Derivatives Lab

Session 19

November 20, 2012

Traders often like to know the sensitivity of the value of a derivative to the change of parameters. (These sensitivity measures are often refereed to as "The Greeks".)

Let us, as an example, look at

$$\kappa = \frac{\partial C}{\partial \sigma}$$

which is often referred to as "Vega" (not a Greek letter!).

1. Derive a partial differential equation for κ. What are the boundary conditions?

2. Modify your Black–Scholes solver to find κ.

3. Compare to the explicit formula (which can be obtained by direct differentiation of the Black–Scholes formula) for a European put or call option, where

$$\kappa = S \sqrt{T} \, N'(x)$$

   where

$$x = \frac{\ln(S/K) + (r + \sigma^2/2)T}{\sigma \sqrt{T}}$$

   and

$$N'(x) = \frac{1}{\sqrt{2\pi}} \, e^{-x^2/2}$$

   is the probability density function of the standard normal distribution.