



PREMIER  
TRADER  
UNIVERSITY

**Greeks**



# Volatility and the Options Pricing Model

## Calculating Option Price with known historical Volatility



## Calculating implied Volatility with known Option Price



# Week 2 Session 1: Greeks

- Pricing models
- Each one of the following inputs in the pricing model can be tracked using the greeks
- 6 major inputs that effect an options extrinsic value
  - **Price** - The first factor is the price of the underlying product (in our case the stock being traded). As the stock increases in value the calls will become more expensive and puts become cheaper. As the stock decreases the calls will become cheaper and the puts more expensive.
  - **Time** - The more time that exists before expiration will result in both calls and puts being more expensive. This reflects the reality that the more time that a stock has to move the better chance an option has of hitting its strike price. With each passing day that an option is held, the owner is paying a price to hold that option.

# Greeks - continued

- **Strike Price** - The options strike price will also affect the pricing of an option. The further in the money and option is the less affect time will have on the option. On the flipside the further out of the money an option is the less affect time will have on the option. This is true because the stock is required to make a bigger move to get back to its strike price. The less likely this move is the cheaper the time value will be in the pricing of the option. This becomes important when we discuss how to select which option to trade. Selecting the incorrect strike price could lead to not profiting from the position even with a move in the stock in your direction.

# Greeks - continued

- **Volatility** - Volatility is the measurement of how much the price of the stock is expected to move over a given amount of time. If the stock has shown to move in more dramatic swings over time it is said to be more volatile.
- **Dividends** - As an option holder we do not have the benefit of collecting a stock's dividend. However, the dividend will affect the pricing of the options. If a company increases its dividend the calls will become cheaper and the puts more expensive. This reflects the fact that the stock will drop after paying the dividend. Therefore the calls become cheaper and the puts more expensive.

# Greeks - continued

- **Interest Rates** - When interest rates are high calls will become more expensive and puts will become cheaper. We will not get too in depth into the effect of interest rates because many of the strategies discussed in this course will focus in on short time frames. The effect of interest rates on these shorter term strategies is very minimal and therefore will be left for a later discussion.

# Greeks - Delta

## 1. Delta

- The delta of an option is a measurement that estimates how much an option premium will increase or decrease with every \$1 move in the underlying stock or index. Also known as the % change.
- Calls will have a positive delta ranging from 0 to 1
- Puts will have a negative delta ranging from 0 to -1
- The delta of a call increases in value as a stock moves up and decreases as the stock moves down.
- The delta of a put decreases as a stock moves up and increases as the stock moves down.
- ATM options will have a delta close to +/- .50
- ITM options will have a higher delta which means they react faster to the movement in the stock
- Delta will also increase and decrease faster as you get closer to expiration.

# Greeks – Delta cont.

## 1. Delta cont.

- Delta can also be looked at as the % chance that the option will close ITM
- For example, if an option has a delta of .75 then it has a 75% chance of closing ITM at expiration
- More time to expiration = more doubt that the option will close ITM
- Delta can also be used as a hedge ratio which tells you how many options or shares of stock it will take to make your position delta neutral (no directional bias).



# Greeks – Delta cont.

## 1. Calls:

- Positive delta
- ITM delta  $>.50$
- ATM delta  $=.50$
- OTM delta  $<.50$

## 2. Puts:

- Negative delta
- ITM delta  $> -.50$
- ATM delta  $= -.50$
- OTM delta  $< -.50$

# Greeks – Delta cont.

- What effects the delta of an option?
  - Time: More time to expiration = more doubt that the option will close ITM
  - Volatility
    - ITM options: Drop in volatility = higher delta (less probability of option falling OTM)
    - OTM options: Drop in volatility = lower delta (less probability of option moving ITM)

# Greeks - Gamma

## 2. Gamma

- An option's gamma is a measurement that estimates the rate of change in an option's delta for each dollar move in the underlying stock.
- The delta of the delta
- Buy an option = long gamma
- Sell an option = short gamma
- Gamma will reflect the volatility of the stock
  - Higher volatility = lower gamma
  - This reflects the fact that a larger move on a volatile stock isn't as significant as a larger move on a slower one.

# Greeks – Gamma cont.

- Example:
  - XYZ \$30
  - 30 strike call option \$1.50
  - Stock moves to \$31
  - Call option moves from \$1.50 to \$2.00 (delta of the option was .50)
  - Stock moves to \$32
  - Call option moves from \$2.00 to \$2.75
  - Delta of the option during the move from \$31-\$32 was .75
  - This means the gamma of the 30 option was .25 (taking the difference between the deltas of both \$1 moves)

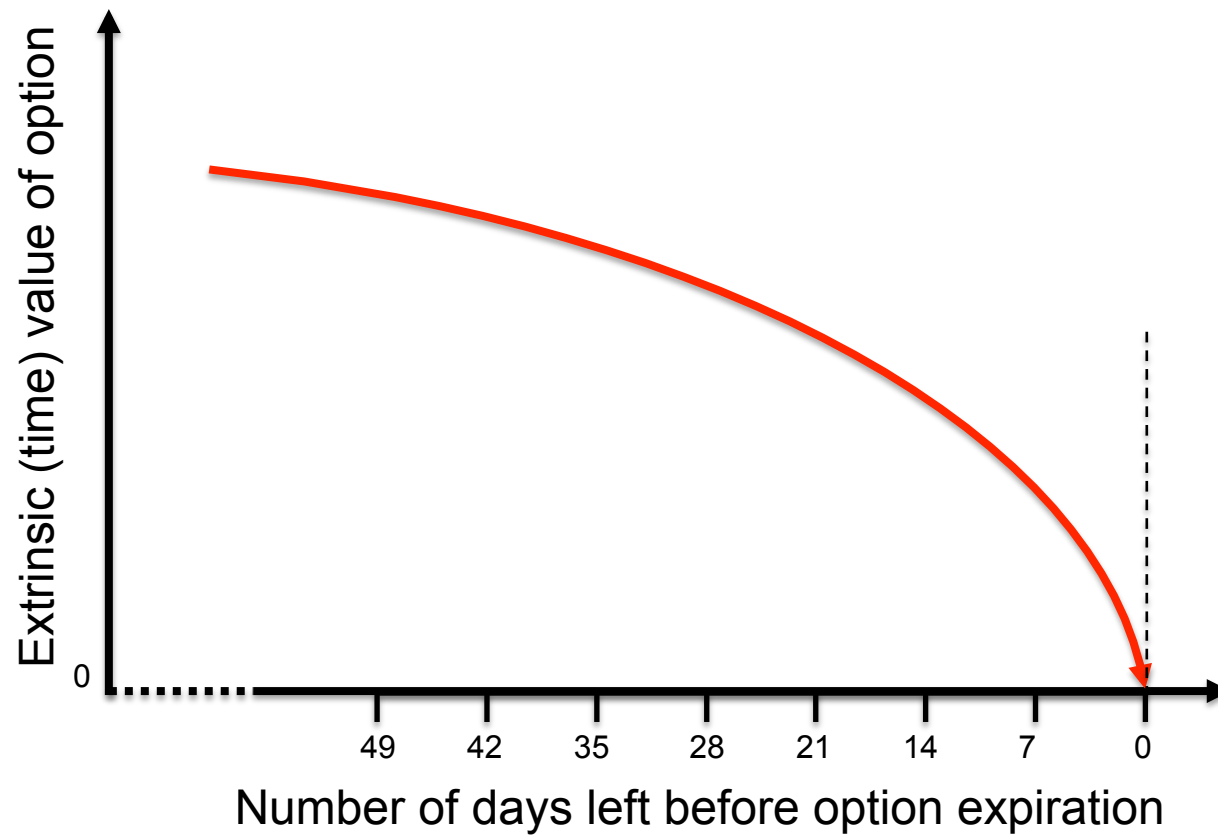
# Greeks – Gamma cont.

- Gamma cont.
  - Gamma highest for the ATM options
  - Gamma highest in the front month options
  - Higher gamma is good for the option buyer as long as the stock moves fast enough
  - The further ITM or OTM an option moves the more stable gamma becomes.

## 3. Theta

- A measure of time decay on an option with a one day change in time.
- Options have 2 values
  - Intrinsic value – does not decay
  - Extrinsic value – value over and above intrinsic value.
- Not the same for each option
- Not the same each day
  - Decay at a non-linear fashion

# Time Decay



# GOOG Time Decay



| GOOG Google Inc. ETB NASDAQ B: 581.70 A: 582.02 581.70 -9.52 -1.61% |          |          |          |         |           |            |          |        |       |  |  |
|---------------------------------------------------------------------|----------|----------|----------|---------|-----------|------------|----------|--------|-------|--|--|
| UNDERLYING                                                          |          |          |          |         |           |            |          |        |       |  |  |
| Last X                                                              | Net Chng | Bid X    | Ask X    | Size    | Volume    | Open       | High     | Low    |       |  |  |
| 581.70 D                                                            | -9.52    | 581.70 Z | 582.02 Q | 1 x 1   | 1,503,469 | 587.01     | 589.01   | 578.20 |       |  |  |
| TRADE GRID                                                          |          |          |          |         |           |            |          |        |       |  |  |
| OPTIONS Spread: Single Layout: Theta, Delta Exchange: Composite     |          |          |          |         |           |            |          |        |       |  |  |
| CALLS                                                               |          |          |          |         |           | Strikes: 1 | PUTS     |        |       |  |  |
| Theta                                                               | Delta    | Bid X    | Ask X    | Exp     | Strike    | Bid X      | Ask X    | Theta  | Delta |  |  |
| NOV4 10 (3) 100 (Weeklys) 24.19%                                    |          |          |          |         |           |            |          |        |       |  |  |
| -0.66                                                               | 0.56     | 6.00 C   | 6.40 C   | NOV4 10 | 580       | 4.10 N     | 4.20 C   | -0.58  | -0.44 |  |  |
| DEC 10 (24) 100 28.38%                                              |          |          |          |         |           |            |          |        |       |  |  |
| -0.33                                                               | 0.53     | 17.20 C  | 17.50 N  | DEC 10  | 580       | 15.20 N    | 15.40 B  | -0.32  | -0.47 |  |  |
| JAN 11 (59) 100 31.88%                                              |          |          |          |         |           |            |          |        |       |  |  |
| -0.24                                                               | 0.54     | 29.10 X  | 29.80 A  | JAN 11  | 580       | 26.50 A    | 27.20 C  | -0.23  | -0.47 |  |  |
| MAR 11 (115) 100 30.68%                                             |          |          |          |         |           |            |          |        |       |  |  |
| -0.17                                                               | 0.54     | 38.80 X  | 39.60 X  | MAR 11  | 580       | 35.80 C    | 36.50 C  | -0.16  | -0.46 |  |  |
| JUN 11 (206) 100 30.93%                                             |          |          |          |         |           |            |          |        |       |  |  |
| -0.13                                                               | 0.55     | 52.00 I  | 54.40 A  | JUN 11  | 580       | 48.90 I    | 50.20 I  | -0.12  | -0.45 |  |  |
| JAN 12 (423) 100 32.05%                                             |          |          |          |         |           |            |          |        |       |  |  |
| -0.09                                                               | 0.57     | 78.10 I  | 80.50 I  | JAN 12  | 580       | 72.50 I    | 75.00 I  | -0.09  | -0.43 |  |  |
| JAN 13 (787) 100 27.77%                                             |          |          |          |         |           |            |          |        |       |  |  |
| -0.07                                                               | 0.60     | 107.40 N | 110.70 B | JAN 13  | 580       | 99.20 I    | 102.00 C | -0.06  | -0.40 |  |  |



# Greeks – Theta Cont.

- **Theta cont.**
  - Highest with the ATM option
    - Decreases the further ITM or OTM you go
  - Highest in the front month options
    - Decreases the further out in time that you go

## 4. Vega

- The amount that an options price will change with a one point change in implied volatility.
- A change in the implied volatility of an option reflects the higher potential for movement in the stock.
- Highest for the ATM options
- Decreases as you move farther ITM or OTM
- Get's higher the further out in time that you go
- As you get closer to expiration, the options become less sensitive to changes in implied volatility.