

Off-policy MC prediction (policy evaluation) for estimating $Q \approx q_\pi$

Input: an arbitrary target policy π

Initialize, for all $s \in \mathcal{S}$, $a \in \mathcal{A}(s)$:

$$Q(s, a) \in \mathbb{R} \text{ (arbitrarily)}$$

$$C(s, a) \leftarrow 0$$

Loop forever (for each episode):

$b \leftarrow$ any policy with coverage of π

Generate an episode following b : $S_0, A_0, R_1, \dots, S_{T-1}, A_{T-1}, R_T$

$$G \leftarrow 0$$

$$W \leftarrow 1$$

Loop for each step of episode, $t = T-1, T-2, \dots, 0$, while $W \neq 0$:

$$G \leftarrow \gamma G + R_{t+1}$$

$$C(S_t, A_t) \leftarrow C(S_t, A_t) + W$$

$$Q(S_t, A_t) \leftarrow Q(S_t, A_t) + \frac{W}{C(S_t, A_t)} [G - Q(S_t, A_t)]$$

$$W \leftarrow W \frac{\pi(A_t | S_t)}{b(A_t | S_t)}$$