Black-Scholes Option Pricing Model

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1 Assumptions

1. The stock price follows the *lognormal distribution.*

2. There are no tax and transaction cost in the market.

3. European Options

4. There is no riskless arbitrage opportunuty.

5. Investors are able to debit and credit with the riskless interest rate.

2 Formula

The call price of option is

$$c = (S - D_t e^{-rT})N(d_1) - Xe^{-rT}N(d_2), \text{ where}$$
$$d_1 = \frac{\ln \frac{S}{L} + T\left(r + \frac{\sigma^2}{2}\right)}{\sigma \sqrt{T}}$$
$$d_2 = d_1 - \sigma \sqrt{T}$$

The put price of option is

$$p = Xe^{-rT}N(-d_2) - (S - D_t e^{-rT})N(-d_1)$$

The symbols represent

- c: initial option price

- X: strike price of the option

- S: present value of the trading financial asset

- D_t: dividends at time t

- T: the ratio of expiry and 365 days

- r: riskless interest rate

- σ^2: variation or volatility

- $N(\cdot)$: cumulative distribution function of standard normal distribution

3   Reference

B-S Model