

EXAM MFE QUESTIONS OF THE WEEK

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Week of March 19/07

A call option on a non-dividend paying stock has a strike price of 100 and expires in one year.

You are given the following:

- current stock price is 100
- current option price is 19.384- continuously compounded risk free interest rate is 8%
- the call delta is .6554

For the same stock, find the price of a similar call option with a strike price of 110.

The solution can be found below.

Week of March 19/07 - Solution

$\Delta = N(d_1) = .6554 \rightarrow d_1 = .4$ (from the standard normal table).

For the option with a strike price of 100, and $T = 1$, $r = .08$, we have

$$C(0) = 19.384 = S_0 N(d_1) - K e^{-rT} N(d_2) = 100(.6554) - 100e^{-.08} N(d_2) .$$
$$\rightarrow N(d_2) = .5000 \rightarrow d_2 = 0 = d_1 - \sigma\sqrt{T} = .4 - \sigma \rightarrow \sigma = .4 .$$

Alternatively, we can find σ as follows:

$$d_1 = \frac{\ln(S/K) + (r + \frac{1}{2}\sigma^2)T}{\sigma\sqrt{T}} = \frac{\ln(100/100) + (.08 + \frac{1}{2}\sigma^2)}{\sigma} = .4$$

$$\rightarrow .08 + .5\sigma^2 = .4\sigma \rightarrow \sigma^2 - .8\sigma + .16 = 0 \rightarrow \sigma = .4 .$$

For the option with a strike price of 110, and $T = 1$, $r = .08$, we have

$$d_1 = \frac{\ln(100/110) + (.08 + \frac{1}{2}(.16))}{.4} = .16 \text{ and } d_2 = .1617 - .4 = -.24 .$$

$$C(0) = S_0 N(d_1) - K e^{-rT} N(d_2) = 100(.5636) - 110e^{-.08}(.4052) = 15.21 .$$