HW4 - Calculate Price of European Put and Call Option

我使用兩種方式以 BS model 計算歐洲選擇權的價格，第一種是老師提供的計算方式，先將各期股利折現並從現值中扣除；第二種是不計算 p head，而是在計算公式時以現價乘以(e^(-dividend_yield*t))代替，此方法參考 john hull《Options, Futures, and Other Derivatives》，計算方式如下。

$$c = S_0 e^{-qT} N(d_1) - K e^{-rT} N(d_2)$$
$$p = K e^{-rT} N(-d_2) - S_0 e^{-qT} N(-d_1)$$

參考網站 : https://goodcalculators.com/black-scholes-calculator/

計算流程:

1. 輸入 current price、 σ 、dividends、times dividend paid in a year、interest rate、strike price、maturity from now
2. 計算各期股利折現並從現值中扣除
3. $$d_1 = \frac{\ln(S_0/K) + (r - q + \sigma^2/2)T}{\sigma\sqrt{T}}$$
   $$d_2 = \frac{\ln(S_0/K) + (r - q - \sigma^2/2)T}{\sigma\sqrt{T}} = d_1 - \sigma\sqrt{T}$$
4. $$c = S_0 e^{-qT} N(d_1) - K e^{-rT} N(d_2)$$
   $$p = K e^{-rT} N(-d_2) - S_0 e^{-qT} N(-d_1)$$
   Normal distribution: scipy.stats.norm(0, 1).cdf()
5. 輸出 Price of European Put and Call Option