

## The Black-Scholes Formulas for European Option on Discrete Dividend-Paying Stock

Dividend-adjusted stock price

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

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

$$\text{where } d_1 = \frac{\ln((S_0 - De^{-rt}) / K) + (r + \sigma^2 / 2)T}{\sigma \sqrt{T}}$$

$$d_2 = d_1 - \sigma \sqrt{T}, \text{ and}$$

$De^{-rt}$  is the present value of all cash dividends that will be paid before option expiration date

$N(\cdot)$  the cumulative standard normal distribution function

$$N(-d_1) = 1 - N(d_1)$$

輸入外生變數:  $S_0, D, r, t, K, T, \sigma$

利用迴圈可以輸入發放股利的次數、金額、到期日

利用上圖的公式計算  $d_1, d_2$  的值

利用得到  $d_1, d_2$  的值計算出  $c, p$  選擇權的價格