Problem 8.4.8

Nicolai Siim Larsen

02407 Stochastic Processes

We need to verify the option valuation on p. 426, where we consider a call option on a share of the Hewlett-Packard stock. The current spot price of the Hewlett-Packard stock is \$59, and the stock has a volatility of 35%, i.e. $\sigma = 0.35$. We may also assume that the prevalent risk-free rate in the market is 5% per year, i.e. $r = 0.05$. We then consider a call option with a strike price of \$60 and maturity six months (half a year) in the future, i.e. $K = 60$ ($a = 60$) and $\tau = 0.5$. To verify the option valuation, we apply the Black-Scholes formula (eq. 8.56). We let $F = F(59, 0.5)$ and get

$$\begin{aligned} F &= 59\Phi\left(\frac{\ln(59/60) + (0.05 + 0.35^2/2)0.5}{0.35\sqrt{0.5}}\right) - 60e^{-0.05\cdot 0.5}\Phi\left(\frac{\ln(59/60) + (0.05 - 0.35^2/2)0.5}{0.35\sqrt{0.5}}\right) \\ &\approx 6.03, \end{aligned}$$

which agrees with the result in the book. If we change the volatility to $\sigma = 0.30$, we get a price of \$5.21.