) is achieved when the market expires at 7854 (7800 + 54). Therefore we can generalize the breakeven point for a bull call spread as **Lower Strike + Net Debit**
3. The strategy makes money if the market moves above 7854, however the maximum profit achievable is Rs.46 i.e the difference between the strikes minus the net debit
    a. 7900 – 7800 = 100
    b. 100 – 54 = 46

I suppose at this stage you may be wondering why anyone would choose to implement a bull call spread versus buying a plain vanilla call option. Well, the main reason is the reduced strategy cost.

Do remember your outlook is 'moderately bullish'. Given this buying an OTM option is ruled out. If you were to buy the ATM option you would have to pay Rs.79 as the option premium and if the market proves you wrong, you stand to lose Rs.79. However by implementing a bull call spread you reduce the overall cost to Rs.54 from Rs.79. As a tradeoff you also cap your upside. In my view this is a fair deal considering you are not aggressively bullish on the stock/index.

2.3 – Strike Selection

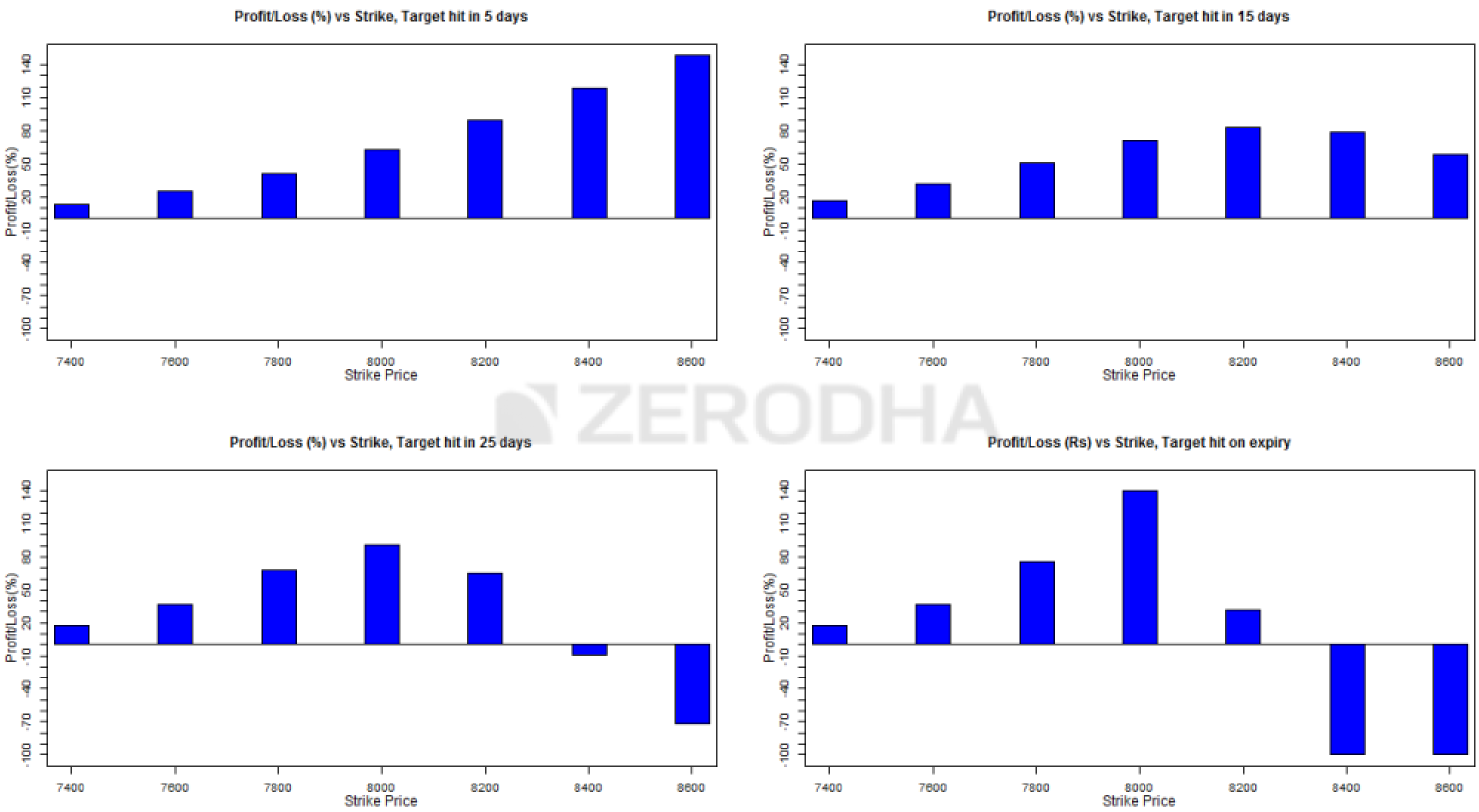
How would you quantify moderately bullish/bearish? Would you consider a 5% move on Infosys as moderately bullish move, or should it be 10% and above? What about the index such as Bank Nifty and Nifty 50? What about mid caps stocks such as Yes Bank, Mindtree, Strides Arcolab etc? Well, clearly there is no one shoe fits all solution here. One can attempt to quantify the 'moderate-ness' of the move by evaluating the stock/index volatility.

Based on volatility I have devised a few rules (works alright for me) you may want to improvise on it further - If the stock is highly volatile, then I would consider a move of 5-8% as 'moderate'. However if the stock is not very volatile I would consider sub 5% as 'moderate'. For indices I would consider sub 5% as moderate.

Now consider this - you have a 'moderately bullish' view on Nifty 50 (sub 5% move), given this which are the strikes to select for the bull call spread? Is the ATM + OTM combo the best possible spread?

The answer to this depends on good old Theta!

Here are a bunch of graphs that will help you identify the best possible strikes based on time to expiry.



Before understanding the graphs above a few things to note –

1. Nifty spot is assumed to be at 8000
2. Start of the series is defined as anytime during the first 15 days of the series
3. End of the series is defined as anytime during the last 15 days of the series
4. The bull call spread is optimized and the spread is created with 300 points difference

The thought here is that the market will move up moderately by about 3.75% i.e from 8000 to 8300. So considering the move and the time to expiry, the graphs above suggest –

1. **Graph 1 (top left)** - You are at the start of the expiry series and you expect the move over the next **5 days**, then a bull spread with far OTM is most profitable i.e 8600 (lower strike long) and 8900 (higher strike short)

2. **Graph 2 (top right)** - You are at the start of the expiry series and you expect the move over the next **15 days**, then a bull spread with slightly OTM is most profitable i.e 8200 and 8500
3. **Graph 3 (bottom left)** - You are at the start of the expiry series and you expect the move in **25 days**, then a bull spread with ATM is most profitable i.e 8000 and 8300. It is also interesting to note that the strikes above 8200 (OTM options) make a loss.
4. **Graph 4 (bottom right)** - You are at the start of the expiry series and you expect the move to occur **by expiry**, then a bull spread with ATM is most profitable i.e 8000 and 8300. Do note, the losses with OTM and far OTM options deepen.

Here are another bunch of charts; the only difference is that for the same move (i.e 3.75%) these charts suggest the best possible strikes to select assuming you are in the 2nd half of the series.

1. **Graph 1 (top left)** – If you expect a moderate move during the 2nd half of the series, and you expect the move to happen within **a day (or two)** then the best strikes to opt are far OTM i.e 8600 (lower strike long) and 8900 (higher strike short)
2. **Graph 2 (top right)** - If you expect a moderate move during the 2nd half of the series, and you expect the move to happen over the next **5 days** then the best strikes to opt are far OTM i.e 8600 (lower strike long) and 8900 (higher strike short). Do note, both Graph 1 and 2 are suggesting the same strikes, but the profitability of the strategy reduces, thanks to the effect of Theta!
3. **Graph 3 (bottom right)** - If you expect a moderate move during the 2nd half of the series, and you expect the move to happen over the next **10 days** then the best strikes to opt are slightly OTM (1 strike away from ATM)
4. **Graph 4 (bottom left)** - If you expect a moderate move during the 2nd half of the series, and you expect the move to happen on **expiry day**, then the best strikes to opt are ATM i.e 8000 (lower strike, long) and 8300 (higher strike, short). Do note, far OTM options lose money even if the market moves up.

2.3 – Creating Spreads

Here is something you should know, wider the spread, higher is the amount of money you can potentially make, but as a trade off the breakeven also increases.

To illustrate –

Today is 28th November, the first day of the December series. Nifty spot is at 7883, consider 3 different bull call spreads –

Set 1 – Bull call spread with ITM and ATM strikes

Lower Strike (ITM, Long)	7700
Higher Strike (ATM, short)	7800
Spread	7800 – 7700 = 100
Lower Strike Premium Paid	296
Higher Strike Premium Received	227
Net Debit	296 – 227 = 69
Max Loss (same as net debit)	69
Max Profit (Spread – Net Debit)	100 – 69 = 31
Breakeven	7700 + 69 = 7769

Remarks	Considering the outlook is moderately bullish, 7769 breakeven is easily achievable, however the max profit is 31, skewing the risk (69 pts) to reward (31 pts) ratio.

Set 2 – Bull call spread with ATM and OTM strikes (classic combo)

Lower Strike (ATM, Long)	**7800**
Higher Strike (ATM, short)	7900
Spread	7900 – 7800 = 100
Lower Strike Premium Paid	227
Higher Strike Premium Received	167
Net Debit	227 - 167 = 60
Max Loss (same as net debit)	60
Max Profit (Spread – Net Debit)	100 – 60 = 40
Breakeven	7800 + 60 = 7860
Remarks	Risk reward is better, but the breakeven is higher

Set 3 – Bull call spread with OTM and OTM strikes

Lower Strike (ATM, Long)	**7900**
Higher Strike (ATM, short)	8000
Spread	8000 – 7900 = 100
Lower Strike Premium Paid	167
Higher Strike Premium Received	116
Net Debit	167 - 116 = 51
Max Loss (same as net debit)	51
Max Profit (Spread – Net Debit)	100 – 51 = 49
Breakeven	7900 + 51 = 7951
Remarks	Risk reward is attractive, but the breakeven is higher

So the point is that, the risk reward changes based on the strikes that you choose. However don't just let the risk reward dictate the strikes that you choose. Do note you can create a bull call spread with 2 options, for example - buy 2 ATM options and sell 2 OTM options.

Like other things in options trading, do consider the Greeks, Theta in particular!

I suppose this chapter has laid a foundation for understanding basic 'spreads'. Going forward I will assume you are familiar with what a moderately bullish/bearish move would mean, hence I would probably start directly with the strategy notes.

Key takeaways from this chapter

1. A moderate move would mean you expect a movement in the stock/index but the outlook is not too aggressive
2. One has to quantify 'moderate' by evaluating the volatility of the stock/index
3. Bull Call spread is a basic spread that you can set up when the outlook is moderately bullish
4. Classic bull call spread involves buying ATM option and selling OTM option – all belonging to same expiry, same underlying, and equal quantity
5. The theta plays an important role in strike selection
6. The risk reward gets skewed based on the strikes you choose

Download the Bull Call Spread Excel sheet.

CHAPTER 3

Bull Put Spread

3.1 – Why Bull Put Spread?

Similar to the Bull Call Spread, the Bull Put Spread is a two leg option strategy invoked when the view on the market is 'moderately bullish'. The Bull Put Spread is similar to the Bull Call Spread in terms of the payoff structure; however there are a few differences in terms of strategy execution and strike selection. The bull put spread involves creating a spread by employing 'Put options' rather than 'Call options' (as is the case in bull call spread).

You may have a fundamental question at this stage – when the payoffs from both Bull call spread and Bull Put spread are similar, why should one choose a certain strategy over the other?

Well, this really depends on how attractive the premiums are. While the Bull Call spread is executed for a **debit**, the bull put spread is executed for a **credit**. So if you are at a point in the market where –

1. The markets have declined considerably (therefore PUT premiums have swelled)
2. The volatility is on the higher side
3. There is plenty of time to expiry

And you have a moderately bullish outlook looking ahead, then it makes sense to invoke a Bull Put Spread for a net credit as opposed to invoking a Bull Call Spread for a net debit. Personally I do prefer strategies which offer net credit rather than strategies which offer net debit.

3.2 – Strategy Notes

The bull put spread is a two leg spread strategy traditionally involving ITM and OTM Put options. However you can create the spread using other strikes as well.

To implement the bull put spread –

1. Buy 1 OTM Put option (leg 1)
2. Sell 1 ITM Put option (leg 2)

When you do this ensure –

1. All strikes belong to the same underlying
2. Belong to the same expiry series
3. Each leg involves the same number of options

For example –

Date – 7th December 2015

Outlook – Moderately bullish (expect the market to go higher)

Nifty Spot – 7805

Bull Put Spread, trade set up -

1. **Buy 7700 PE** by paying Rs.72/- as premium; do note this is an OTM option. Since money is going out of my account this is a debit transaction
2. **Sell 7900 PE** and receive Rs.163/- as premium, do note this is an ITM option. Since I receive money, this is a credit transaction
3. The net cash flow is the difference between the debit and credit i.e 163 – 72 = **+91,** since this is a positive cashflow, there is a net credit to my account.

Generally speaking in a bull put spread there is always a 'net credit', hence the bull put spread is also called referred to as a 'Credit spread'.

After we initiate the trade, the market can move in any direction and expiry at any level. Therefore let us take up a few scenarios to get a sense of what would happen to the bull put spread for different levels of expiry.

Scenario 1 - Market expires at 7600 (below the lower strike price i.e OTM option)

The value of the Put options at expiry depends upon its intrinsic value. If you recall from the previous module, the intrinsic value of a put option upon expiry is –

Max [Strike-Spot, 0]

In case of 7700 PE, the intrinsic value would be –

Max [7700 - 7600 – 0]

= Max [100, 0]

= 100

Since we are long on the 7700 PE by paying a premium of Rs.72, we would make

= Premium Paid – Intrinsic Value

= 100 – 72

= 28

Likewise, in case of the 7900 PE option it has an intrinsic value of 300, but since we have sold/written this option at Rs.163

Payoff from 7900 PE this would be –

163 - 300

= - **137**

Overall strategy payoff would be –

+ 28 – 137

= **- 109**

Scenario 2 - Market expires at 7700 (at the lower strike price i.e the OTM option)

The 7700 PE will not have any intrinsic value, hence we will lose all the premium that we have paid i.e Rs.72.

The 7900 PE's intrinsic value will be Rs.200.

Net Payoff from the strategy would be –

Premium received from selling 7900PE - Intrinsic value of 7900 PE – Premium lost on 7700 PE

= 163 – 200 – 72

= **- 109**

Scenario 3 - Market expires at 7900 (at the higher strike price, i.e ITM option)

The intrinsic value of both 7700 PE and 7900 PE would be 0, hence both the potions would expire worthless.

Net Payoff from the strategy would be –

Premium received for 7900 PE - Premium Paid for 7700 PE

= 163 – 72

= + **91**

Scenario 4 - Market expires at 8000 (above the higher strike price, i.e the ITM option)

Both the options i.e 7700 PE and 7900 PE would expire worthless, hence the total strategy payoff would be

Premium received for 7900 PE - Premium Paid for 7700 PE

= 163 – 72

= + **91**

To summarize –

Market Expiry	7700 PE (intrinsic value)	7900 PE (intrinsic value)	Net pay off
7600	100	300	-109
7700	0	200	-109
7900	0	0	91
8000	0	0	91

From this analysis, 3 things should be clear to you –

1. The strategy is profitable as and when the market moves higher
2. Irrespective of the down move in the market, the loss is restricted to Rs.109, the maximum loss also happens to be the difference between "**Spread and net credit**' of the strategy
3. The maximum profit is capped to 91. This also happens to be the **net credit** of the strategy.

We can define the '**Spread**' as -

Spread = Difference between the higher and lower strike price

We can calculate the overall profitability of the strategy for any given expiry value. Here is screenshot of the calculations that I made on the excel sheet –

Market Expiry	LS - IV	PP	LS Payoff	HS - IV	PR	HS Payoff	Strategy Payoff
7000	700	-72	628	900	163	-737	-109
7100	600	-72	528	800	163	-637	-109
7200	500	-72	428	700	163	-537	-109
7300	400	-72	328	600	163	-437	-109
7400	300	-72	228	500	163	-337	-109
7500	200	-72	128	400	163	-237	-109
7600	100	-72	28	300	163	-137	-109
7700	0	-72	-72	200	163	-37	-109
7800	0	-72	-72	100	163	63	-9
7900	0	-72	-72	0	163	163	91
8000	0	-72	-72	0	163	163	91
8100	0	-72	-72	0	163	163	91
8200	0	-72	-72	0	163	163	91
8300	0	-72	-72	0	163	163	91
8400	0	-72	-72	0	163	163	91
8500	0	-72	-72	0	163	163	91

- *LS – IV --- Lower Strike - Intrinsic value (7700 PE, OTM)*
- *PP --- Premium Paid*
- *LS Payoff --- Lower Strike Payoff*
- *HS-IV --- Higher strike - Intrinsic Value (7900 PE, ITM)*
- *PR --- Premium Received*
- *HS Payoff --- Higher Strike Payoff*

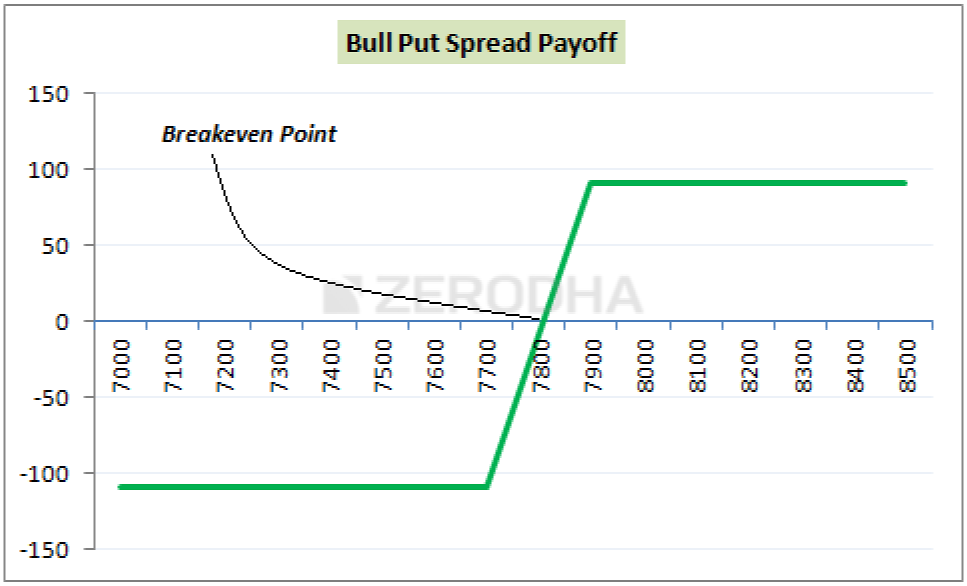
As you can notice, the loss is restricted to Rs.109, and the profit is capped to Rs.91. Given this, we can generalize the Bull Put Spread to identify the Max loss and Max profit levels as -

Bull PUT Spread Max loss = Spread – Net Credit

Net Credit = Premium Received for higher strike – Premium Paid for lower strike

Bull Put Spread Max Profit = Net Credit

This is how the pay off diagram of the Bull Put Spread looks like –



There are three important points to note from the payoff diagram –

1. The strategy makes a loss if Nifty expires below 7700. However the loss is restricted to Rs.109.
2. The breakeven point (where the strategy neither make a profit or loss) is achieved when the market expires at 7809. Therefore we can generalize the breakeven point for a Bull Put spread as **Higher Strike - Net Credit**
3. The strategy makes money if the market moves above 7809, however the maximum profit achievable is Rs.91 i.e the difference between the Premium Received for ITM PE and the Premium Paid for the OTM PE

    1. Premium Paid for 7700 PE = 72
    2. Premium Received for 7900 PE = 163
    3. Net Credit = 163 – 72 = 91

3.3 – Other Strike combinations

Remember the **spread** is defined as the difference between the two strike prices. The Bull Put Spread is always created with 1 OTM Put and 1 ITM Put option, however the strikes that you choose can be any OTM and any ITM strike. The further these strikes are the larger the spread, the larger the spread the larger is possible reward.

Let us take some examples considering spot is at 7612 –

Bull Put spread with 7500 PE (OTM) and 7700 PE (ITM)

Lower Strike (OTM, Long)	**7500**
Higher Strike (ITM, short)	7700
Spread	7700 – 7500 = **200**
Lower Strike Premium Paid	62
Higher Strike Premium Received	137
Net Credit	137 – 62 = **75**
Max Loss (Spread – Net Credit)	200 – 75 = **125**
Max Profit (Net Credit)	75
Breakeven (Higher Strike – Net Credit)	7700 – 75 = **7625**

Bull Put spread with 7400 PE (OTM) and 7800 PE (ITM)

Lower Strike (OTM, Long)	**7400**
Higher Strike (ITM, short)	7800
Spread	7800 – 7400 = **400**
Lower Strike Premium Paid	40
Higher Strike Premium Received	198
Net Credit	198 – 40 = **158**
Max Loss (Spread – Net Credit)	400 – 158 = 242
Max Profit (Net Credit)	158
Breakeven (Higher Strike – Net Credit)	7800 – 158 = **7642**

Bull Put spread with 7500 PE (OTM) and 7800 PE (ITM)

Lower Strike (OTM, Long)	**7500**
Higher Strike (ITM, short)	7800
Spread	7800 – 7500 = **300**
Lower Strike Premium Paid	62
Higher Strike Premium Received	198
Net Credit	198 – 62 = **136**
Max Loss (Spread – Net Credit)	300 – 136 = 164
Max Profit (Net Credit)	136
Breakeven (Higher Strike – Net Credit)	7800 – 136 = **7664**

So the point here is that, you can create the spread with any combination of OTM and ITM option. However based on the strikes that you choose (and therefore the spread you create), the risk reward ratio changes. In general, if you have a high conviction on a 'moderately bullish' view then go ahead and create a larger spread; else stick to a smaller spread.

Download the Bull Put Spread excel.

Key takeaways from this chapter

1. The Bull Put Spread is an alternative to the Bull Call Spread. Its best executed when the outlook on the market is 'moderately bullish'
2. Bull Put Spread results in a net credit
3. The Bull Put Spread is best executed when the market has cracked, put premiums are high, the volatility is on the higher side, and you expect the market to hold up (without cracking further)
4. The Bull Put strategy involves simultaneously buying a OTM Put option and selling a ITM Put option
5. Maximum profit is limited to the extent of the net credit
6. Maximum loss is limited to the Spread minus Net credit
7. Breakeven is calculated as Higher Strike – Net Credit
8. One can create the spread by employing any OTM and ITM strikes
9. Higher the spread, higher the profit potential, and higher the breakeven point.

Call Ratio Back Spread

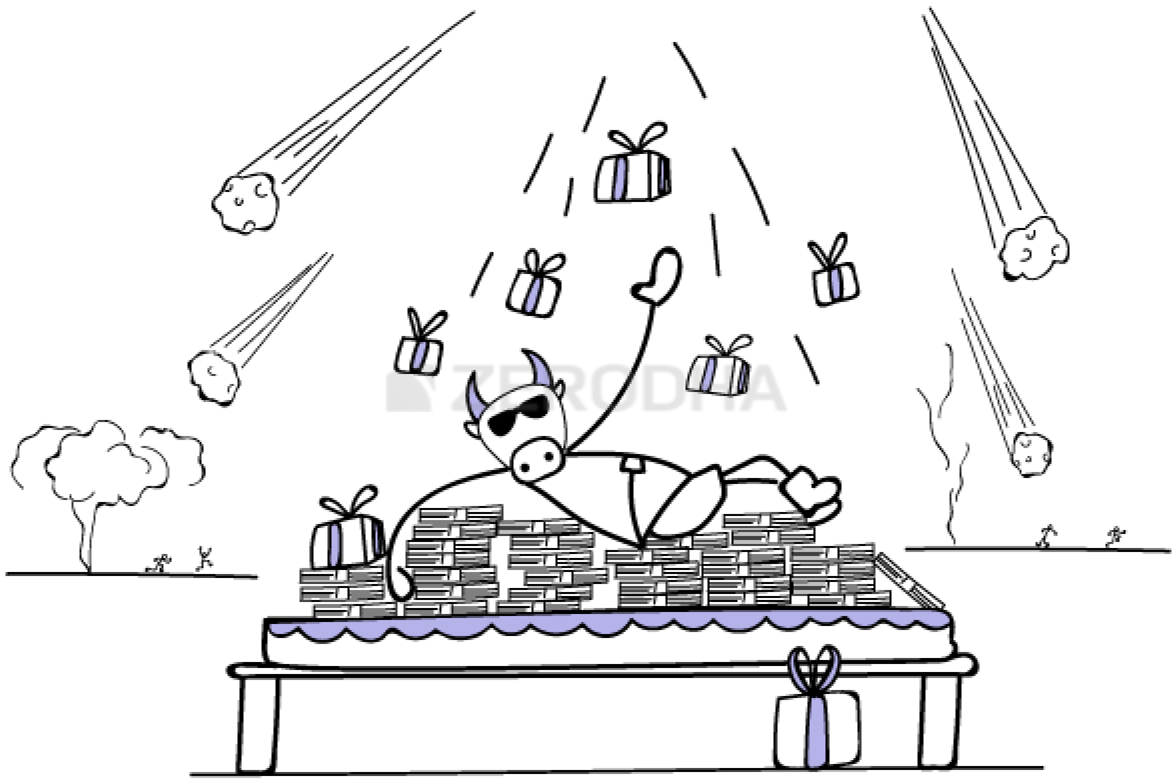
4.1 – Background

The Call Ratio Back Spread is an interesting options strategy. I call this interesting keeping in mind the simplicity of implementation and the kind of pay off it offers the trader. This should certainly have a spot in your strategy arsenal. The strategy is deployed when one is out rightly bullish on a stock (or index), unlike the bull call spread or bull put spread where one is moderately bullish.

At a broad level this is what you will experience when you implement the Call Ratio Back Spread-

1. Unlimited profit if the market goes up
2. Limited profit if market goes down
3. A predefined loss if the market stay within a range

In simpler words you can get to make money as long as the market moves in either direction.



Usually, the Call Ratio Back Spread is deployed for a ‘net credit’, meaning money flows into your account as soon as you execute Call Ratio Back Spread. The ‘net credit’ is what you make if the market goes down, as opposed to your expectation (i.e market going up). On the other hand if the market indeed goes up, then you stand to make an unlimited profit. I suppose this should also explain why the call ratio spread is better than buying a plain vanilla call option.

So let’s go ahead and figure out how this works.

4.2 – Strategy Notes

The Call Ratio Back Spread is a 3 leg option strategy as it involves **buying two OTM** call option and **selling one ITM** Call option. This is the classic 2:1 combo. In fact the call ratio back spread has to be executed in the 2:1 ratio meaning 2 options bought for every one option sold, or 4 options bought for every 2 option sold, so on and so forth.

Let take an example - assume Nifty Spot is at 7743 and you expect Nifty to hit 8100 by the end of expiry. This is clearly a bullish outlook on the market. To implement the Call Ratio Back Spread -

1. Sell **one** lot of 7600 CE (ITM)
2. Buy **two** lots of 7800 CE (OTM)

Make sure –

1. The Call options belong to the same expiry
2. Belongs to the same underlying
3. The ratio is maintained

The trade set up looks like this –

1. 7600 CE, one lot short, the premium received for this is Rs.201/-
2. 7800 CE, two lots long, the premium paid is Rs.78/- per lot, so Rs.156/- for 2 lots
3. Net Cash flow is = Premium Received – Premium Paid i.e 201 – 156 = **45** (Net Credit)

With these trades, the call ratio back spread is executed. Let us check what would happen to the overall cash flow of the strategies at different levels of expiry.

Do note we need to evaluate the strategy payoff at various levels of expiry as the strategy payoff is quite versatile.

Scenario 1 – Market expires at 7400 (below the lower strike price)

We know the intrinsic value of a call option (upon expiry) is –

Max [Spot – Strike, 0]

The 7600 would have an intrinsic value of

Max [7400 – 7600, 0]

= 0

Since we have sold this option, we get to retain the premium received i.e Rs.201

The intrinsic value of 7800 call option would also be zero; hence we lose the total premium paid i.e Rs.78 per lot or Rs.156 for two lots.

Net cash flow would Premium Received – Premium paid

= 201 – 156

= **45**

Scenario 2 – Market expires at 7600 (at the lower strike price)

The intrinsic value of both the call options i.e 7600 and 7800 would be zero, hence both of them expire worthless.

We get to retain the premium received i.e Rs.201 towards the 7600 CE however we lose Rs.156 on the 7800 CE resulting in a net payoff of **Rs.45.**

Scenario 3 – Market expires at 7645 (at the lower strike price plus net credit)

You must be wondering why I picked the 7645 level, well this is to showcase the fact that the strategy break even is at this level.

The intrinsic value of 7600 CE would be –

Max [Spot – Strike, 0]

= [7645 – 7600, 0]

= 45

Since, we have sold this option for 201 the net pay off from the option would be

201 – 45

= 156

On the other hand we have bought two 7800 CE by paying a premium of 156. Clearly the 7800 CE would expire worthless hence, we lose the entire premium.

Net payoff would be –

156 – 156

= **0**

So at 7645 the strategy neither makes money or loses any money for the trader, hence 7645 is treated as a breakeven point for this trade.

Scenario 4 – Market expires at 7700 (half way between the lower and higher strike price)

The 7600 CE would have an intrinsic value of 100, and the 7800 would have no intrinsic value.

On the 7600 CE we get to retain 101, as we would lose 100 from the premium received of 201 i.e 201 – 100 = 101.

We lose the entire premium of Rs.156 on the 7800 CE, hence the total payoff from the strategy would be

= 101 – 156

= **- 55**

Scenario 5 – Market expires at 7800 (at the higher strike price)

This is an interesting market expiry level, think about it –

1. At 7800 the 7600 CE would have an intrinsic value of 200, and hence we have to let go of the entire premium received i.e 201
2. At 7800, the 7800 CE would expire worthless hence we lose the entire premium paid for the 7800 CE i.e Rs.78 per lot, since we have 2 of these we lose Rs.156

So this is like a 'double whammy' point for the strategy!

The net pay off for the strategy is –

Premium Received for 7600 CE – Intrinsic value of 7600 CE – Premium Paid for 7800 CE

= 201 – 200 - 156

= **-155**

This also happens to be the maximum loss of this strategy.

Scenario 6 – Market expires at 7955 (higher strike i.e 7800 + Max loss)

I've deliberately selected this strike to showcase the fact that at 7955 the strategy breakeven!

But we dealt with a breakeven earlier, you may ask?

Well, this strategy has two breakeven points – one on the lower side (7645) and another one on the upper side i.e 7955.

At 7955 the net payoff from the strategy is –

Premium Received for 7600 CE – Intrinsic value of 7600 CE + (2* Intrinsic value of 7800 CE) – Premium Paid for 7800 CE

= 201 – 355 + (2*155) – 156

= 201 – 355 + 310 – 156

= **0**

Scenario 7 – Market expires at 8100 (higher than the higher strike price, your expected target)

The 7600 CE will have an intrinsic value of 500, and the 7800 CE will have an intrinsic value of 300.

The net payoff would be –

Premium Received for 7600 CE – Intrinsic value of 7600 CE + (2* Intrinsic value of 7800 CE) – Premium Paid for 7800 CE

= 201 – 500 + (2*300) – 156

= 201 – 500 + 600 -156

= **145**

Here are various other levels of expiry, and the eventual payoff from the strategy. Do note, as the market goes up, so does the profits, but when the market goes down, you still make some money, although limited.

Calculations

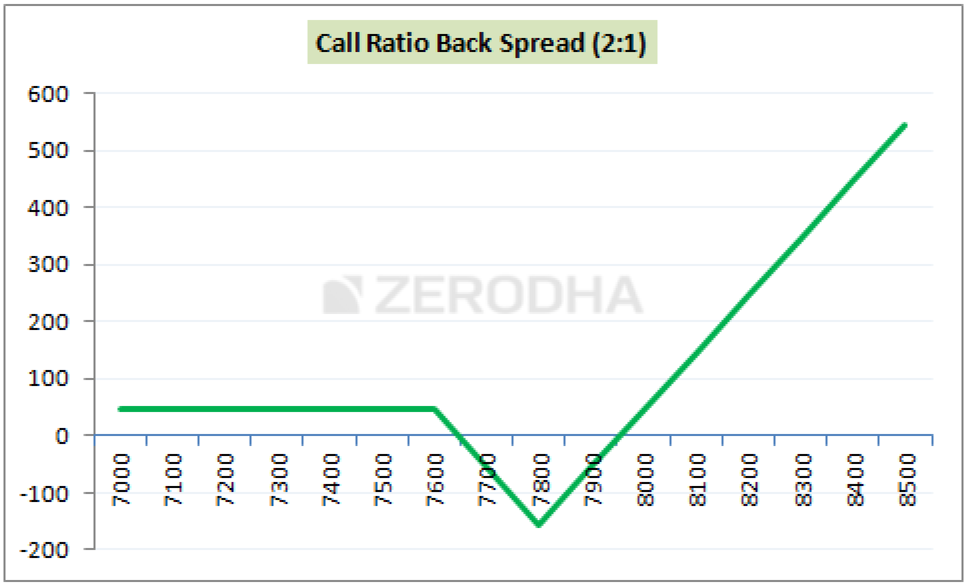
Market Expiry	LS - IV	PR	LS Payoff	HS - IV	PP	HS Payoff	Strategy Payoff
7000	0	201	201	0	156	-156	45
7100	0	201	201	0	156	-156	45
7200	0	201	201	0	156	-156	45
7300	0	201	201	0	156	-156	45
7400	0	201	201	0	156	-156	45
7500	0	201	201	0	156	-156	45
7600	0	201	201	0	156	-156	45
7700	100	201	101	0	156	-156	-55
7800	200	201	1	0	156	-156	-155
7900	300	201	-99	100	156	44	-55
8000	400	201	-199	200	156	244	45
8100	500	201	-299	300	156	444	145
8200	600	201	-399	400	156	644	245
8300	700	201	-499	500	156	844	345
8400	800	201	-599	600	156	1044	445
8500	900	201	-699	700	156	1244	545

4.3 – Strategy Generalization

Going by the above discussed scenarios we can make few generalizations –

- Spread = Higher Strike – Lower Strike
- Net Credit = Premium Received for lower strike – 2*Premium of higher strike
- Max Loss = Spread – Net Credit
- Max Loss occurs at = Higher Strike
- The payoff when market goes down = Net Credit
- Lower Breakeven = Lower Strike + Net Credit
- Upper Breakeven = Higher Strike + Max Loss

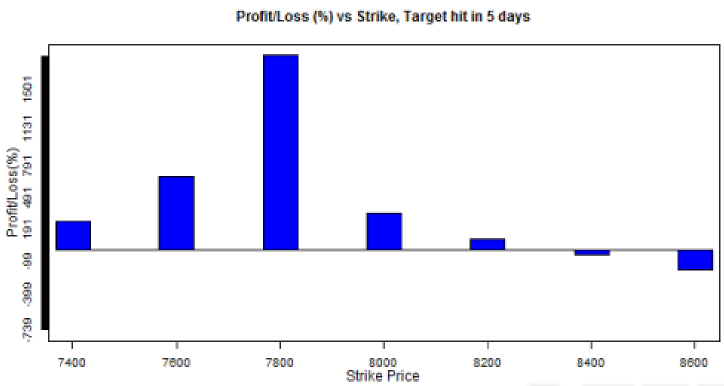
Here is a graph that highlights all these important points –

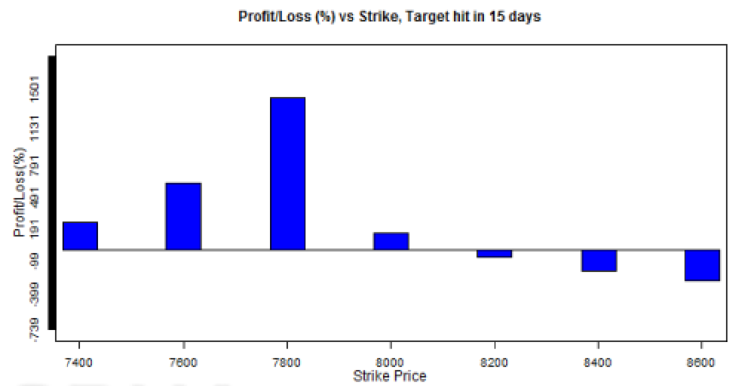


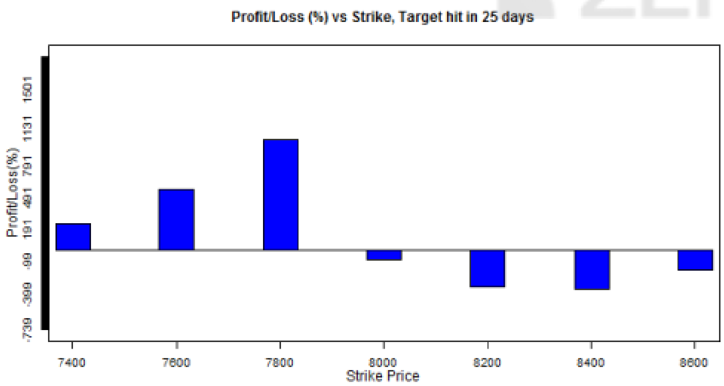
Notice how the payoff remains flat even when the market goes down, the maximum loss at 7800, and the way the payoff takes off beyond 7955.

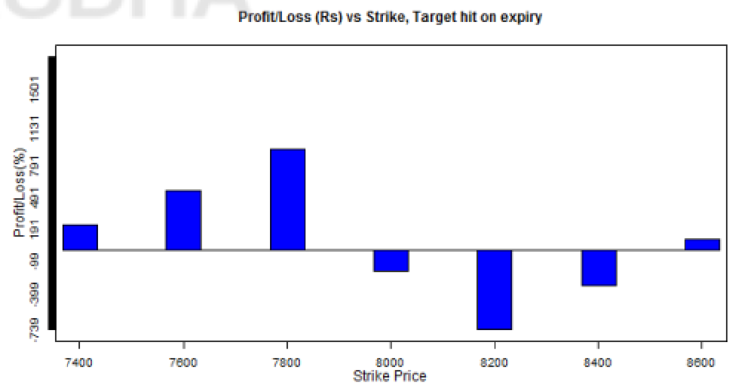
4.4 – Welcome back the Greeks

I suppose you are familiar with these graphs by now. The following graphs show the profitability of the strategy considering the time to expiry and therefore these graphs help the trader select the right strikes.









Before understanding the graphs above, note the following –

1. Nifty spot is assumed to be at 8000
2. Start of the series is defined as anytime during the first 15 days of the series
3. End of the series is defined as anytime during the last 15 days of the series
4. The Call Ratio Back Spread is optimized and the spread is created with 300 points difference

The thought here is that the market will move up by about 6.25% i.e from 8000 to 8500. So considering the move and the time to expiry, the graphs above suggest –

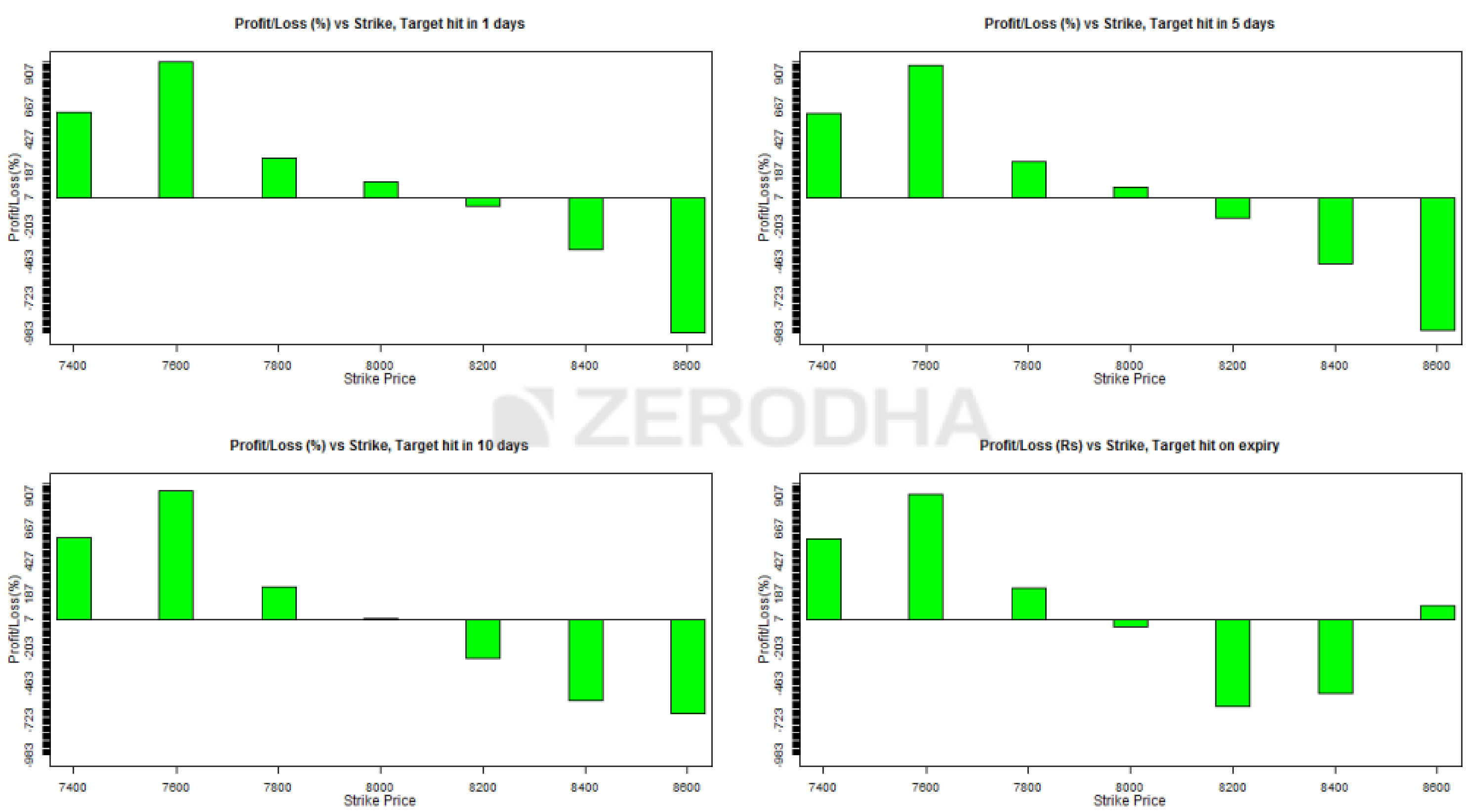
1. **Graph 1 (top left) and Graph 2 (top right)** - You are at the start of the expiry series and you expect the move over the next 5 days (and 15 days in case of Graph 2), then a Call Ratio Spread with 7800 CE (ITM) and 8100 CE (OTM) is the **most profitable** wherein you would sell 7800 CE and buy 2 8100 CE. Do note - even though

you would be right on the direction of movement, selecting other far OTM strikes call options tend to lose money

2. **Graph 3 (bottom left) and Graph 4 (bottom right)** - You are at the start of the expiry series and you expect the move in **25 days** (and expiry day in case of Graph 3), then a Call Ratio Spread with 7800 CE (ITM) and 8100 CE (OTM) is the most profitable wherein you would sell 7800 CE and buy 2 8100 CE.

You must be wondering that the selection of strikes is same irrespective of time to expiry. Well yes, in fact this is the point – Call ratio back spread works best when you sell slightly ITM option and buy slightly OTM option **when there is ample time to expiry**. In fact all other combinations lose money, especially the ones with far OTM options and especially when you expect the target to be achieved closer to the expiry.

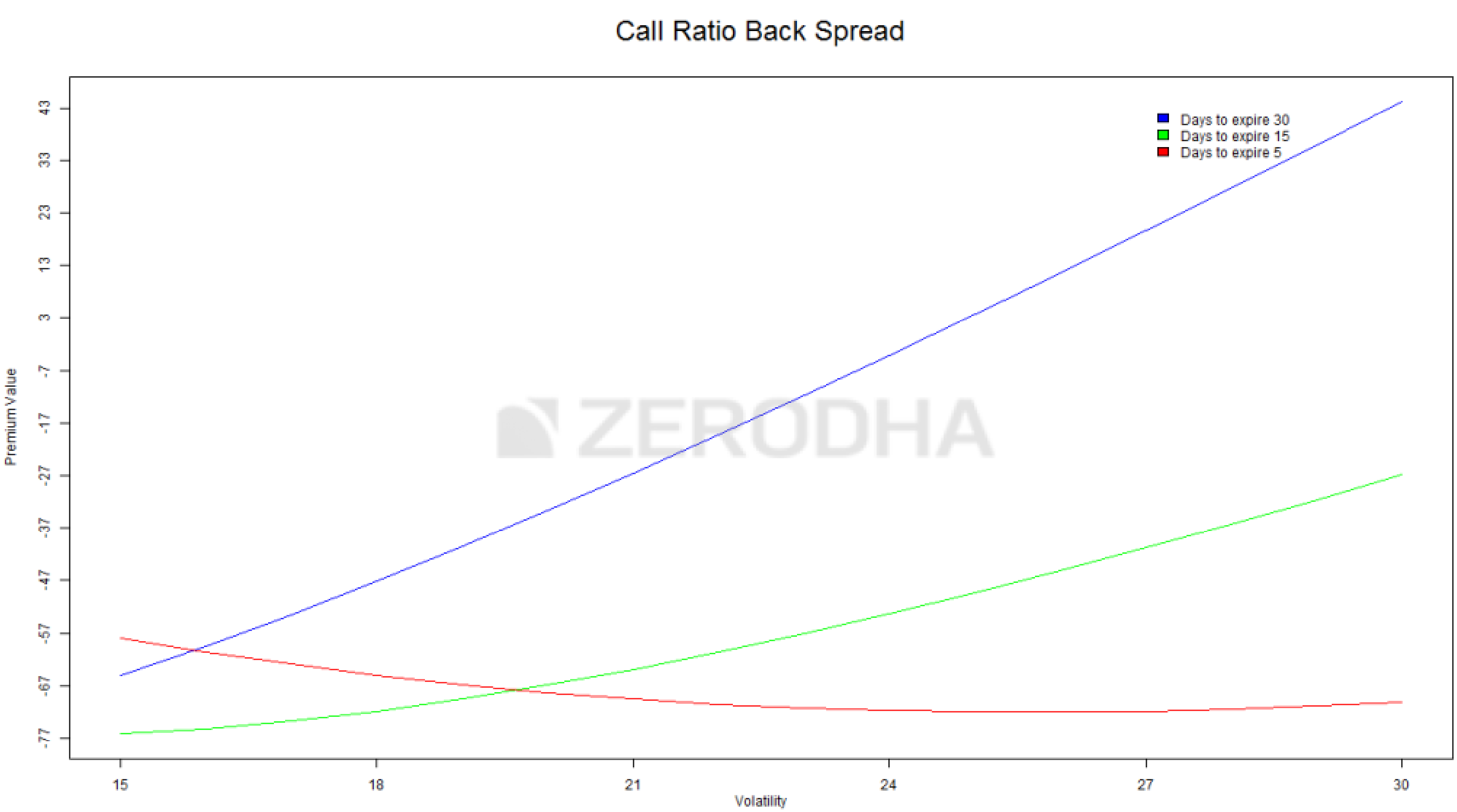
Here are another bunch of charts; the only difference is that the move (i.e 6.25%) occurs during the 2nd half of the series -



1. **Graph 1 (top left) & Graph 2 (top right)** – If you expect the move during the 2nd half of the series, and you expect the move to happen within **a day (or within 5 days, graph 2)** then the best strikes to opt are deep ITM and slightly ITM i.e 7600 (lower strike short) and 7900 (higher strike long). Do note, this is not the classic combo of an ITM + OTM spread, instead this is an ITM and ITM spread! In fact all other combinations don't work.
2. **Graph 3 (bottom right) & Graph 4 (bottom left)** - If you expect the move during the 2nd half of the series, and you expect the move to happen within **10 days (or on expiry day, graph 4)** then the best strikes to opt are deep ITM and slightly ITM i.e 7600 (lower strike short) and 7900 (higher strike long). This is similar to what graph 1 and graph 2 suggest.

Again, the point to note here is besides getting the direction right, the strike selection is the key to the profitability of this strategy. One needs to be diligent enough to map the time to expiry to the right strike to make sure that the strategy works in your favor.

What about the effect of volatility on this strategy? Well, volatility plays a key role here, have a look at the image below –



There are three colored lines depicting the change of "net premium" aka the strategy payoff versus change in volatility. These lines help us understand the effect of increase in volatility on the strategy keeping time to expiry in perspective.

1. **Blue Line** – This line suggests that an increase in volatility when there is ample time to expiry (30 days) is beneficial for the Call ratio back spread. As we can see the strategy payoff increases from -67 to +43 when the volatility increase from 15% to 30%. Clearly this means that when there is ample time to expiry, besides being right on the direction of stock/index you also need to have a view on volatility. For this reason, even though I'm bullish on the stock, I would be a bit hesitant to deploy this strategy at the start of the series if the volatility is on the higher side (say more than double of the usual volatility reading)
2. **Green line** - This line suggests that an increase in volatility when there are about 15 days time to expiry is beneficial, although not as much as in the previous case. As we can see the strategy payoff increases from -77 to -47 when the volatility increase from 15% to 30%.
3. **Red line –** This is an interesting, counter intuitive outcome. When there are very few days to expiry, increase in volatility has a negative impact on the strategy! Think about it, increase in volatility when there are few days to expiry enhances the possibility of the option to expiry OTM, hence the premium decreases. So, if you are bullish on a stock / index with few days to expiry, and you also expect the volatility to increase during this period then thread cautiously.

Download the Call Ratio Back spread Excelsheet.

Key takeaways from this chapter

1. The Call Ratio Backspread is best executed when your outlook on the stock/index is bullish
2. The strategy requires you to sell 1 ITM CE and buy 2 OTM CE, and this is to be executed in the same ratio i.e for every 1 sold option, 2 options have to be purchased
3. The strategy is usually executed for a 'net Credit'
4. The strategy makes limited money if the stock price goes down, and unlimited profit if the stock price goes up. The loss is pre defined
5. There are two break even points – lower breakeven and upper breakeven points

6. Spread = Higher Strike – Lower Strike
7. Net Credit = Premium Received for lower strike – 2*Premium of higher strike
8. Max Loss = Spread – Net Credit
9. Max Loss occurs at = Higher Strike
10. The payoff when market goes down = Net Credit
11. Lower Breakeven = Lower Strike + Net Credit
12. Upper Breakeven = Higher Strike + Max Loss
13. Irrespective of the time to expiry opt for slightly ITM + Slightly OTM combination of strikes
14. Increase in volatility is good for this strategy when there is more time to expiry, but when there is less time to expiry, increase in volatility is not really good for this strategy.

Bear Call Ladder

5.1 – Background

The 'Bear' in the "Bear Call Ladder" should not deceive you to believe that this is a bearish strategy. The Bear Call Ladder is an improvisation over the Call ratio back spread; this clearly means you implement this strategy when you are out rightly bullish on the stock/index.

In a Bear Call Ladder, the cost of purchasing call options is financed by selling an 'in the money' call option. Further, the Bear Call Ladder is also usually setup for a 'net credit', where the cash flow is invariably better than the cash flow of the call ratio back spread. However, do note that both these strategies showcase similar payoff structures but differ slightly in terms of the risk structure.

5.2 – Strategy Notes

The Bear Call Ladder is a 3 leg option strategy, usually setup for a "net credit", and it involves –

1. Selling 1 ITM call option
2. Buying 1 ATM call option
3. Buying 1 OTM call option

This is the classic Bear Call Ladder setup, executed in a 1:1:1 combination. The bear Call Ladder has to be executed in the 1:1:1 ratio meaning for every 1 ITM Call option sold, 1 ATM and 1 OTM Call option has to be bought. Other combination like 2:2:2 or 3:3:3 (so on and so forth) is possible.

Let's take an example - assume Nifty Spot is at 7790 and you expect Nifty to hit 8100 by the end of expiry. This is clearly a bullish outlook on the market. To implement the Bear Call Ladder -

1. Sell 1 ITM Call option
2. Buy 1 ATM Call option
3. Buy 1 OTM Call option

Make sure –

1. The Call options belong to the same expiry
2. Belongs to the same underlying
3. The ratio is maintained

The trade set up looks like this –

1. 7600 CE, one lot short, the premium received for this is Rs.247/-
2. 7800 CE, one lot long, the premium paid for this option is Rs.117/-
3. 7900 CE, one lot long, the premium paid for this option is Rs.70/-
4. The **net credit** would be 247-117-70 = **60**

With these trades, the bear call ladder is executed. Let us check what would happen to the overall cash flow of the strategies at different levels of expiry.

Do note we need to evaluate the strategy payoff at various levels of expiry as the strategy payoff is quite versatile.

Scenario 1 – Market expires at 7600 (below the lower strike price)

We know the intrinsic value of a call option (upon expiry) is –

Max [Spot – Strike, 0]

The 7600 would have an intrinsic value of

Max [7600 – 7600, 0]

= 0

Since we have sold this option, we get to retain the premium received i.e Rs.247/-

Likewise the intrinsic value of 7800 CE and 7900 CE would also be zero; hence we lose the premium paid i.e Rs.117 and Rs.70 respectively.

Net cash flow would Premium Received – Premium paid

= 247 – 117 - 70

= **60**

Scenario 2 – Market expires at 7660 (lower strike + net premium received)

The 7600 CE would have an intrinsic value of –

Max [Spot – Strike, 0]

The 7600 would have an intrinsic value of

Max [7660 – 7600, 0]

= 60

Since the 7600 CE is short, we will lose 60 from 247 and retain the balance

= 247 – 60

= 187

The 7800 and 7900 CE would expire worthless, hence we lose the premium paid i.e 117 and 70 respectively.

The total strategy payoff would be -

= 187 – 117 – 70

= 0

Hence at 7660, the strategy would neither make money nor lose money. Hence this is considered a (lower) breakeven point.

Scenario 3 – Market expires at 7700 (between the breakeven point and middle strike i.e 7660 and 7800)

The intrinsic value of 7600 CE would be –

Max [Spot – Strike, 0]

= [7700 – 7600, 0]

= 100

Since, we have sold this option for 247 the net pay off from the option would be

247 – 100

= 147

On the other hand we have bought 7800 CE and 7900 CE, both of which would expire worthless, hence we lose the premium paid for these options i.e 117 and 70 respectively -

Net payoff from the strategy would be –

147 – 117 – 70

= **- 40**

Scenario 4 – Market expires at 7800 (at the middle strike price)

Pay attention here, as this is where the tragedy strikes!

The 7600 CE would have an intrinsic value of 200, considering we have written this option for a premium of Rs.247, we stand to lose the intrinsic value which is Rs.200.

Hence on the 7600 CE, we lose 200 and retain -

247 – 200

= 47/-

Both 7800 CE and 7900 CE would expire worthless, hence the premium that we paid goes waste, i.e 117 and 70 respectively. Hence our total payoff would be –

47 – 117 – 70

= **-140**

Scenario 5 – Market expires at 7900 (at the higher strike price)

Pay attention again, tragedy strikes again

The 7600 CE would have an intrinsic value of 300, considering we have written this option for a premium of Rs.247, we stand to lose all the premium value plus more.

Hence on the 7600 CE, we lose -

247 - 300

= -53

Both 7800 CE would have an intrinsic value of 100, considering we have paid a premium of Rs.117, the pay off for this option would be -

100 – 117

= - 17

Finally 7900 CE would expire worthless, hence the premium paid i.e 70 would go waste. The final strategy payoff would be –

-53 – 17 – 70

= **-140**

Do note, the loss at both 7800 and 7900 is the same.

Scenario 6 – Market expires at 8040 (sum of long strike minus short strike minus net premium)

Similar to the call ratio back spread, the bear call ladder has two breakeven points i.e the upper and lower breakeven. We evaluated the lower breakeven earlier (scenario 2), and this is the upper breakeven point. The upper breakeven is estimated as –

(7900 + 7800) – 7600 – 60

= 15700 – 7600 - 60

= 8100 – 60

= 8040

Do note, both 7900 and 7800 are strikes we are long on, and 7600 is the strike we are short on. 60 is the net credit.

So at 8040, all the call options would have an intrinsic value –

7600 CE would have an intrinsic value of 8040 – 7600 = 440, since we are short on this at 247, we stand to lose 247 - 440 = **-193.**

7800 CE would have an intrinsic value of 8040 – 7800 = 240, since we are long on this at 117, we make 240 – 117 = **+123**

7900 CE would have an intrinsic value of 8040 – 7900 = 140, since we are long on this at 70, we make 140 – 70 = **+70**

Hence the total payoff from the Bear Call Ladder would be –

-193 + 123 + 70

= **0**

Hence at 8040, the strategy would neither make money nor lose money. Hence this is considered a (upper) breakeven point.

Do note, at 7800 and 7900 the strategy was making a loss and at 8040 the strategy broke even. This should give you a sense that beyond 8040, the strategy would make money. Lets just validate this with another scenario.

Scenario 7 – Market expires at 8300

At 8300 all the call options would have an intrinsic value.

7600 CE would have an intrinsic value of 8300 – 7600 = 700, since we are short on this at 247, we stand to lose 247 - 700 = **-453.**

7800 CE would have an intrinsic value of 8300 – 7800 = 500, since we are long on this at 117, we make 500 – 117 = **+383**

7900 CE would have an intrinsic value of 8300 – 7900 = 400, since we are long on this at 70, we make 400 - 70 = **+330**

Hence the total payoff from the Bear Call Ladder would be –

-453 + 383 + 330

= **260**

As you can imagine, the higher the market move, the higher is the profit potential. Here is a table that gives you the payoffs at various levels.

Calculations

Market Expiry	LS_IV (ITM)	PR	Payoff	HS_IV (ATM)	PP	Payoff	HS_IV (OTM)	PP	Payoff	Net Payoff
7000	0	247	247	0	-117	-117	0	-70	-70	60
7100	0	247	247	0	-117	-117	0	-70	-70	60
7200	0	247	247	0	-117	-117	0	-70	-70	60
7300	0	247	247	0	-117	-117	0	-70	-70	60
7400	0	247	247	0	-117	-117	0	-70	-70	60
7500	0	247	247	0	-117	-117	0	-70	-70	60
7600	0	247	247	0	-117	-117	0	-70	-70	60
7700	100	247	147	0	-117	-117	0	-70	-70	-40
7800	200	247	47	0	-117	-117	0	-70	-70	-140
7900	300	247	-53	100	-117	-17	0	-70	-70	-140
8000	400	247	-153	200	-117	83	100	-70	30	-40
8100	500	247	-253	300	-117	183	200	-70	130	60
8200	600	247	-353	400	-117	283	300	-70	230	160
8300	700	247	-453	500	-117	383	400	-70	330	260
8400	800	247	-553	600	-117	483	500	-70	430	360
8500	900	247	-653	700	-117	583	600	-70	530	460
8600	1000	247	-753	800	-117	683	700	-70	630	560
8700	1100	247	-853	900	-117	783	800	-70	730	660

Do notice, when the market goes below you stand to make a modest gain of 60 points, but when the market moves up the profits are uncapped.

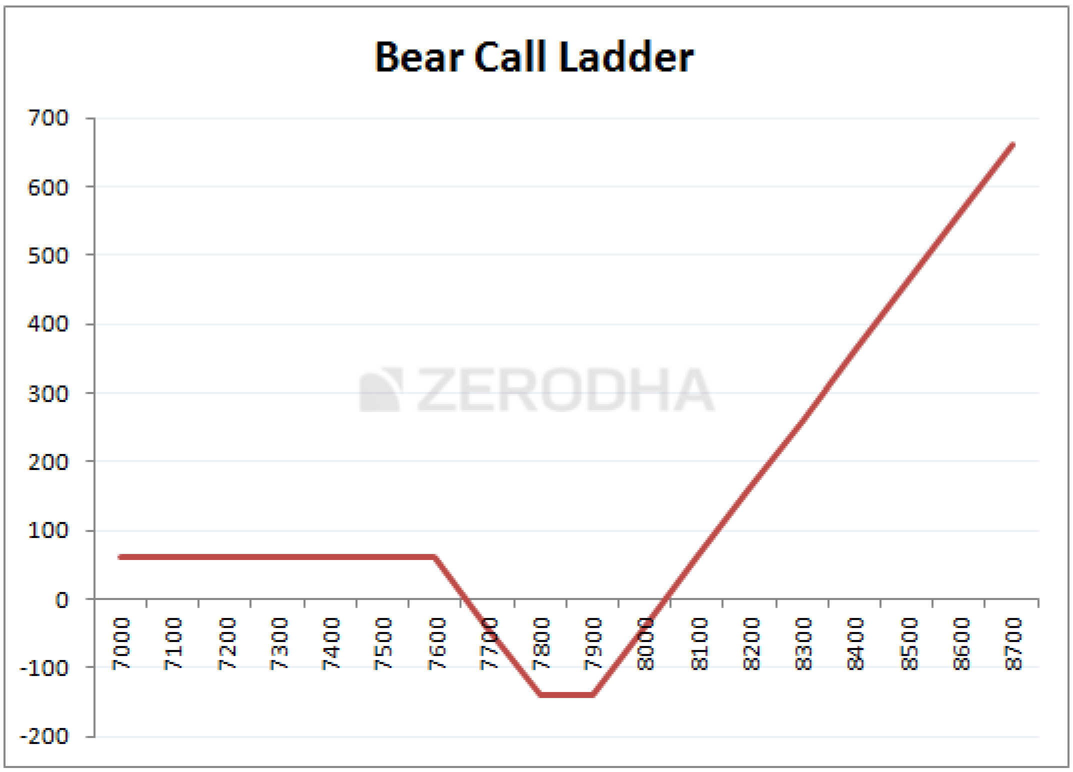
5.3 – Strategy Generalization

Going by the above discussed scenarios we can make few generalizations –

- Spread = technically this is a ladder and not really a spread. However the 1st two option legs creates a classic "spread" wherein we sell ITM and buy ATM. Hence the spread could be taken as the difference between the ITM and ITM options. In this case it would be 200 (7800 – 7600)

- Net Credit = Premium Received from ITM CE – Premium paid to ATM & OTM CE
- Max Loss = Spread (difference between the ITM and ITM options) – Net Credit
- Max Loss occurs at = ATM and OTM Strike
- The payoff when market goes down = Net Credit
- Lower Breakeven = Lower Strike + Net Credit
- Upper Breakeven = Sum of Long strike minus short strike minus net premium

Here is a graph that highlights all these important points –

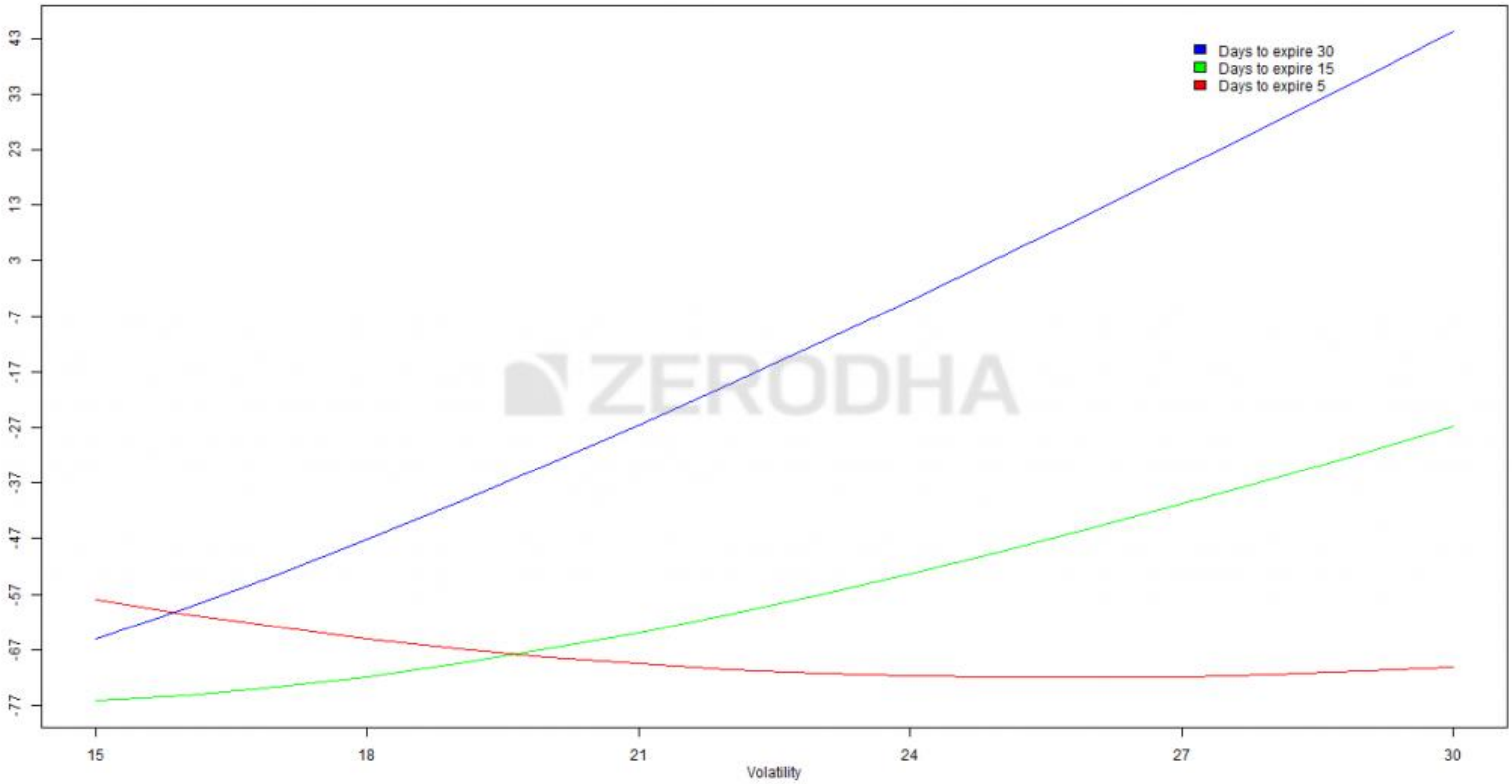


Notice how the strategy makes a loss between 7660 and 8040, but ends up making a huge profit if the market moves past 8040. Even if the market goes down you still end up making a modest profit. But you are badly hit if the market does not move at all. Given this characteristics of the Bear Call Ladder, I would suggest you implement the strategy only when you are absolutely sure that the market will move, irrespective of the direction.

From my experience, I believe this strategy is best executed on stocks (rather than index) when the quarterly results are due.

5.4 – Effect of Greeks

The effect of Greeks on this strategy is very similar to the effect of Greeks on Call Ratio Back spread, especially the volatility bit. For your easy reference, I'm reproducing the discussion on volatility we had in the previous chapter.



There are three colored lines depicting the change of "net premium" aka the strategy payoff versus change in volatility. These lines help us understand the effect of increase in volatility on the strategy keeping time to expiry in perspective.

1. **Blue Line** – This line suggests that an increase in volatility when there is ample time to expiry (30 days) is beneficial for the Bear Call Ladder spread. As we can see the strategy payoff increases from -67 to +43 when the volatility increase from 15% to 30%. Clearly this means that when there is ample time to expiry, besides being right on the direction of stock/index you also need to have a view on volatility. For this reason, even though I'm bullish on the stock, I would be a bit hesitant to deploy this strategy at the start of the

series if the volatility is on the higher side (say more than double of the usual volatility reading)
2. **Green line** - This line suggests that an increase in volatility when there are about 15 days time to expiry is beneficial, although not as much as in the previous case. As we can see the strategy payoff increases from -77 to -47 when the volatility increase from 15% to 30%.
3. **Red line –** This is an interesting, counter intuitive outcome. When there are very few days to expiry, increase in volatility has a negative impact on the strategy! Think about it, increase in volatility when there are few days to expiry enhances the possibility of the option to expiry OTM, hence the premium decreases. So, if you are bullish on a stock / index with few days to expiry, and you also expect the volatility to increase during this period then thread cautiously.

Download the Bear Call Ladder excel.

Key takeaways from this chapter

1. Bear Call Ladder is an improvisation over the Call Ratio Spread
2. Invariably the cost of executing a bear call ladder is better than the Call Ratio Spread, but the range above which the market has to move also becomes large
3. The Bear Call Ladder is executed by selling 1 ITM CE, buying 1 ATM CE, and 1 OTM CE
4. Net Credit = Premium Received from ITM CE – Premium paid to ATM & OTM CE
5. Max Loss = Spread (difference between the ITM and ITM options) – Net Credit
6. Max Loss occurs at = ATM and OTM Strike
7. The payoff when market goes down = Net Credit
8. Lower Breakeven = Lower Strike + Net Credit
9. Upper Breakeven = Sum of Long strike minus short strike minus net premium
10. Execute the strategy only when you are convinced that the market will move significantly higher.

CHAPTER 6

Synthetic Long & Arbitrage

6.1 – Background

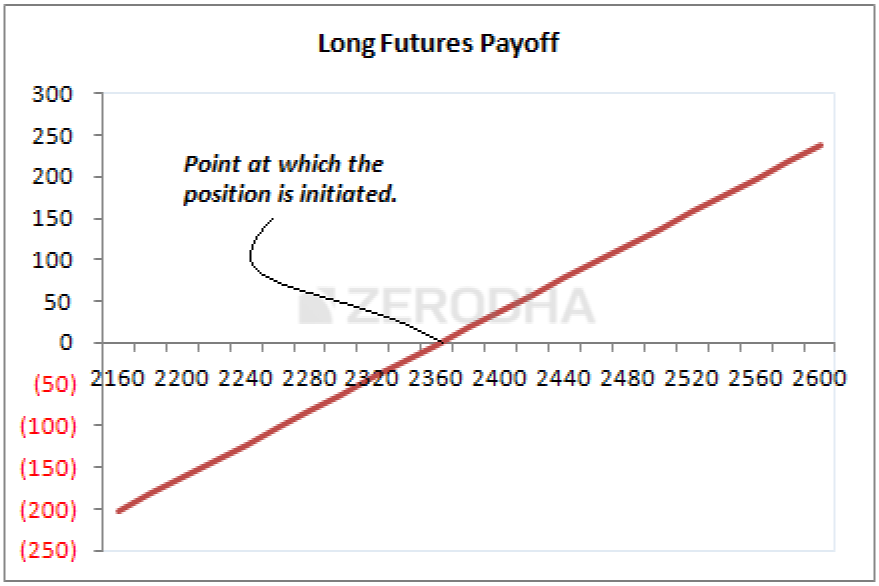
Imagine a situation where you would be required to simultaneously establish a long and short position on Nifty Futures, expiring in the same series. How would you do this and more importantly why would you do this?

We will address both these questions in this chapter. To begin with let us understand how this can be done and later move ahead to understand why one would want to do this (if you are curious, arbitrage is the obvious answer).

Options as you may have realized by now, are highly versatile derivative instruments; you can use these instruments to create any kind of payoff structure including that of the futures (both long and short futures payoff).

In this chapter we will understand how we can artificially replicate a long futures pay off using options. However before we proceed, you may want to just review the long Future's 'linear' payoff **here**

Alternatively, here is a quick overview –



As you can see, the long futures position has been initiated at 2360, and at that point you neither make money nor lose money, hence the point at which you initiate the position becomes the breakeven point. You make a profit as the futures move higher than the breakeven point and you make a loss the lower the futures move below the breakeven point. The amount of profit you make for a 10 point up move is exactly the same as the amount of loss you'd make for a 10 point down move. Because of this linearity in payoff, the future is also called a linear instrument.

The idea with a Synthetic Long is to build a similar long Future's payoff using options.

6.2 – Strategy Notes

Executing a Synthetic Long is fairly simple; all that one has to do is –

1. Buy the ATM Call Option
2. Sell the ATM Put Option

When you do this, you need to make sure –

1. The options belong to the same underlying
2. Belongs to the same expiry

Let us take an example to understand this better. Assume Nifty is at 7389, which would make 7400 the ATM strike. Synthetic Long would require us to go long on 7400 CE, the premium for this is Rs.107 and we would short the 7400 PE at 80.

The net cash outflow would be the difference between the two premiums i.e 107 – 80 = **27.**

Let us consider a few market expiry scenarios –

Scenario 1 – Market expires at 7200 (below ATM)

At 7200, the 7400 CE would expire worthless, hence we would lose the premium paid i.e Rs.107/-. However the 7400 PE would have an intrinsic value, which can be calculated as follows –

Intrinsic value of Put Option = Max [Strike-Spot, 0]

= Max [7400 – 7200, 0]

=Max [200, 0]

= 200.

Clearly, since we are short on this option, we would lose money from the premium we have received. The loss would be –

80 – 200 = -120

Total payoff from the long Call and short Put position would be –

= -107 – 120

= **-227**

Scenario 2 – Market expires at 7400 (At ATM)

If the market expires exactly at 7400, both the options would expire worthless and hence –

1. We lose the premium paid for the 7400 CE option i.e 107
2. We get the retain the premium for the 7400 PE option i.e 80
3. Net payoff from both the positions would be **-27**e 80 – 107

Do note, 27 also happens to be the net cash outflow of the strategy, which is also the difference between the two premiums

Scenario 3 – Market expires at 7427 (ATM + Difference between the two premiums)

7427 is an interesting level, this is the breakeven point for the strategy, where we neither make money nor lose money.

1. 7400 CE – the option is ITM and has an intrinsic value of 27. However we have paid 107 as premium hence we experience a total loss of 80
2. 7400 PE – the option would expire OTM, hence we get to retain the entire premium of 80.
3. On one hand we make 80 and the other we lose 80. Hence we neither make nor lose any money, making 7427 the **breakeven point** for this strategy.

Scenario 4 – Market expires at 7600 (above ATM)

At 7600, the 7400 CE would have an intrinsic value of 200, we would make -

Intrinsic value – Premium

= 200 – 107

= 93

The 7400 PE would expire worthless; hence we get to retain the entire premium of Rs.80.

Total payoff from the strategy would be –

= 93 + 80

= 173

With the above 4 scenarios, we can conclude that the strategy makes money while the market moves higher and loses money while the market goes lower, similar to futures. However this still does not necessarily mean that the payoff is similar to that of futures. To establish that the synthetic long payoff behaves similar to futures, we need evaluate the payoff of the strategy with reference to the breakeven point; let's say 200 point above and below the breakeven point. If the payoff is identical, then clearly there is linearity in the payoff, similar to futures.

So let's figure this out.

We know the breakeven point for this is –

ATM + difference between the premiums

= 7400 + 27

= **7427**

The payoff around this point should be symmetric. We will consider **7427 + 200 = 7627** and **7427-200 = 7227** for this.

At 7627 –

1. The 7400 CE would have an intrinsic value of 227, hence we get to make 227 – 107 = 120
2. The 7400 PE would expire worthless, hence we get to keep the entire premium of 80
3. In all we experience a payoff of 120 + 80 = **200**

At 7227 –

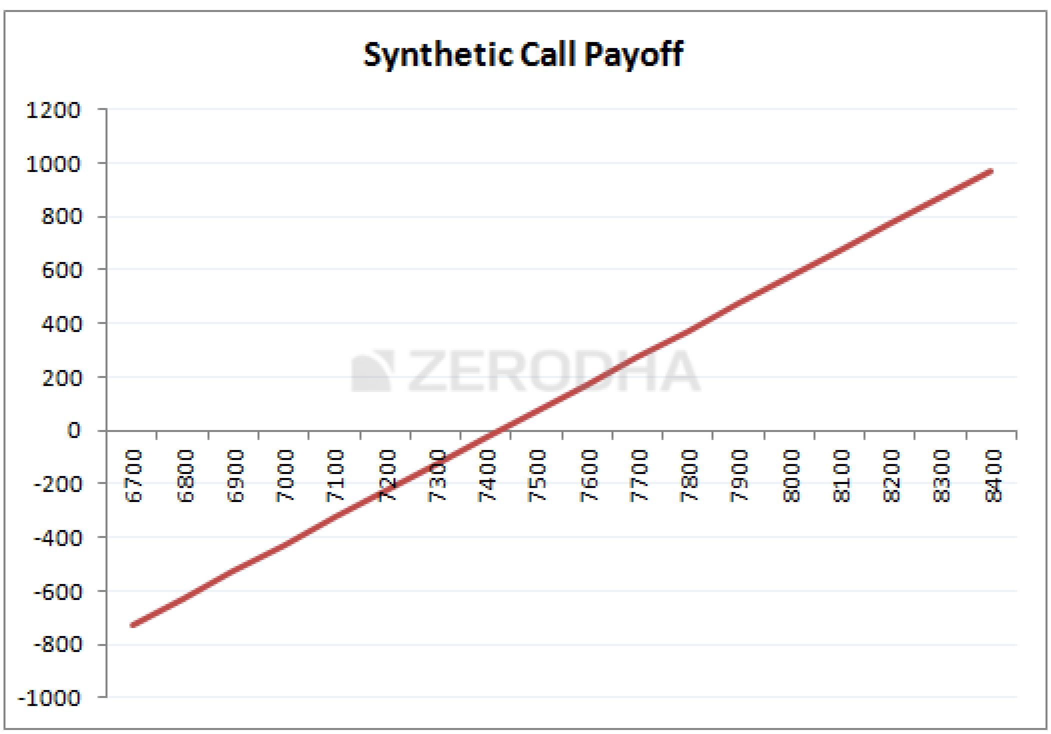
1. The 7400 CE would not have any intrinsic value, hence we lose the entire premium paid i.e 107
2. The 7400 PE would have an intrinsic value of 7400 – 7227 = 173, since we have received 80 as premium the net loss would be 80 – 173 = -93.
3. In all we experience a payoff of -93-107 = **-200**

Clearly, there is payoff symmetry around the breakeven, and for this reason, the **Synthetic Long mimics the payoff of the long futures instrument.**

Further, here is the payoff at various expiry levels –

Market Expiry	CE_IV (ATM)	PP	Payoff	PE_IV (OTM)	PP	Payoff	Net Payoff
6700	0	107	-107	700	80	-620	-727
6800	0	107	-107	600	80	-520	-627
6900	0	107	-107	500	80	-420	-527
7000	0	107	-107	400	80	-320	-427
7100	0	107	-107	300	80	-220	-327
7200	0	107	-107	200	80	-120	-227
7300	0	107	-107	100	80	-20	-127
7400	0	107	-107	0	80	80	-27
7500	100	107	-7	0	80	80	73
7600	200	107	93	0	80	80	173
7700	300	107	193	0	80	80	273
7800	400	107	293	0	80	80	373
7900	500	107	393	0	80	80	473
8000	600	107	493	0	80	80	573
8100	700	107	593	0	80	80	673
8200	800	107	693	0	80	80	773
8300	900	107	793	0	80	80	873
8400	1000	107	893	0	80	80	973

And when you plot the Net Payoff, we get the payoff structure which is similar to the long call futures.



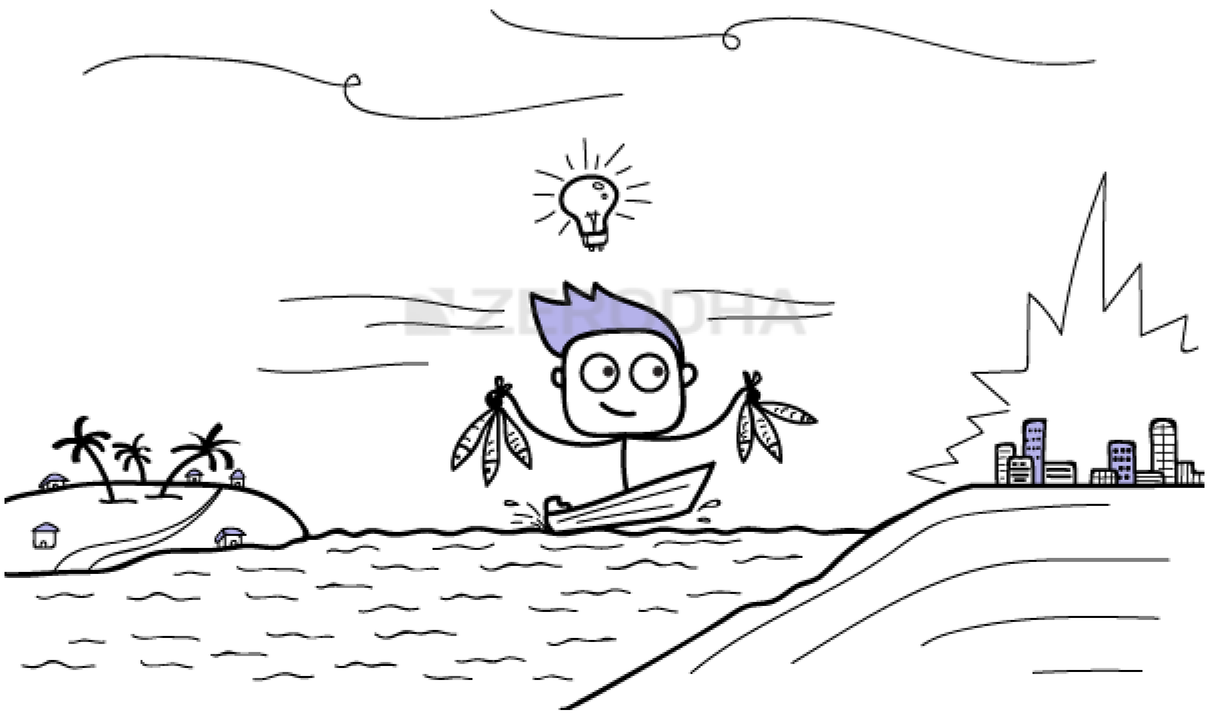
Having figured out how to set up a Synthetic long, we need to figure out the typical circumstances under which setting up a synthetic long is required.

6.3 – The Fish market Arbitrage

I'll assume that you have a basic understanding on Arbitrage. In easy words, arbitrage is an opportunity to buy goods/asset in a cheaper market and sell the same in expensive markets and pocket the difference in prices. If executed well, arbitrage trades are almost risk free. Let me attempt to give you a simple example of an arbitrage opportunity.

Assume you live by a coastal city with abundant supply of fresh sea fish, hence the rate at which fish is sold in your city is very low, let's say Rs.100 per Kg. The neighboring city which is 125 kms away has a huge demand for the same fresh sea fish. However, in this neighboring city the same fish is sold at Rs.150 per Kg.

Given this if you can manage to buy the fish from your city at Rs.100 and manage to sell the same in the neighboring city at Rs.150, then in process you clearly get to pocket the price differential i.e Rs.50. Maybe you will have to account for transportation and other logistics, and instead of Rs.50, you get to keep Rs.30/- per Kg. This is still a beautiful deal and this is a typical arbitrage in the fish market!



It looks perfect, think about it - if you can do this everyday i.e buy fish from your city at Rs.100 and sell in the neighboring city at Rs.150, adjust Rs.20 towards expenses then Rs.30 per KG is guaranteed risk free profit.

This is indeed risk free, provides nothing changes. But if things change, so will your profitability, let me list few things that could change -

1. **No Fish (opportunity risk)** – Assume one day you go to the market to buy fish at Rs.100, and you realize there is no fish in the market. Then you have no opportunity to make Rs.30/-.
2. **No Buyers (liquidity risk)** – You buy the fish at Rs.100 and go to the neighboring town to sell the same at Rs.150, but you realize that there are no buyers. You are left holding a bag full of dead fish, literally worthless!
3. **Bad bargaining (execution risk)** – The entire arbitrage opportunity hinges upon the fact that you can 'always' bargain to buy at Rs.100 and sell at Rs.150. What if on a bad day you happen to buy at 110 and sell at 140? You still have to pay 20 for transport, this means instead of the regular 30 Rupees profit you get to make only 10 Rupees, and if this continues, then the arbitrage opportunity would become less attractive and you may not want to do this at all.

4. **Transport becomes expensive (cost of transaction) –** This is another crucial factor for the profitability of the arbitrage trade. Imagine if the cost of transportation increases from Rs.20 to Rs.30? Clearly the arbitrage opportunity starts looking less attractive as the cost of execution goes higher and higher. Cost of transaction is a critical factor that makes or breaks an arbitrage opportunity
5. **Competition kicks in (who can drop lower?)** – Given that the world is inherently competitive you are likely to attract some competition who would also like to make that risk free Rs.30. Now imagine this –
    a. So far you are the only one doing this trade i.e buy fish at Rs.100 and sell at Rs.150
    b. Your friend notices you are making a risk free profit, and he now wants to copy you. You can't really prevent his as this is a free market.
    c. Both of you buy at Rs.100, transport it at Rs.20, and attempt to sell it in the neighboring town
    d. A potential buyer walks in, sees there is a new seller, selling the same quality of fish. Who between the two of you is likely to sell the fish to the buyer?
    e. Clearly given the fish is of the same quality the buyer will buy it from the one selling the fish at a cheaper rate. Assume you want to acquire the client, and therefore drop the price to Rs.145/-
    f. Next day your friend also drops the price, and offers to sell fish at Rs.140 per KG, and therefore igniting a price war. In the whole process the price keeps dropping and the arbitrage opportunity just evaporates.
    g. How low can the price drop? Obviously it can drop to Rs.120 (cost of buying fish plus transport). Beyond 120, it does not makes sense to run the business
    h. Eventually in a perfectly competitive world, competition kicks in and arbitrage opportunity just ceases to exist. In this case, the cost of fish in neighboring town would drop to Rs.120 or a price point in that vicinity.

I hope the above discussion gave you a quick overview on arbitrage. In fact we can define any arbitrage opportunity in terms of a simple mathematical expression, for example with respect to the fish example, here is the mathematical equation –

[Cost of selling fish in town B - Cost of buying fish in town A] = 20

If there is an imbalance in the above equation, then we essentially have an arbitrage opportunity. In all types of markets - fish market, agri market, currency market, and stock market such arbitrage opportunities exist and they are all governed by simple arithmetic equations.

6.4 – The Options arbitrage

Arbitrage opportunities exist in almost every market, one needs to be a keen observer of the market to spot it and profit from it. Typically stock market based arbitrage opportunities allow you to lock in a certain profit (small but guaranteed) and carry this profit irrespective of which direction the market moves. For this reason arbitrage trades are quite a favorite with risk intolerant traders.

I would like to discuss a simple arbitrage case here, the roots of which lie in the concept of **'Put Call Parity'**. I will skip discussing the Put Call Parity theory but would instead jump to illustrate one of its applications.

However I'd suggest you watch this beautiful video from Khan Academy to understand the Put Call Parity –

So based on Put Call Parity, here is an arbitrage equation –

Long Synthetic long + Short Futures = 0

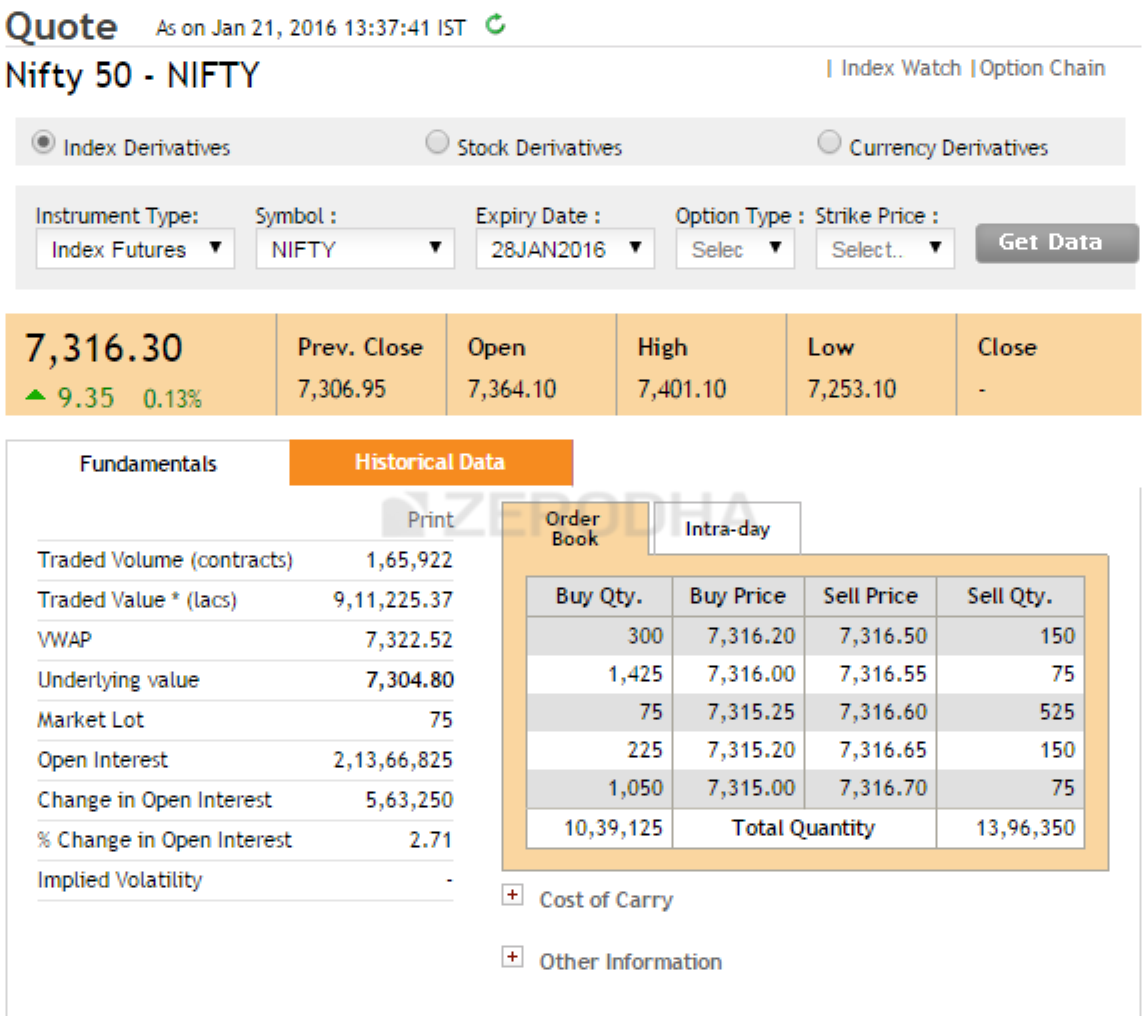
You can elaborate this to –

Long ATM Call + Short ATM Put + Short Futures = 0

The equation states that the P&L upon expiry by virtue of holding a long synthetic long and short future should be zero. Why should this position result in a zero P&L, well the answer to this is attributable to the Put Call Parity.

However, if the P&L is a non zero value, then we have an arbitrage opportunity.

Here is an example that will help you understand this well.



On 21st Jan, Nifty spot was at 7304, and the Nifty Futures was trading at 7316.

-21,450	2,446	23.89	319.00	-0.70	225	316.25	319.95	450	7000.00	975	14.05	14.20	450	-2.00	14.10	26.08	154,618	49,350
-	2	19.57	239.15	-99.85	75	203.15	383.05	4,425	7050.00	75	18.05	18.20	375	-2.05	18.10	25.05	7,112	106,275
158,400	5,998	19.39	228.25	0.45	75	226.40	229.50	75	7100.00	225	23.35	23.60	1,125	-3.10	23.40	23.93	234,664	419,100
525	370	20.82	162.00	-25.50	75	180.40	191.20	75	7150.00	375	30.40	30.70	75	-3.45	30.95	23.09	13,313	54,300
-55,650	43,224	19.60	145.00	-0.50	75	144.90	145.40	75	7200.00	75	41.05	41.20	600	-4.30	41.20	22.01	373,480	459,225
175,200	9,838	18.20	109.00	-0.75	150	108.25	109.15	150	7250.00	150	54.55	54.85	75	-4.40	54.80	21.19	37,144	170,325
873,450	232,896	18.57	79.40	-1.70	750	78.95	79.50	75	7300.00	300	73.85	74.30	300	-5.10	74.25	20.57	371,024	578,250
280,875	36,476	18.24	54.80	-2.40	150	54.75	55.20	150	7350.00	450	95.60	97.10	150	-4.75	96.40	19.71	16,894	67,875
1,342,725	462,621	18.10	36.15	-1.65	75	36.20	36.40	300	7400.00	225	127.45	128.05	150	-3.80	127.45	19.59	160,081	59,925
60,150	38,792	17.98	22.60	-0.95	225	22.65	22.85	975	7450.00	150	162.10	165.65	300	3.55	163.70	21.72	1,217	-9,375
654,225	363,141	17.92	13.50	-1.30	1,425	13.45	13.65	2,100	7500.00	12,150	204.00	205.50	150	-4.95	204.30	19.80	31,169	-145,650
46,275	34,627	18.02	7.45	-1.75	150	7.45	7.50	150	7550.00	150	243.50	250.40	150	-4.35	245.00	18.99	272	-3,075
366,075	219,831	18.53	4.45	-1.30	1,350	4.45	4.50	1,275	7600.00	150	293.35	295.00	75	-6.05	294.90	23.99	8,126	-2,550
23,175	17,070	19.55	2.95	-0.90	3,300	2.90	3.00	225	7650.00	150	335.90	341.85	150	8.45	342.30	25.10	203	-2,925
-118,050	123,734	20.45	2.05	-0.75	21,975	2.00	2.05	1,500	7700.00	150	390.10	391.35	150	0.60	393.35	25.33	5,910	-4,500
-26,775	6,195	22.12	1.90	-0.60	675	1.85	1.95	1,575	7750.00	150	435.55	448.35	1,875	-4.60	439.10	29.90	54	-375
-74,250	55,273	23.58	1.65	-0.20	37,950	1.60	1.65	35,475	7800.00	150	490.60	491.95	75	4.15	490.95	29.20	1,850	-29,400
-23,175	2,222	25.30	1.65	-0.25	375	1.65	1.70	825	7850.00	300	531.10	542.05	300	-20.00	580.00	34.93	19	-225
-102,675	21,261	26.83	1.40	-0.15	47,100	1.40	1.45	4,500	7900.00	75	588.85	590.00	225	-4.45	589.00	-	1,939	-35,475
-5,925	831	28.74	1.40	-0.40	150	1.40	1.55	150	7950.00	75	629.55	642.40	300	29.00	674.00	32.85	23	-750
-57,750	8,926	30.03	1.20	-0.15	14,550	1.20	1.25	300	8000.00	300	688.45	690.00	75	-2.90	689.00	36.69	1,656	-5,100

The 7300 CE and PE (ATM options) were trading at 79.5 and 73.85 respectively. Do note, all the contracts belong to the January 2016 series.

Going by the arbitrage equation stated above, if one were to execute the trade, the positions would be –

1. Long 7300 CE @ 79.5
2. Short 7300 PE @ 73.85
3. Short Nifty futures @ 7316

Do note, the first two positions together form a long synthetic long. Now as per the arbitrage equation, upon expiry the positions should result in a zero P&L. Let's evaluate if this holds true.

Scenario 1 – Expiry at 7200

- The 7300 CE would expire worthless, hence we lose the premium paid i.e **79.5**
- The 7300 PE would have an intrinsic value of 100, but since we are short at 73.85, the net payoff would be 73.85 – 100 = **-26.15**

- We are short on futures at 7316, which would result in a profit of 116 points (7316 – 7200)
- Net payoff would be -79.5 – 26.15 + 116 = **+10.35**

Clearly, instead of a 0 payoff, we are experiencing a positive non zero P&L.

Scenario 2 – Expiry at 7300

- The 7300 CE would expire worthless, hence we lose the premium paid i.e **79.5**
- The 7300 PE would expire worthless, hence we get to retain 73.85
- We are short on futures at 7316, which would result in a profit of 16 points (7316 – 7300)
- Net payoff would be -79.5 +73.85+16 = **+10.35**

Scenario 3 – Expiry at 7400

- The 7300 CE would have an intrinsic value of 100, and therefore the payoff would be 100 – 79.5 = 20.5
- The 7300 PE would expire worthless, hence we get to retain 73.85
- We are short on futures at 7316, which would result in loss of 84 points (7316 – 7400)
- Net payoff would be 20.5 + 73.85 - 84 = **+10.35**

You could test this across any expiry value (in other words the markets can move in any direction) but you are likely to pocket 10.35 points, **upon expiry.** I'd like to stress this again; this arbitrage lets you make 10.35, upon expiry.

Here is the payoff structure at different expiry values –

Market Expiry	CE_IV (ATM)	PP	Payoff	PE_IV (OTM)	PP	Payoff	Fut Payoff	Net Payoff
6700	0	79.5	-79.5	600	73.85	-526.15	616	10.35
6800	0	79.5	-79.5	500	73.85	-426.15	516	10.35
6900	0	79.5	-79.5	400	73.85	-326.15	416	10.35
7000	0	79.5	-79.5	300	73.85	-226.15	316	10.35
7100	0	79.5	-79.5	200	73.85	-126.15	216	10.35
7200	0	79.5	-79.5	100	73.85	-26.15	116	10.35
7300	0	79.5	-79.5	0	73.85	73.85	16	10.35
7400	100	79.5	20.5	0	73.85	73.85	-84	10.35
7500	200	79.5	120.5	0	73.85	73.85	-184	10.35
7600	300	79.5	220.5	0	73.85	73.85	-284	10.35
7700	400	79.5	320.5	0	73.85	73.85	-384	10.35
7800	500	79.5	420.5	0	73.85	73.85	-484	10.35
7900	600	79.5	520.5	0	73.85	73.85	-584	10.35
8000	700	79.5	620.5	0	73.85	73.85	-684	10.35
8100	800	79.5	720.5	0	73.85	73.85	-784	10.35
8200	900	79.5	820.5	0	73.85	73.85	-884	10.35
8300	1000	79.5	920.5	0	73.85	73.85	-984	10.35
8400	1100	79.5	1020.5	0	73.85	73.85	-1084	10.35

Interesting isn't it? But what's the catch you may ask?

Transaction charges!

One has to account for the cost of execution of this trade and figure out if it still makes sense to take up the trade. Consider this –

- **Brokerage** – if you are trading with a traditional broker, then you will be charged on a percentage basis which will eat away your profits. So on one hand you make 10 points, but you may end up paying 8 – 10 points as brokerage. However if you were to do this trade with a discount broker like Zerodha, your breakeven on this trade would be around 4-5 points. This should give you more reason to open your account with Zerodha

- **STT** – Do remember the P&L is realised upon expiry; hence you would have to carry forward your positions to expiry. If you are long on an ITM option (which you will be) then upon expiry you will have to pay a hefty STT, which will further eat away your profits. Please do **read this** to know more.
- **Other applicable taxes –** Besides you also have to account for service tax, stamp duty etc

So considering these costs, the efforts to carry an arbitrage trade for 10 points may not make sense. But it certainly would, if the payoff was something better, maybe like 15 or

20 points. With 15 or 20 points you can even maneuver the STT trap by squaring off the positions just before expiry - although it will shave off a few points.

Download the Synthetic long & Arbitrage excel.

Key takeaways from this chapter

1. You can use options to replicate futures payoff
2. A synthetic long replicates the long futures payoff
3. Simultaneously buying ATM call and selling ATM Put creates a synthetic long
4. The breakeven point for the synthetic long is the **ATM strike + net premium paid**
5. An arbitrage opportunity is created when Synthetic long + short futures yields a positive non zero P&L upon expiry
6. Execute the arbitrage trade only if the P&L upon expiry makes sense after accounting for expenses.

CHAPTER 7

Bear Put Spread

7.1 – Spreads versus naked positions

Over the last five chapters we've discussed various multi leg bullish strategies. These strategies ranged to suit an assortment of market outlook - from an outrightly bullish market outlook to moderately bullish market outlook. Reading through the last 5 chapters you must have realised that most professional options traders prefer initiating a spread strategy versus taking on naked option positions. No doubt, spreads tend to shrink the overall profitability, but at the same time spreads give you a greater visibility on risk. Professional traders value 'risk visibility' more than the profits. In simple words, it's a much better deal to take on smaller profits as long as you know what would be your maximum loss under worst case scenarios.

Another interesting aspect of spreads is that invariably there is some sort of financing involved, wherein the purchase of an option is funded by the sale of another option. In fact, financing is one of the key aspects that differentiate a spread versus a normal naked directional position. Over the next few chapters we will discuss strategies which you can deploy when your outlook ranges from moderately bearish to out rightly bearish. The composition of these strategies is similar to the bullish strategies that we discussed earlier in the module.

The first bearish strategy we will look into is the Bear Put Spread, which as you may have guessed is the equivalent of the Bull Call Spread.

7.2 – Strategy notes

Similar to the Bull Call Spread, the Bear Put Spread is quite easy to implement. One would implement a bear put spread when the market outlook is moderately bearish, i.e you expect the market to go down in the near term while at the same time you don't expect it to go down much. If I were to quantify 'moderately bearish', a 4-5% correction would be apt. By invoking a bear put spread one would make a modest gain if the markets correct (go down) as expected but on the other hand if the markets were to go up, the trader will end up with a limited loss.

A conservative trader (read as risk averse trader) would implement Bear Put Spread strategy by simultaneously –

1. Buying an In the money Put option
2. Selling an Out of the Money Put option

There is no compulsion that the Bear Put Spread has to be created with an ITM and OTM option. The Bear Put spread can be created employing any two put options. The choice of strike depends on the aggressiveness of the trade. However do note that both the options should belong to the same expiry and same underlying. To understand the implementation better, let's take up an example and see how the strategy behaves under different scenarios.

As of today Nifty is at 7485, this would make 7600 PE In the money and 7400 PE Out of the money. The 'Bear Put Spread' would require one to sell 7400 PE, the premium received from the sale would partially finance the purchase of the 7600 PE. The premium paid (PP) for the 7600 PE is Rs.165, and the premium received (PR) for the 7400 PE is Rs.73/-. The net debit for this transaction would be –

73 – 165

= **-92**

To understand how the payoff of the strategy works under different expiry circumstances, we need to consider different scenarios. Please do bear in mind the payoff is upon expiry, which means to say that the trader is expected to hold these positions till expiry.

Scenario 1 – Market expires at 7800 (above long put option i.e 7600)

This is a case where the market has gone up as opposed to the expectation that it would go down. At 7800 both the put option i.e 7600 and 7400 would not have any intrinsic value, hence they would expire worthless.

- The premium paid for 7600 PE i.e Rs.165 would go to 0, hence we retain nothing
- The premium received for 7400 PE i.e Rs.73 would be retained entirely
- Hence at 7800, we would lose Rs.165 on one hand but this would be partially offset by the premium received i.e Rs.73
- The overall loss would be -165 + 73 = **-92**

Do note the '-ve' sign associated with 165 indicates that this is a money outflow from the account, and the '+ve' sign associated with 73 indicates that the money is received into the account.

Also, the net loss of 92 is equivalent to the net debit of the strategy.

Scenario 2 – Market expired at 7600 (at long put option)

In this scenario we assume the market expires at 7600, where we have purchased a Put option. But then, at 7600 both 7600 and 7400 PE would expire worthless (similar to scenario 1) resulting in a loss of **-92.**

Scenario 3 – Market expires at 7508 (breakeven)

7508 is half way through 7600 and 7400, and as you may have guessed I've picked 7508 specifically to showcase that the strategy neither makes money nor loses any money at this specific point.

- The 7600 PE would have an intrinsic value equivalent to Max [7600 -7508, 0], which is 92.
- Since we have paid Rs.165 as premium for the 7600 PE, some of the premium paid would be recovered. That would be 165 – 92 = 73, which means to say the net loss on 7600 PE at this stage would be Rs.73 and not Rs.165
- The 7400 PE would expire worthless, hence we get to retain the entire premium of Rs.73
- So on hand we make 73 (7400 PE) and on the other we lose 73 (7600 PE) resulting in a no loss no profit situation

Hence, 7508 would be the breakeven point for this strategy.

Scenario 4 – Market expires at 7400 (at short put option)

This is an interesting level, do recall when we initiated the position the spot was at 7485, and now the market has gone down as expected. At this point both the options would have interesting outcomes.

- The 7600 PE would have an intrinsic value equivalent to Max [7600 -7400, 0], which is 200
- We have paid a premium of Rs.165, which would be recovered from the intrinsic value of Rs.200, hence after compensating for the premium paid one would retain Rs.35/-
- The 7400 PE would expire worthless, hence the entire premium of Rs.73 would be retained
- The net profit at this level would be 35+73 = 108

The net payoff from the strategy is in line with the overall expectation from the strategy i.e the trader gets to make a modest profit when the market goes down.

Scenario 5 – Market expires at 7200 (below the short put option)

This is again an interesting level as both the options would have an intrinsic value. Lets figure out how the numbers add up –

- The 7600 PE would have an intrinsic value equivalent to Max [7600 -7200, 0], which is 400
- We have paid a premium of Rs.165, which would be recovered from the intrinsic value of Rs.400, hence after compensating for the premium paid one would retain Rs.235/-
- The 7400 PE would have an intrinsic value equivalent to Max [7400 -7200, 0], which is 200
- We received a premium of Rs.73, however we will have to let go of the premium and bear a loss over and above 73. This would be 200 -73 = 127
- On one hand we make a profit of Rs.235 and on the other we lose 127, therefore the net payoff of the strategy would be 235 – 127 = 108.

Summarizing all the scenarios (I've put up the payoff values directly after considering the premiums)

Market Expiry	Long Put (7600)_IV	Short Put (7400)_IV	Net payoff
7800	0	0	-92
7600	0	0	-92
7508	92	0	0
7200	400	200	+108

Do note, the net payoff from the strategy is in line with the overall expectation from the strategy i.e the trader gets to make a modest profit when the market goes down while at the same time the losses are capped in case the market goes up.

Have a look at the table below -

Market Expiry	Long Put_IV	PP	Long put payoff	Short put_IV	PR	Short put payoff	Strategy Payoff
6600	1000	-165	835	800	73	-727	108
6700	900	-165	735	700	73	-627	108
6800	800	-165	635	600	73	-527	108
6900	700	-165	535	500	73	-427	108
7000	600	-165	435	400	73	-327	108
7100	500	-165	335	300	73	-227	108
7200	400	-165	235	200	73	-127	108
7300	300	-165	135	100	73	-27	108
7400	200	-165	35	0	73	73	108
7500	100	-165	-65	0	73	73	8
7600	0	-165	-165	0	73	73	-92
7700	0	-165	-165	0	73	73	-92
7800	0	-165	-165	0	73	73	-92
7900	0	-165	-165	0	73	73	-92
8000	0	-165	-165	0	73	73	-92
8100	0	-165	-165	0	73	73	-92

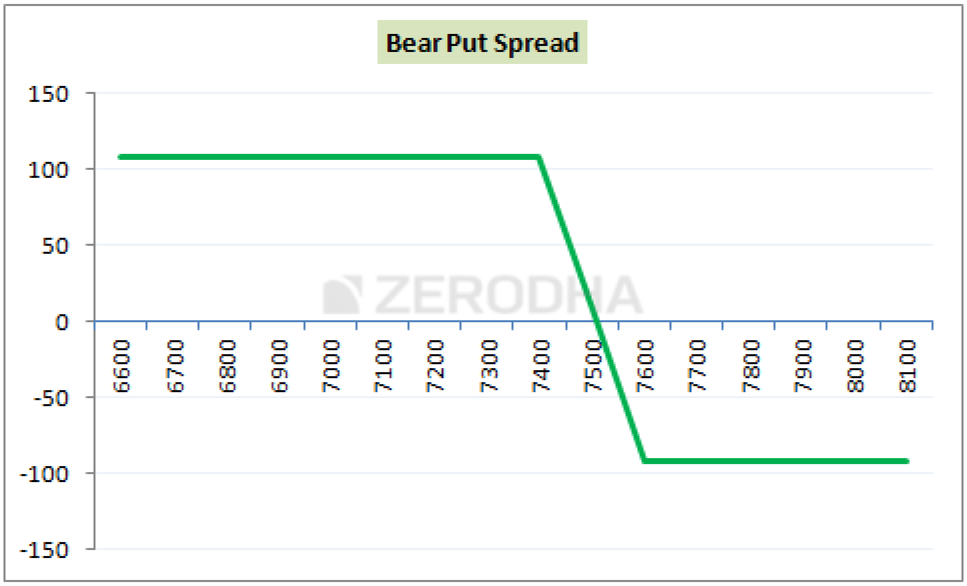
The table below shows the strategy payoff at different expiry levels. The losses are capped to 92 (when markets go up) and the profits are capped to 108 (when markets go down).

7.3 – Strategy critical levels

From the above discussed scenarios we can generalize a few things –

1. Strategy makes a loss if the spot moves above the breakeven point, and makes a profit below the breakeven point
2. Both the profits and loss are capped
3. Spread is **difference between the two strike prices**.
    a. In this example spread would be 7600 – 7400 = 200
4. Net Debit = Premium Paid – Premium Received
    a. 165 – 73 = 92
5. Breakeven = Higher strike – Net Debit
    a. 7600 – 92 = 7508
6. Max profit = Spread – Net Debit
    a. 200 – 92 = 108
7. Max Loss = Net Debit
    a. 92

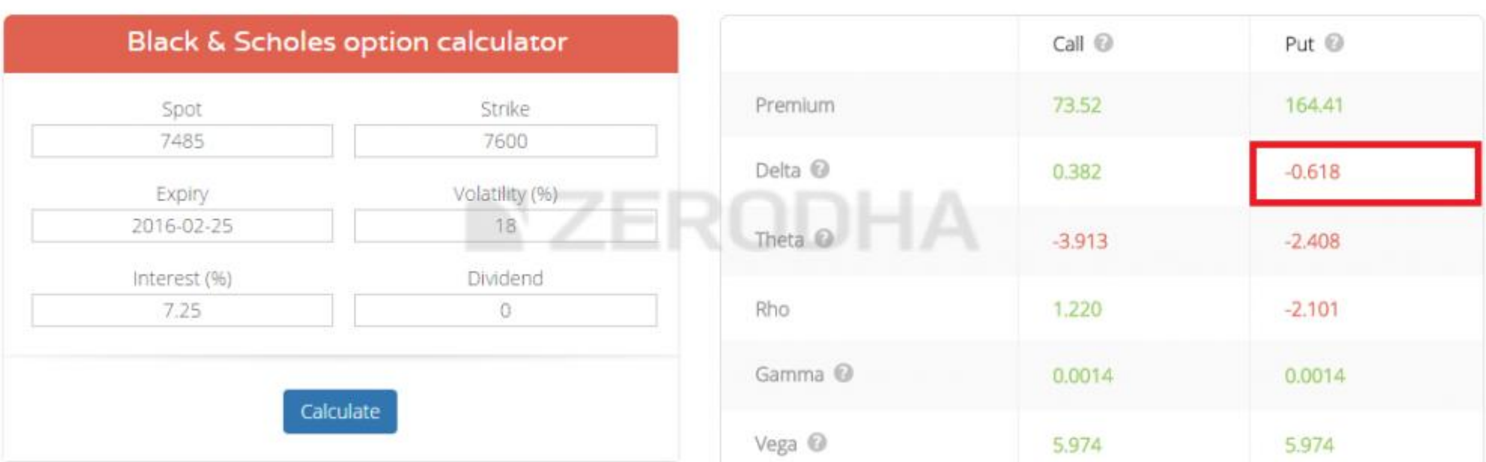
You can note all these critical points in the strategy payoff diagram -



7.4 – Quick note on Delta

This is something I missed talking about in the earlier chapters, but its better late than never :-). Whenever you implement an options strategy always add up the deltas. I used the **B&S calculator** to calculate the deltas.

The delta of 7600 PE is -0.618



The delta of 7400 PE is – 0.342

The negative sign indicates that the put option premium will go down if the markets go up, and premium gains value if the markets go down. But do note, we have written the 7400 PE, hence the Delta would be

-(-0.342)

+ 0.342

Now, since deltas are additive in nature we can add up the deltas to give the combined delta of the position. In this case it would be –

-0.618 + (+0.342)

= - 0.276

This means the strategy has an overall delta of 0.276 and the '–ve' indicates that the premiums will go up if the markets go down. Similarly you can add up the deltas of other strategies we've discussed earlier - Bull Call Spread, Call Ratio Back spread etc and you will realize they all have a positive delta indicating that the strategy is bullish.

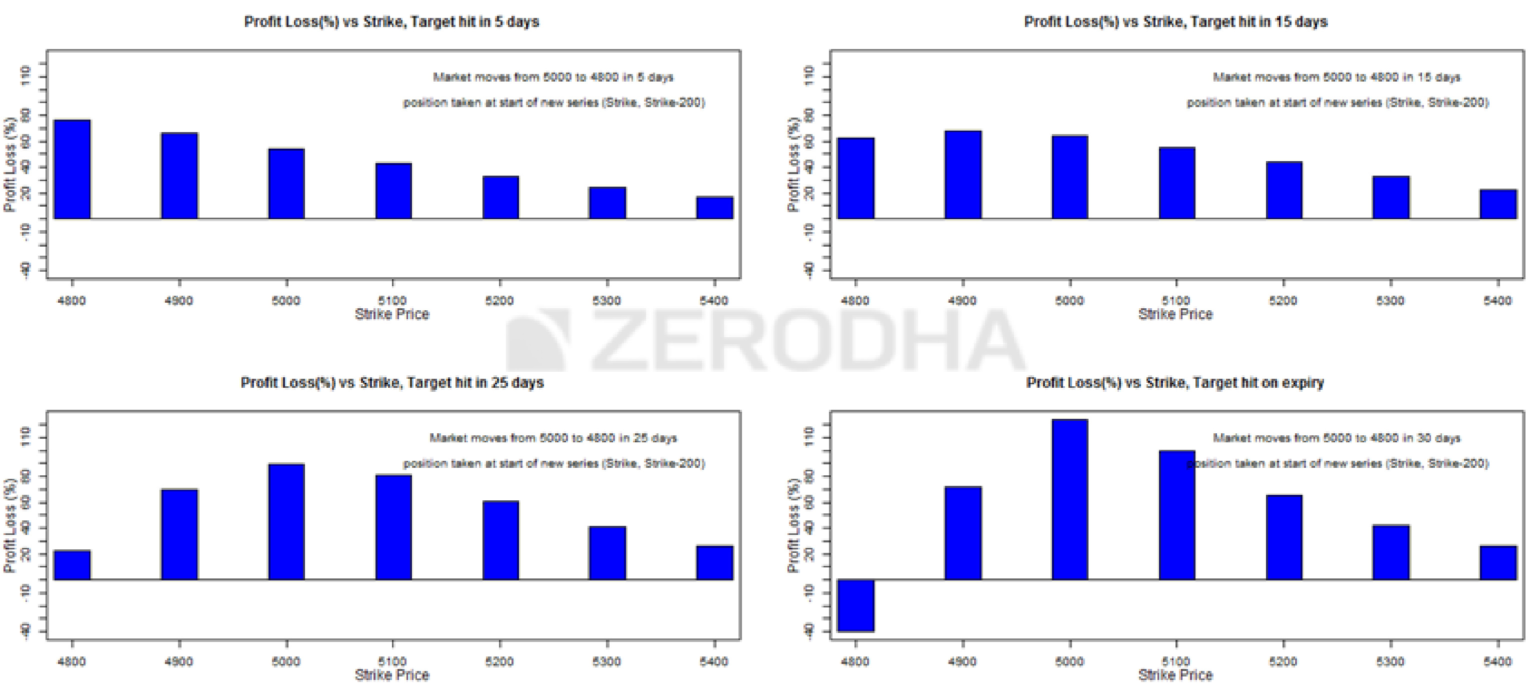
When you have more than 2 option legs it gets really difficult to estimate the overall bias of the strategy (whether the strategy is bullish or bearish), in such cases you can quickly add up the deltas to know the bias. Further, if in case the deltas add to zero, then it means that the strategy is not really biased to any direction. Such strategies are called 'Delta Neutral'. We will eventually discuss these strategies at a later point in this module.

Also, you may be interested to know that while the delta neutral strategies are immune to market's directional move, they react to changes in volatility and time, hence these are also sometime called "Volatility based strategies".

7.5 – Strike selection and effect of volatility

The strike selection for a bear put spread is very similar to the strike selection methodology of a bull call spread. I hope you are familiar with the '1st half of the series' and '2nd half of the series' methodology. If not I'd suggest you to kindly read through **section 2.3**.

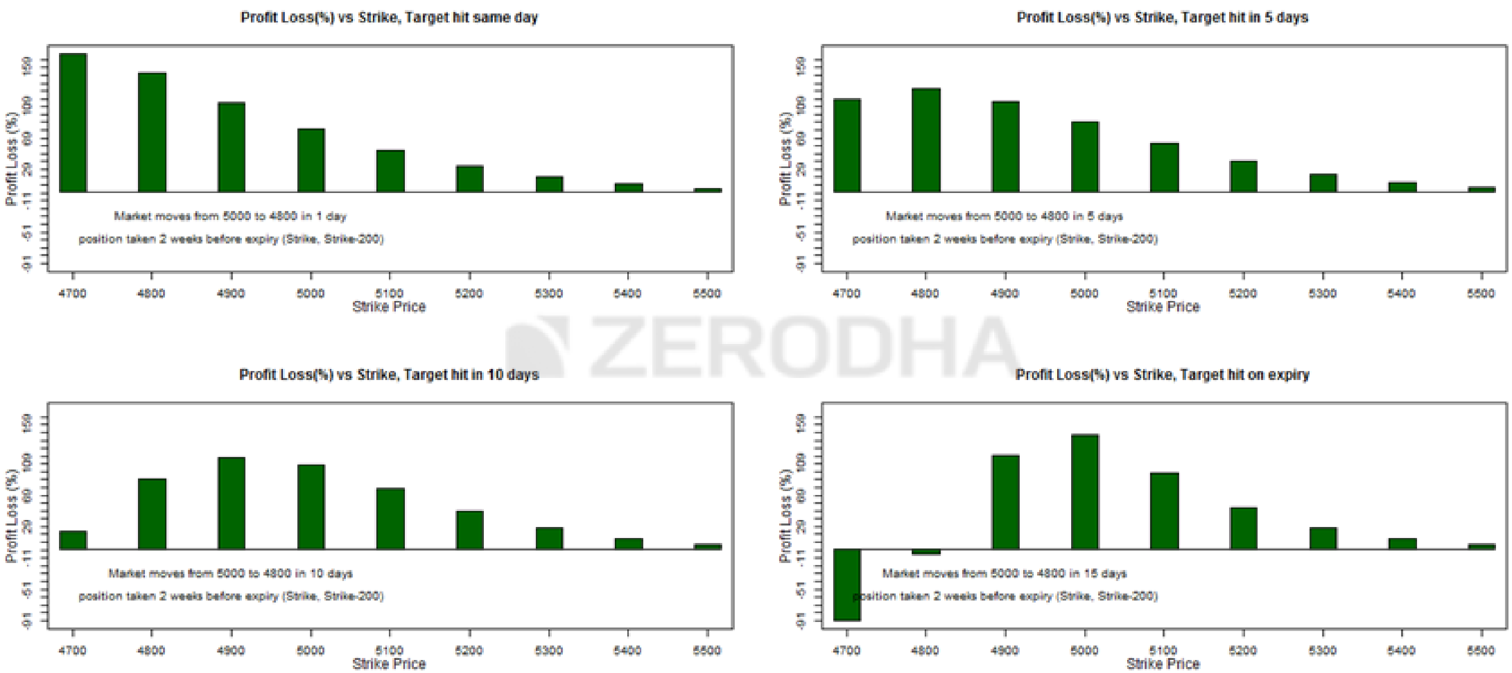
Have a look at the graph below –



If we are in the first half of the series (ample time to expiry) and we expect the market to go down by about 4% from present levels, choose the following strikes to create the spread

Expect 4% move to happen within	Higher strike	Lower strike	Refer graph on
5 days	Far OTM	Far OTM	Top left
15 days	ATM	Slightly OTM	Top right
25 days	ATM	OTM	Bottom left
At expiry	ATM	OTM	Bottom right

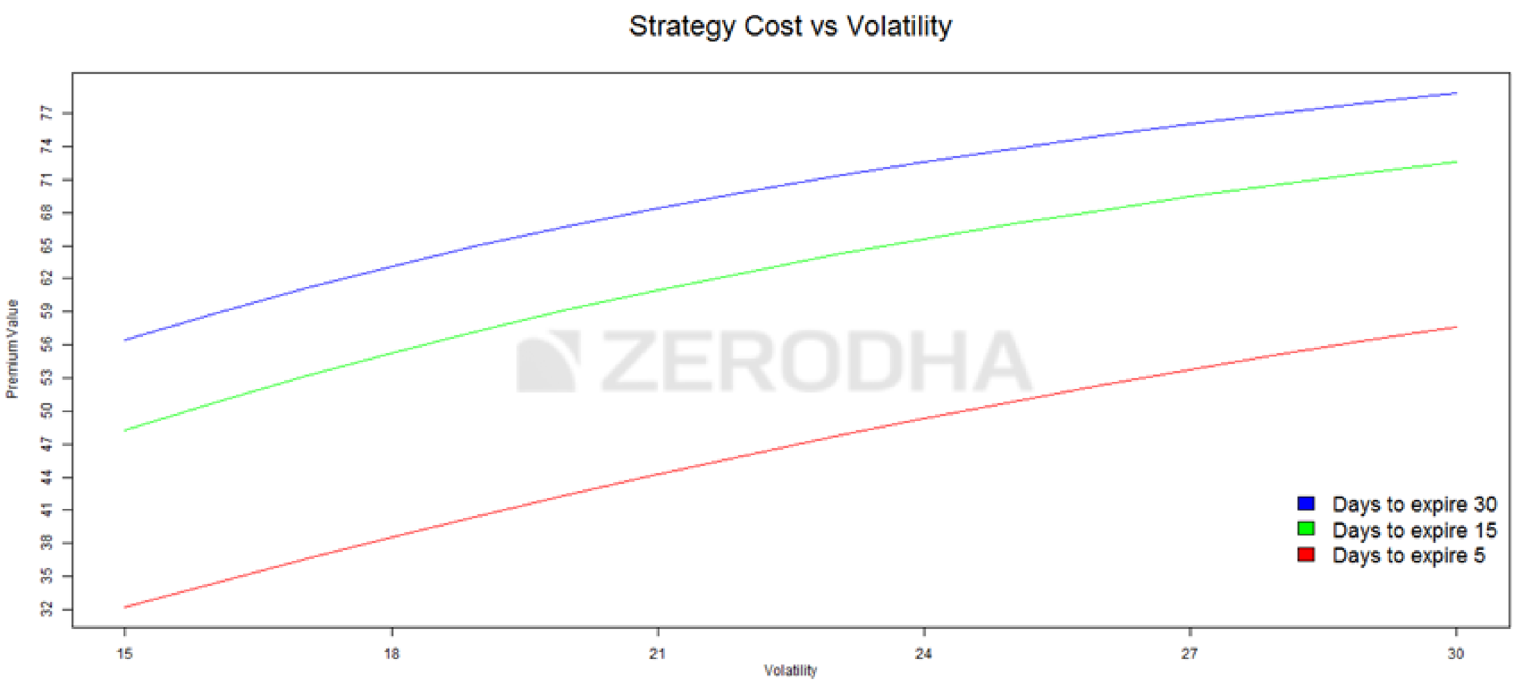
Now assuming we are in the 2nd half of the series, selecting the following strikes to create the spread would make sense –



Expect 4% move to happen within	Higher strike	Lower strike	Refer graph on
Same day (even specific)	OTM	OTM	Top left
5 days	ITM/OTM	OTM	Top right
10 days	ITM/OTM	OTM	Bottom left
At expiry	ITM/OTM	OTM	Bottom right

I hope you will find the above two tables useful while selecting the strikes for the bear put spread.

We will now shift our focus on the effect of volatility on the bear put spread. Have a look at the following image –



The graph above explains how the premium varies with respect to variation in volatility and time.

- The blue line suggests that the cost of the strategy **does not vary much** with the increase in volatility when there is **ample time to expiry** (30 days)
- The green line suggests that the cost of the strategy **varies moderately** with the increase in volatility when there is about **15 days to expiry**
- The red line suggests that the cost of the strategy **varies significantly** with the increase in volatility when there is about **5 days to expiry**

From these graphs it is clear that one should not really be worried about the changes in the volatility when there is ample time to expiry. However one should have a view on volatility between midway and expiry of the series. It is advisable to take the bear put spread only when the volatility is expected to increase, alternatively if you expect the volatility to decrease, its best to avoid the strategy.

Download the Bear Put Spread excel.

Key takeaways from this chapter

1. Spread offers visibility on risk but at the same time shrinks the reward
2. When you create a spread, the proceeds from the sale of an option offsets the purchase of an option
3. Bear put spread is best invoked when you are moderately bearish on the markets
4. Both the profits and losses are capped
5. Classic bear put spread involves simultaneously purchasing ITM put options and selling OTM put options
6. Bear put spread usually results in a net debit
7. Net Debit = Premium Paid – Premium Received
8. Breakeven = Higher strike – Net Debit
9. Max profit = Spread – Net Debit
10. Max Loss = Net Debit
11. Select strikes based on the time to expiry
12. Implement the strategy only when you expect the volatility to increase (especially in the 2^{nd} half of the series)

CHAPTER 8

Bear Call Spread

8.1 – Choosing Calls over Puts

Similar to the Bear Put Spread, the Bear Call Spread is a two leg option strategy invoked when the view on the market is 'moderately bearish'. The Bear Call Spread is similar to the Bear Put Spread in terms of the payoff structure; however there are a few differences in terms of strategy execution and strike selection. The Bear Call spread involves creating a spread by employing 'Call options' rather than 'Put options' (as is the case in bear put spread).

You may have a fundamental question at this stage – when the payoffs from both Bear Put spread and Bear Call spread are similar, why should one choose a Bear Call spread over a Bear Put spread?

Well, this really depends on how attractive the premiums are. While the Bear Put spread is executed for a **debit**, the Bear Call spread is executed for a **credit**. So if you are at a point in the market where –

1. The markets have rallied considerably (therefore CALL premiums have swelled)
2. The volatility is favorable
3. Ample time to expiry

And you have a moderately bearish outlook going forward, then it makes sense to invoke a Bear Call Spread for a net credit as opposed to invoking a Bear Put Spread for a net debit. Personally I do prefer strategies which offer net credit rather than strategies which offer net debit.

8.2 – Strategy Notes

The Bear Call Spread is a two leg spread strategy traditionally involving ITM and OTM Call options. However you can create the spread using other strikes as well. Do remember, the higher the difference between the two selected strikes (spread), larger is the profit potential.

To implement the bear call spread –

1. Buy 1 OTM Call option (leg 1)
2. Sell 1 ITM Call option (leg 2)

Ensure –

1. All strikes belong to the same underlying
2. Belong to the same expiry series
3. Each leg involves the same number of options

Let us take up example to understand this better -

Date – February 2016

Outlook – Moderately bearish

Nifty Spot – 7222

Bear Call Spread, trade set up -

1. **Buy 7400 CE** by paying Rs.38/- as premium; do note this is an OTM option. Since money is going out of my account this is a debit transaction
2. **Sell 7100 CE** and receive Rs.136/- as premium, do note this is an ITM option. Since I receive money, this is a credit transaction
3. The net cash flow is the difference between the debit and credit i.e 136 – 38 = **+98,** since this is a positive cashflow, there is a net credit to my account.

Generally speaking in a bear call spread there is always a 'net credit', hence the bear call spread is also called referred to as a 'credit spread'. After we initiate the trade, the market can move in any direction and expiry at any level. Therefore let us take up a few scenarios to get a sense of what would happen to the bear put spread for different levels of expiry.

Scenario 1 – Market expires at 7500 (above the long Call)

At 7500, both the Call options would have an intrinsic value and hence they both would expire in the money.

- 7400 CE would have an intrinsic value of 100, since we have paid a premium of Rs.38, we would be in a profit of 100 – 38 = 62
- 7100 CE would have an intrinsic value of 400, since we have sold this option at Ra.136, we would incur a loss of 400 – 136 = **-264**
- Net loss would be -264 + 62 = **- 202**

Scenario 2 – Market expires at 7400 (at the long call)

At 7400, the 7100 CE would have an intrinsic value and hence would expire in the money. The 7400 CE would expire worthless.

- 7400 CE would expire worthless, hence the entire premium of Rs.38 would be written of as a loss.
- 7100 CE would have an intrinsic value of 300, since we have sold this option at Ra.136, we would incur a loss of 300 – 136 = **-164**
- Net loss would be -164 -38 = **- 202**

Do note, the loss at 7400 is similar to the loss at 7500 pointing to the fact that above a certain point loss is capped to 202.

Scenario 3 – Market expires at 7198 (breakeven)

At 7198, the trade neither makes money or losses money, hence this is considered a breakeven point. Let us see how the numbers play out here –

- At 7198, the 7100CE would expire with an intrinsic value of 98. Since we have sold the option at Rs.136, we get to retain a portion of the premium i.e 136 – 98 = **+38**
- 7400 CE would expire worthless, hence we will lose the premium paid i.e 38
- Net payoff would -38 + 38 = 0

This clearly indicates that the strategy neither makes money or losses money at 7198.

Scenario 4 – Market expires at 7100 (at the short call)

At 7100, both the Call options would expire worthless, hence it would be out of the money.

- 7400 would not have any value, hence the premium paid would be a complete loss, i.e Rs.38
- 7100 will also not have any intrinsic value, hence the entire premium received i.e Rs.136 would be retained back
- Net profit would be 136 - 38 = **98**

Clearly, as and when the market falls, the strategy makes a profit.

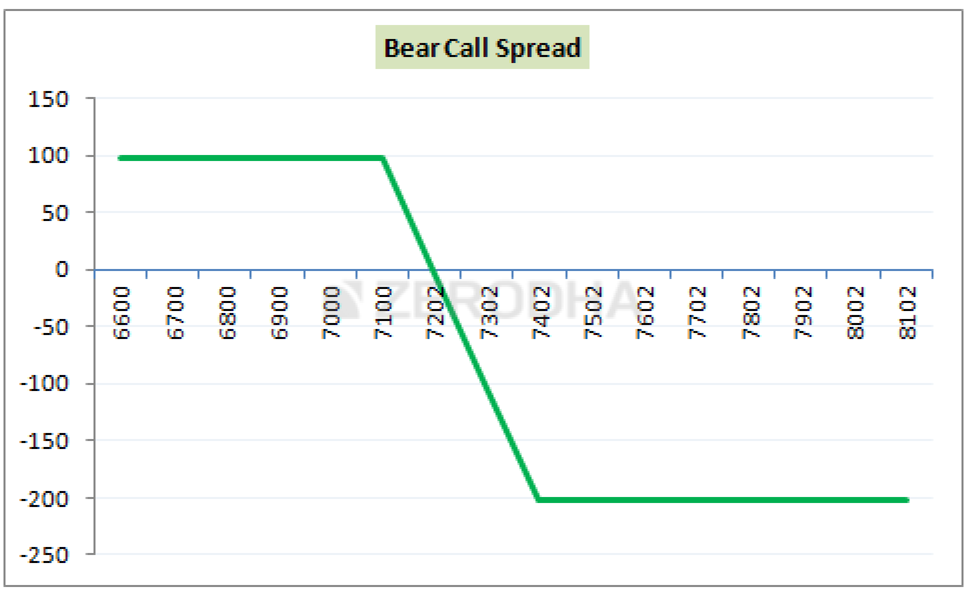
Scenario 5 – Market expires at 7000 (below the short call)

This scenario tests the profitability of the strategy when the market falls further. At 7000, both the call options would expire worthless. While we treat the premium paid for 7400 CE i.e Rs.38 as a loss , we will retain the entire premium received for 7100 CE i.e Rs.136 as a profit. Hence the net profit from the strategy would be 136-38 = **98.** Clearly, as and when the market falls, the strategy tends to make money, but it is capped to Rs.98.

Here is the payoff for the strategy at different expiries –

Market Expiry	Long Call_IV	PP	Long call payoff	Short call_IV	PR	Short call payoff	Strategy Payoff
6600	0	-38	-38	0	136	136	98
6700	0	-38	-38	0	136	136	98
6800	0	-38	-38	0	136	136	98
6900	0	-38	-38	0	136	136	98
7000	0	-38	-38	0	136	136	98
7100	0	-38	-38	0	136	136	98
7202	0	-38	-38	102	136	34	-4
7302	0	-38	-38	202	136	-66	-104
7402	2	-38	-36	302	136	-166	-202
7502	102	-38	64	402	136	-266	-202
7602	202	-38	164	502	136	-366	-202
7702	302	-38	264	602	136	-466	-202
7802	402	-38	364	702	136	-566	-202
7902	502	-38	464	802	136	-666	-202
8002	602	-38	564	902	136	-766	-202
8102	702	-38	664	1002	136	-866	-202

These payoffs can be plotted to get the graph of the strategy payoff –



As you can observe, the payoff is similar to a bear put spread where both the profits under best case scenario and losses under worst case scenario is pre defined.

8.3 – Strategy Generalization

Going by the above payoff we can generalize the key trigger points for the strategy –

- Spread = Difference between the strikes
  - 7400 – 7100 = 300
- Net Credit = Premium Received – Premium Paid
  - 136 – 38 = 98
- Breakeven = Lower strike + Net Credit
  - 7100 + 98 = 7198
- Max Profit = Net Credit
- Max Loss = Spread – Net Credit
  - 300 – 98 = 202

At this stage, we can add up the Deltas to get the overall position delta to know the strategy's sensitivity to the directional movement.

From the BS calculator I got the Delta values as follows –

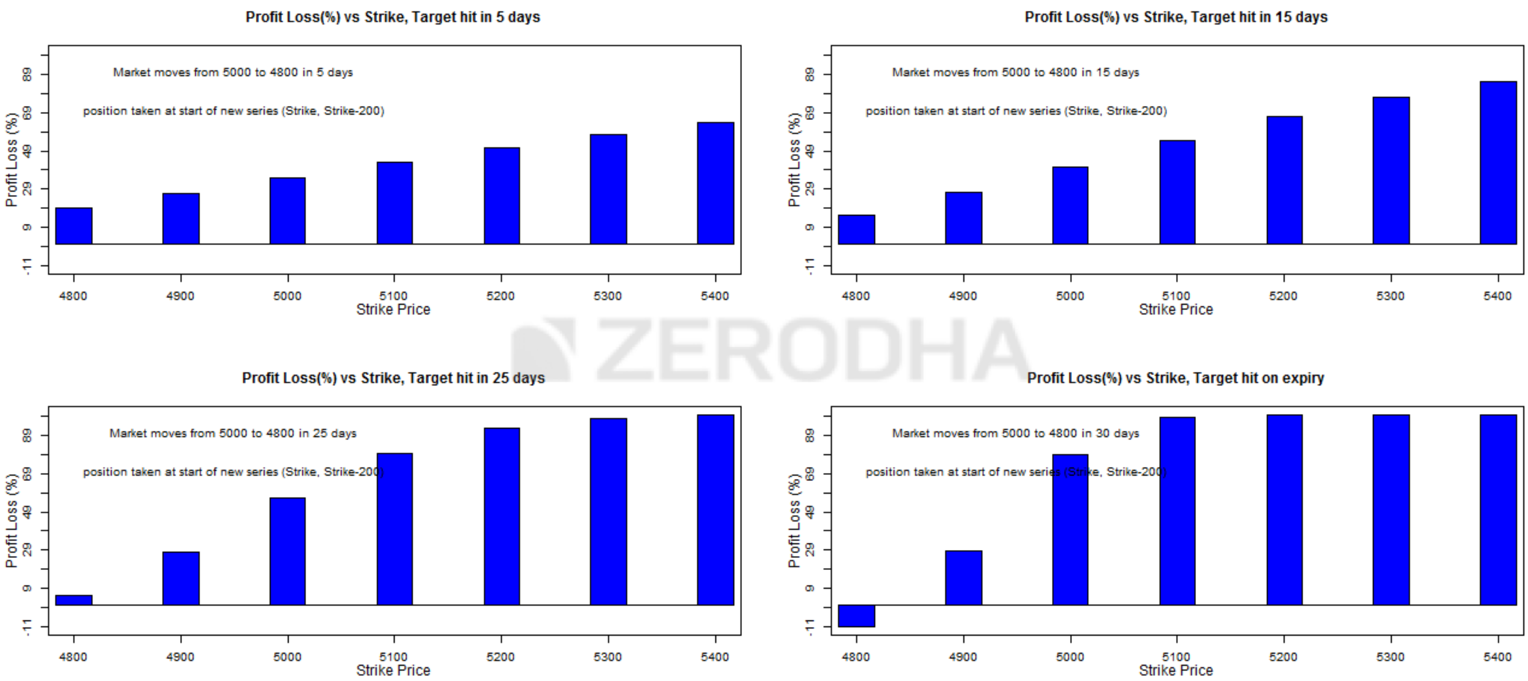
- 7400 CE is OTM option and has a delta of +0.32
- 7100 CE is ITM option and has a delta of +0.89
- Since we are short 7100 CE, the delta is –(+0.89) = -0.89
- Overall position delta is = +0.32 + (-0.89) = **-0.57**

The delta of the strategy is negative, and it indicates that the strategy makes money when the underlying goes down, and makes a loss when the underlying goes up.

8.4 – Strike Selection and impact of Volatility

The following images help us identify the best call option strikes to choose, given the time to expiry. We have discussed the split up of time frame (1^{st} and 2^{nd} half of the series) several times before, hence for this reason I will just post the graphs and the summary table.

Strikes to select when we are in the 1^{st} half of the series –

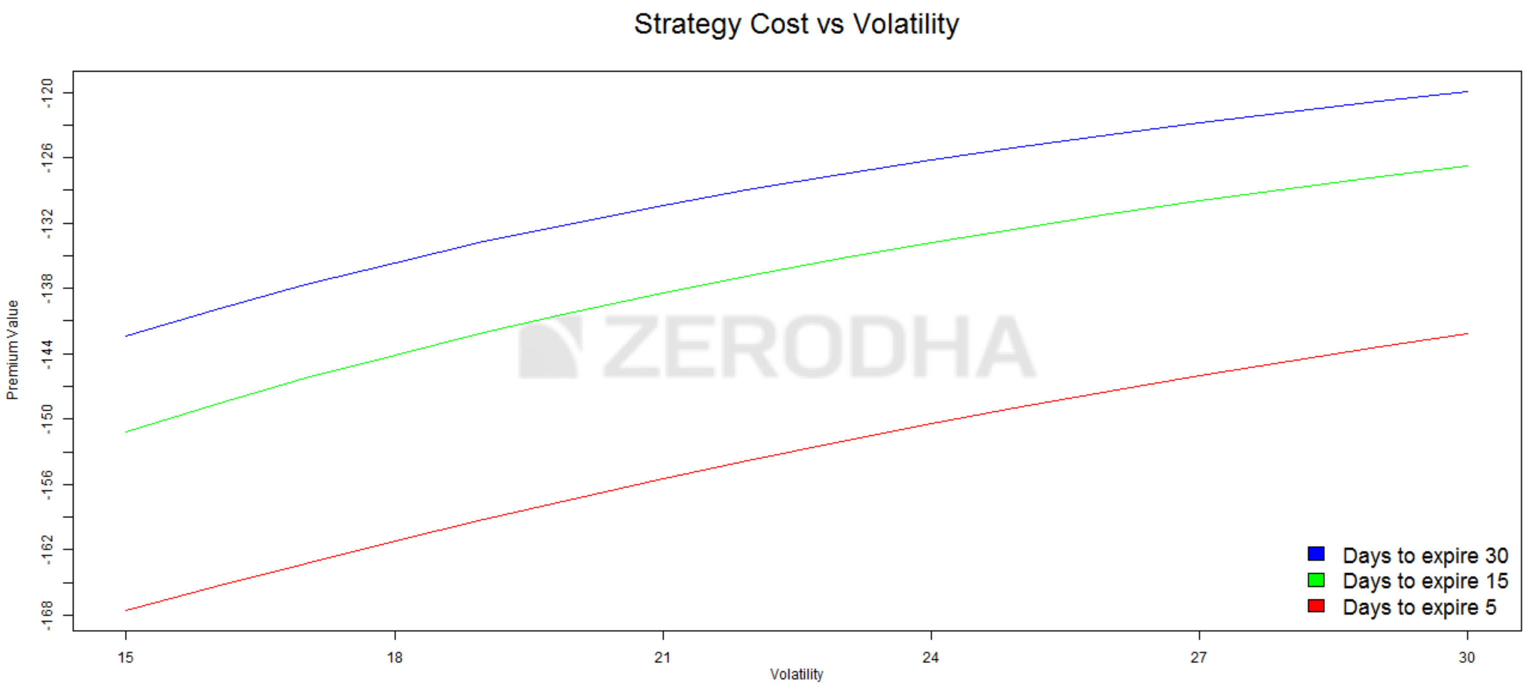


Expect 4% move to happen within	Higher strike	Lower strike	Refer graph on
5 days	Far OTM	ATM+2 strikes	Top left
15 days	Far OTM	ATM + 2 strikes	Top right
25 days	OTM	ATM + 1 strike	Bottom left
At expiry	OTM	ATM	Bottom right

Strikes to select when we are in the 2nd half of the series –

Expect 4% move to happen within	Higher strike	Lower strike	Refer graph on
5 days	Far OTM	Far OTM	Top left
15 days	Far OTM	Slightly OTM	Top right
25 days	Slightly OTM	ATM	Bottom left
At expiry	OTM	ATM/ITM	Bottom right

The following graph talks about the variation in strategy cost with respect to changes in the volatility –



The graph above explains how the premium varies with respect to variation in volatility and time.

- The blue line suggests that the cost of the strategy **does not vary much** with the increase in volatility when there is **ample time to expiry** (30 days)
- The green line suggests that the cost of the strategy **varies moderately** with the increase in volatility when there is about **15 days to expiry**
- The red line suggests that the cost of the strategy **varies significantly** with the increase in volatility when there is about **5 days to expiry**

From these graphs it is clear that one should not really be worried about the changes in the volatility when there is ample time to expiry. However one should have a view on volatility between midway and expiry of the series. It is advisable to take the bear call spread only when the volatility is expected to increase, alternatively if you expect the volatility to decrease, its best to avoid the strategy.

Download the Bear Call Spread excel.

Key takeaways from this chapter

1. Bear call spread is best invoked when you are moderately bearish on the markets
2. You choose a bear call spread over a bear put spread when the call option premiums are more attractive than put options.
3. Both the profits and losses are capped
4. Classic bear call spread involves simultaneously purchasing OTM call options and selling ITM call options
5. Bear call spread usually results in a net credit, in fact this is another key reason to invoke a bear call spread versus a bear put spread
6. Net Credit = Premium Received – Premium Paid
7. Breakeven = Lower strike + Net Credit
8. Max profit = Net Credit
9. Max Loss = Spread – Net Credit
10. Select strikes based on the time to expiry
11. Implement the strategy only when you expect the volatility to increase (especially in the 2^{nd} half of the series)

CHAPTER 9

Put Ratio Back Spread

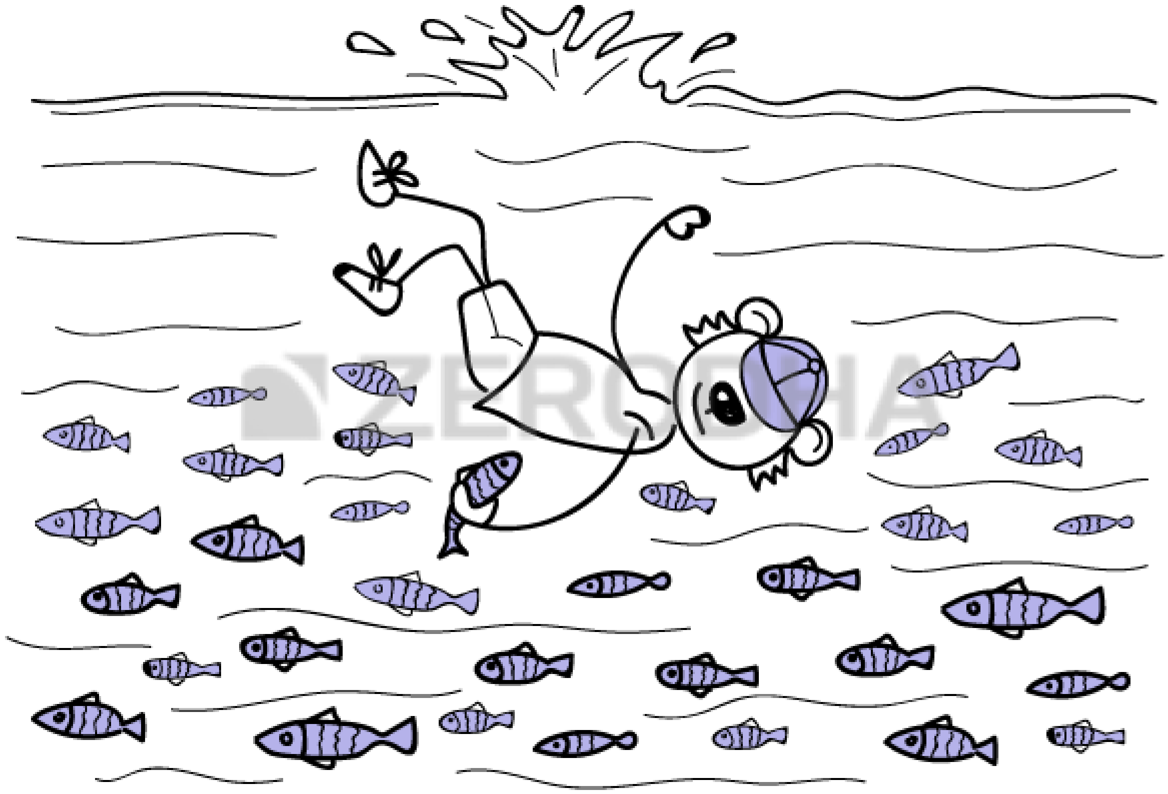
9.1 – Background

We discussed the “Call Ratio Back spread” strategy extensively in chapter 4 of this module. The Put ratio back spread is similar except that the trader invokes this when he is bearish on the market or stock.

At a broad level this is what you will experience when you implement the Put Ratio Back Spread

1. Unlimited profit if the market goes down
2. Limited profit if market goes up
3. A predefined loss if the market stays within a range

In simpler words you make money as long as the market moves in either direction, of course the strategy is more favorable if market goes down.



Usually, the Put Ratio Back Spread is deployed for a 'net credit', meaning money flows into your account as soon as you execute Put Ratio Back Spread. The 'net credit' is what you make if the market goes up, as opposed to your expectation (i.e market going down). On the other hand if the market indeed goes down, then you stand to make an unlimited profit.

I suppose this should also explain why the put ratio back spread is better than buying a plain vanilla put option.

9.2 – Strategy Notes

The Put Ratio Back Spread is a 3 leg option strategy as it involves **buying two OTM** Put options and **selling one ITM** Put option. This is the classic 2:1 combo. In fact the put ratio back spread has to be executed in the 2:1 ratio meaning 2 options bought for every one option sold, or 3 options bought for every 2 options sold, so on and so forth.

Let take an example - Nifty Spot is at 7506 and you expect Nifty to hit 7000 by the end of expiry. This is clearly a bearish expectation. To implement the Put Ratio Back Spread -

1. Sell **one** lot of 7500 PE (ITM)
2. Buy **two** lots of 7200 PE (OTM)

Make sure –

1. The Put options belong to the same expiry
2. Belong to the same underlying
3. The ratio is maintained

The trade set up looks like this –

1. 7500 PE, one lot short, the premium received for this is Rs.134/-
2. 7200 PE, two lots long, the premium paid is Rs.46/- per lot, so Rs.92/- for 2 lots
3. Net Cash flow is = Premium Received – Premium Paid i.e 134 – 92 = **42** (Net Credit)

With these trades, the Put ratio back spread is executed. Let us check what would happen to the overall cash flow of the strategies at different levels of expiry.

Do note we need to evaluate the strategy payoff at various levels of expiry, as the strategy payoff is quite versatile.

Scenario 1 – Market expires at 7600 (above the ITM option)

At 7600, both the Put options would expire worthless. The intrinsic value of options and the eventual strategy payoff is as below –

- 7200 PE, would expire worthless, since we are long 2 lots of this option at Rs.46 per lot, we would **lose** the entire premium of Rs.92 paid
- 7500 PE would also expire worthless, but we have written this option and received a premium of Rs.134, which in this case can be retained back
- The net payoff from the strategy is 134 – 92 = **42**

Do note, the net payoff of the strategy at 7600 (higher than the ITM strike) is equivalent to the net credit.

Scenario 2 – Market expires at 7500 (at the higher strike i.e the ITM option)

At 7500 both the options would have no intrinsic value, hence they both would expire worthless. Hence the payoff would be similar to the payoff we discussed at 7600. Hence the net strategy payoff would be equal to Rs.42 (net credit).

In fact as you may have guessed, the payoff of the strategy at any point above 7500 is equal to the net credit.

Scenario 3 – Market expires at 7458 (higher break even)

Like in the call ratio back spread strategy, the put ratio back spread too has two breakeven points i.e the upper breakeven and the lower breakeven point. 7458 marks the upper breakeven level; of course we will discuss how we arrived at the upper breakeven point a little later in the chapter.

- At 7458, the 7500 PE will have an intrinsic value. As you may recall, the put option intrinsic value can be calculated as Max[Strike – Spot, 0] i.e Max[7500 – 7458, 0] hence 42
- Since we have sold 7500 PE at 134, we will lose a portion of the premium received and retain the rest. Hence the payoff would be 134 – 42 = **92**
- The 7200 PE will not have any intrinsic value, hence the entire premium paid i.e 92 is lost
- So on one hand we made 92 on the 7500 PE and on the other we would lose 92 on the 7200 PE resulting in no loss, no gain. Thus, 7458 marks as one of the breakeven points.

Scenario 4 – Market expires at 7200 (Point of maximum pain)

This is the point at which the strategy causes maximum pain, let us figure out why.

- At 7200, 7500 PE would have an intrinsic value of 300 (7500 – 7200). Since we have sold this option and received a premium of Rs.134, we would lose the entire premium received and more. The payoff on this would be 134 - 300 = **- 166**

- 7200 PE would expire worthless as it has no intrinsic value. Hence the entire premium paid of Rs.92 would be lost
- The net strategy payoff would be -166 – 92 = **- 258**
- This is a point where both the options would turn against us, hence is considered as the point of maximum pain

Scenario 5 – Market expires at 6942 (lower break even)

At 6942, both the options would have an intrinsic value; however this is the lower breakeven point. Let's figure out how this works –

- At 6942, 7500 PE will have an intrinsic value equivalent of 7500 – 6942 = 558. Since have sold this option at 134, the payoff would be 134 – 558 = **- 424**
- The 7200 PE will also have an intrinsic value equivalent of 7200 – 6942 = 258 per lot, since we are long two lots the intrinsic value adds upto 516. We have initially paid a premium of Rs.92 (both lots included), hence this needs to be deducted to arrive at the payoff would be 516 – 92 = +424
- So on one hand we make 424 on the 7200 PE and on the other we would lose 424 on the 7500 PE resulting in no loss, no gain. Thus, 6942 marks as one of the breakeven points.

Scenario 6 – Market expires at 6800 (below the lower strike price)

Remember, the put ratio backspread is a bearish strategy. It is supposed to make money once the market goes below the lower breakeven point. So lets understand how the pay off behaves at a point lower than the lower breakeven point.

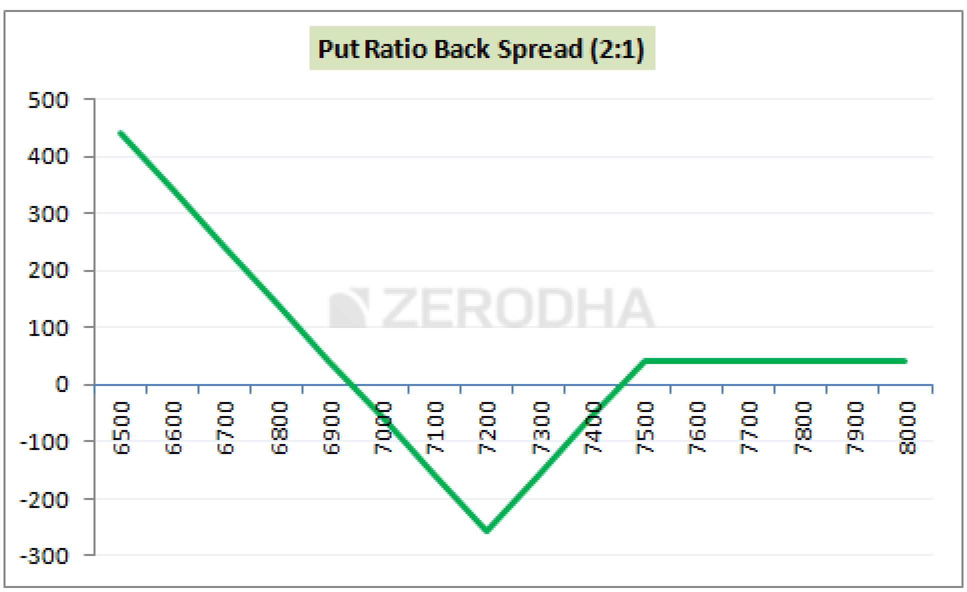
- At 6800, 7500 PE will have an intrinsic value of 700 and since we are short 7500PE at 134, we would lose 134 -700 = **- 566**
- 7200 PE will have an intrinsic value of 400. Since we are long 2 lots, the intrinsic value would be 800. Premium paid for two lots is Rs.92, hence after adjusting for the premium paid, we get to make 800 – 92 = +708
- Net strategy payoff would be 708 – 566 = +142

Likewise, you can evaluate the strategy payoff at different levels of market expiry and you will realize that the profits are uncapped as long as the market continues to slide. The following table showcases the same –

Calculations

Market Expiry	ITM_IV	PR	ITM Payoff	OTM_IV	PP	OTM_Payoff	Strategy Payoff
6500	1000	134	-866	1400	92	1308	442
6600	900	134	-766	1200	92	1108	342
6700	800	134	-666	1000	92	908	242
6800	700	134	-566	800	92	708	142
6900	600	134	-466	600	92	508	42
7000	500	134	-366	400	92	308	-58
7100	400	134	-266	200	92	108	-158
7200	300	134	-166	0	92	-92	-258
7300	200	134	-66	0	92	-92	-158
7400	100	134	34	0	92	-92	-58
7500	0	134	134	0	92	-92	42
7600	0	134	134	0	92	-92	42
7700	0	134	134	0	92	-92	42
7800	0	134	134	0	92	-92	42
7900	0	134	134	0	92	-92	42
8000	0	134	134	0	92	-92	42

Plotting the different payoff points, gives us the strategy payoff graph –



Clearly from the graph above, we can conclude –

1. If markets go down, then the profits are unlimited

2. There are two breakeven points
3. The point at which maximum loss occurs is at 7200
4. If markets goes up, then the profits are limited

9.3 – Strategy generalization

We can generalize the key strategy levels as below –

1. Spread = Higher Strike – lower strike
   a. 7500 – 7200 = 300
2. Max loss = Spread – Net credit
   a. 300 – 42 = 258
3. Max Loss occurs at = Lower strike price
4. Lower Breakeven point = Lower strike – Max loss
   a. 7200 – 258 = 6942
5. Upper breakeven point = Lower strike + Max loss
   a. 7200 + 258 = 7458

9.4 – Delta, strike selection, and effect of volatility

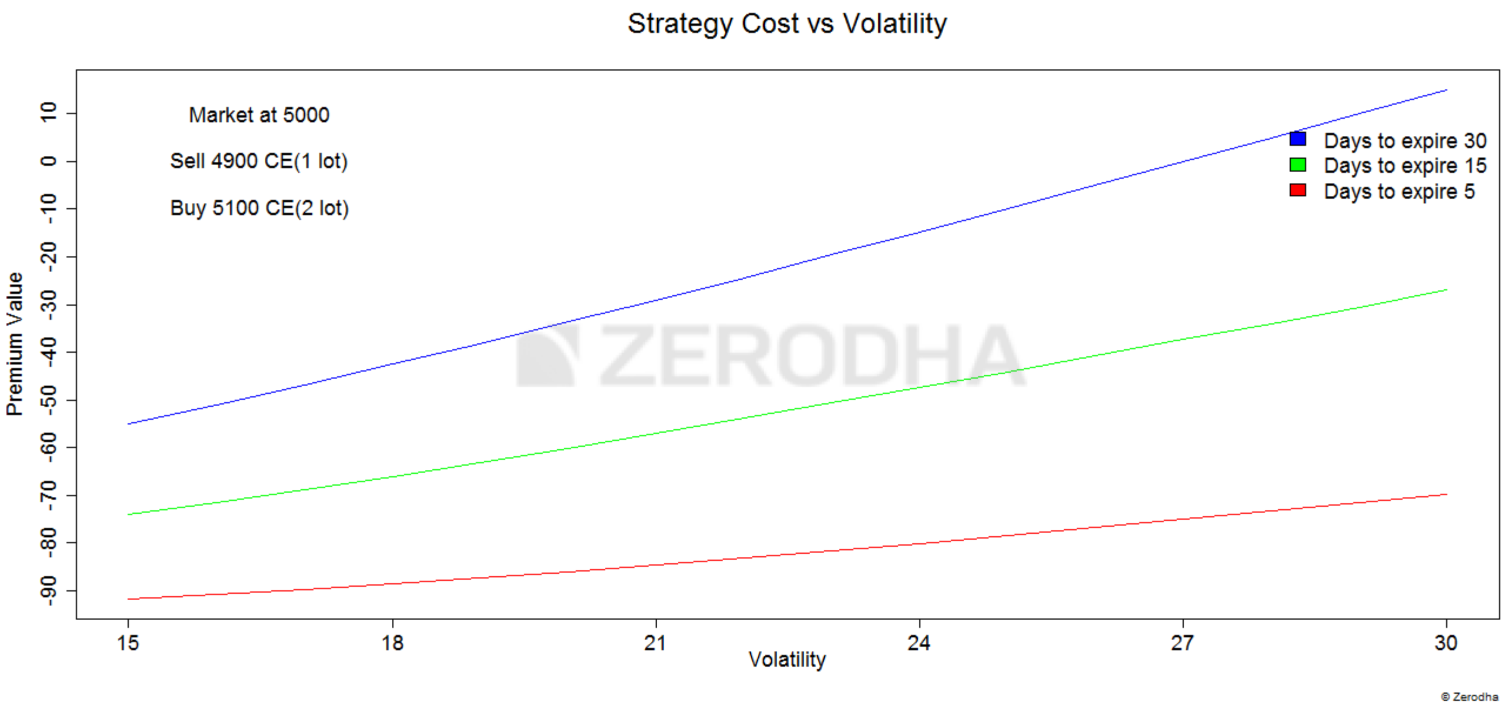
As we know, the strategy gets more profitable as and when the market falls. In other words this is a directional strategy (profitable when markets go down) and therefore the delta at overall strategy level should reflect this. Let us do the math to figure this out –

- 7500 PE is ITM option, delta is - 0.55. However since we have written the option, the delta is –(-0.55) = +0.55
- 7200 PE is OTM, has a delta of - 0.29, remember we are long two lots here
- The overall position delta would be +0.55 + (-0.29) +(-0.29) = **- 0.03**

The non zero Delta value clearly indicates that the strategy is sensitive to the directional movement (although negligible). The negative sign indicates that the strategy makes money when the market goes down.

As far as the strikes are concerned, I'd suggest you stick to the classic combination of ITM and OTM options. Remember the trade needs to be executed for a 'Net Credit'. Do not initiate this strategy if there is a net outflow of cash at the time of execution.

Let's look at the variation in volatility and its effect on the strategy –



There are three colored lines depicting the change of "premium value" versus change in volatility. These lines help us understand the effect of increase in volatility on the strategy keeping time to expiry in perspective.

1. **Blue Line** – This line suggests that an increase in volatility when there is ample time to expiry (30 days) is beneficial for the Put ratio back spread. As we can see the strategy payoff increases from -57 to +10 when the volatility increase from 15% to 30%. Clearly this means that when there is ample time to expiry, besides being right on the direction of stock/index you also need to have a view on volatility. For this reason, even though I'm bearish on the stock, I would be a bit hesitant to deploy this strategy at the start of the series if the volatility is on the higher side (say more than double of the usual volatility reading)
2. **Green line** - This line suggests that an increase in volatility when there are about 15 days time to expiry is beneficial, although not as much as in the previous case. As we can see the strategy payoff increases from -77 to -47 when the volatility increase from 15% to 30%.

3. **Red line** – Clearly increase in volatility when we have a few days to expiry does not have much impact on the premium value. This means, when you are close to expiry you only need to worry about the directional movement and need not really worry much about the variation in volatility.

Download the Put Ratio Back spread excel.

Key takeaways from this chapter

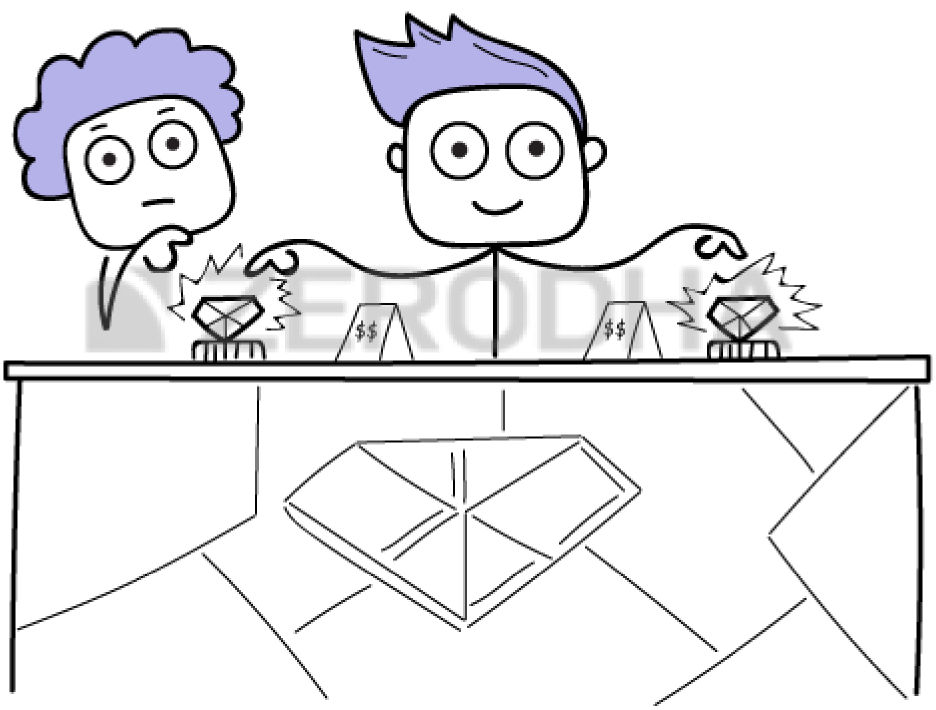
1. The Put Ratio Back spread is best executed when your outlook on the stock/index is bearish
2. The strategy requires you to sell 1 ITM PE and buy 2 OTM PE, and this is to be executed in the same ratio i.e for every 1 option sold, 2 options have to be purchased
3. The strategy is usually executed for a 'Net Credit'
4. The strategy makes limited money if the stock price goes up, and unlimited profit when the stock price goes down
5. There are two break even points – lower breakeven and upper breakeven
6. Spread = Higher Strike – Lower Strike
7. Net Credit = Premium Received for Higher strike – 2*Premium paid for lower strike
8. Max Loss = Spread – Net Credit
9. Max Loss occurs at = Lower Strike
10. The payoff when market goes up = Net Credit
11. Lower Breakeven = Lower Strike – Max Loss
12. Upper Breakeven = Lower Strike + Max Loss
13. Irrespective of the time to expiry opt for ITM and OTM strike combination
14. Increase in volatility is good for this strategy when there is more time to expiry

CHAPTER 10

The Long Straddle

10.1 – The directional dilemma

How many times have you been in a situation wherein you take a trade after much conviction, either long or short and right after you initiate the trade the market moves just the other way round? All your strategy, planning, efforts, and capital go for a toss. I'm certain this is one situation all of us have been in. In fact this is one of the reasons why most professional traders go beyond the regular directional bets and set up strategies which are insulated against the unpredictable market direction. Strategies whose profitability does not really depend on the market direction are called "Market Neutral" or "Delta Neutral" strategies. Over the next few chapters we will understand some of the market neutral strategies and how a regular retail trader can execute such strategies. Let us begin with a 'Long Straddle'.



10.2 – Long Straddle

Long straddle is perhaps the simplest market neutral strategy to implement. Once implemented, the P&L is not affected by the direction in which the market moves. The market can move in any direction, but it has to move. As long as the market moves (irrespective of its direction), a positive P&L is generated. To implement a long straddle all one has to do is –

1. Buy a Call option
2. Buy a Put option

Ensure –

1. Both the options belong to the same underlying
2. Both the options belong to the same expiry
3. Belong to the same strike

Here is an example which explains the execution of a long straddle and the eventual strategy payoff. As I write this, the market is trading at 7579, which would make the strike 7600 'At the money'. Long straddle would require us to simultaneously purchase

CALLS												PUTS										
Chart	OI	Chng in OI	Volume	IV	LTP	Net Chng	Bid Qty	Bid Price	Ask Price	Ask Qty	Strike Price	Bid Qty	Bid Price	Ask Price	Ask Qty	Net Chng	LTP	IV	Volume	Chng in OI	OI	Chart
	225	-	-	-	-	-	6,225	817.20	843.10	2,625	6750.00	600	2.55	3.50	600	-1.00	3.00	29.43	11	-	57,975	
	428,325	-1,800	51	-	784.40	53.05	75	781.40	786.75	150	6800.00	22,125	3.10	3.15	75	-1.20	3.10	28.07	5,037	1,725	3,249,375	
	1,575	-	-	-	-	-	6,150	718.45	743.80	2,250	6850.00	1,875	3.25	3.40	525	-1.00	3.35	26.74	117	4,275	51,075	
	449,775	-375	51	-	694.50	76.05	75	683.25	688.00	75	6900.00	6,525	3.60	3.65	8,925	-1.55	3.65	25.50	5,375	50,925	2,500,650	
	5,250	-	-	-	-	-	5,550	619.90	643.65	1,350	6950.00	75	3.65	4.00	75	-2.00	3.90	24.15	91	2,850	84,000	
	1,188,375	-2,850	181	-	586.85	59.30	375	584.35	589.25	225	7000.00	1,650	4.35	4.40	7,275	-2.55	4.35	23.00	9,019	225	6,112,575	
	29,475	-	-	-	-	-	5,775	519.15	541.40	300	7050.00	75	4.65	5.35	75	-3.50	5.00	21.85	117	975	90,000	
	1,090,500	675	87	-	490.80	60.15	150	488.75	492.20	375	7100.00	6,450	5.85	5.90	9,525	-4.10	5.85	20.81	8,025	-50,250	3,841,950	
	53,025	-	3	-	445.10	68.10	150	430.95	441.00	75	7150.00	1,275	7.50	7.75	10,350	-4.70	7.70	20.17	989	-5,025	167,025	
	3,324,275	-9,450	372	-	392.05	52.50	150	393.00	394.95	75	7200.00	2,250	9.20	9.30	750	-6.80	9.30	19.18	13,896	-17,625	6,343,875	
	77,775	-3,300	69	-	344.00	50.70	150	340.00	346.75	75	7250.00	2,100	11.90	12.15	75	-8.55	12.15	18.53	1,051	-15,675	209,475	
	1,785,375	-7,650	526	9.83	296.50	46.80	75	298.25	299.40	75	7300.00	1,875	15.75	15.85	1,050	-11.40	15.75	17.88	27,791	-328,425	4,707,675	
	113,925	-675	36	12.42	251.90	40.15	300	253.55	256.75	75	7350.00	150	20.70	20.90	1,125	-15.20	20.90	17.21	1,506	11,625	297,075	
	4,103,100	-56,175	4,029	12.02	212.20	43.10	300	212.40	212.75	75	7400.00	7,200	27.90	28.10	1,950	-18.00	28.10	16.65	29,385	65,325	5,999,700	
	321,375	-15,225	1,175	12.69	171.05	37.05	300	172.25	172.95	75	7450.00	225	36.70	36.80	600	-22.20	36.80	16.02	1,992	2,025	476,025	
	7,100,025	53,400	21,639	12.84	136.20	32.15	450	136.15	136.50	300	7500.00	1,950	49.60	49.85	150	-28.05	49.90	15.59	35,368	337,000	4,658,825	
	605,625	-2,625	2,292	12.77	103.40	25.70	1,875	103.40	104.00	300	7550.00	150	65.55	65.90	675	-32.30	66.00	15.14	3,233	135,750	615,525	
	6,058,275	56,700	41,078	12.91	76.90	20.95	600	76.80	76.95	375	7600.00	75	88.05	88.35	525	-38.90	88.25	15.08	21,004	350,325	1,593,300	
	354,300	30,000	2,115	12.82	54.10	15.45	450	54.05	54.50	225	7650.00	75	114.00	116.25	75	-47.15	114.40	14.74	58	1,275	24,825	
	6,831,225	-14,550	36,560	12.83	36.80	11.10	750	36.75	36.90	675	7700.00	150	146.25	146.80	75	-49.50	147.10	15.12	3,482	33,225	788,025	
	273,600	-8,475	1,124	12.71	23.35	6.95	450	23.50	23.60	75	7750.00	150	180.40	186.70	75	-59.70	180.15	14.21	1	-	17,175	
	4,538,100	42,150	23,604	12.70	14.80	4.30	1,275	14.75	14.85	1,725	7800.00	75	222.80	224.00	150	-57.05	225.00	15.24	496	11,175	496,950	
	113,775	15,375	689	12.63	8.60	1.70	975	8.40	8.95	75	7850.00	450	262.90	278.50	600	-	-	-	-	-	375	
	1,449,075	233,025	14,064	13.13	5.80	1.20	1,275	5.80	5.85	1,875	7900.00	75	314.80	316.20	75	-61.35	317.00	17.89	113	225	163,425	
	79,050	-	49	13.88	4.25	1.05	975	2.55	3.95	75	7950.00	5,925	339.75	383.65	5,925	-	-	-	-	-	-	
	3,880,100	87,375	10,261	14.12	2.70	0.25	150	2.65	2.70	7,575	8000.00	300	413.00	414.10	75	-60.50	416.00	20.74	96	-3,600	635,675	
	525	-	-	-	-	-	975	1.00	2.40	75	8050.00	6,000	435.35	481.85	4,875	-	-	-	-	-	375	

the ATM call and put options.As you can see from the snapshot above, 7600CE is trading at 77 and 7600 PE is trading at 88. The simultaneous purchase of both these options would result in a net debit of Rs.165. The idea here is – the trader is long on both the call and put options belonging to the ATM strike. Hence the trader is not really worried about which direction the market would move. If the market goes up, the trader would expect to see gains in Call options far higher than the loss made (read premium paid) on the put option. Similarly, if the market goes down, the gains in the Put option far exceeds the loss on the call option. Hence irrespective of the direction, the gain in one option is good enough to offset the loss in the other and still yield a positive P&L. Hence the market direction here is meaningless. Let us break this down further and evaluate different expiry scenarios. **Scenario 1 – Market expires at 7200, put option makes money** This is a scenario where the gain in the put option not only offsets the loss made in the call option but also yields a positive P&L over and above. At 7200 –

- 7600 CE will expire worthless, hence we lose the premium paid i.e **Rs. 77**
- 7600 PE will have an intrinsic value of 400. After adjusting for the premium paid i.e Rs.88, we get to retain 400 – 88 = 312
- The net payoff would be 312 – 77 = **+ 235**

As you can see, the gain in put option after adjusting for the premium paid for put option and after adjusting for the premium paid for the call option still yields a positive P&L. **Scenario 2 – Market expires at 7435 (lower breakeven)** This is a situation where the strategy neither makes money nor loses any money.

- 7600 CE would expire worthless; hence the premium paid has to be written off. Loss would be Rs.77
- 7600 PE would have an intrinsic value of 165, hence this is the gain in the put option
- However the net premium paid for the call and put option is Rs.165, which gets adjusted with the gain in the put option

If you think about it, with respect to the ATM strike, market has indeed expired at a lesser value. So therefore the put option makes money. However, the gains made in the put option adjusts itself against the premium paid for both the call and put option, eventually leaving no money on the table. **Scenario 3 – Market expires at 7600 (at**

the ATM strike) At 7600, the situation is quite straight forward as both the call and put option would expire worthless and hence the premium paid would be gone. The loss here would be equivalent to the net premium paid i.e Rs.165. **Scenario 4 – Market expires at 7765 (upper breakeven)** This is similar to the 2nd scenario we discussed. This is a point at which the strategy breaks even at a point higher than the ATM strike.

- 7600 CE would have an intrinsic value of 165, hence this is the gain in Call option
- 7600 PE would expire worthless, hence the premium paid towards the option is lost
- The gain made in the 7600 CE is offset against the combined premium paid

Hence the strategy would breakeven at this point. **Scenario 5 – Market expires at 8000, call option makes money** Clearly the market in this scenario is way above the 7600 ATM mark. The call option premiums would swell, so much so that the gains in call option will more than offset the premiums paid. Let us check the numbers –

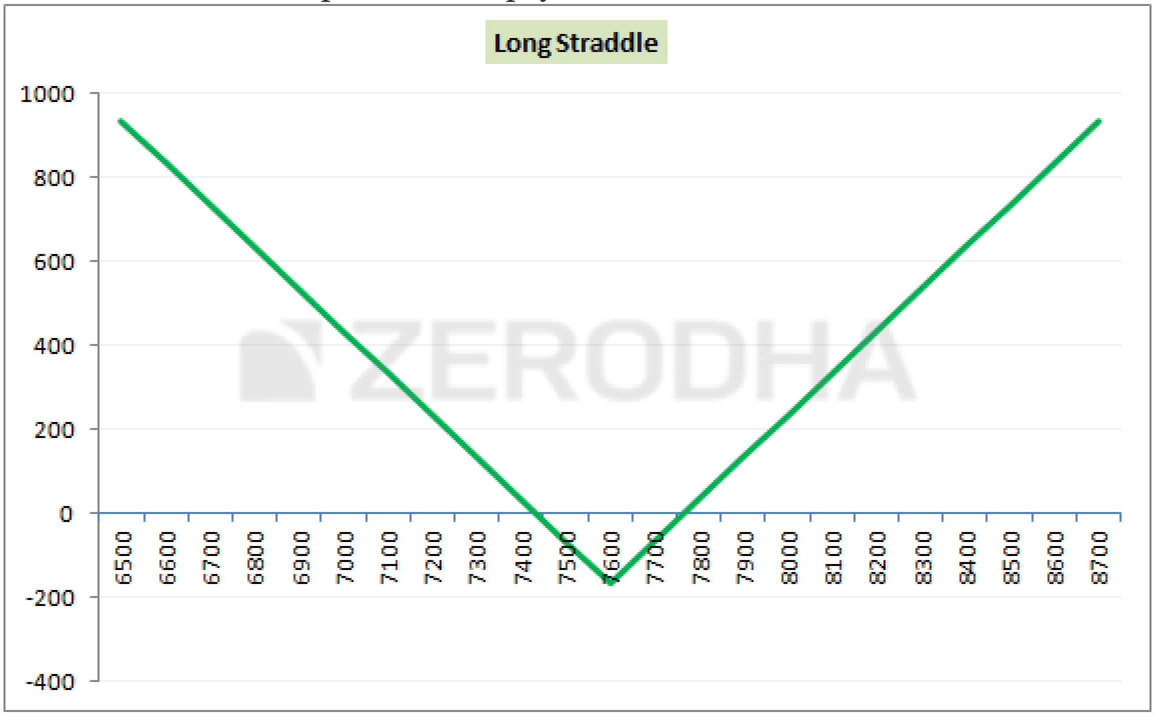
- 7600 PE will expire worthless, hence the premium paid i.e Rs.88 is to be written off
- At 8000, the 7600 CE will have an intrinsic value of 400
- The net payoff here is 400 – 88 – 77 = **+235**

Market Expiry	CE_IV	PP	CE Payoff	PE_IV	PP	PE_Payoff	Strategy Payoff
6500	0	-77	-77	1100	-88	1012	935
6600	0	-77	-77	1000	-88	912	835
6700	0	-77	-77	900	-88	812	735
6800	0	-77	-77	800	-88	712	635
6900	0	-77	-77	700	-88	612	535
7000	0	-77	-77	600	-88	512	435
7100	0	-77	-77	500	-88	412	335
7200	0	-77	-77	400	-88	312	235
7300	0	-77	-77	300	-88	212	135
7400	0	-77	-77	200	-88	112	35
7500	0	-77	-77	100	-88	12	-65
7600	0	-77	-77	0	-88	-88	-165
7700	100	-77	23	0	-88	-88	-65
7800	200	-77	123	0	-88	-88	35
7900	300	-77	223	0	-88	-88	135
8000	400	-77	323	0	-88	-88	235
8100	500	-77	423	0	-88	-88	335
8200	600	-77	523	0	-88	-88	435
8300	700	-77	623	0	-88	-88	535
8400	800	-77	723	0	-88	-88	635
8500	900	-77	823	0	-88	-88	735
8600	1000	-77	923	0	-88	-88	835
8700	1100	-77	1023	0	-88	-88	935

So as you can see, the gain in call option is significant enough to offset the combined premiums paid. Here is the payoff table at different market expiry levels.As you can observe –

1. The maximum loss (165) occurs at 7600, which is the ATM strike
2. The profits are unlimited in either direction of the market

We can visualize these points in the payoff structure here –



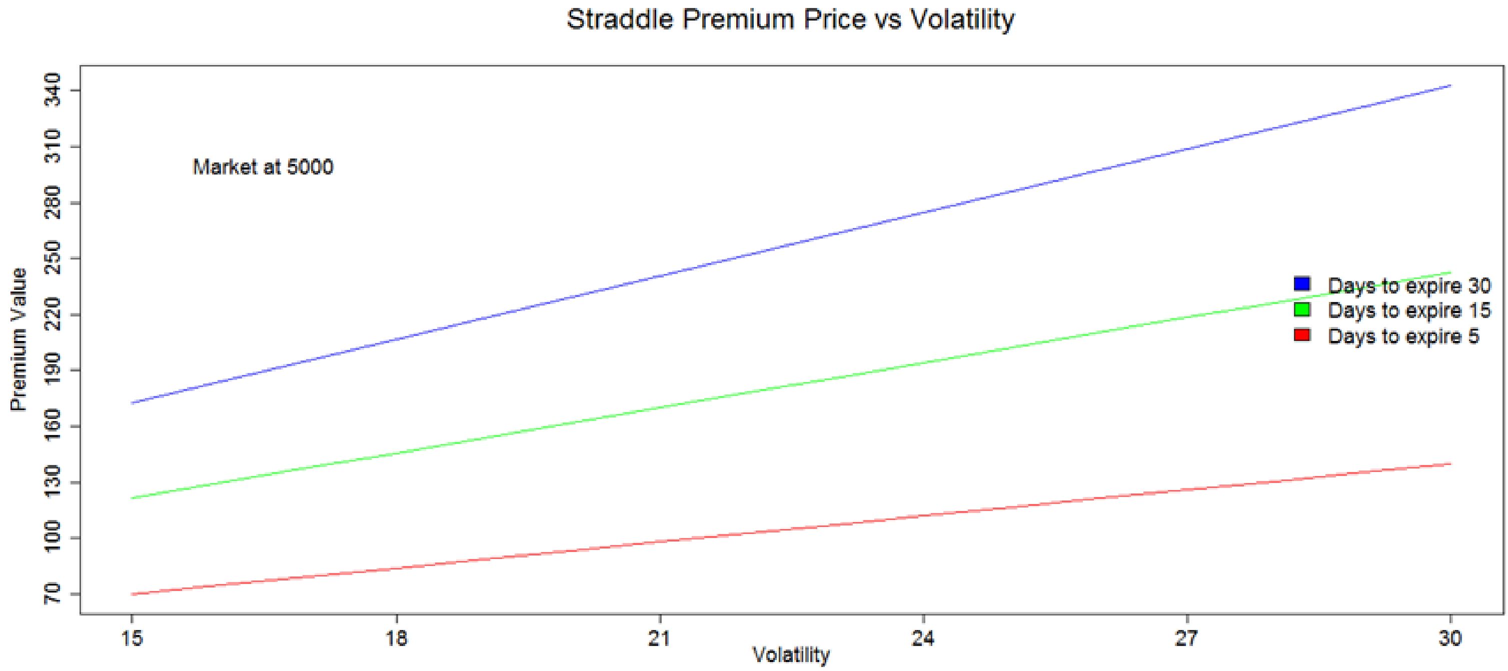
From the V shaped payoff graph, the following things are quite clear –

1. With reference to the ATM strike, the strategy makes money in either direction
2. Maximum loss is experienced when markets don't move and stay at ATM
   a. Max loss = Net premium paid
3. There are two breakevens – on either side, equidistant from ATM
   a. Upper Breakeven = ATM + Net premium
   b. Lower Breakeven = ATM – Net premium

I'm certain, you find this strategy quite straight forward to understand and implement. In summary, you buy calls and puts, each leg has a limited down side, hence the combined position also has a limited downside and an unlimited profit potential. So in essence, a long straddle is like placing a bet on the price action each-way - you make money if the market goes up or down. Hence the direction does not matter here. But let me ask you this – if the direction does not matter, what else matters for this strategy?

10.3 – Volatility Matters

Yes, volatility matters quite a bit when you implement the straddle. I would not be exaggerating if I said that volatility makes or breaks the straddle. Hence a fair assessment on volatility serves as the backbone for the straddle's success. Have a look at this graph below –The y-axis represents the cost of the strategy, which is simply the



combined premium of both the options and the x-axis represents volatility. The blue, green, and red line represents how the premium increases when the volatility increases given that there is 30, 15, and 5 days to expiry respectively. As you can see, this is a linear graph and irrespective of time to expiry, the strategy cost increases as and when the volatility increases. Likewise the strategy costs decreases when the volatility decreases. Have a look at the blue line; it suggests when volatility is 15%, the cost of setting up a long straddle is 160. Remember the cost of a long straddle represents the combined premium required to buy both call and put options. So at 15% volatility it costs Rs.160 to set up the long straddle, however keeping all else equal, when volatility increases to 30% it costs Rs.340 to set up the same long straddle. In other words, you are likely to double your money in the straddle provided –

1. You set up the long straddle at the start of the month
2. The volatility at the time of setting up the long straddle is relatively low
3. After you set up the long straddle, the volatility doubles

You can make similar observations with the green and red line which represents the 'price to volatility' behavior when the time to expiry is 15 and 5 days respectively. Now, this also means you will lose money if you execute the straddle when the volatility is high which starts to decline after you execute the long straddle. **This is an extremely crucial point to remember.** At this point, let us have a quick discussion on the overall strategy's delta. Since we are long on ATM strike, the delta of both the options is close to 0.5.

- The call option has a delta of + 0.5
- The put option has a delta of - 0.5

The delta of call option offsets the delta of put option thereby resulting in a net '0' overall delta. Recall, delta shows the direction bias of the position. A +ve delta indicates a bullish bias and a -ve delta indicates a bearish bias. Given this, a 0 delta indicates that there is no bias whatsoever to the direction of the market. So all strategies which have zero deltas are called 'Delta Neutral' and Delta Neutral strategies are insulated against the market direction.

10.4 – What can go wrong with the straddle?

On the face of it a long straddle looks great. Think about it – you get to make money whichever way the market decides to move. All you need is the right volatility estimate. Therefore, what can really go wrong with a straddle? Well, two things come in between you and the profitability of a long straddle –

1. **Theta Decay** – All else equal, options are depreciating assets and this particularly hurts long positions. The closer you get to expiration, the lesser time value of the option. Time decay accelerates exponentially during the last week before expiration, so you do not want to hold onto out-of-the-money or at-the-money options into the last week and lose premiums rapidly.
2. **Large breakevens** – Recollect, in the example we discussed earlier, the breakeven points were 165 points away from the ATM strike. The lower breakeven point was 7435 and the upper breakeven was 7765, considering the ATM strike was 7600. In percentage terms, the market has to move 2.2% (either ways) to achieve breakeven. This means that from the time you initiate the straddle, the market or the stock has to move atleast 2.2% either ways for you to start making money…and this move has to happen within a maximum of 30 days. Further if you want to make a profit of atleast 1% on this trade, then we are talking about a 1% move over and above 2.2% on the index. Such large move on

the index is quite a challenge in my opinion and I will explain why in the next chapter.

Keeping the above two points plus the impact on volatility in perspective, we can summarize what really needs to work in your favor for the straddle to be profitable -

1. The volatility should be relatively low at the time of strategy execution
2. The volatility should increase during the holding period of the strategy
3. The market should make a large move – the direction of the move does not matter
4. The expected large move is time bound, should happen quickly – well within the expiry

From my experience trading long straddles, they are profitable when setup around major market events and the impact of such events should exceed over and above what the market expects. Let me explain the 'event and expectation' part a bit more, please do read the following carefully. Let us take the Infosys results as an example here. **Event** - Quarterly results of Infosys **Expectation** – 'Muted to flat' revenue guideline for the coming few quarters. **Actual Outcome** – As expected Infosys announces 'muted to flat' revenue guideline for the coming few quarters. If you were the set up a long straddle in the backdrop of such an event (and its expectation), and eventually the expectation is matched, then chances are that the straddle would fall apart. This is because around major events, volatility tends to increase which tends to drive the premium high. So if you are to buy ATM call and put options just around the corner of an event, then you are essentially buying options when the volatility is high. When events are announced and the outcome is known, the volatility drops like a ball, and therefore the premiums. This naturally breaks the straddle down and the trader would lose money owing to the 'bought at high volatility and sold at low volatility' phenomena. I've noticed this happening over and over again, and unfortunately have seen many traders lose money exactly for this reason. **Favorable Outcome** – However imagine, instead of 'muted to flat' guideline they announce an 'aggressive' guideline. This would essentially take the market by surprise and drive premiums much higher, resulting in a profitable straddle trade. This means there is another angle to straddles – your assessment of the event's outcome should be couple of notches better than the general market's assessment. You cannot setup a straddle with a mediocre assessment of events and its outcome. This may seem like a difficult proposition but you will have to trust me here – few quality years of trading experience will actually get you to assess situations way better than the rest of the market. So, just for clarity, I'd like to repost all the angles which need to be aligned for the straddle to be profitable –

1. The volatility should be relatively low at the time of strategy execution
2. The volatility should increase during the holding period of the strategy
3. The market should make a large move – the direction of the move does not matter
4. The expected large move is time bound, should happen quickly – well within the expiry
5. Long straddles are to be set around major events, and the outcome of these events to be drastically different from the general market expectation.

You may be wondering there are far too many points that come in between you and the long straddle's profitability. But worry not, I'll share an antidote in the next chapter – The Short Straddle, and why it makes sense. **Download** the long straddle excel.

Key takeaways from this chapter

1. Strategies which are insulated to market direction are called 'Market Neutral' or 'Delta neutral'
2. Market neutral strategies such as long straddle makes money either which way the market moves
3. Long straddle requires you to simultaneously buy the ATM Call and Put option. The options should belong to the same underlying, same strike, and same expiry
4. By buying the CE and PE – the trader is placing the bet on either direction
5. The maximum loss is equal to the net premium paid, and it occurs at the strike at which the long straddle has been initiated
6. The upper breakeven is 'strike + net premium'. The lower breakeven is 'strike – net premium'
7. The deltas in a long straddle adds up to zero
8. The volatility should be relatively low at the time of strategy execution
9. The volatility should increase during the holding period of the strategy
10. The market should make a large move – the direction of the move does not matter

11. The expected large move is time bound, should happen quickly – well within the expiry
12. Long straddles are to be set around major events, and the outcome of these events to be drastically different from the general market expectation.

CHAPTER 11

The Short Straddle

11.1 – Context

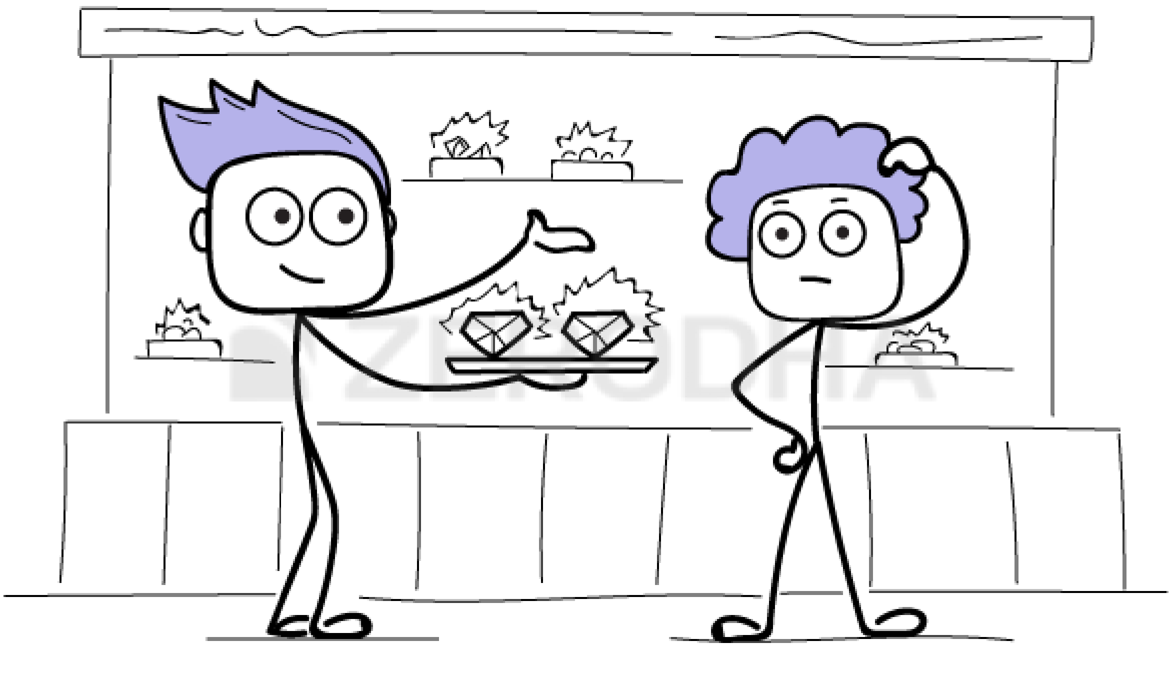
In the previous chapter we understood that for the long straddle to be profitable, we need a set of things to work in our favor, reposting the same for your quick reference –

1. The volatility should be relatively low at the time of strategy execution
2. The volatility should increase during the holding period of the strategy
3. The market should make a large move – the direction of the move does not matter
4. The expected large move is time bound, should happen quickly – well within the expiry
5. Long straddles are to be setup around major events, and the outcome of these events to be drastically different from the general market expectation.

Agreed that the directional movement of the market does not matter in the long straddle, but the bargain here is quite hard. Considering the 5 points list, getting the long straddle to work in you favor is quite a challenge. Do recall, in the previous chapter the breakdown was at 2%, add to this another 1% as desired profits and we are essentially looking for, at least a 3% move on the index. From my experience expecting the market to make such moves regularly is quite a challenge. In fact for this reason alone, I think twice each and every time I need to initiate a long straddle.

I have witnessed many traders recklessly set up long straddles thinking they are insulated to the market's directional movement. But in reality they end up losing money in a long straddle – time delay and the general movement in the market (or the lack of it) works against them. Please note, I'm not trying to discourage you from employing the long straddle, no one denies the simplicity and elegance of a long straddle. It works extremely well when all the 5 points above are aligned. My only issue with long straddle is the probability of these 5 points aligning with each other.

Now think about this – there are quite a few factors which prevents the long straddle to be profitable. So as an extension of this – the same set of factors **'should'** favor the opposite of a long straddle, i.e the 'Short Straddle'.



11.2 – The Short Straddle

Although many traders fear the short straddle (as losses are uncapped), I personally prefer trading the short straddle on certain occasions over its peer strategies. Anyway let us quickly understand the set up of a short straddle, and how its P&L behaves across various scenarios.

Setting up a short straddle is quite straight forward – as opposed to buying the ATM Call and Put options (like in long straddle) you just have to sell the ATM Call and Put option. Obviously the short strategy is set up for a net credit, as when you sell the ATM options, you receive the premium in your account.

Here is any example, consider Nifty is at 7589, so this would make the 7600 strike ATM. The option premiums are as follows –

- 7600 CE is trading at 77
- 7600 PE is trading at 88

So the short straddle will require us to sell both these options and collect the net premium of 77 + 88 = 165.

Please do note – the options should belong to the same underlying, same expiry, and of course same strike. So assuming you have executed this short straddle, let's figure out the P&L at various market expiry scenarios.

Scenario 1 – Market expires at 7200 (we lose money on put option)

This is a scenario where the loss in the put option is so large that it eats away the premium collected by both the CE and PE, resulting in an overall loss. At 7200 –

- 7600 CE will expire worthless, hence we get the retain the premium received i.e 77
- 7600 PE will have an intrinsic value of 400. After adjusting for the premium received i.e Rs.88, we lose 400 – 88 = **- 312**
- The net loss would be 312 – 77 = **- 235**

As you can see, the gain in call option is offset by the loss in the put option.

Scenario 2 – Market expires at 7435 (lower breakdown)

This is a situation where the strategy neither makes money nor loses any money.

- 7600 CE would expire worthless; hence the premium received is retained. Profit here is Rs.77
- 7600 PE would have an intrinsic value of 165, out of which we have received Rs.88 as premium, hence our loss would be 165 – 88 = -77
- The gain in the call option is completely offset by the loss in the put option. Hence we neither make money nor lose money at 7435.

Scenario 3 – Market expires at 7600 (at the ATM strike, maximum profit)

This is the most favorable outcome for a short straddle. At 7600, the situation is quite straight forward as both the call and put option would expire worthless and hence the premium received from both the call and put option will be retained. The gain here would be equivalent to the net premium received i.e Rs.165.

So this means, in a short straddle you make maximum money when the markets don't move!

Scenario 4 – Market expires at 7765 (upper breakdown)

This is similar to the 2nd scenario we discussed. This is a point at which the strategy breaks even at a point higher than the ATM strike.

- 7600 CE would have an intrinsic value of 165, hence after adjusting for the premium received of Rs. 77, we stand to lose Rs.88 (165 – 77)
- 7600 PE would expire worthless, hence the premium received i.e Rs.88 is retained
- The gain made in the 7600 PE is offset against the loss on the 7600 CE, hence we neither make money nor lose money.

Clearly this is the upper breakdown point.

Scenario 5 – Market expires at 8000 (we lose money on call option)

Clearly the market in this scenario is way above the 7600 ATM mark. The call option premium would swell, so would the loss –

- 7600 PE will expire worthless, hence the premium received i.e Rs.88 is retained
- At 8000, the 7600 CE will have an intrinsic value of 400, hence after adjusting for the premium received of Rs. 77, we stand to lose Rs. 323(400 -77)
- We have received Rs.88 as premium for the Put option, therefore the loss would be 88- 323 = **-235**

So as you can see, the loss in the call option is significant enough to offset the combined premiums received.

Here is the payoff table at different market expiry levels.

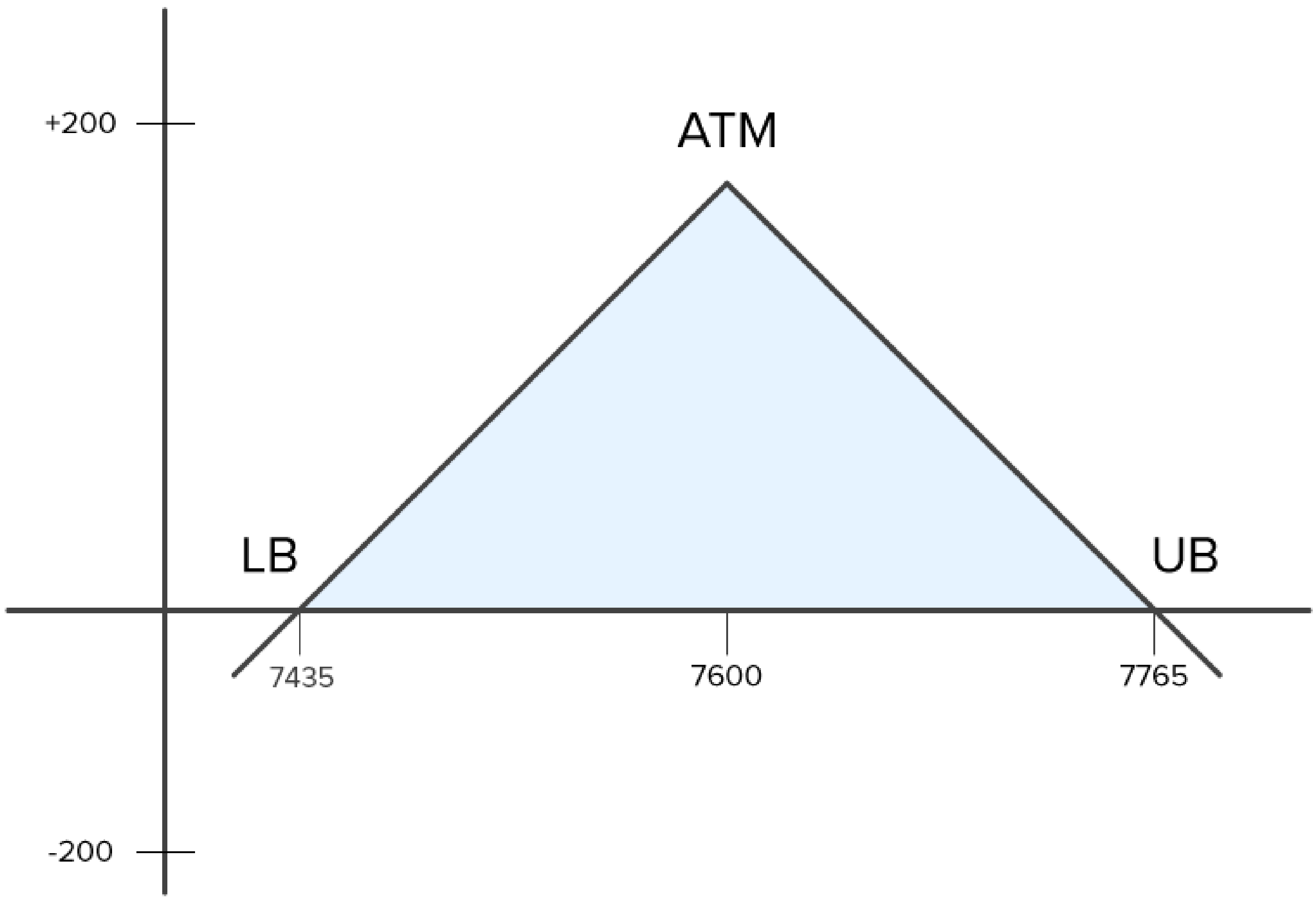
Market Expiry	CE_IV	PR	CE Payoff	PE_IV	PR	PE_Payoff	Strategy Payoff
6500	0	77	77	1100	88	-1012	-935
6600	0	77	77	1000	88	-912	-835
6700	0	77	77	900	88	-812	-735
6800	0	77	77	800	88	-712	-635
6900	0	77	77	700	88	-612	-535
7000	0	77	77	600	88	-512	-435
7100	0	77	77	500	88	-412	-335
7200	0	77	77	400	88	-312	-235
7300	0	77	77	300	88	-212	-135
7400	0	77	77	200	88	-112	-35
7500	0	77	77	100	88	-12	65
7600	0	77	77	0	88	88	165
7700	100	77	-23	0	88	88	65
7800	200	77	-123	0	88	88	-35
7900	300	77	-223	0	88	88	-135
8000	400	77	-323	0	88	88	-235
8100	500	77	-423	0	88	88	-335
8200	600	77	-523	0	88	88	-435
8300	700	77	-623	0	88	88	-535
8400	800	77	-723	0	88	88	-635
8500	900	77	-823	0	88	88	-735

As you can observe –

1. The maximum profit 165 occurs at 7600, which is the ATM strike
2. The strategy remains profitable only between the lower and higher breakdown numbers
3. The losses are unlimited in either direction of the market

We can visualize these points in the payoff structure here –

From the inverted V shaped payoff graph, the following things are quite clear –



1. The point at which you can experience maximum profits is at ATM, the profits shrink as you move away from the ATM mark
2. The strategy is profitable as long as the market stays within the breakdown points
3. Maximum loss is experienced when markets move further away from the breakdown point. The further away the market moves from the breakdown point, higher the loss
    a. Max loss = Unlimited
4. There are two breakdown points – on either side, equidistant from ATM
    a. Upper Breakdown = ATM + Net premium
    b. Lower Breakdown = ATM – Net premium

As you may have realized by now, the short straddle works exactly opposite to the long straddle. Short straddle works best when markets are expected to be in a range and not really expected to make a large move.

Many traders fear short straddle considering the fact that short straddles have unlimited losses on either side. However from my experience, short straddles work really well if you know how exactly to deploy this. In fact in the last chapter of the previous module, I had posted a case study involving short straddle. Probably that was one of the best examples of when to implement the short straddle.

I will repost the same again here and I hope you will be able to appreciate the case study better.

11.3 – Case Study (repost from previous module)

The following case study was a part of **Module 5, Chapter 23**. I'm reposting the same here as I assume you would appreciate the example better at this stage. To get the complete context, I'd request you to read the chapter.

Infosys was expected to announce their Q2 results on 12th October. The idea was simple – news drives volatility up, so short options with an expectation that you can buy it back when the volatility cools off. The trade was well planned and the position was initiated on 8th Oct - 4 days prior to the event.

Infosys was trading close to Rs.1142/- per share, so he decided to go ahead with the 1140 strike (ATM).

Here is the snapshot at the time of initiating the trade -

Option Chain (Equity Derivatives)

Underlying Stock: **INFY 1142.60** As on Oct 08, 2015 10:36:06 IST

View Options Contracts for: Select Index OR Search for an underlying stock: GO Filter by: Expiry Date 29OCT2015 Futures contracts

CALLS												PUTS										
Chart	OI	Chng in OI	Volume	IV	LTP	Net Chng	Bid Qty	Bid Price	Ask Price	Ask Qty	Strike Price	Bid Qty	Bid Price	Ask Price	Ask Qty	Net Chng	LTP	IV	Volume	Chng in OI	OI	Chart
	-	-	-	-	-	-	1,250	273.00	-	-	760.00	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,250	252.50	-	-	780.00	-	-	-	-	-	-	-	-	-	-	
	3,500	-	-	-	-	-	1,500	233.00	-	-	800.00	3,250	0.05	1.95	250	-	-	-	-	-	250	
	-	-	-	-	-	-	1,500	213.00	-	-	820.00	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,500	193.00	-	-	840.00	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,500	173.00	-	-	860.00	-	-	3.00	250	-	-	-	-	-	-	
	-	-	-	-	-	-	1,500	153.50	-	-	880.00	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,500	233.80	243.25	1,500	900.00	1,000	2.00	3.00	2,250	-	-	-	-	-	15,250	
	-	-	-	-	-	-	1,500	214.55	223.90	1,500	920.00	3,500	1.15	4.85	3,000	-	-	-	-	-	750	
	-	-	-	-	-	-	1,500	195.80	206.30	1,500	940.00	500	2.50	4.45	3,000	-	-	-	-	-	10,000	
	5,250	-	-	-	-	-	1,500	175.55	-	-	960.00	250	3.50	3.85	1,750	-0.40	3.70	50.35	8	250	46,250	
	750	-	-	-	-	-	2,250	59.00	-	-	980.00	500	4.90	5.10	1,250	-1.30	5.10	49.11	43	2,000	28,000	
	13,500	-	-	-	-	-	2,250	142.25	-	-	1000.00	20,750	6.90	7.15	3,250	-0.95	7.15	48.75	366	6,000	228,250	
	12,500	-	-	-	-	-	2,250	124.50	-	-	1020.00	250	9.35	9.70	3,000	-1.70	9.60	48.51	93	2,000	56,000	
	2,750	-	-	-	-	-	4,500	105.50	114.45	500	1040.00	250	12.70	12.90	500	-2.30	12.95	47.66	348	28,250	233,500	
	8,500	-	-	-	-	-	5,250	91.00	99.15	3,000	1060.00	750	17.05	17.35	500	-3.35	17.00	47.59	139	-	209,500	
	7,250	250	2	41.28	87.50	11.50	4,250	80.05	85.10	5,500	1080.00	750	22.75	23.10	500	-3.75	22.85	47.59	110	6,250	90,250	
	113,750	-10,250	91	38.38	70.10	3.55	3,000	69.15	71.70	4,750	1100.00	500	29.75	30.00	2,500	-4.25	29.75	47.91	586	3,000	292,250	
	192,250	-	165	39.94	59.05	3.05	250	58.45	59.05	750	1120.00	250	37.85	38.15	750	-5.35	37.95	47.96	325	1,750	379,250	
	602,500	52,750	1,103	40.26	48.00	3.55	750	47.70	48.20	250	1140.00	2,250	46.95	47.45	250	-5.40	47.00	48.00	823	67,250	497,500	
	255,000	35,500	609	41.18	39.95	3.15	1,500	39.60	40.00	750	1160.00	2,750	58.40	59.80	250	-6.00	58.40	49.13	36	-250	121,250	
	173,750	20,250	263	41.85	33.00	2.60	250	32.50	32.80	750	1180.00	4,000	70.85	74.45	5,000	-6.35	70.50	49.29	5	-	47,000	
	1,021,250	57,500	1,170	42.88	26.90	1.65	250	26.70	26.95	750	1200.00	500	84.50	86.40	4,000	-6.00	85.00	51.66	6	-500	40,000	
	382,500	3,250	150	43.46	21.35	1.25	1,500	21.25	21.70	3,000	1220.00	4,500	94.85	105.55	1,750	-	-	-	-	-	750	
	195,750	19,750	308	43.65	16.50	0.15	750	16.60	16.80	250	1240.00	4,250	108.75	127.55	2,000	-	-	-	-	-	500	
	222,500	7,000	203	43.99	13.10	0.30	750	12.90	13.10	1,000	1260.00	-	-	-	-	-	-	-	-	-	500	
	130,750	16,000	152	44.37	10.00	-0.10	1,750	10.00	10.25	250	1280.00	2,500	144.00	-	-	-	-	-	-	-	250	
	500,250	26,250	539	44.67	7.85	-0.30	2,000	7.80	8.15	6,000	1300.00	500	68.00	167.35	500	-	-	-	-	-	11,250	
	75,000	9,000	70	45.06	6.10	-0.15	1,750	5.95	6.20	500	1320.00	1,500	178.25	190.00	1,500	-	-	-	-	-	-	
	49,750	2,000	23	45.56	5.00	0.15	750	4.60	4.85	750	1340.00	2,250	194.65	-	-	-	-	-	-	-	250	
	33,250	4,250	46	45.93	3.50	-0.50	1,500	3.55	3.70	250	1360.00	1,500	215.80	225.35	1,500	-	-	-	-	-	250	
	64,000	4,000	21	46.44	3.00	-0.30	1,500	2.65	2.85	2,250	1380.00	750	233.80	243.95	750	-	-	-	-	-	-	
Total	4,066,250																				2,309,000	Total

On 8th October around 10:35 AM the 1140 CE was trading at 48/- and the implied volatility was at 40.26%. The 1140 PE was trading at 47/- and the implied volatility was at 48%. The combined premium received was 95 per lot.

Market's expectation was that Infosys would announce fairly decent set of numbers. In fact the numbers were better than expected, here are the details -

"For the July-September quarter, Infosys posted a net profit of $519 million, compared with $511 million in the year-ago period. Revenue jumped 8.7 % to $2.39 billion. On a sequential basis, revenue grew 6%, comfortably eclipsing market expectations of 4- 4.5% growth.

In rupee terms, net profit rose 9.8% to Rs.3398 crore on revenue of Rs. 15,635 crore, which was up 17.2% from last year". *Source: Economic Times.*

The announcement came in around 9:18 AM, 3 minutes after the market opened, and this trader did manage to close the trade around the same time.

Here is the snapshot -

Option Chain (Equity Derivatives)

Underlying Stock: **INFY 1187.15** As on Oct 12, 2015 09:21:04 IST

View Options Contracts for: Select Index ▼ OR Search for an underlying stock: GO Filter by: Expiry Date 29OCT2015 ▼ Futures contracts

CALLS												PUTS										
Chart	OI	Chng in OI	Volume	IV	LTP	Net Chng	Bid Qty	Bid Price	Ask Price	Ask Qty	Strike Price	Bid Qty	Bid Price	Ask Price	Ask Qty	Net Chng	LTP	IV	Volume	Chng in OI	OI	Chart
	3,500	-	-	-	-	-	1,250	245.50	-	-	800.00	4,000	0.20	-	-	-	-	-	-	-	500	
	-	-	-	-	-	-	1,000	241.00	-	-	820.00	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,250	221.00	-	-	840.00	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,000	201.00	-	-	860.00	-	-	-	-	-	-	-	-	-	-	
	-	-	-	-	-	-	1,250	181.00	-	-	880.00	-	-	3.00	1,250	-	-	-	-	-	-	
	750	-	-	-	-	-	1,500	140.00	-	-	900.00	1,000	1.20	1.30	8,500	-1.35	1.25	64.84	175	-2,750	389,250	
	250	-	-	-	-	-	1,250	159.05	-	-	920.00	250	1.15	1.30	2,750	-1.70	1.15	61.87	13	-500	5,500	
	-	-	-	-	-	-	1,500	127.60	-	-	940.00	750	1.35	1.45	250	-1.70	1.40	59.07	39	-1,000	23,250	
	5,250	-	-	-	-	-	1,500	107.00	-	-	960.00	250	1.50	1.75	500	-2.15	1.75	55.73	39	1,750	69,750	
	750	-	-	-	-	-	1,500	87.00	-	-	980.00	250	1.80	1.95	500	-2.70	1.90	52.26	73	1,000	62,250	
	13,250	-	-	-	-	-	250	178.60	196.90	250	1000.00	1,500	2.30	2.50	4,250	-3.60	2.35	50.59	717	23,500	675,250	
	12,500	-	-	-	-	-	1,750	51.00	-	-	1020.00	250	2.65	2.85	1,250	-5.00	2.60	47.90	210	5,000	131,250	
	3,250	-	-	-	-	-	1,250	24.00	-	-	1040.00	1,250	3.65	3.90	500	-6.20	3.75	46.26	744	-17,250	426,000	
	8,750	-	1	-	125.40	7.20	250	131.05	199.00	500	1060.00	250	4.90	5.35	750	-7.85	5.35	43.50	1,219	-6,750	960,000	
	9,250	1,750	10	-	111.05	4.15	2,500	112.10	121.80	500	1080.00	750	6.70	7.00	5,250	-10.95	7.00	43.24	561	-7,000	266,500	
	157,250	-500	95	-	96.90	7.10	250	95.10	97.55	250	1100.00	250	9.95	10.15	250	-14.20	10.00	42.59	2,384	107,000	1,054,000	
	336,250	-5,750	66	24.09	81.45	5.45	250	78.45	81.30	250	1120.00	1,000	13.90	13.95	250	-17.40	13.90	41.30	1,082	41,000	614,500	
	1,012,500	-27,750	607	28.18	55.00	-10.65	250	53.50	57.35	250	1140.00	500	20.00	20.40	750	-19.00	20.35	40.44	1,748	20,750	846,500	
	775,250	-49,250	1,256	29.97	46.05	-8.90	250	44.55	45.95	250	1160.00	500	26.65	27.50	500	-21.50	27.50	40.48	1,382	10,000	360,750	
	446,500	5,500	1,149	30.65	32.00	-13.80	250	31.80	33.65	250	1180.00	500	33.10	33.35	250	-25.80	33.30	40.36	722	46,500	105,500	
	2,635,000	71,250	6,776	31.26	26.10	-11.45	500	25.15	26.10	250	1200.00	500	43.05	44.00	2,000	-27.30	43.75	40.86	1,122	99,750	167,500	
	823,000	23,500	1,567	31.60	18.10	-11.10	250	18.00	18.70	1,250	1220.00	1,000	55.20	56.50	1,250	-45.20	54.70	40.58	42	3,500	5,250	
	1,285,500	-26,750	2,212	32.54	14.20	-8.75	250	13.70	14.10	250	1240.00	500	59.40	71.20	750	-58.75	65.85	45.36	2	-	750	
	633,000	-6,000	1,817	33.10	9.70	-8.40	500	9.55	9.80	750	1260.00	750	60.15	114.05	750	-	-	-	-	-	750	
	397,000	14,500	909	33.83	7.00	-7.00	500	7.00	7.65	1,250	1280.00	250	45.05	231.95	250	-	-	-	-	-	500	
	1,259,000	77,250	2,422	35.31	6.10	-4.55	3,000	6.00	6.25	1,000	1300.00	250	78.05	-	-	-26.85	118.15	51.87	15	1,500	13,000	
	216,500	11,750	446	34.90	4.40	-3.80	1,500	4.25	4.50	250	1320.00	-	-	-	-	-	-	-	-	-	-	
	165,000	44,250	476	36.41	4.00	-2.10	2,250	3.70	4.25	1,750	1340.00	-	-	-	-	-	-	-	-	-	250	
	516,750	6,250	791	37.95	3.00	-1.95	250	2.90	3.00	2,750	1360.00	-	-	288.00	250	-	-	-	-	-	250	
	181,500	14,250	268	37.37	1.80	-1.75	1,000	1.75	1.90	250	1380.00	-	-	-	-	-	-	-	-	-	-	
Total	10,897,500																				6,179,000	Total

The 1140 CE was trading at 55/- and the implied volatility had dropped to 28%. The 1140 PE was trading at 20/- and the implied volatility had dropped to 40%.

Do pay attention to this - the speed at which the call option shot up was lesser than the speed at which the Put option dropped its value. The combined premium was 75 per lot, and he made a 20 point profit per lot.

11.4 – The Greeks

Since we are dealing with ATM options, the delta of both CE and PE would be around 0.5. We could add the deltas of each option and get a sense of how the overall position deltas behave.

- 7600 CE Delta @ 0.5, since we are short, the delta would be -0.5
- 7600 PE Delta @ - 0.5, since we are short, the delta would be + 0.5
- Combined delta would be -0.5 + 0.5 = 0

The combined delta indicates that the strategy is directional neutral. Remember both long and short straddle is delta neutral. In case of long straddle, delta neutral suggests that the profits are uncapped and in case of short straddle, the losses are uncapped.

Now here is something for you to think about – When you initiate a straddle you are obviously delta neutral. But as the markets move, will your position still remain delta neutral? If yes, why do you think so? If no, then is there a way to keep the position delta neutral?

If you can build your thoughts around these points, then I can guarantee you that your options knowledge is far greater than 90% of the market participants. To answer these simple questions, you will need to step a little deeper and get into 2nd level of thinking.

Do post your comments below.

You can **download** the Short straddle excel.

Key takeaways from this chapter

1. Short straddle requires you to simultaneously Sell the ATM Call and Put option. The options should belong to the same underlying, same strike, and same expiry
2. By selling the CE and PE – the trader is placing the bet that the market wont move and would essentially stay in a range
3. The maximum profit is equal to the net premium paid, and it occurs at the strike at which the long straddle has been initiated

4. The upper breakdown is ‘strike + net premium’. The lower breakdown is ‘strike – net premium’
5. The deltas in a short straddle adds up to zero
6. The volatility should be relatively high at the time of strategy execution
7. The volatility should decrease during the holding period of the strategy
8. Short straddles can be set around major events, wherein before the event, the volatility would drive the premiums up and just after the announcement, the volatility would cool off, and so would the premiums.

CHAPTER 12

The Long & Short Straddle

12.1 – Background

If you have understood the straddle, then understanding the 'Strangle' is quite straightforward. For all practical purposes, the thought process behind the straddle and strangle is quite similar. Strangle is an improvisation over the straddle, mainly to reduce the cost of implementation. Let me explain this further.

Consider this – Nifty is trading at 5921, which would make 5900 the ATM strike. If you were to set up the long straddle here, you would be required to buy the 5900 CE and 5900 PE. The premiums for both these options are 66 and 57 respectively.

Net cash outlay = 66 + 57 = 123

Upper breakeven = 5921+123 = 6044

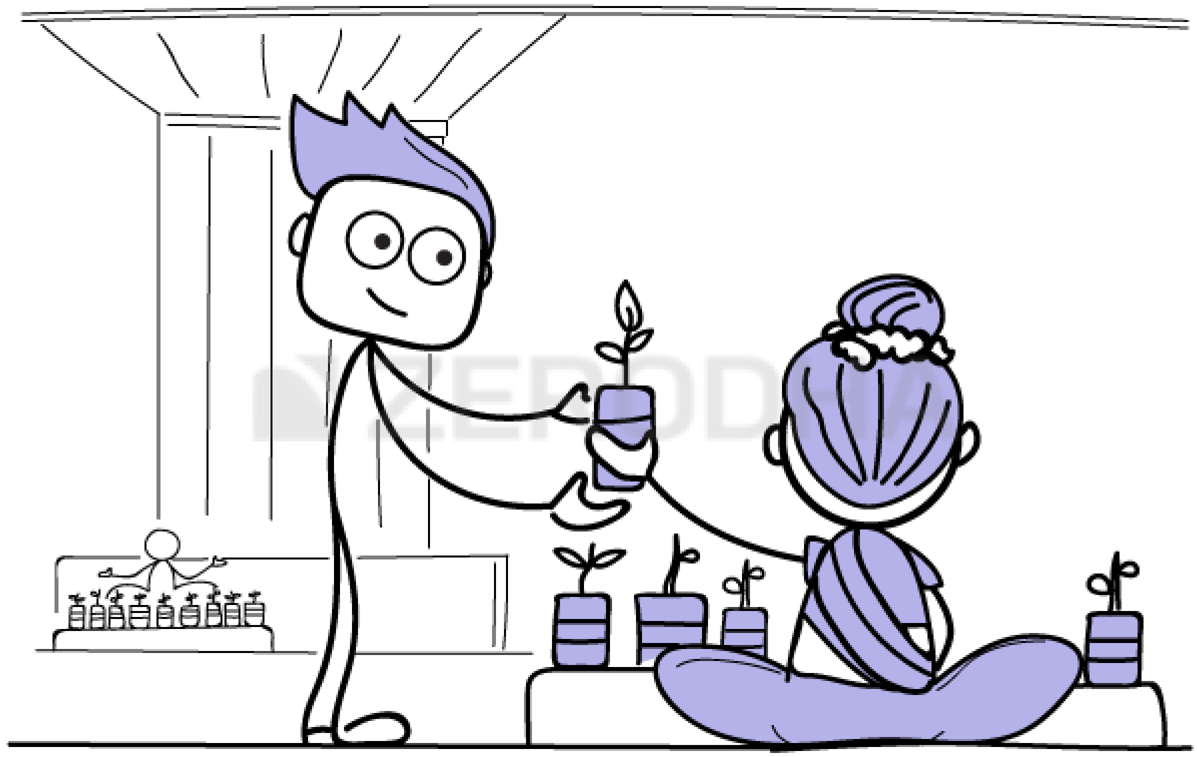
Lower breakeven = 5921 – 123 = 5798

Therefore to set up a straddle, you spend 123 and the breakeven on either side is 2.07% away. As you know the straddle is delta neutral, meaning the strategy is insulated to the directional movement of the market. The idea here is that you know that the market will move to a large extent, but the direction is unknown.

Consider this – from your research you know that the market will move (direction unknown) hence you have set up the straddle. However the straddle requires you to make an upfront payment of 123.

How would it be if you were to set up a market neutral strategy - similar to the straddle, but at a much lower cost?

Well, the 'Strangle' does just that.



12.2 – Strategy Notes

The strangle is an improvisation over the straddle. The improvisation mainly helps in terms of reduction of the strategy cost, however as a tradeoff the points required to breakeven increases.

In a straddle you are required to buy call and put options of the ATM strike. However the strangle requires you to buy OTM call and put options. Remember when compared to the ATM strike, the OTM will always trade cheap, therefore this implies setting up a strangle is cheaper than setting up a straddle.

Let's take an example to explain this better –

Nifty is trading at 7921, to set up a strangle we need to buy OTM Call and Put options. Do note, both the options should belong to the same expiry and same underlying. Also the execution should happen in the same ratio (missed this point while discussing straddle).

Same ratio here means – one should buy the same number of call option as that of put option. For instance it can be 1:1 ratio meaning 1 lot of call, 1 lot of put option. Or it can be 5:5, meaning buy 5 lots of call and 5 lots of put option. Something like 2:3 is not considered strangle (or straddle) as in this case you would be buying 2 lots of call options and 3 lots of put options.

Going back to the example, considering Nifty is at 5921, we need to buy OTM Call and Put options. I'd prefer to buy strikes which are 200 points either way (note, there is no particular reason for choosing strikes 200 points away). So this would mean I would buy 7700 Put option and 8100 Call option. These options are trading at 28 and 32 respectively.

The combined premium paid to execute the 'strangle' is 60. Let's figure out how the strategies behave under various scenarios. I'll keep this discussion brief as I do believe you are now comfortable accessing the P&L across various market scenarios.

Scenario 1 – Market expires at 7500 (much below the PE strike)

At 7500, the premium paid for the call option i.e. 32 will go worthless. However the put option will have an intrinsic value of 200 points. The premium paid for the Put option is 28, hence the total profit from the put option will be 200 – 28 = **+172**

We can further deduct for the premium paid for call option i.e. 32 from the profits of Put option and arrive at the overall profitability i.e. 172 – 32 = **+140**

Scenario 2 – Market expires at 7640 (lower breakeven)

At 7640, the 7700 put option will have an intrinsic value of 60. The put option's intrinsic value offsets the combined premium paid towards both the call and put option i.e. 32+28 = 60. Hence at 7640, the strangle neither makes money nor losses money.

Scenario 3 – Market expires at 7700 (at PE strike)

At 7700, both the call and put options would expire worthless, hence we would lose the entire premium paid i.e. 32 + 28 = 60. Do note, this also happens to be the maximum loss the strategy would suffer.

Scenario 4 – Market expires at 7900, 8100 (ATM and CE strike respectively)

Both the options expire worthless at 7900 and 8100. Hence we would lose the entire premium paid i.e. 60.

Scenarios 5 – Market expires at 8160 (upper breakeven)

At 8160, the 8100 Call option has an intrinsic value of 60, the gains in the call option would offset the loss incurred against the premium paid towards the call and put options.

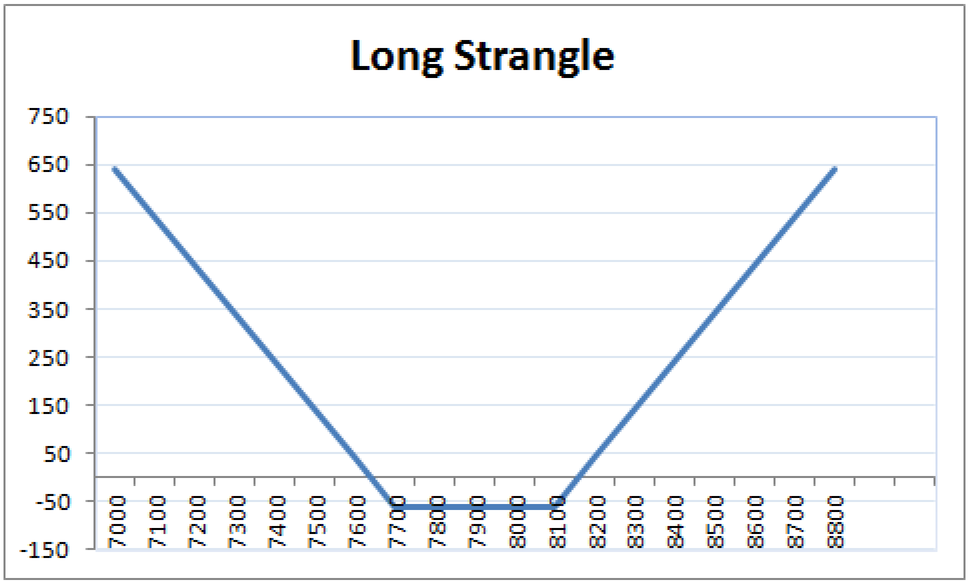
Scenarios 6 – Market expires at 8300 (much higher than the CE strike)

Clearly at 8300, the 8100 call option would have an intrinsic value of 200 points; therefore the option would make 200 points. After adjusting for the combined premium paid of 60 points, we would be left with 140 points profit. Notice the symmetry of payoff above the upper and below the lower breakeven points.

Here is a table which contains various other market expiry scenarios and the eventual payoff at these expiry levels –

Market Expiry	CE_IV	PP	CE Payoff	PE_IV	PP	PE_Payoff	Strategy Payoff
7000	0	-32	-32	700	-28	672	640
7100	0	-32	-32	600	-28	572	540
7200	0	-32	-32	500	-28	472	440
7300	0	-32	-32	400	-28	372	340
7400	0	-32	-32	300	-28	272	240
7500	0	-32	-32	200	-28	172	140
7600	0	-32	-32	100	-28	72	40
7700	0	-32	-32	0	-28	-28	-60
7800	0	-32	-32	0	-28	-28	-60
7900	0	-32	-32	0	-28	-28	-60
8000	0	-32	-32	0	-28	-28	-60
8100	0	-32	-32	0	-28	-28	-60
8200	100	-32	68	0	-28	-28	40
8300	200	-32	168	0	-28	-28	140
8400	300	-32	268	0	-28	-28	240
8500	400	-32	368	0	-28	-28	340
8600	500	-32	468	0	-28	-28	440
8700	600	-32	568	0	-28	-28	540
8800	700	-32	668	0	-28	-28	640

We can plot the strategy payoff to visualize the payoff diagram of the strangle –



We can generalize a few things about the 'Strangle' –

1. The maximum loss is restricted to the net premium paid
2. The loss would be maximum between the two strike prices
3. Upper Breakeven point = CE strike + net premium paid
4. Lower Breakeven point = PE strike – net premium paid
5. Profit potentially is unlimited

So as long as the market moves (irrespective of the direction) the profits are expected to follow.

12.3 – Delta and Vega

Both straddles and strangles are similar strategies, therefore the Greeks have a similar effect on strangle and straddles.

Since we are dealing with OTM options (remember we chose strikes that are equidistant from ATM), the delta of both CE and PE would be around 0.3, or lesser. We could add the deltas of each option and get a sense of how the overall position deltas behave.

- 7700 PE Delta @ - 0.3
- 8100 CE Delta @ + 0.3
- Combined delta would be -0.3 + 0.3 = 0

Of course, I've just assumed 0.3 for both the options for convenience; however both the deltas could be slightly different, hence we could not be delta neutral in a strict sense. But then the deltas will certainly not be too high such that it renders a directional bias on the strategy. Anyway, the combined delta indicates that the strategy is directional neutral.

The volatility has similar effect on both straddles and strangles. I'd suggest you refer **Chapter 10, section 10.3** to get a sense of how the volatility impacts the strangles.

To summarize the effect of Greeks on strangles -

1. The volatility should be relatively low at the time of strategy execution
2. The volatility should increase during the holding period of the strategy
3. The market should make a large move – the direction of the move does not matter
4. The expected large move is time bound, should happen quickly – well within the expiry
5. Long strangle is to be setup around major events, and the outcome of these events have to be drastically different from the general market expectation

I suppose you understand why long strangles have to be set up around major market events; we have discussed this point earlier as well. If you are confused, I'd request you to read Chapter 10.

12.4 – Short Strangle

The execution of a short strangle is the exact opposite of the long strangle. One needs to sell OTM Call and Put options which are equidistant from the ATM strike. In fact you would short the 'strangle' for the exact opposite reasons as to why you go long strangle. I will skip discussing the different expiry scenarios as I assume you are fairly comfortable with establishing the payoff by now.

I've used the same strikes (the one used in long strangle example) for the short strangle example. Instead of buying these options, you would sell these OTM options to set up a short strangle. Here is the payoff table of the short strangle –

Market Expiry	CE_IV	PP	CE Payoff	PE_IV	PP	PE_Payoff	Strategy Payoff
7000	0	32	32	700	28	-672	-640
7100	0	32	32	600	28	-572	-540
7200	0	32	32	500	28	-472	-440
7300	0	32	32	400	28	-372	-340
7400	0	32	32	300	28	-272	-240
7500	0	32	32	200	28	-172	-140
7600	0	32	32	100	28	-72	-40
7700	0	32	32	0	28	28	60
7800	0	32	32	0	28	28	60
7900	0	32	32	0	28	28	60
8000	0	32	32	0	28	28	60
8100	0	32	32	0	28	28	60
8200	100	32	-68	0	28	28	-40
8300	200	32	-168	0	28	28	-140
8400	300	32	-268	0	28	28	-240
8500	400	32	-368	0	28	28	-340
8600	500	32	-468	0	28	28	-440
8700	600	32	-568	0	28	28	-540
8800	700	32	-668	0	28	28	-640

As you can notice, the strategy results in a loss as and when the market moves in any particular direction. However the strategy remains profitable between the lower and upper breakeven points. Recall –

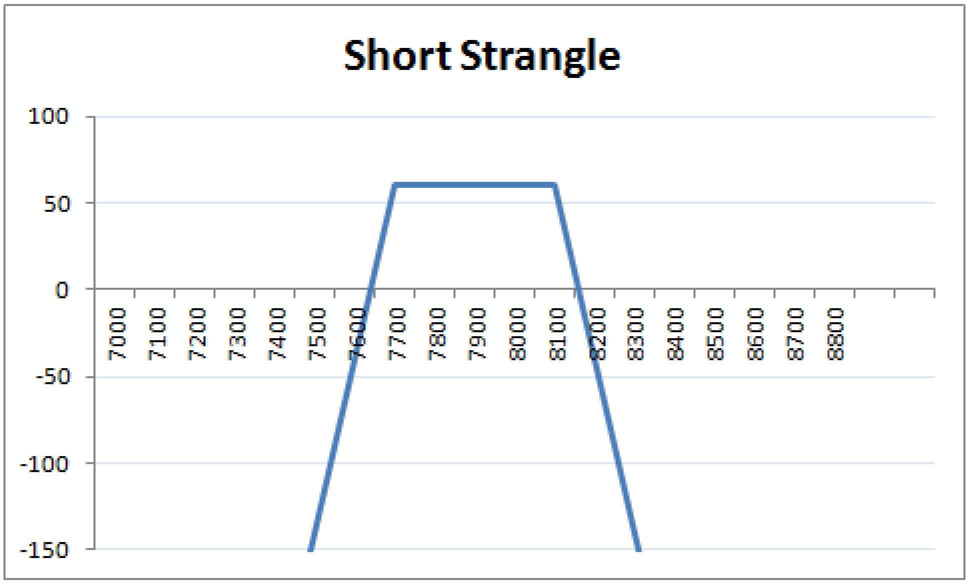
- Upper breakeven point is at 8160
- Lower breakeven point is at 7640
- Max profit is net premium received, which is 60 points

In other words you get to take home 60 points as long as the market stays within 7640 and 8160. In my opinion this is a fantastic proposition. More often than not market stays within certain trading ranges and therefore the market presents such beautiful trading opportunities.

So here is something for you to think about – identify stocks which are in a trading range, typically stocks in a trading range form double/triple tops and bottom. Setup the 'strangle' by writing strikes which are outside the upper and lower range. When you write strangles in this backdrop make sure you watch closely for breakouts or breakdowns.

I remember setting up this trade over and over again in Reliance couple of years ago - Reliance was stuck between 850 and 1000 for the longest time.

Anyway, here is the payoff graph of the short strangle –



As you can notice –

1. The payoff of the short strangle looks exactly opposite of the long strangle
2. The profits are restricted to the extent of the net premium received
3. The profits are maximum as long as the stock stays within the two strike prices
4. The losses are potentially unlimited

The breakeven point calculation is the same as the breakeven points of a long strangle, which we have discussed earlier.

You can **download** the long and short strangle excel here.

Key takeaways from this chapter

1. The strangle is an improvisation over the straddle, the improvisation helps in the strategy cost reduction
2. Strangles are delta neutral and is insulated against any directional risk
3. To set up a long strangle one needs to buy OTM Call and Put option
4. The maximum loss in a long strangle is restricted to the extent of the premium received
5. The profit potential is virtually unlimited in the long strangle

6. The short strangle is the exact opposite of the long strangle. You are required to sell the OTM call and put option in a short strangle
7. The Greeks have the same effect on strangles and straddles

CHAPTER 13

Max Pain & PCR

13.1 – My experience with Option Pain theory

In the never ending list of controversial market theories, the theory of 'Option Pain' certainly finds a spot. Option Pain, or sometimes referred to as 'Max Pain' has a significant fan following and probably an equal number of people who despise it. I'll be honest; I've been in both camps! In the initial days of following Option Pain, I was never able to make money consistently. However, overtime I found methods to improvise on this theory to suit my own risk appetite, and that yielded a decent result. Later in the chapter I will discuss this as well.

Anyway, now this is my attempt to present you the Option Pain theory and talk to you about what I like and what I don't about Max Pain. You can take cues from this chapter and decide for yourself which camp you want to be in.

Option Pain theory requires you to be familiar with the concept of **'Open Interest'.**

So, let's get started.

13.2 – Max Pain Theory

The origins of Option Pain dates back to 2004. So, in a sense, this is still a very young theory. As far as I know there are no academic/scholastic papers on it, which makes one wonder why the academia has ignored this concept.

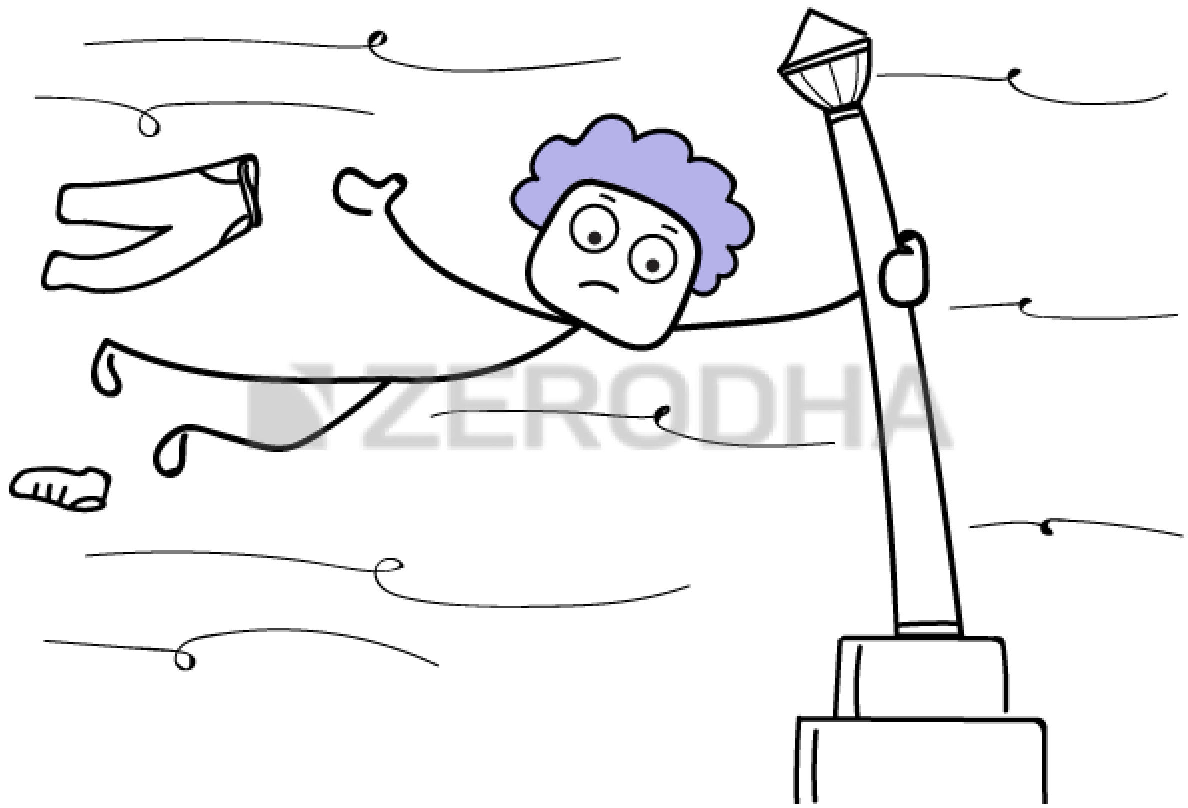
The theory of options pain stems as a corollary to the belief - "90% of the options expire worthless, hence option writers/sellers tend to make money more often, more consistently than the option buyers".

Now if this statement is true, then we can make a bunch of logical deductions -

1. At any point only one party can make money i.e either the option buyers or option sellers, but not both. From the above statement, it is clear that the sellers are the ones making money.
2. If option sellers tend to make maximum money, then it also means that the price of the option on expiry day should be driven to a point where it would cause least amount of loss to option writers.
3. If point 2 is true, then it further implies that option prices can be manipulated, at least on the day of expiry.
4. If point 3 is true, then it further implies that there exists a group of traders who can manipulate the option prices, at least on the day of expiry.
5. If such a group exists then it must be the option writers/sellers since it is believed that they are the ones who make maximum money/consistently make money trading options.

Now considering all the above points, there must exist a single price point at which, if the market expires, then it would cause least amount of pain to the option writers (or cause maximum amount of pain to option buyers).

If one can identify this price point, then it's most likely that this is the point at which markets will expire. The 'Option Pain' theory does just this – identify the price at which the market is likely to expire considering least amount of pain is caused to option writers.



Here is how optionspain.com formally defines Option Pain – "*In the options market, wealth transfer between option buyers and sellers is a zero sum game. On option expiration days, the underlying stock price often moves toward a point that brings maximum loss to option buyers. This specific price, calculated based on all outstanding options in the markets, is called Option Pain. Option Pain is a proxy for the stock price manipulation target by the option selling group*".

13.3 – Max Pain Calculation

Here is a step by step guide to calculate the Max Pain value. At this stage, you may find this a bit confusing, but I recommend you read through it all the same. Things ill get clearer once we take up an example –

Step 1 – List down the various strikes on the exchange and note down the open interest of both calls and puts for these strikes.

Step 2 – For each of the strike price that you have noted, assume that the market expires at that strike.

Step 3 – Calculate how much money is lost by option writers (both call option and put option writers) assuming the market expires as per the assumption in step 2.

Step 4 – Add up the money lost by call and put option writers.

Step 5 – Identify the strike at which the money lost by option writers is least.

This level, at which least amount of money is lost by option writers is the point at which maximum pain is caused to option buyers. Therefore this is the price at which the market is most likely to expire.

Let us take up a very simple example to understand this. For the sake of this example, I'll assume there are only 3 Nifty strikes available in the market. I have made a note of the open interest for both call and put options for the respective strike.

Strike	Call Option OI	Put option OI
7700	1823400	5783025
7800	3448575	4864125
7900	5367450	2559375

Scenario 1 – Assume markets expires at 7700

Remember when you write a **Call** option, you will lose money only if the market moves above the strike. Likewise, when you write a **Put** option you will lose money only when the market moves below the strike price.

Therefore if the market expires at 7700, none of the call option writers will lose money. Which means call option writers of 7700, 7800, and 7900 strikes will retain the premiums received.

However, the put option writers will be in trouble. Let's start with the 7900 PE writers –

At 7700 expiry, 7900 PE writers would lose 200 points. Since the OI is 2559375, the Rupee value of loss would be –

= 200 * 2559375 = Rs.5,11,875,000/-

7800 PE writers would lose 100 points, the Rupee value would be

= 100 * 4864125 = Rs.4,864,125,000/-

7700 PE writers will not lose any money.

So the combined money lost by option writers if the markets expire at 7700 would be –

Total money lost by Call Option writers + Total money lost by Put Option writers

= 0 + Rs.511875000 + 4,864125000 = **Rs.9,98,287,500**/-

Keep in mind that total money lost by Call Option writers = money lost by 7700 CE writer + money lost by 7800 CE + money lost by 7900 CE

Likewise the Total money lost by Put Option writers = money lost by 7700 PE writer + money lost by 7800 PE + money lost by 7900 PE

Scenario 2 – Assume markets expires at 7800

At 7800, the following call option writers would lose money –

7700 CE writers would lose 100 points, multiplying with its Open Interest we get the Rupee value of the loss.

100*1823400 = Rs.1,82,340,000/-

Both 7800 CE and 7900 CE seller would not lose money.

The 7700 and 7800 PE seller wouldn't lose money

The 7900 PE would lose 100 points, multiplying with the Open Interest, we get the Rupee value of the loss.

100*2559375 = Rs.2,55,937,500/-

So the combined loss for Options writers when market expires at 7800 would be –

= 182340000 + 255937500

= **Rs.4,38,277,500/-**

Scenario 3 – Assume markets expires at 7900

At 7900, the following call option writers would lose money –

7700 CE writer would lose 200 points, the Rupee value of this loss would be –

200 *1823400 = Rs.3,646,800,000/-

7800 CE writer would lose 100 points, the Rupee value of this loss would be –

100*3448575 = Rs.3,44,857,500/-

7900 CE writers would retain the premiums received.

Since market expires at 7900, all the put option writers would retain the premiums received.

So therefore the combined loss of option writers would be –

= 3646800000 + 344857500 = **Rs. 7,095,375,000/-**

So at this stage, we have calculated the total Rupee value loss for option writers at every possible expiry level. Let me tabulated the same for you –

Strike	Call Option OI	Put option OI	Loss value of calls	Loss value of Puts	Total loss
7700	1823400	5783025	0	998287500	998287500
7800	3448575	4864125	182340000	255937500	438277500
7900	5367450	2559375	7095375000	0	7095375000

Now that we have identified the combined loss the option writers would experience at various expiry level, we can easily identify the point at which the market is likely to expire.

As per the option pain theory, the market will expire at such a point where there is least amount of pain (read it as least amount of loss) to Option **sellers**.

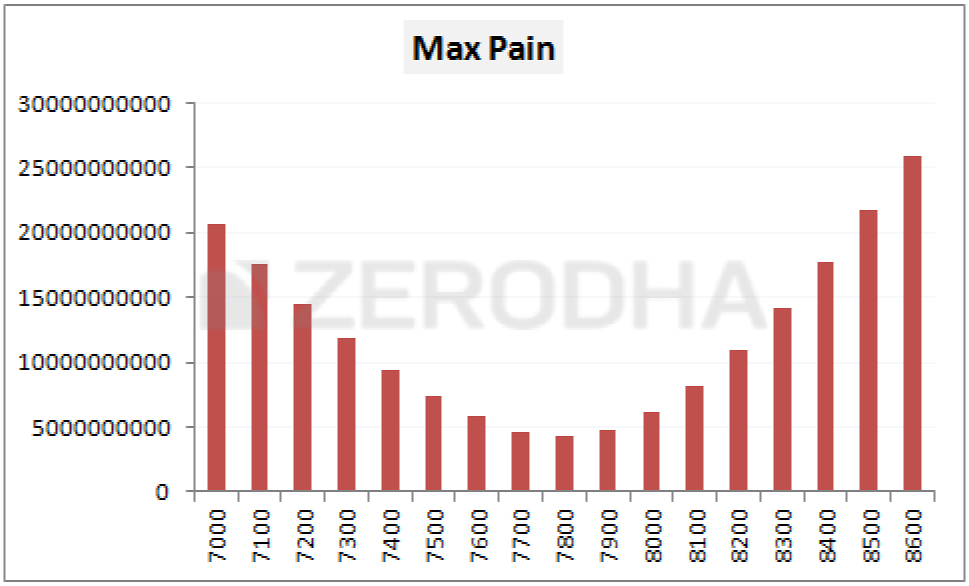
Clearly, from the table above, this point happens to be 7800, where the combined loss is around **438277500** or about 43.82 Crores, which is much lesser compared to the combined loss at 7700 and 7900.

The calculation is as simple as that. However, I've used only 3 strikes in the example for simplicity. But in reality there are many strikes for a given underlying, especially Nifty. Calculations become a bit cumbersome and confusing, hence one would have to resort to a tool like excel.

I've calculated the option pain value as of today (10th May 2016) on excel, have a look at the image –

Strike	Call OI	Put OI	Cumulative Call	Cumulative Put	Total Value
7000	1404300	4087050	0	20691180000	20691180000
7100	335700	1029150	140430000	17398192500	17538622500
7200	482100	2977875	314430000	14208120000	14522550000
7300	422475	1975650	536640000	11315835000	11852475000
7400	963900	2336700	801097500	8621115000	9422212500
7500	999975	4548450	1161945000	6160065000	7322010000
7600	785550	3690900	1622790000	4153860000	5776650000
7700	1823400	5783025	2162190000	2516745000	4678935000
7800	3448575	4864125	2883930000	1457932500	4341862500
7900	5367450	2559375	3950527500	885532500	4836060000
8000	6510975	1447125	5553870000	569070000	6122940000
8100	5900325	310500	7808310000	397320000	8205630000
8200	5113350	248775	10652782500	256620000	10909402500
8300	3844500	355725	14008590000	140797500	14149387500
8400	2135625	255525	17748847500	60547500	17809395000
8500	2252250	488475	21702667500	5850000	21708517500
8600	1083750	58500	25881712500	0	25881712500

For all the available strikes, we assume market would expire at that point and then compute the Rupee value of the loss for CE and PE option writers. This value is shown in the last column titled "Total Value". Once you calculate the total value, we simply have to identify the point at which the least amount of money is lost by the option writer. You can identify this by plotting the 'bar graph' of the total value. The bar graph would look like this –



As you can see, the 7800 strike is the point at which option writers would lose the least amount of money, so as per the option pain theory, 7800 is where the market is likely to expire for the May series.

Now that you have established the expiry level, how can you use this information? Well, there are multiple ways you can use this information.

Most traders use this max pain level to identity the strikes which they can write. In this case, since 7800 is the expected expiry level, one can choose to write call options above 7800 or put options below 7800 and collect all the premiums.

13.4 – A Few Modifications

In the initial days, I was very eager to learn about Option Pain. Everything about it made absolute sense. I remember crunching numbers, identifying the expiry level, and writing options to glory. But shockingly the market would expire at some other point leaving me booking a loss and I wondering if I was wrong with my calculations or if the entire theory is flawed!

So I eventually improvised on the classic option pain theory to suit my risk appetite. Here is what I did –

1. The OI values change every day. This means the option pain could suggest 7800 as the expiry level on 10th of May and may very well suggest 8000 on 20th of May.

I froze on a particular day of the month to run this computation. I preferred doing this when there were 15 days to expiry.
2. I identified the expiry value as per the regular option pain method.
3. I would add a 5% 'safety buffer'. So at 15 days to expiry, the theory suggest 7800 as expiry, then I'd add a 5% safety buffer. This would make the expiry value as 7800 + 5% of 7800 = 8190 or 8200 strike.
4. I would expect the market to expire at any point between 7800 to 8200.
5. I would set up strategies keeping this expiry range in mind, my most favorite being to write call options beyond 8200.
6. I would avoid writing Put option for this simple belief – panic spreads faster than greed. This means markets can fall faster than it can go up.
7. I would hold the options sold up to expiry, and would usually avoid averaging during this period.

The results were much better when I followed this method. Unfortunately, I never tabulated the results, hence I cannot quantify my gains. However if you come from a programming background, you can easily back test this logic and share the results with the rest of community here. Anyway, at a much later stage I realized the 5% buffer was essentially taking to strikes which were approximately 1.5 to 2% standard deviations away, which meant the probability of markets moving beyond the expected expiry level was about 34%.

If you are not sure what this means, I'd suggest you read this chapter on **standard deviation and distribution of returns**.

You can **download** the Option Pain computation excel.

13.5 – The Put Call Ratio

The Put Call Ratio is a fairly simple ratio to calculate. The ratio helps us identify extreme bullishness or bearishness in the market. PCR is usually considered a contrarian indicator. Meaning, if the PCR indicates extreme bearishness, then we expect the market to reverse, hence the trader turns bullish. Likewise if PCR indicates extreme bullishness, then traders expect markets to reverse and decline.

To calculate PCR, all one needs to do is divide the total open interest of Puts by the total open interest of the Calls. The resulting value usually varies in and around one. Have a look at the image below –

Strike	Call OI	Put OI
7000	1404300	4087050
7100	335700	1029150
7200	482100	2977875
7300	422475	1975650
7400	963900	2336700
7500	999975	4548450
7600	785550	3690900
7700	1823400	5783025
7800	3448575	4864125
7900	5367450	2559375
8000	6510975	1447125
8100	5900325	310500
8200	5113350	248775
8300	3844500	355725
8400	2135625	255525
8500	2252250	488475
8600	1083750	58500
Total	42874200	37016925

As on 10th May, the total OI of both Calls and Puts has been calculated. Dividing the Put OI by Call OI gives us the PCR ratio –

37016925 / 42874200 = **0.863385**

The interpretation is as follows –

- If the PCR value is above 1, say 1.3 – then it suggests that there are more Puts being bought compared to Calls. This suggests that the markets have turned extremely bearish, and therefore sort of oversold. One can look for reversals and expect the markets to go up.
- Low PCR values such as 0.5 and below indicates that there are more calls being bought compared to puts. This suggests that the markets have turned extremely bullish, and therefore sort of overbought. Once can look for reversals and expect the markets to go down.

- All values between 0.5 and 1 can be attributed to regular trading activity and can be ignored.

Needless to say, this is a generic approach to PCR. What would really make sense is to historically plot the daily PCR values for say 1 or 2 years and identify these extreme values. For example for Nifty value such as 1.3 can indicate extreme bearishness, but for say Infy something like 1.2 could be extreme bearishness. So you need to be clear about this, hence back testing helps.

You may wonder why the PCR is used as a contrarian indicator. Well, the explanation to this is rather tricky, but the general opinion is this – if the traders are bearish/bullish, then most of them have already taken their respective position (hence a high/low PCR) and therefore there aren't many other players who can come in and drive the positions in the desired direction. Hence the position will eventually be squared off which would drive the stock/index in the opposite direction.

So that's PCR for you. You may come across many variants of this – some prefer to take the total traded value instead of OI, some even prefer to take the volumes. But I personally don't think it is required to over-think PCR.

13.6 – Final thoughts

And with this, I'd like to end this module on Options, which has spread across 2 modules and 36 chapters!

We have discussed close to 15 different option strategies in this module, which I personally think is more than sufficient for retail traders to trade options professionally. Yes, going forward you will encounter many fancy option strategies, perhaps your friend will suggest a fancy option strategy and show off the technicalities of the strategy, but do remember – 'fancy' does not really translate to profit. Some of the best strategies are simple , elegant and easy to implement.

The content we have presented in both, Module 5 and Module 6, is written with an intention of giving you a clear picture on options trading - what is possible to be achieve with options trading and what is not possible. We have thought through and discussed what is required and what isn't. Frankly these two modules are more than sufficient to answer most of your concerns/doubts related to options.

So please do take some time to read through the contents here, at your own pace, and I'm certain you will you will start trading options the way it is supposed to be done.

Finally, I hope you will enjoy reading this as much as I enjoyed writing this for you.

Good luck and stay profitable!

Key takeaways from this chapter

1. Option Pain theory assumes that the option writers tend to make more money consistently compared to option buyers.
2. Option pain assumes that option writers can influence the price of options on the day of expiry.
3. One can use the theory of option pain to identify the price at which the stock/index is likely to expiry.
4. The strike at which the option writers would experience least amount of loss is the strike at which the stock/index likely to expire.
5. The PCR is calculated by dividing the total open interest of Puts by the total open interest of the Calls.
6. The PCR is considered as a contrarian indicator.
7. Generally a PCR value of over 1.3 is considered bearish and a PCR value of less than 0.5 is considered bullish.