- For general t, *(exercise)*

$$V_t(s) = \mathbb{E}[G_t \mid S_t = s]$$

$$= \mathbb{E}\left[\sum_{i=t}^{n} r_t \mid S_t = s\right]$$

$$= \mathbb{E}[r_t + r_{t+1} \cdots r_n \mid S_t = s]$$

$$\mathbb{E}[r_t \mid S_t = s] = R(s)$$

$$= R(s) + \mathbb{E}[r_{t+1} + \cdots + r_n \mid S_t = s]$$

$$= R(s) + \mathbb{E}[G_{t+1} \mid S_t = s]$$

$$= R(s) + \sum_{s' \in S} P_{ss'}\, \mathbb{E}[G_{t+1} \mid S_{t+1} = s']$$

$$= R(s) + \sum_{s' \in S} P_{ss'} V_{t+1}(s')$$

I. Motivation | II. Method 1 - Monte-Carlo simulation | III. Method 2 - Iterative solution