기말고사 답안

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14.2)

$\sigma = 0.3$
거래일 기준 표준편차 : $\sigma/\sqrt{252} = 0.0189$
14.4)

$S_0 = 50, K = 50, T = 3/12, r = 0.1, \sigma = 0.3$

$$d_1 = \frac{ln(S_0/K) + (r + \sigma^2/2)T}{\sigma\sqrt{T}} \approx 0.2417$$

$$d_2 = \frac{ln(S_0/K) + (r - \sigma^2/2)T}{\sigma\sqrt{T}} \approx 0.0917$$

$$p = -S_0N(-d_1) + Ke^{-rT}N(-d_2)$$

$$p = -50 \times N(-0.2417) + 50e^{-0.1\times3/12}N(-0.0917)$$

$$p = -50 \times 0.4052 + 50e^{-0.1\times3/12} \times 0.4641$$

$$p \approx 2.3759$$

14.5)

$S_0 = 50, K = 50, T = 3/12, t = 2/12, r = 0.1, \sigma = 0.3$

$$D = 1.5e^{-0.1*2/12}$$

$$D = 1.4752$$

$$S_0^* = S_0 - D = 48.5248$$

$$d_1 = \frac{ln(S_0^*/K) + (r + \sigma^2/2)T}{\sigma\sqrt{T}} \approx 0.042$$

$$d_2 = \frac{ln(S_0^*/K) + (r - \sigma^2/2)T}{\sigma\sqrt{T}} \approx -0.108$$

$$p = -S_0^* N(-d_1) + Ke^{-rT} N(-d_2)$$
$$p = -48.5248 \times N(-0.042) + 50e^{-0.1 \times 3/12} N(0.108)$$
$$p = -48.5248 \times 0.484 + 50e^{-0.1 \times 3/12} \times 0.5438$$
$$p \approx 3.0302$$

14.7)

$\mu = 0.15, T = 24/12, \sigma = 0.25, \alpha = 0.95$

$$x = \frac{1}{T} ln(\frac{S_T}{S_0}) \sim \phi((\mu - \frac{\sigma^2}{2}), \frac{\sigma^2}{T})$$
$$x \sim= \phi(0.1187, 0.0312)$$
$$0.1187 - 1.96 \times 0.1768 < x < 0.1187 + 1.96 \times 0.1768$$
$$-0.2277 < x < 0.4652$$

14.8-a)

$\mu = 0.16, T = 6/12, \sigma = 0.35, S_0 = 38, = 40$

$$lnS_T \sim \phi((ln(S_0) + \mu - \frac{\sigma^2}{2})T, \sigma^2 T)$$
$$ln(S_T) \sim \phi(3.687, 0.0612)$$

유로피언 콜옵션이 행사될 확률은 다음과 같다.

$$P(S_T > K) = P(ln(S_T) > ln(K))$$
$$= P(Z > \frac{ln(K) - 3.687}{0.2475})$$
$$= P(Z > 0.0078)$$
$$= 1 - P(Z < 0.0078)$$
$$= 1 - 0.5031$$
$$= 0.4969$$

14.8-b)

$\mu = 0.16, T = 6/12, \sigma = 0.35, S_0 = 38, = 40$

$$lnS_T \sim \phi((ln(S_0) + \mu - \frac{\sigma^2}{2})T, \sigma^2 T)$$
$$ln(S_T) \sim \phi(3.687, 0.0612)$$

유로피언 풋옵션이 행사될 확률은 다음과 같다.

$$P(S_T < K) = P(ln(S_T) < ln(K))$$
$$= P(Z < \frac{ln(K) - 3.687}{0.2475})$$
$$= 0.5031$$

14.13)

$S_0 = 52, K = 50, T = 3/12, r = 0.12, \sigma = 0.3$

$$d_1 = \frac{ln(S_0/K) + (r + \sigma^2/2)T}{\sigma\sqrt{T}} \approx 0.5365$$

$$d_2 = \frac{ln(S_0/K) + (r - \sigma^2/2)T}{\sigma\sqrt{T}} \approx 0.3865$$

$$c = S_0N(d_1) - Ke^{-rT}N(d_2)$$
$$c = 52 \times N(0.5365) - 50e^{-0.12\times3/12}N(0.3865)$$
$$c \approx 52 \times 0.7054 - 50e^{-0.12\times3/12} \times 0.6517$$
$$c \approx 5.0574$$

14.14)

$S_0 = 69, K = 70, T = 6/12, r = 0.05, \sigma = 0.35$

$$d_1 = \frac{ln(S_0/K) + (r + \sigma^2/2)T}{\sigma\sqrt{T}} \approx 0.1666$$

$$d_2 = \frac{ln(S_0/K) + (r - \sigma^2/2)T}{\sigma\sqrt{T}} \approx -0.0809$$

$$p = -S_0N(-d_1) + Ke^{-rT}N(-d_2)$$
$$p = -69 \times N(-0.1666) + 70e^{-0.05\times6/12}N(0.0809)$$
$$p = -69 \times 0.4325 + 70e^{-0.05\times6/12} \times 0.5319$$
$$p \approx 6.4696$$

14.26)

$\mu = 0.18, T = 24/12, \sigma = 0.3, S_0 = 50, \alpha = 0.95$

$$lnS_T \sim \phi((ln(S_0) + \mu - \frac{\sigma^2}{2})T, \sigma^2T)$$

$$ln(S_T) \sim \phi(4.182, 0.18)$$

$$4.182 - 1.96 \times 0.4243 < ln(S_T) < 4.182 + 1.96 \times 0.4243$$

$$3.3505 < ln(S_T) < 5.0136$$

$$28.516 < S_T < 150.4424$$

14.29-(a))

$S_0 = 30, K = 29, T = 4/12, r = 0.05, \sigma = 0.25$

$$d_1 = \frac{ln(S_0/K) + (r + \sigma^2/2)T}{\sigma\sqrt{T}} \approx 0.4225$$

$$d_2 = \frac{ln(S_0/K) + (r - \sigma^2/2)T}{\sigma\sqrt{T}} \approx 0.2782$$

$$c = S_0 N(d_1) - Ke^{-rT} N(d_2)$$

$$c = 30 \times N(0.4225) - 29e^{-0.05\times 4/12} N(0.2782)$$

$$c \approx 30 \times 0.6628 - 29e^{-0.05\times 4/12} \times 0.6103$$

$$c \approx 2.4777$$

14.29-(c))

$S_0 = 30, K = 29, T = 4/12, r = 0.05, \sigma = 0.25$

$$d_1 = \frac{ln(S_0/K) + (r + \sigma^2/2)T}{\sigma\sqrt{T}} \approx 0.4225$$

$$d_2 = \frac{ln(S_0/K) + (r - \sigma^2/2)T}{\sigma\sqrt{T}} \approx 0.2782$$

$$p = -S_0 N(-d_1) + Ke^{-rT} N(-d_2)$$

$$p = -30 \times N(-0.4225) + 29e^{-0.05\times 4/12} N(-0.2782)$$

$$p = -30 \times 0.3372 + 29e^{-0.05\times 4/12} \times 0.3897$$

$$p \approx 0.9983$$