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

**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) ≥ L=A2

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