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.

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

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.

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.

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.

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.