

Derivatives Lab

Session 20

November 28, 2011

1. Traders often like to know the sensitivity of the value of a derivative to the change of parameters. (These sensitivity measures are often referred 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 Greek).

- Derive a partial differential equation for κ . What are the boundary conditions?
- Modify your Black–Scholes solver to find κ .
- 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.