Stock price, S = \$40

Strike price, K = \$45

Time to mature, t = 4 months = (4/12) years = 0.333333 years

Risk free rate, r = 3%/year = 0.03

Standard deviation, δ = 40%/year = 0.4

Black Scholes call price, C = ?

<u>Solution</u>

Black Scholes call price, C = SNd_1 - $Ke^{-rt}.Nd_2$

Where, $d_1 = \frac{[\ln\left(\frac{S}{K}\right)+\left(r+\frac{\delta^2}{2}\right).t]}{\delta\sqrt{t}}$

$d_2 = d_1 - \delta\sqrt{t}$

The values of Nd_1 and Nd_2 can be obtained from the standard normal Table.

Therefore:

$$d_1 = \frac{[\ln\left(\frac{40}{45}\right)+\left(0.03+\frac{0.4^2}{2}\right).0.333333]}{0.4 * \sqrt{0.333333}}$$

$$d_1 = \frac{[\ln(0.888889)+(0.11)(0.333333)]}{0.23094}$$

$$d_1 = \frac{-0.117783 + 0.036667}{0.23094}$$

$$d_1 = \frac{-0.091116}{0.23094}$$

thus, d_1 = -0.351243 ≈ -0.35

also,

$d_2 = d_1 - \delta\sqrt{t}$

$d_2 = -0.351243 - 0.4\sqrt{0.333333}$

$d_2 = -0.351243 - 0.23094$

thus, d_2 = -0.582183 ≈ -0.58

From the standard normal table,

Nd_1 = 0.3632

Nd_2 = 0..2810

Substituting these values into the equation for Black Scholes call price,

$C = SNd_1 - Ke^{-rt}.Nd_2$

$C = 40 * 0.3632 – 45 * e^{-(0.03)(0.333333)} * 0.2810$

C = 14.528 – 12.51918

C = $2.00882

Thus, The Black Scholes call price is $2.00882 ≈ $2.01