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cf_call

Let

- T = maturity date $(T > t)$
- K = strike price
- x = spot price
- t = pricing date
- σ = volatility
- r = interest rate
- δ = dividend yields
- $\theta = T - t$
- $b = r - \delta$

Set:

$$d_1 = \frac{\log\left(\frac{x}{K}\right) + \left(b + \frac{\sigma^2}{2}\right)\theta}{\sigma\sqrt{\theta}} \qquad d_2 = d_1 - \sigma\sqrt{\theta}$$

and N as the cumulative normal distribution function:

$$N(d) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{d} e^{-x^2/2} dx.$$

Call Option

Payoff	$C_T = (S_T - K)_+$
Price	$C(t, x; K) = xe^{-\delta\theta} N(d_1) - Ke^{-r\theta} N(d_2)$
Delta	$\frac{\partial C(t, x; K)}{\partial x} = e^{-\delta\theta} N(d_1)$

References