Econ4925 – Seminar 3

Nonrenewables, monopoly and backstop technologies

A non renewable resource of a known stock S_0 can be extracted at zero cost. Demand for the resource is of the form:

$$D(p_t) = p_t^{-\epsilon} \quad \epsilon > 0$$

At a known future date $t = s$ a competitively supplied perfect substitute becomes available. Its production causes constant unit costs c.

1. Derive the time paths for resource extraction and price when the resource market is perfectly competitive and:

(a) $s = 0$

(b) $s \to \infty$[1].

2. Given that $\epsilon > 1$ and there is no limit to production of the substitute, show the extraction and price paths from monopolistic ownership for the three cases:

(a) $s = 0$

(b) $s \to \infty$

(c) $0 < s < \infty$.

How do these compare to (1)?

3. Assuming now that $0 < \epsilon < 1$ and that there is a limit $L = c^{-\epsilon}$ to how much of the substitute can be provided every period, draw the profit function of a monopolist and try to derive the monopolist's optimal extraction and price paths.

[1] You may want to look at seminar 1 and make use of the keys "control + c" and "control + v" on your keyboard to solve this one...