Introduction to Options

Part 3: Greeks, Time Value and Implied Volatility for Options Traders

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What are the Greeks?

- The "Greeks" is a term in options that describes the different areas of risk with an options contract that a trader have exposure to
- They help understand the profit and loss response as price of the underlying asset moves
- The common Greeks are Delta, Gamma, Theta, Vega, and Rho
- Used in pricing models for options **(Ex: Black-Scholes model)**

Understanding the basics

- Each Greek has a number associated to it
- The number is used to define how the individual contract moves and the risks involved
- The number (value) associated with each Greek will fluctuate over time
- Some portfolio managers and traders will periodically monitor the values to consistently define risk and make adjustments as needed

Delta (Δ)

- The rate of change between the value of the option and the dollar change of the underlying asset
- Price sensitivity of the option relative to the underlying asset
- The delta of a call option has a range of 0 to 1
- For a put option the range is 0 to -1
- **Ex:** Theoretically, if a call has a delta of .5 at the time of purchase and price of underlying asset increases by a dollar the option will rise in value by $0.50 cents

Delta used in practice

- Delta is a representation of the hedge ratio when taking a delta-neutral position
- Hedge Ratio- The comparison of a position protected through the use of a hedge with the size of the net position (term used in futures and options)
- Ex: To hedge a call with .5 delta, shorting 50 shares will keep the trader hedged when necessary
- Another example of when Delta is used in practice calculating the probability of when a contract will be ITM by expiration
- **Ex:** A call with .5 delta at the time of purchase has a 50% change of being ITM by expiration

Gamma (Γ)

- Rate of change between the delta and the price of the underlying asset
- Known as second-order (secondary derivative) price sensitivity
- Indicates the delta will fluctuate given $1 changes of the underlying asset
- Higher gamma implies the delta will fluctuate dramatically to small price changes of the underlying asset
- **Ex:** Going long a call with .5 delta and .1 gamma. If the underlying asset fluctuates by $1.00 the option's delta will fluctuate by .1 per $1.00 (increase or decrease)
- Used to determine the stability of delta
- Gamma is higher if an option is ATM and lower if ITM or OTM
- Increases largely as the option approaches expiration
- Price changes will have an impact on gamma

- Gamma is smaller typically the further out the date of expiration (Ex: LEAPs)
- Some traders will implement delta-gamma neutral positions so the delta will remain closer to 0
- Delta-gamma neutral- strategy to hedge gamma as well as delta

Theta (Θ)

- Rate of change between the price of an option and the time (time decay)
- Calls and puts will have a negative theta number
- Indicates that the option will decline in value as it approaches the expiration date
- Increases when an option is ATM and declines when ITM or OTM
- The closer to expiration the faster the time decay of the option

Vega (v)

- The rate of change in an option's value relative to the implied volatility (sensitivity to volatility)
- Implied volatility
- Ex: Vega is .1, implying that the value of an option will move up $0.1 if the implied volatility changes per 1%
- Increased volatility implies greater rate of change in the underlying asset, which in turn increases the value of an option (think higher risk with increased volatility premium should be higher due to risk)
- Inversely, a decline of volatility will decline the value of the same option

Rho (p)

- A representation of the rate of change between the value of an option and 1% change in interest
- Displays the sensitivity of the option to interest rates
- Ex: A call has a .05 rho and priced at $1.5 at the time of purchase. If rates increase by 1%, the call increases in value to $1.55

Time Value

- With limited risk buying options, it makes it very advantageous for traders and portfolio managers to utilize them
- Even though there is risk with the time element involved as suppose to buying the underlying asset outright, there are other ways to benefit from this component of an options contract
- On the other side of an options contract purchase is a seller who is collecting a premium and benefitting from the time-value decay of the option sold
- The rate of time decay (theta) is also known as extrinsic value
- It is composed of two variables
    - Time remaining until the option expires
    - How close the underlying asset's price is to the strike
- Ignoring the other components of an options contract and focusing on solely theta, the premium of a contract is more valuable the further out to expiration is
- In regards to the strike price and the current price of an underlying asset, this is will affect the premium of an option as well
- The closer it is to being in the money (ITM), the more expensive an option will be
- Ex: If $tsla is trading at $700 and two calls with the same date of expiration are trading with a strike of $700 and $720, the $700 strike will be worth more due to how close it is to being ITM

- The example shows the different levels of extrinsic value due to the strike in relation to time value

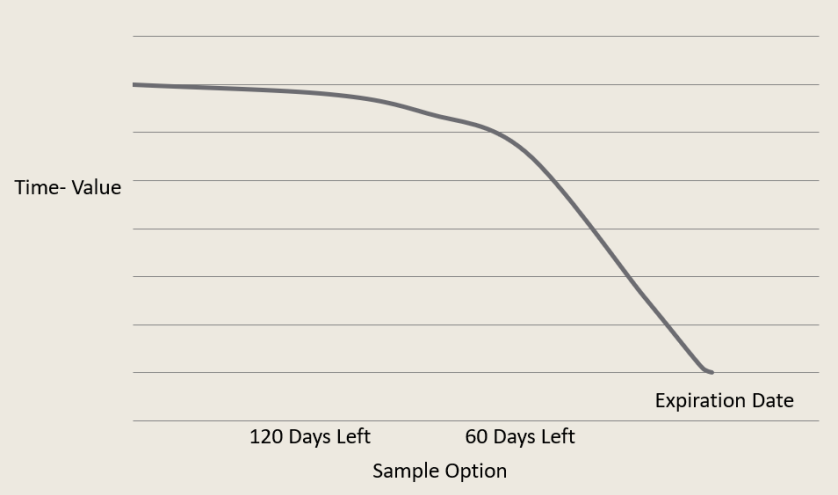
Cases of Time Value

	In-the-money (ITM)	Out-the-money (OTM)	At-the-money (ATM)
Put/Call	Intrinsic Value increase, while the time-value decreases	Intrinsic value is zero, while time-value decreases, but doesn't go to zero	Intrinsic Value is Zero, while time-value reaches the maximum value

Rate of Time-Value Decay

- Time-value decay accelerates the closer to expiration
- The further out the date of expiration the slower the time decay is (LEAPs)
- It's important to understand theta because it provides you one of the primary components to the value of an option

Time-Value Decay Sample



Implied Volatility (IV)

- The metric that shows the market's view of the probable changes in a security's price
- This should not be mistaken for historical/realized volatility
- Historical volatility, as the name suggests, is the past market changes (volatility) and the end result
- Implied volatility is a forecast of potential changes in price movement
- Implied volatility (IV) is used to price an option (both calls and puts)
- The higher the implied volatility, the more expensive the premium is
- Supply, demand, and time value are the factors that assess the implied volatility
- Just as the volatility declines in bull cycles, implied volatility also declines and the inverse applies to bearish market conditions
- Implied Volatility (σ) is used a proxy of market risk for traders and portfolio managers

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- You will see it expressed using % and standard deviations over a specific time horizon
- When thinking of why the price of an option is more when implied volatility is higher, think of the risk involved
- The higher the volatility is expected that large fluctuations in price are more probable (not guaranteed) in either direction
- IV does not imply which direction it's likely to go
- It's important to acknowledge that implied volatility is based on probability not certainty

- It’s only a probability and there are times when volatility declines and implied volatility doesn’t define, which direction the option will go
- Something that is valuable with implied volatility is that it gives one insight on what other participants of the market think

What Affects Implied Volatility

- As market conditions change so does the implied volatility of an asset
- Supply and demand
- Like anything else, the more demand there is for an underlying asset the higher the premium of an option is due to the increase of volatility risk involved
- The less demand there is the implied volatility will decline
- Time of expiration
- The short-dated options have lower implied volatility due to the probability of a spike in volatility is lower because of there is less time before expiration for significant changes in price movement
- Long-dated options have a higher implied volatility due to expectation of volatility increasing as time progresses

Summary

- It estimates the size of expected moves that the underlying asset of an option is going to be
- It does not give a trader the direction of the actual move
- Implied volatility is used by writers to provide a fair value of an options contract
- Traders and portfolio managers use IV when considering risk prior to taking a position
- When IV is high it provides a sense of good opportunity, but also assessing risk as to whether or not taking a position is advantageous
- IV does not put into consideration fundamentals, only price movements
- Certain events such as earnings, wars, various “black swan” events, and so on can have a dramatic impact on implied volatility where it can change very quickly

Article Sources

Chen, James. “How Options Work for Buyers and Sellers.” Investopedia. Investopedia, March 2, 2020. https://www.investopedia.com/terms/o/option.asp.

Downey, Lucas. “The Essential Options Trading Guide. Investopedia. Investopedia, April 22, 2020. https://www.investopedia.com/options-basics-tutorial-4583012.

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