ECO 203: Environmental and Resource Economics

Group-B: Resource Economics

Unit-2: Exhaustible Resources

Lecture-I

With exhaustible resources we cannot speak of sustainable yield. The resource will be depleted so long as the "Harvest" is positive." In this case we need to know the *optimal rate at which to deplete the resource.*

THE FUNDAMENTAL PRINCIPLE OF EXHAUSTIBLE RESOURCE USE

The basic rule for optimally utilising a renewable resource with cost-less extraction was:

$$F'(X)+\frac{\dot{P}}{P}=s \quad (1)$$

For an exhaustible resource there is no growth function, the resource has a fixed size. Hence $F'(X)$=0. Modifying equation (1) accordingly, we get:

$$\frac{\dot{P}}{P}=s \quad (2)$$

Equation (2) is the fundamental principle of the economics of exhaustible resource use. It says that the *resource should be depleted in such a way that the rate of growth of price of the extracted resource should equal to the rate of the discount.* The Fundamental equation (2) is known as the "***Hotelling Rule***" after an important demonstration by *Harrold Hotelling* in 1931. An alternative variant, which says the same thing, is:

$$P_t = P_0 e^{st} \quad (3)$$

$\Rightarrow$The price of the resource in any period *t* = the price in some initial period, 0, compounded at the rates *s*, the discounted rate.

$\Rightarrow$The owner of the resource should be indifferent between a unit of the resource at P_0 now and the same unit at $P_0 e^{st}$ in *t* years time.

Reason behind such result:

- The natural resource economics treats resources "in the ground" as capital assets. Thus by leaving resources in ground the resource owner can expect capital gains as the resource price rises through time.
- Thus the owner will be indifferent between holding the resource in the ground and extracting it ***if the rate of capital gain ($\frac{\dot{P}}{P}$) = the rate of interest on alternative assets***.

Reference: Economics of Natural resources and the Environment- David W. Pearce and R. Kerry Turner