Intuition

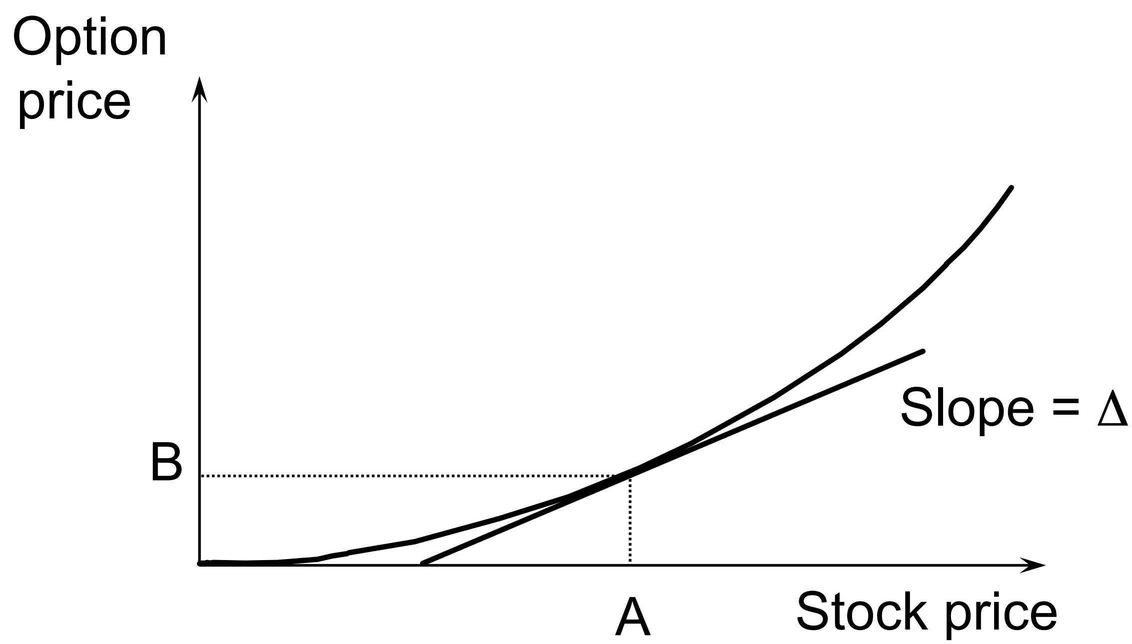
The Greeks measure the sensitivity of options to their determinants.

– These measurements are accurate for small changes only!

– The Greeks are partial derivatives, not total derivatives. Each measures the sensitivity of option's value to one determinant, holding all others constant!

Delta (Δ)

- **Delta [Δ]** is the rate of change of the option price with respect to the underlying.



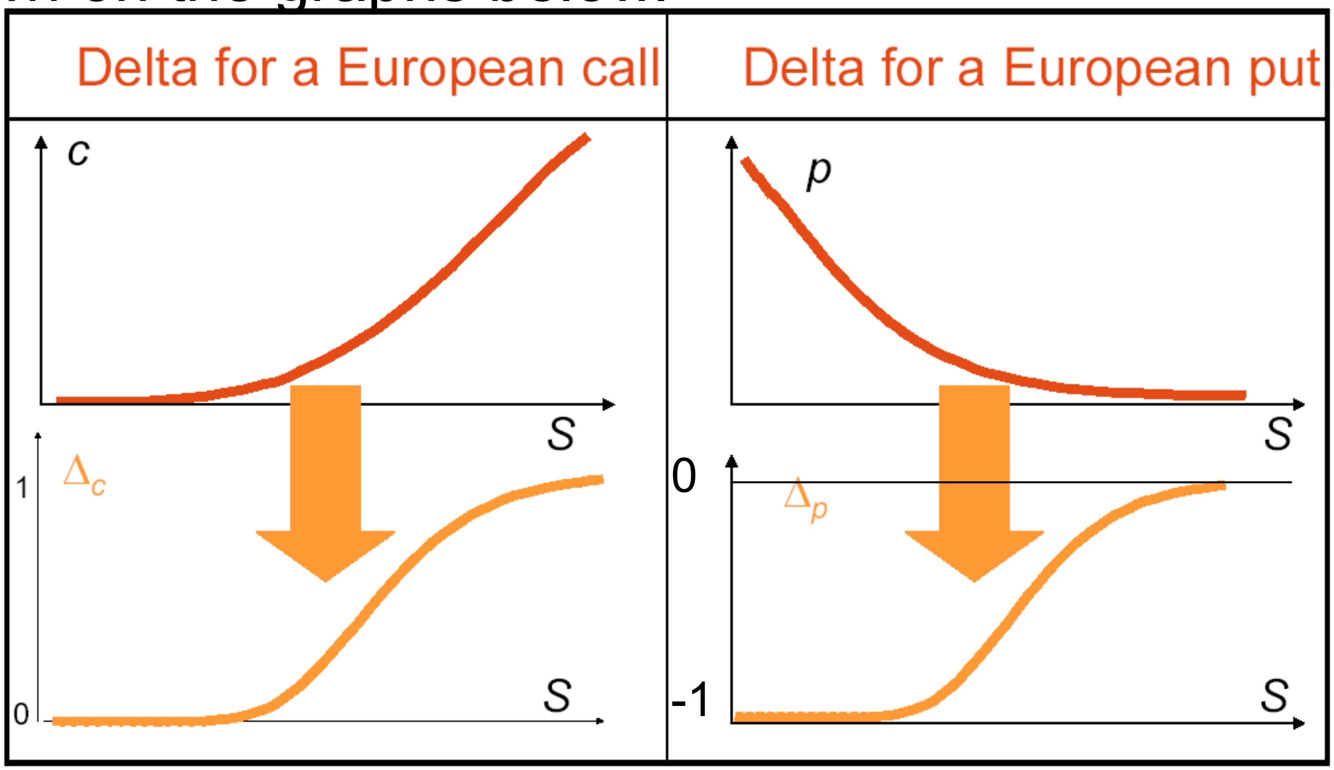
Delta (Δ)

$$\boxed{\Delta = \frac{\partial V}{\partial S}}$$

- Call: $\Delta_c = N(d_1)$
- Put: $\Delta_p = N(d_1) - 1$
- $\Delta_c > 0$, $\Delta_p < 0$

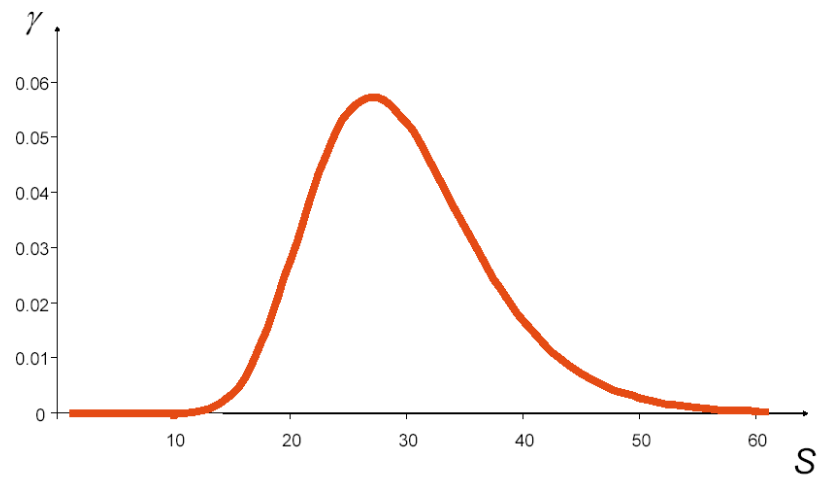
Delta (Δ)

Delta [Δ] :
Measures the change in the option price for a change in the underlying price. Graphically, delta is the slope of the option as shown on the graphs below.



Gamma (Γ)

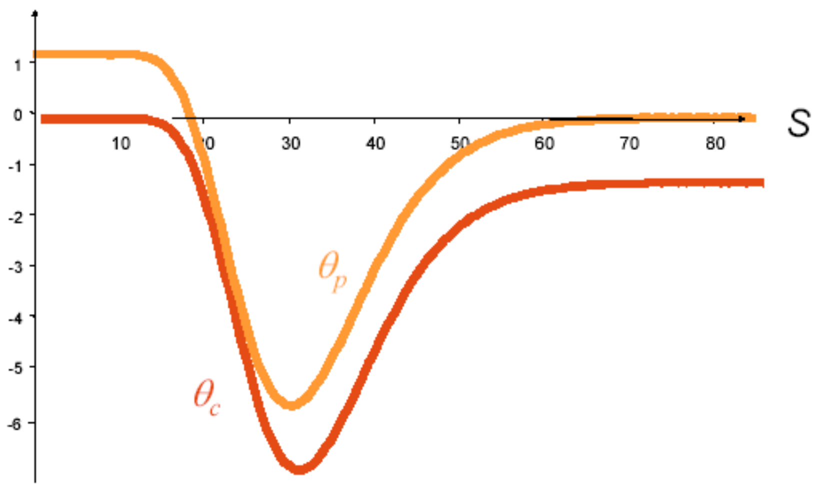
Gamma [Γ] :
Gamma (Γ) measures the change in the option delta (Δ) as the underlying price changes.



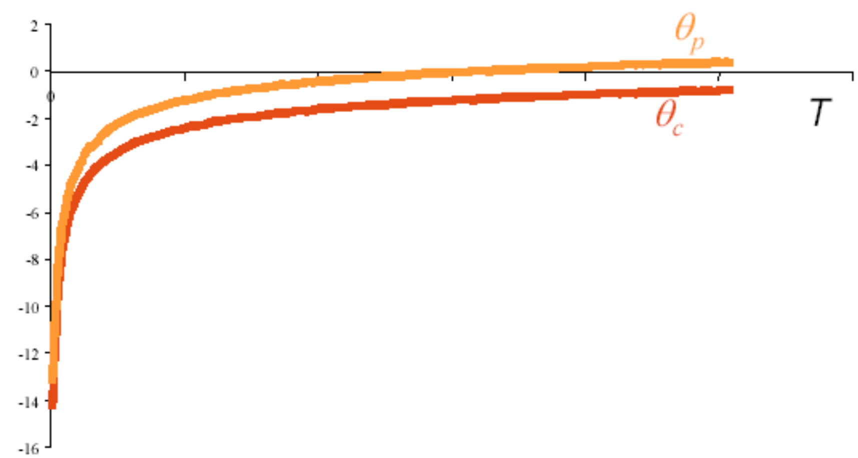
Gamma is greatest for options that are at-the-money

Theta (Θ)

Theta [Θ] :
Theta measures the change in the option price as the expiration date approaches. It is usually negative since an option becomes less valuable as time passes.



Θ as a function of underlying price (S)

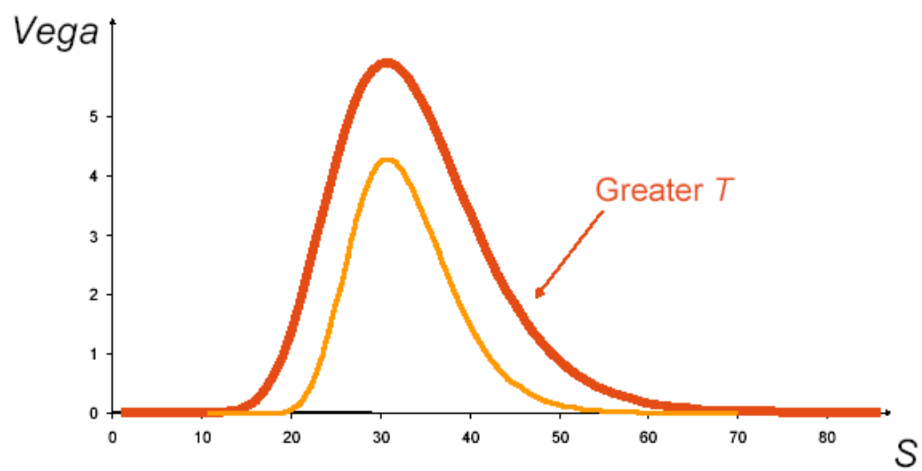


Θ as a function of time to maturity (T)

Vega

Vega [υ] :

Vega measures the change in the option price with respect to a change in the volatility of the underlying asset. It is positive since an option on more volatile assets is more valuable.



Rho (ρ)

Rho [ρ] :

Measures the change in the option price with respect to a change in the interest rate. It is positive for calls and negative for puts.