For a worker in the matching model, utility while employed is w and utility while unemployed is b. The instantaneous probability of moving from unemployed to employed is the job-finding rate a while the instantaneous probability of moving from E to U is the separation rate λ. In a steady state, the value (lifetime expected discounted utility) of being in any state is constant.

Recall that the dynamic programming solution gives the steady-state flow return to being in state X as

$$rV_X = \text{flow of utility while in X} + \left(\text{probability of leaving X} \times \text{gain in V from leaving X}\right).$$

1. Write the equations for rV_E and rV_U.

For firms, they earn a flow of profit $y - w - c$ from a filled job and $-c$ from a vacant one. Vacant jobs are filled at the job-filling rate $\alpha(t)$ and filled jobs become vacant at the separation rate λ.

2. Write the equations for rV_F and rV_V.