Q.N.3: Show that it is never optimal to exercise an American call option on a non-dividend-paying stock before expiration

Given points: 4

Ans:

The decision to exercise or hold American call option depends on time value **t** and underlying stock value **L(t)**. Exercise time **p** is chosen to maximize the value of the option.

It is never optimal to exercise an American call option on a non-dividend-paying stock before expiration because that exercise requires payment of the strike price K (assume). Option holder saves the interest on K, by holding onto K until the expiration time.

Let, 2 portfolios: (p =exercise time)

A1: an American call c, $Ke^{-r(T-t)}$ cash

A2: a share L

Case 1: if Exercise time p<T, then, A1 = (L-K)+ $Ke^{-r(T-p)}$ < L =A2

Case 2: if Exercise time p=T,then, A1 = max(L-K,0)+K = max(L,K) $\geq$ L=A2

Which follows, A1 $\geq$ A2 all the times, therefore, one should never take p < T.