Q1.(a)

(b)

(d) According to the property of American option, it is never optimal to exercise early, so if we have m exercise opportunities out of n possible dates, the strategy should be using the m opportunities for the last m days (need checking whether it is optimal). In this way, we actually have a combination of m European Options and we can have a close form.

Comments:

1.The basic idea is that I decide whether or not to exercise upon each point, that is comparing the expectation of payoff with the payoff of exercising now. For example, if k2(-)=1, then we choose to exercise at T3 or T2, use S2[i] as initial price to conduct CrankNicolson method in interval [T2,T3].

2. CrankNicolson finite difference method will converge to the true value and rate of converge is . The solution is also stable if we make a small change to initial condition.

Q2.

Comments:

The idea is using B( i \* (delta T),j\*(delta T) ) = E[ exp{ -(delta T)\* (r(i) + ... +r(j-1) ) } to get bond price first and then get L.