Economics 70312: Environmental Economics
Problem Set 5
DUE: Friday, May 13

Professor Jensen Spring 2011

Consider the model of invasive species in my working paper. Specifically, consider the problem of choosing expenditures on prevention $p \in [0,1]$ to maximize the PDV of social welfare,

$$\begin{aligned} V(p;c,n,r,y) &= \int_0^\infty e^{-rt}[h(p,n)e^{-h(p,n)t}\left[U(y-c)/r\right] + e^{-h(p,n)t}U(y-p)]dt \\ &= \frac{\left[h(p,n)/r\right]U(y-c) + U(y-p)}{r+h(p,n)}, \end{aligned} \tag{1}$$

where $c = d(k^*) + k^*$ and $k^*$is the solution to the problem choose k to maximize $D(k;r,y) = \int_0^\infty e^{-rt}U(y-d(k)-k)dt = \frac{U(y-d(k)-k)}{r}$.

Assume that $U(y) = -e^{-\rho y}$, where $\rho > 0$ is a constant (its inverse is the well-known rate of constant relative risk-aversion).

1. Characterize the solution p^* when $h(p,n) = n - m(\frac{p}{1+p})$. Note that you can compute it as a function of c.

2. Characterize the solution p^* when $h(p,n) = n - (\frac{m}{2})p$.

3. Compare these outcomes. My reason for asking is that Leung et al assume the linear form of hazard function, which does give different results than a decreasing returns form (consider changes in m).