Name | Student Number
Oluwatomilayo Adegbite | 500569283
Nikolas Maier | 500461990

Will adding a constant, *c*, alter the logic of rewards in equation 3.8?

Equation 3.8: $G_t = \sum_{k=0}^{\infty} \gamma^k R_{t+k+1}$

Proposed change is to add c to all rewards, ie: $G_t = \sum_{k=0}^{\infty} \gamma^k (c + R_{t+k+1})$

Here is what happens:

$G_t = \sum_{k=0}^{\infty} \gamma^k c + \gamma^k R_{t+k+1}$ Multiply each number inside brackets by Gamma K

$G_t = \sum_{k=0}^{\infty} \gamma^k c + \sum_{k=0}^{\infty} \gamma^k R_{t+k+1}$ Seperate the two summations through algebra rules

$G_t = c \sum_{k=0}^{\infty} \gamma^k + \sum_{k=0}^{\infty} \gamma^k R_{t+k+1}$ As c is a constant we can pull it out of the summation

What we are left with is the regular G_t formula + the discount multiplied by constant c. This is applied to every state, meaning each state would be changed by exactly c * γ^k . When every state is changed in the same manner by a constant addition, there is no change in overall reward, as all rewards are changed the same way.

Ergo, only the interval between rewards matters, not the actual reward itself.