Black_Scholes_Formula

September 29, 2021

1 Black Scholes Formula

[1]:
```
import numpy as np
import scipy.stats as ss
```

[2]:
```
def d1(S0, K, r, sigma, T):
    d1 = (np.log(S0/K) + (r + sigma**2 / 2) * T)/(sigma * np.sqrt(T))
    return d1
```

[3]:
```
def d2(S0, K, r, sigma, T):
    d2 = (np.log(S0 / K) + (r - sigma**2 / 2) * T) / (sigma * np.sqrt(T))
    return d2
```

[4]:
```
def BlackScholesCall(S0, K, r, sigma, T):
    BSC = S0 * ss.norm.cdf(d1(S0, K, r, sigma, T)) - K * np.exp(-r * T) * ss.
 ↪norm.cdf(d2(S0, K, r, sigma, T))
    return BSC
```

[5]:
```
def BlackScholesPut(S0, K, r, sigma, T):
    BSP = K * np.exp(-r * T) * ss.norm.cdf(-d2(S0, K, r, sigma, T)) - S0 * ss.
 ↪norm.cdf(-d1(S0, K, r, sigma, T))
    return BSP
```

[6]:
```
# Input
S0 = 100.0
K = 100.0
r = 0.1
sigma = 0.30
T = 3
```

[7]:
```
print("S0\tCurrent Stock Price:", S0)
print("K\tStrike Price:", K)
print("r\tContinuously compounded risk-free rate:", r)
print("sigma\tVolatility of the stock price per year:", sigma)
print("T\tTime to maturity in trading years:", T)
```

```
S0      Current Stock Price: 100.0
K       Strike Price: 100.0
r       Continuously compounded risk-free rate: 0.1
sigma   Volatility of the stock price per year: 0.3
T       Time to maturity in trading years: 3
```

[8]:
```
Call_BS = BlackScholesCall(S0, K, r, sigma, T)
Call_BS
```

[8]: 33.60448376282812

[9]:
```
Put_BS = BlackScholesPut(S0, K, r, sigma, T)
Put_BS
```

[9]: 7.686305830999903