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# The “Greeks”

## Option Sensitivities



# Variables in Option Trading



- Option pricing models consider the following variables:
  1. Price
  2. Strike
  3. Time
  4. Volatility
  5. Dividend
  6. Interest



# Greeks



- The “Greeks” measure the change in the value of an option due to a change in one of the pricing variables.



# Greeks



- Pro traders use the “Greeks” to create hedged positions.
- Average traders use them to understand how a change in one of the variables will change the option price.



# Variables in Option Trading



The 5 Greeks:

1. Delta
2. Gamma
3. Vega
4. Theta
5. Rho



# Delta (Change in Price)



- Delta is a mathematical measure to show the rate of change in an option price relative to the rate of change in the underlying stock.







# Delta Example



Stock price: \$50.00  
Option strike: \$50.00  
Time: 30 days  
Option price: \$2.32  
**Delta: 0.530**

Stock price:  \$51.00  
Option strike: \$50.00  
Option price:  \$2.85

Stock price:  \$49.00  
Option strike: \$50.00  
Option price:  \$1.79



# Delta



- As a call option becomes deeper “in-the-money”, the delta will approach 1.
- Call options always have a positive delta.
- As a put option becomes deeper “in-the-money”, the delta will approach -1.
- Put options always have a negative delta.



# Gamma (Change in Delta)



- Gamma is the rate of change in the delta.
- This is primarily used by pro traders that are using options to delta hedge portfolios.
- The higher the gamma, the more frequently the trader would need to adjust their delta hedged portfolio.



# Vega (Volatility)



- Vega is a measure of the change in the price of an option relative to percentage change in implied volatility.



# Vega Example



Stock price: \$50.00 (remains unchanged)

Strike price: \$50.00

Time: 30 days

Option price: \$2.06

**Implied volatility: 35%**

**Vega: 0.057**

Implied volatility:	↑ 36%	Implied volatility:	↓ 34%
Vega:	0.057	Vega:	0.057
Option price:	↑ \$2.12	Option price:	↓ \$2.00




# Theta (Time)





- Theta is a measure of the change in the price of an option relative to a change in time to maturity.
- Every day that passes, an option loses value. Theta measures the rate of time decay.



# Theta Example



Stock price: \$50.00 (remains unchanged)  
Strike price: \$50.00  
Option price: \$2.06  
**Time: 30 days**  
**Theta: -0.041**

Time:  29 days  
Theta: -0.041  
Option price:  \$2.02



# Rho (Interest Rate)



- Rho is a measure of the change in the price of an option relative to a change in the risk-free interest rate.







# Rho Example



Stock price: \$50.00 (remains unchanged)  
Strike price: \$50.00  
Time: 30 days  
Option price: \$2.06  
**Interest rate: 3.00%**  
**Rho: 0.020**

Interest rate:  **4.00%**  
Rho: 0.020  
Option price:  **\$2.08**

Interest rate:  **2.00%**  
Rho: 0.020  
Option price:  **\$2.04**



# Greeks



- By learning the option Greeks, an investor or trader is able to understand why an option is or is not moving in correlation with the underlying stock.





Jason Ayres, President  
**Optionsource.net**

