

Extra questions

3. Consider the basic model for an aggregate system

$$\max \sum_{t=1}^T \int_{z=0}^{e_t^H} p_t(z) dz$$

subject to

$$R_t = R_{t-1} + w_t - e_t^H$$

$$R_t \leq \bar{R}$$

$$R_t, e_t^H \geq 0$$

$$T, w_t, R_0, \bar{R} \text{ given, } R_T \text{ free, } t = 1, \dots, T$$

Replace the condition of a free R_T with the restriction $R_T \geq \underline{R}_T$ ($0 < \underline{R}_T < \bar{R}$) and interpret the new 1.order condition for period T (hint: remember that in the maximisation problem the constraints are of the type less than or equal in the Lagrangian). Discuss the interpretation of the shadow price on the constraints on the termnal value of the reservoir.

4. We can find in the media views arguing for a restriction on the reservoirs in order to avoid high prices when the reservoirs are running down in the winter time. Discuss consequences of this proposal demanding that in one period the reservoir shall not be less than a prescribed level: $R_t \geq \underline{R}_t$ ($0 < \underline{R}_t < \bar{R}$) for $t = t_o$ where t_o is a period after the period $t + 1$ in Figure 3.10 when the reservoir is emptied, and furthermore, we assume that this price is the highest within the T periods before the new regulation. Give an economic interpretation of the new 1.order condition for period t_o .

5. (Extra – extra) Answer 4 by using the disaggregated model with N plants and reservoirs if all reservoirs get the same restriction based on a common percentage filling of the maximal. What may happen if only a few reservoirs are regulated?