



Options made easy: A brief explanation of how options work

An option is the right to buy or sell an asset at a pre-agreed price at a future date.

A *put* option gives the holder the right to sell the underlying asset.

A *call* option gives the holder the right to buy the underlying asset at a pre-agreed price.

The pre-agreed price is known as the *strike* price.

The date in the future is known as the *expiry* date.

European options only allow the holder to exercise his option (if he wishes to do so) on the *expiry* date.

American options allow the holder to exercise his option at any time up to the date of expiry. i.e.: he may exercise the option early if he wishes.

Valuing options

Options have existed at least in concept since antiquity. It wasn't until publication of the Black-Scholes option pricing formula in 1973 that a theoretically consistent framework for pricing options became available.

The formula developed by Myron Scholes and Fischer Black is based on the following inputs.

1. The volatility of the price of the underlying security. - The higher the volatility, the more chance of the option being exercised, therefore the higher the premium that the writer of the option will charge.
2. The Black-Scholes formula assumes that the writer of a call option will have to buy at least a certain amount of the underlying asset to have on hand to deliver, should the holder exercise his option. The formula assumes that the writer of the option would have to borrow money from the bank to finance his purchases, therefore the current risk-free bank rate at which he would borrow is also factored into the formula.
3. Time - How long is the option? The longer the option, the more chance of the underlying price moving, and therefore the greater the chance of the option being exercised. So the longer the option, the higher the premium
4. Strike vs. Spot price: the further away that the strike price is from the current spot price of the underlying asset, the less the chance of the option being exercised. So the closer the strike is to spot, the higher the premium.

Terminology:

When the strike price of the option is far away from underlying spot price the option is known as being "out of the money".

When the strike price of the option is close to or the same as the underlying spot price the option is known as being "at the money".

When the strike price of the option is (above that of the spot price in the case of calls) and (below that of the spot price in the case of puts) the option is known as being "in the money".

The greeks:

Delta : The Delta of an option is purely the ratio of the change in value of the premium given a 1 cent move in the price of the asset.

$$\text{Delta} = \frac{\text{Change in option premium}}{\text{Change in price of underlying security}}$$

When an option is deep out of the money (i.e.: The strike price is a long way from the current spot price of the underlying asset) a one cent change in the spot price will have very little impact on the premium of the option. Therefore the delta will be close to 0.00.

When an option is deep in the money and the option already has intrinsic value, a one cent change in the spot price will near as dammit equate to a 1 cent change in the premium of the option. Therefore the delta will be close to 1.00.

At the money options have a delta of around 0.50.

Therefore by definition : The delta of a call option is always between 0.00 and 1.00.
 The delta of a put option is always between 0.00 and -1.00.

Simplistically speaking :

We can also look at the delta as a measure of what chance we have of the option being exercised.

- A delta of zero means no chance.
- When the option's strike is close to the underlying spot price (at the money) there is a 50% chance.
- When the option is in the money and the delta is approaching 1.00 the option will almost certainly be exercised. (100%)

Gamma : Gamma is purely the rate of change of delta, given movement of the underlying spot price.

Theta : Theta is a measure of the "time decay" and is normally expressed in units of 1-day. All you do is value the option as at today, and then using all the same inputs (spot price etc.) change the date to tomorrow, and revalue it.

The theta is the difference in premium between today's and tomorrow's premium.
(Remember T-theta, and T-time.)

Vega : Vega is a measure of what difference a change in the volatility will have on the premium of the option, and is normally expressed as a change of 1% up OR 1% down.

As with theta, all you do is value the option as at now, and then ONLY change the volatility, and revalue it. Vega is the difference in premium between the two valuations.
(Remember V-vega, and V-volatility.)

RHO : Rho is a measure of what difference a change in the risk-free rate will have on the premium of the option, and is also normally expressed as a change of 1% up OR 1% down. As with vega, all you do is value the option as at now, and then only change the risk-free rate, then revalue it.

Rho is the difference in premium between the two valuations.
(Remember R-rho, and R-risk-free rates.)