MATH 360 - Additional Questions for Homework on Section 1.6.

A. Let $A(t)$ denote the value of a risk-free bond at time t (in years) and let $S(t)$ denote the random variable corresponding to the value of a stock at time t (in years). Suppose that $A(0) = 20$ and $A(2) = 20.50$. Suppose that $S(0) = 15$ and $S(2) = \begin{cases} 18.50 & \text{if stock is up (probability 0.7)} \\ 13.50 & \text{if stock is down (probability 0.3)} \end{cases}$.

Let $C(t)$ denote the value at time t of a European call option for one share of stock with exercise time 2 and strike price 16. Let $P(t)$ denote the value of time t of a European put option for one share of stock with exercise time 2 and strike price 15.50. Suppose that $C(0) = 0.9146$ and $P(0) = 1.2195$.

(i) Considering the final time to be $t = 2$, find the expected return and the standard deviation of the return for both the stock and the risk-free bond.

(ii) Find $C(2)$, $P(2)$, $E(C(2))$, and $E(P(2))$.

(iii) Considering the final time to be $t = 2$, find K_C, K_P, $E(K_C)$, $E(K_P)$, σ_C, and σ_P.

(iv) Consider the portfolio V composed of 10 shares of stock and 8 put contracts (of the type described above). Calculate the expected return and standard deviation of the return for this portfolio over the time interval $[0, 2]$.

(v) Consider the portfolio V composed of 10 shares of stock but is short 8 put contracts (of the type described above). Calculate the expected return and standard deviation of the return for this portfolio over the time interval $[0, 2]$.

(vi) Consider the portfolio V composed of 20 shares of stock, 10 bonds, and being short 6 call contracts (of the type described above). Calculate the expected return and standard deviation of the return for this portfolio over the time interval $[0, 2]$.