The Greek Cheat Sheet

The Greek Family Tree

1st Order Greeks

Symbol	ρ	θ	δ	υ
Name	Rho	Theta	Delta	Vega
Affected by	Interest Rates	Time	Equity Price	Volatiltiy

First order greeks directly affect the price of an option.

2nd Order Greeks

Symbol	Φ	Γ	V	ζ	Ξ
Name	Charm	Gamma	Vanna	Veta	Vomma
Affected by	Time	Equity Price	Volatilty	Time	Volatilty

Second order greeks affect the value of first order greeks

The four main components of an option's price:

1) How much money you can make from selling an option and putting that money in the bank until expiry: Rho (ρ)

2) How much time is left until the option expires: Theta (θ)

3) The movement of the stock's price: Delta (δ)

4) How much the market thinks the stock's price can move until expiry: Vega (υ)

These are known as the greeks and they all have children - known as the 2nd order greeks that change the 1st order greeks' values.

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Importance Score

Little to no impact.

Usually, can be ignored.

Greeks:

Rho
Veta
Vomma

Minor impact.

Influence can be detected, but it is usually not the dominant force.

Greeks:

Charm

Appreciable impact on both option price and the market.

Should be considered for most options plays.

Greeks:

Theta
Vanna

Large impact on both the option's price and the market as a whole.

Should almost always be considered.

Greeks:

Gamma
Vega

Singularly the most impactful for both options pricing and the whole market.

Greeks:

Delta

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Rho

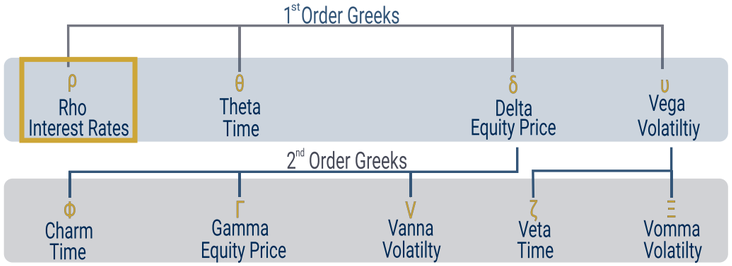
Importance 1/5 Score

Order: 1st

Sensitive to: Interest Rates

Action: Adjusts Price

Impact: Minimal



ρ

What

When the federal interest rates change, this can affect the price of options. How much so is determined by Rho.

How

As interest rates increase, Rho increases an options price if its delta is positive (Long Calls & Short Puts) and decreases an options price if its delta is negative (Short Calls & Long Puts).

Impact

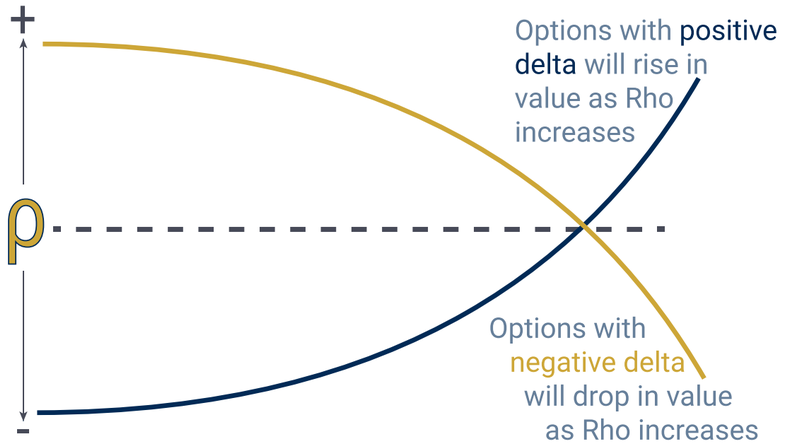
Very little practical impact as rates do not change often and it is not often used in modern options tools as its effects are negligible.

Reasoning

If a trader sells delta to the market (like selling a call). They can put the premium from selling the delta into an interest-rate bearing savings account to earn money. This is included in the price of an option.

Important!

Rho usually has minimal impact on an options trade.



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Theta

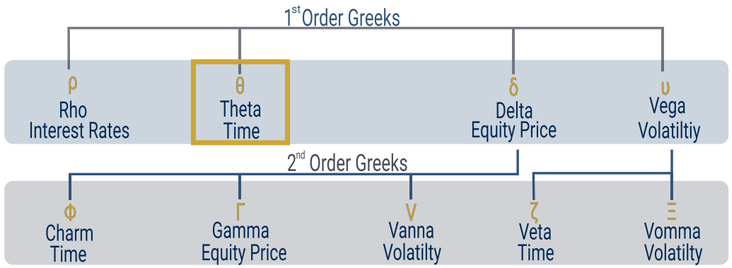
Importance 3/5 Score

Order: 1st

Sensitive to: Time

Action: Adjusts Price

Impact: Moderate



What

Theta is describes how much value an option loses as its expiry approaches.

How

Every day, an amount of value is removed from all options due to the passage of time. The amount that is removed is theta. If theta is 0.25, then every day, the option loses $0.25 of its value.

Impact

Theta can have a moderate to high impact. The closer the option is to expiry, the higher theta will be, and thus, the higher the sensitivity to the passage of ttime the option will have.

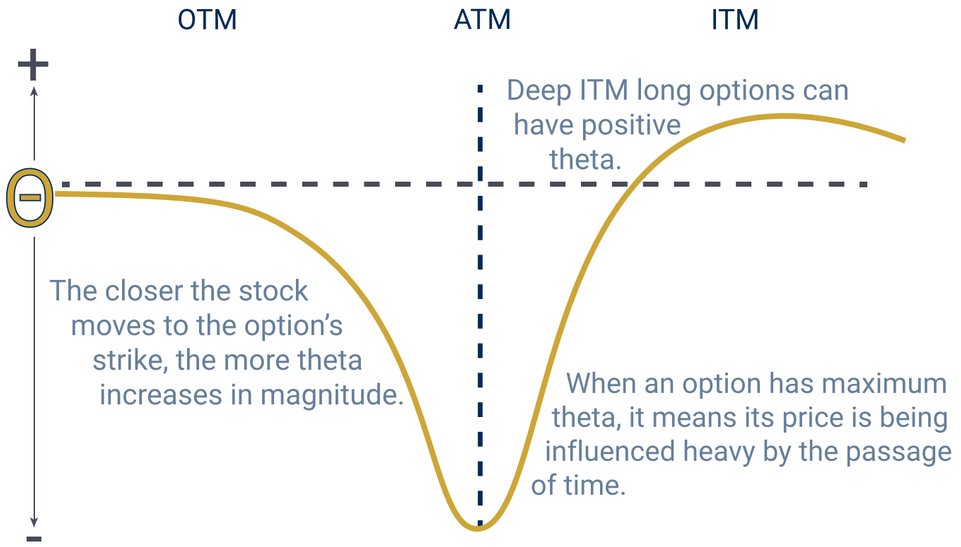
Reasoning

Suppose you have two coupons: one that expires next month and one that expires next week. If you wanted to sell the coupons, the one that expires next month would probably be worth more, as it has more time left to be used.

Important!

A long (bought) option will have negative theta.

A short (sold) option will have positive theta.



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Delta

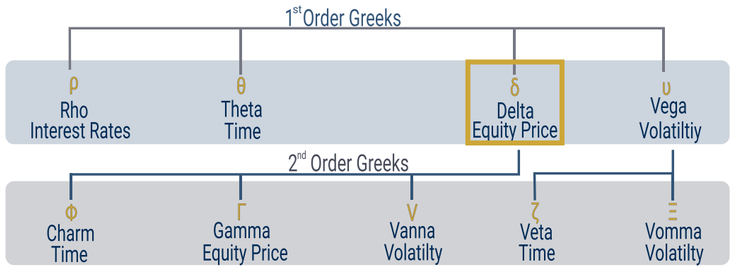
Importance Score: 5/5

Order: 1st

Sensitive to: Equity Price Change

Action: Adjusts Price

Impact: Significant & Systemic



δ

What

The price of an option is partly determined by how likely it is that the option will expire in-the-money (ITM). Delta measures that probability by keeping track of the stock's price movement.

How

Delta's value represents how much money is added or removed from an option's price when the stock moves $1. A delta of 0.56 means that if the underlying equity moves $1, the option will move $0.56 (or, 56% of the stock's price movement).

Impact

Delta has a large impact for both the price of an option as well as on the market-at-large. Options dealers provide liquidity to the option's market, and in order to do so, they perform delta-hedging. This has significant impacts on the markets.

Reasoning

Delta can be thought of as the probability the option will expire ITM, and as the percentage of the 100 shares that an option represents. The higher the delta, the more like 100 shares the option's price acts as. The more share-equivalents an option has, the more the option starts to behave like 100 shares, and thus, the more expensive it becomes.

Important!

Any option can have positive or negative delta!

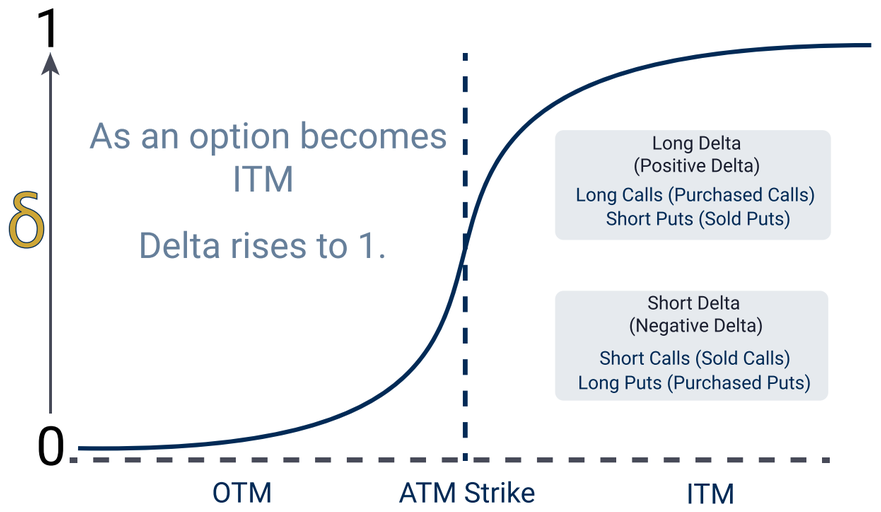
Not all calls have positive delta.

Not all puts have negative delta

To determine if an option has positive or negative delta (the option's "direction"), answer the following question: "If the stock's price rises, does my position increase or decrease in value?"

If the position's value increases: delta is positive.

If the position's value decreases: delta is negative.



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Vega

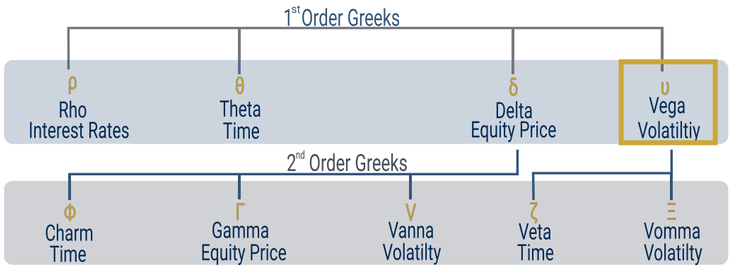
Importance 4/5 Score

Order: 1st

Sensitive to: Equity I.V. Change

Action Adjusts Pice

Impact: Moderate to Significant



υ

What

Vega directly affects an option's price when implied volatility on a stock changes.

How

When a stock's implied volatility changes, the price of an option changes based the direction of the option (if it is long or short), and by how much vega tells us. A long option will gain value when volatility increases and a short option will lose value as volatility increases - by how much is determined by vega.

Impact

Vega can have significant impact on the price of an option. The options with the highest vega are the at-the-money and far-dated options. For instance, all Long options can lose value even if the stock's price is moving in the right direction if I.V. isn't - this is called "I.V. Crush".

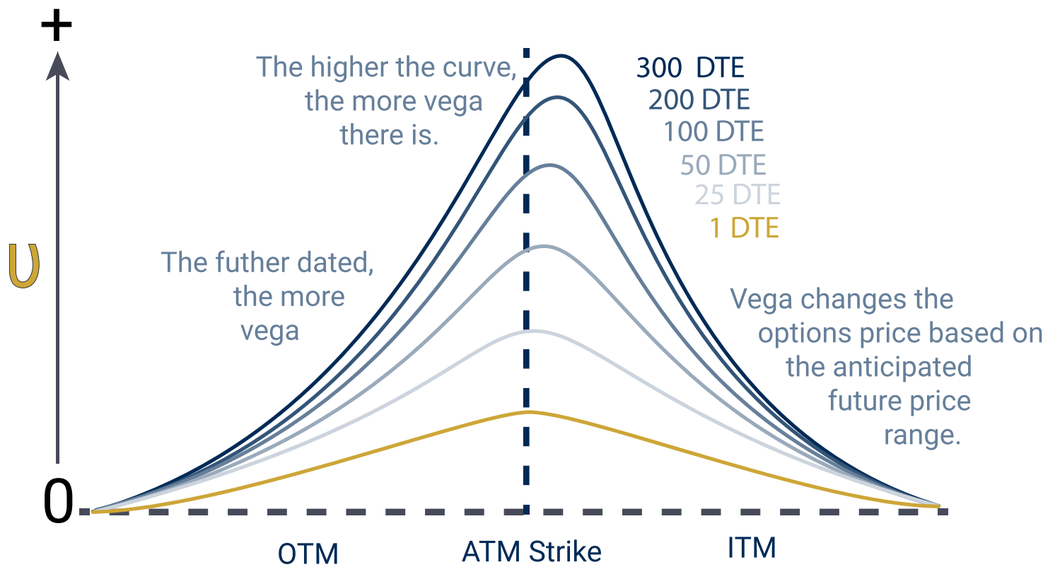
Reasoning

The value of an option is partly based on how much the underlying stock is expected to move. If a stock has a wide range of possible prices, then there is more uncertainty if the option will expire ITM. This uncertainty, or risk, always carries a premium. Thus, if you are selling an option with more risk (higher I.V.), it will have greater cost than if you are selling an option with less risk (lower I.V.). The difference amount is determined by vega.

Important!

I.V. going up always increases the cost of an option.

This means long positions gain value but short positions lose value if I.V. rises.



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Charm

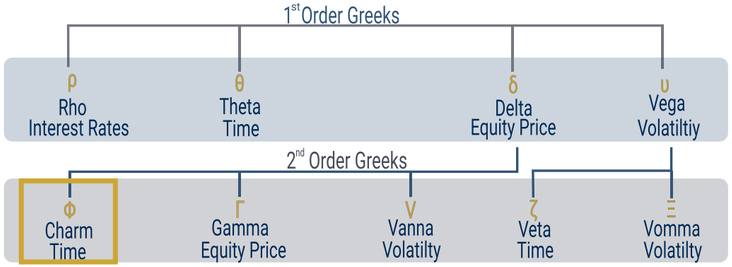
Importance Score: 2/5

Order: 2nd

Sensitive to: Time

Action: Adjusts delta

Impact: Minor to Moderate



ϕ

What

As time passes, Delta will decrease in magnitude, by how much is determined by Charm.

How

Charm influences Delta differently at different strike prices, and at different days to expiry (DTE). The larger the value of charm, the more delta decays per day. The lower the value of charm, the less delta decays per day.

Impact

Charm is most impactful near-expiry the further out from the ITM strike price. It can have a large impact on the market-at-large due to the amount of hedging that charm can produce.

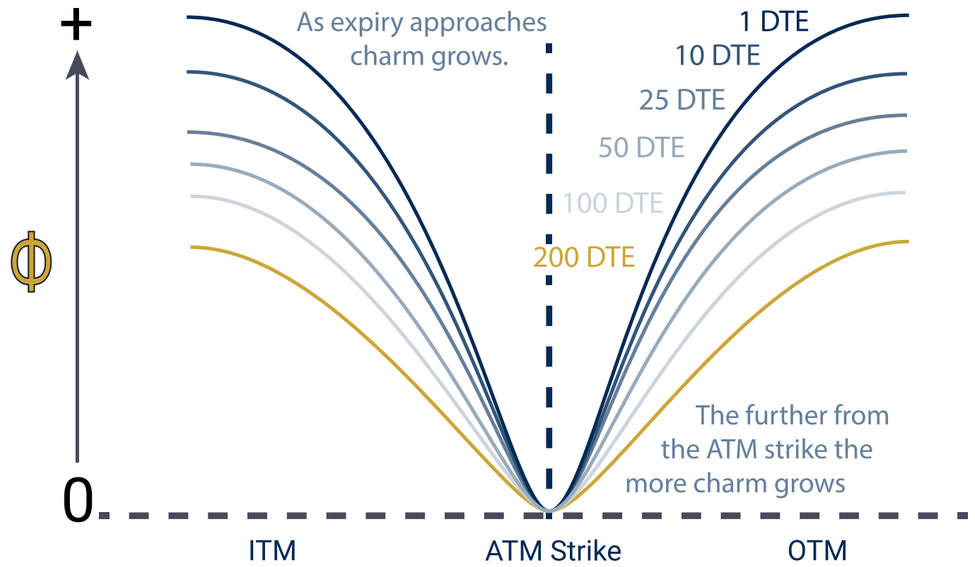
Reasoning

The chance of something happening is partly dependent on how long the time limit is for that something to happen. The same concept applies to options. The longer an option has to expire in-the-money (ITM), the higher the chances of doing so. Delta is the chance of expiring ITM, and charm measures how much time is left to do so.

Important!

Charm is dependent on “moniness”.

This means that for ITM options, as time passes, it pushes delta towards 1 but for OTM options, it pushes delta towards 0.



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Gamma

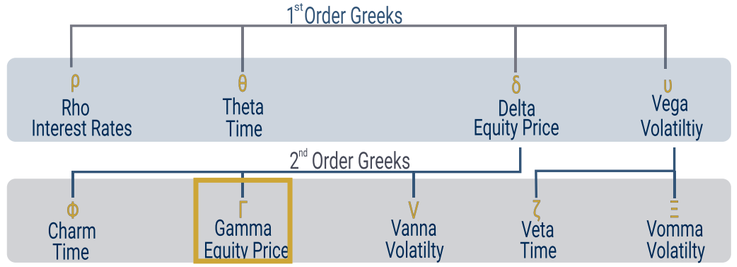
Importance 4/5 Score

Order: 2nd

Sensitive to: Equity Price

Action: Adjusts delta

Impact: Moderate to Significant



What

Gamma either makes delta larger or smaller as the stock's price moves.

How

Gamma's value determines by how much delta changes in size (either increase, or decrease) every time a stock moves. A gamma of 0.005 means that if the stock moves 1 "point", delta will move by 0.005. Gamma is usually said to be either long (positive) or short (negative) depending on how it changes delta if the stock increases.

Impact

Gamma can have a large impact on the price of an option and the market-at-large. Since the highest gamma values are for ATM options that are near-expiry, we see gamma's effects quite significantly during monthly options expiry (OpEx).

Reasoning

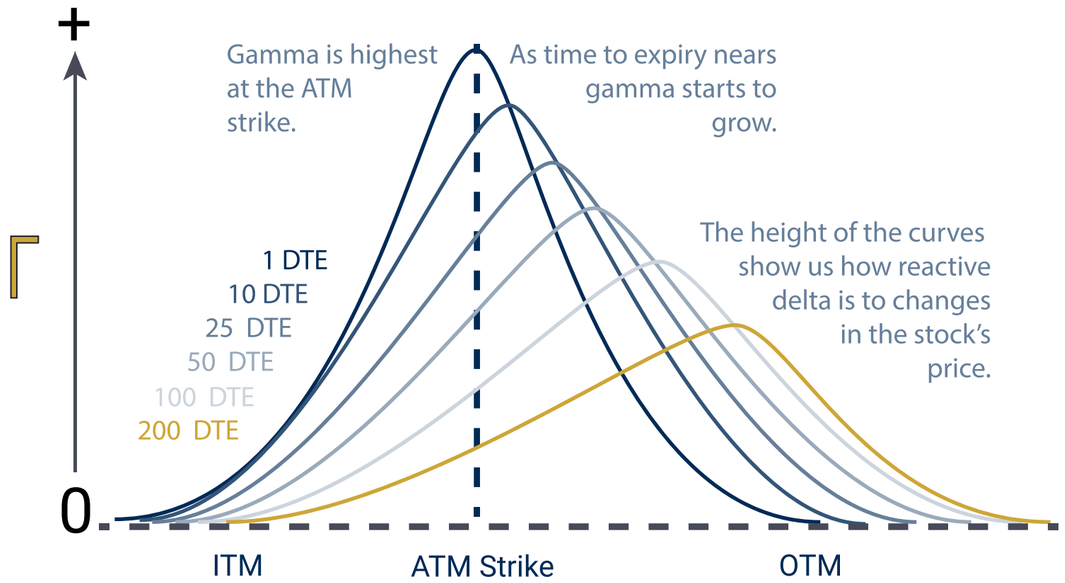
The price of an option is partly based on how likely the market thinks that the option will expire ITM. Since whether or not the option expires ITM is dependent on the stock's price, this means that as the stock's price changes, so too does the probability of expiring ITM. In order to calculate how much the probability changes when the stock's price moves, we use gamma.

Important!

Direction Matters!

A long (bought) option has long (positive) gamma.
A short (sold) option has short (negative) gamma.

This means that an option with short gamma will make delta shrink in magnitude if the price increases.



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Vanna

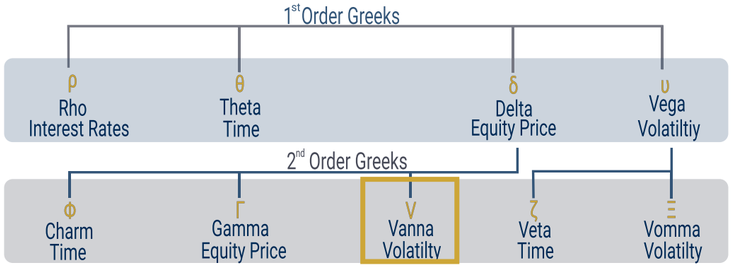
Importance 3/5 Score

Order: 2nd

Sensitive to: Implied Volatility

Action: Adjusts delta

Impact: Either None or Significant



V

What

Vanna increaes or decreases delta depending on how volatilty changes. Volatility determines the stock's anticipated future price range.

How

Vanna either increases or decreases delta depending on if the change in volatilty either increases or decreases the chance of the option expiring ITM (if the option is OTM) or OTM (if the option is ITM). The amount that delta changes is determined by vanna.

Impact

Vanna is a strange greek - it can either have llittle to no influence (if volatility is low or if there is little vanna) or it can quickly gain momentum and become the dominate force controling delta.

Reasoning

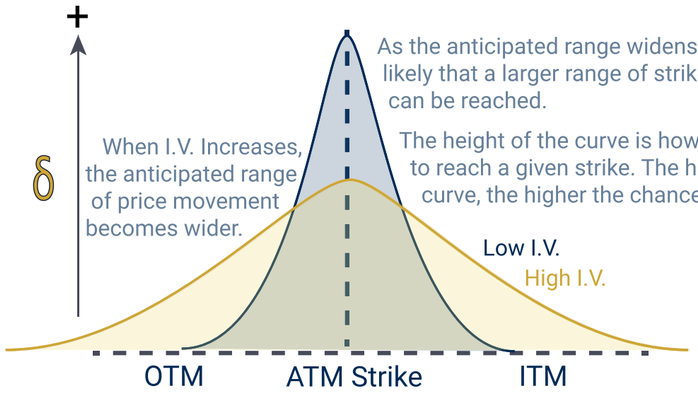
Since delta is the chance that the option will expire with value, and since the chances that an option will expire with value (delta) is partially determined by how much the stock's price can move until expiry (implied volatility), then it makes sense that changes in the anticipated future price range of a stock will affect the current price of an option (vanna).

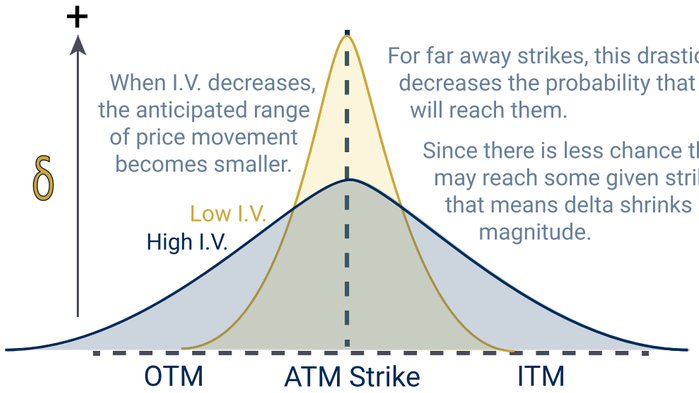
Important!

Direction Matters! Moniness Matters!

Vanna is a very strange greek. When volatility increases, it can either increase or decrease delta depending on the moniness and the direction of the option!

When thinking about delta in terms of vanna, it can be helpful to switch from "delta is the probability of expiring ITM" to "delta is the probability of expiring with value".





Note!

If an option is ITM and I.V. increases, then the option has a greater chance of moving OTM, and thus, a lower chance of expiring ITM.

This means, delta decreases!

Vanna tells us how much delta decreases by.

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The Greek Cheat Sheet

Veta

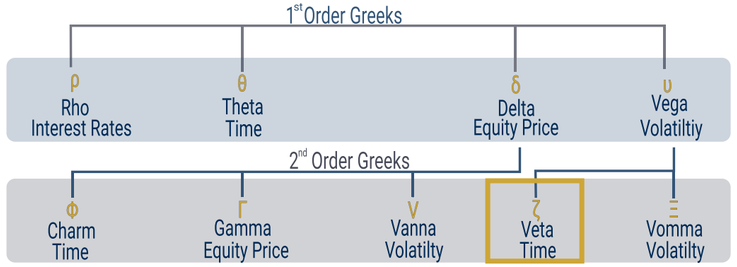
Importance 1/5 Score

Order: 2nd

Sensitive to: Time

Action: Adjusts Vega

Impact: Minor



ζ

What

Veta increases or decreases vega depending on how much time has passed. As time passes, vega shrinks in value, this is because of Veta.

How

Every day, vega's value is adjusted by Veta. The amount that vega is adjusted is the value of veta.

Impact

Veta has a relatively low impact overall but can be particularly important if one is trying to capture volatility plays with vega - understanding how your vega will change with time is important.

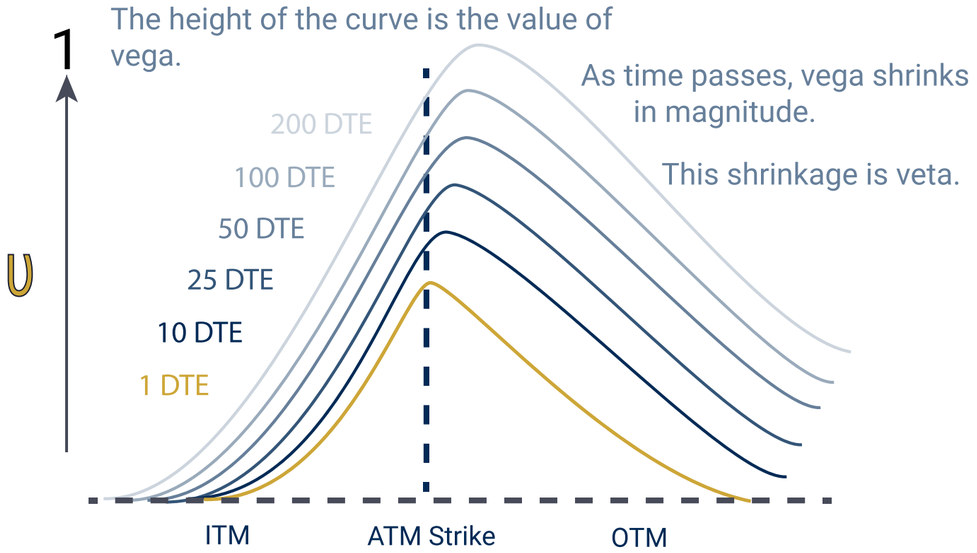
Reasoning

Vega is how the markets price options based on future anticipated price ranges. This anticipated future price range, however, is dependent on the, well, the future! Thus, how much an option is sensitivity to future price ranges is measured in veta: as time grows small, we can consider an option's fate to be "set" - and thus, future outlooks have smaller and smaller variations.

Important!

Veta is an important greek for traders who "trade volatility".

When looking to capture profits from vega, it is important to know how vega will change with the passage of time: will your exposure to volatilty increase, or decrease?



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Vomma

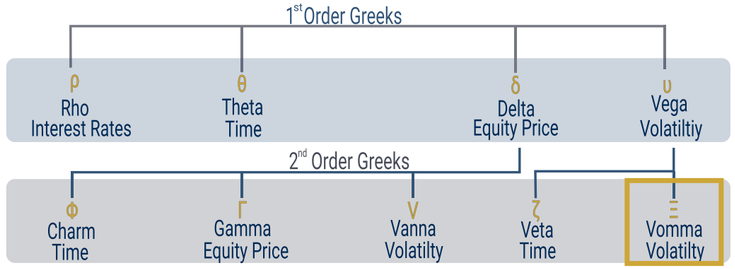
Importance Score: 1/5

Order: 2nd

Sensitive to: Implied Volatility

Relationship: Changes Vega

Impact: Minor



What

Vomma changes how sensitive vega is to volatility. When volatility changes, vega changes. By how much is known as vomma.

How

When I.V. changes, vomma will either expand or contract vega.

Impact

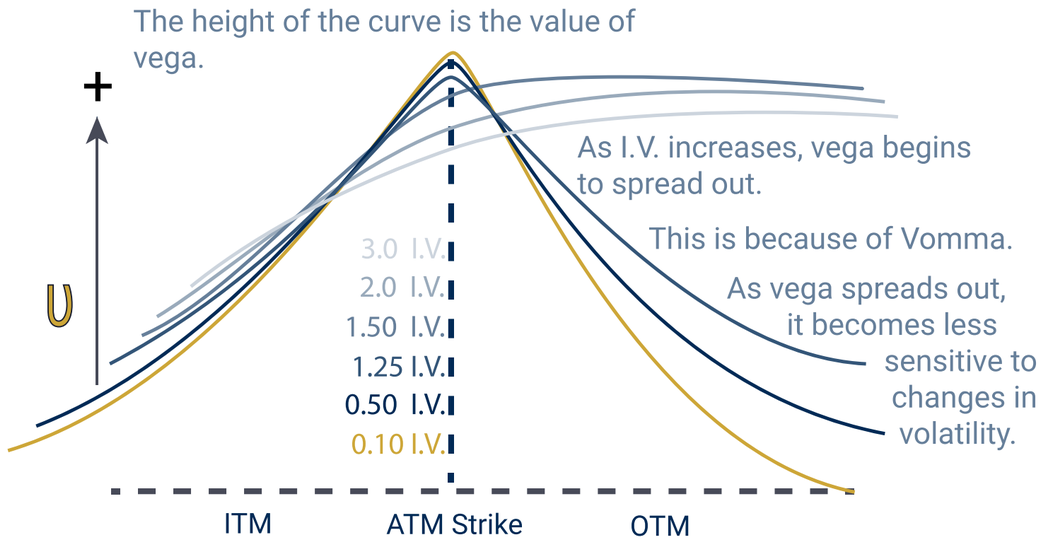
Vomma has a relatively low impact unless a trade is dependent on vega. If so, the impact can be rather large as large changes in volatility will change vega which itself is sensitive to I.V. - this can create a "double I.V. crush" if volatility is moving against you while vega's value (sensitivity to I.V.) increases!

Reasoning

Since vega changes an option's price based on the anticipated price-range, we can think of Vomma as telling Vega how much to keep an eye on I.V. When I.V. is large, then vega is not that sensitive to smaller changes in I.V., but when I.V. is small, vega becames very sensitive to changes in the future forecast for the price-range of a stock.

Important!

Vomma can be important, but it usually isn't too much of a bother unless I.V. changes substantially!



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