Solution To The Black-Scholes Model Call pricing

September 24, 2020

For Yara Inc: $S_t = \$40$

$K = \$45$

$r = 3\%$

$t = 4 months = \frac{1}{3} year$

σ = 40%$peryearvspace0.2in\\\ μ%$ per year

C= call option price

S_t= current stock price

K= strike price

r= risk=free interest rate

t= time to maturity

N= normal distribution

σ= volatility of the stock

Black-Scholes Formular

$$C = S_t N(d_1) - K\exp(-rt)N(d_2) \tag{1}$$

$$d_1 = \frac{ln(\frac{S_t}{K})+(r+0.5\sigma^2)t}{\sigma\sqrt{t}} \tag{2}$$

$$d_2 = d_1 - \sigma\sqrt{t} \tag{3}$$

1 Substitute S_t, K, r, σ, t into equation 2

$$d_1 = \frac{ln(\frac{40}{45})+(\frac{3}{100}+(0.5*0.4^2))\frac{1}{3}}{0.4\sqrt{\frac{1}{3}}}$$

$$d_1 = \frac{-0.1178+0.03667}{0.2309}$$

$$d_1 = -0.3512$$

2 Substitute d_1, σ, t into equation 3

$$d_2 = -0.3512 - 0.2309$$

$$d_2 = -0.5821$$

3 Find the normal distribution $N(d_1)$, $N(d_2)$ of d_1 and d_2

$$N(d_1) = 0.36317$$

$$N(d_2) = 0.28096$$

4 Substitute S_t, $N(d_1)$, K, r, t, $N(d_2)$ into equation 1

$C = 40(0.36317) - 45\exp(\frac{-0.03}{3})(0.28096)$

$C = \$14.5268 - \$12.5174$

$C = \$2.0094$

The call price for zara inc is \$2.0094