Homework #5

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Problem 1.
Model Merton's Portfolio problem as an MDP (write the model in LaTeX)

Solution.
States are: current wealth W_t
Actions are:

$$\text{Allocation of wealth: } \begin{cases} \text{Fraction of wealth allocated to risky assets: } \pi(t, W_t) \\ \text{Fraction of wealth allocated to riskless assets: } 1 - \pi(t, W_t) \end{cases} \tag{1}$$

and wealth consumption per unit time $c(t, W_t)$.
Rewards per unit time (utility) are:

$$U(x) = \begin{cases} \frac{x^{1-\gamma}}{1-\gamma} \text{ for } 0 < \gamma \neq 1 \\ \log(x) \text{ for } \gamma = 1 \end{cases} \tag{2}$$

Discount factor is: Relative Risk-Aversion constant

$$\gamma = -\frac{x \cdot U''(x)}{U'(x)} \tag{3}$$

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