Econ 496, Natural Resource Economics
Winter 2012

Assignment 3

The due date for this assignment is Wednesday, March 21 (in class only). Late assignments will be penalized (the longer the delay, the larger the penalty). No assignment will be accepted after Saturday, March 24. For this assignment you are strongly encouraged to use some computational software. As presented in class, Excel (with the addition of "Solver") can be used to analyze these problems. Group assignments are allowed (up to three people per group). Assignments must be typed and an e-file of the computational analysis must be forwarded to my email.

The demand for a depletable resource, constant at every period, is given by $P_t = 8 - 0.4q_t$, where $t = 1, 2, ..., 20$ denotes the time. The available stock of this depletable resource is $\overline{Q} = 40$ units.

1. Assuming that the marginal cost of extraction is constant at $MC = \$2$, find the optimal allocation of this resource when (i) $r = 0.05$, (ii) $r = 0.1$, and (iii) $r = 0.20$. Repeat the same problem for $r = 0.1$ and (a) $\overline{Q} = 50$, (b) $\overline{Q} = 60$. Report your findings about the per period consumption, prices, MUCs, and the exhaustion date. What happens to your findings when the discount rate increases? What happens to your findings when the available stock increases?

2. Assuming that the marginal cost of extraction is constant at $MC = \$2$, and the existence of a renewable substitute with marginal cost of extraction being $MC_S = \$6$, find the optimal allocation of these resources when (i) $r = 0.05$, (ii) $r = 0.1$, and (iii) $r = 0.20$. Repeat the same problem for $r = 0.1$ and (a) $\overline{Q} = 50$, (b) $\overline{Q} = 60$. Report your findings about the per period consumption, prices, MUCs, the switch period, and the exhaustion date. What happens to your findings when the discount rate increases? What happens to your findings when the available stock increases?

3. Assuming that the marginal cost of extraction is given by $MC_t = 2 + \Sigma q_t$, where $t = 1, 2, ...20$, and the existence of a renewable substitute with marginal cost of extraction being $MC_S = \$6$, find the optimal allocation of these resources when (i) $r = 0.05$, (ii) $r = 0.1$, and (iii) $r = 0.20$. Repeat the same problem for $r = 0.1$ and (a) $\overline{Q} = 50$, (b) $\overline{Q} = 60$. Report your findings about the per period consumption, prices, MUCs, the switch period, and the exhaustion date. What happens to your findings when the discount rate increases? What happens to your findings when the available stock increases?