

**6E:204 Macroeconomics**  
**Assignment 8**

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1. Consider the following one-sided search model. There is a continuum of agents who each maximize

$$E_0 \sum_{t=0}^{\infty} \beta^t u(c_t),$$

where  $\beta = \frac{1}{1+r}$  is the discount factor, with  $r > 0$ , and  $u(\cdot)$  has the same properties as in my notes. An unemployed agent receives an unemployment benefit of  $b > 0$  at the beginning of each period, and then receives a wage offer. The wage offer is  $w_1$  with probability  $\pi$  and 0 with probability  $1 - \pi$ , where  $w_1 > 0$ , and  $0 < \pi < 1$ . When employed, a worker is separated at the end of the period with probability  $\delta$ , where  $0 < \delta < 1$ . A worker who receives a wage  $w_1$  at the beginning of the period may receive a wage reduction at the end of the period, with probability  $\rho$ , where  $0 < \rho < 1$ . Note that an employed worker either keeps his or her job at the wage  $w_1$ , is separated, or keeps the job with a wage reduction to  $w_2$ . If a wage reduction occurs, the worker learns at the end of the period that his or her wage will be  $w_2 < w_1$  forever, if that job is retained. An employed worker earning a wage  $w_2$  has a separation rate of  $\delta$ . On learning of a wage reduction, the worker has the option of quitting and searching for another job. Note that any new job offers are always at a wage of  $w_1$  or 0.

- (a) Write down Bellman equations which determine the values (as of the end of the period) of being unemployed, employed at wage  $w_1$ , and employed at wage  $w_2$ .
- (b) Determine conditions under which an employed worker will or will not quit a job after receiving a wage reduction.
- (c) Determine how  $b$ ,  $w_1$ ,  $w_2$ ,  $\pi$ , and  $\rho$  affect an unemployed worker's decision concerning whether or not to quit when a wage reduction occurs.
- (d) Determine how the steady state unemployment rate depends on  $b$ .