

HOMEWORK

1.  $S_0 = 120$   $\begin{cases} S_1^u = 132 \\ S_1^d = 120 \end{cases}$  ;  $r = .05$

$$\tilde{P}_u = \frac{.05 - 0}{.1 - 0} = \frac{1}{2} ; \tilde{P}_d = \frac{.1 - .05}{.1 - 0} = \frac{1}{2}$$

$$\tilde{C}(u) = \frac{\tilde{P}(u)}{P(u)} = \frac{1/2}{1/3} = 3/2$$

$$\tilde{C}(d) = \frac{\tilde{P}(d)}{P(d)} = \frac{1/2}{2/3} = 3/4$$

2.  $S_0 = e^{-.03} \tilde{E}(S(1))$

$$\begin{aligned} \tilde{E}(S(1)) &= \tilde{E}(110 - U^2) = 110 - \int_{-3}^3 u^2 \frac{du}{6} \\ &= 110 - \frac{u^3}{18} \Big|_{-3}^3 = 107 \end{aligned}$$

$$\begin{aligned} S_0 &= e^{-.03} \tilde{E}(S(1)) \\ &= e^{-.03} 107 \end{aligned}$$

3.

$$\begin{aligned}\tilde{E}(3(1-X)^+) &= \tilde{E}(3-u^2)^+ \\ &= \int_{-\sqrt{3}}^{\sqrt{3}} (3-u^2) \frac{du}{6} \\ &= \sqrt{3} - \frac{1}{\sqrt{3}}\end{aligned}$$

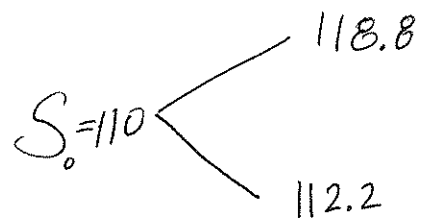
$$C_E(0) = \left(\sqrt{3} - \frac{1}{\sqrt{3}}\right) e^{-.03}$$

The American call has the same value as the European call

$$C_A(0) = \left(\sqrt{3} - \frac{1}{\sqrt{3}}\right) e^{-.03}$$

4.

$$P_E(0) = \frac{1}{1.04} \tilde{E}(X - S_1)^+ ;$$



$$\tilde{p}_u = \frac{.04 - .02}{.08 - .02} = \frac{1}{3} ; \tilde{p}_d = \frac{2}{3}$$

$$P_E(0) = \frac{1}{1.04} \tilde{E}(X - S_1)^+ = \frac{1}{1.04} (115 - 112.2) = \frac{2.8}{1.04}$$

Replicating Portfolio -

$$x_0 = \frac{-2.8}{(118.8 - 112.2)} ; y_0 = \frac{(2.8)(118.8)}{(1.04)(118.8 - 112.2)}$$