Reviewing What People Missed

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Shadow price: The shadow price value equals the value of an additional unit of the constraint (*ie* budget or stock).

$$\frac{\partial \mathcal{L}}{\partial B} = \lambda \tag{1}$$

Number of Choice Variables: If you are going to consume the entirety of a resource in three time periods, that means you only have 2 choice variables. You can choose how much to consume in time period one, time period two, and then those *two* choices will determine what you consume in time period three. This is important to be clear about in policy contexts, because if a policymaker thinks they have a third choice that proves that they are not thinking clearly about how the resource is being exhausted.

Tradeable Permits and Tax: If a quota is set optimally and a tax is set optimally, then you will arrive at the same equilibrium set of prices and quantity.

1 Conrad 3.4

$$\mathcal{L} = \sum_{0}^{\infty} [\rho^t ln(Y_t) + \rho^{t+1} \lambda_{t+1} [X_t + rX_t(1 - X_t/K)^{\beta} - Y_t - X_{t+1}]] \tag{2}$$

FOCs:

$$\frac{\partial \mathcal{L}}{\partial Y} = \frac{1}{Y_t} - \rho \lambda_{t+1} = 0 \tag{3}$$

$$\frac{\partial \mathcal{L}}{\partial X} = \rho^{t+1} \lambda_{t+1} [1 + G'(X_t)] + \rho^t \lambda_t (-1) = 0 \tag{4}$$

$$\frac{\partial \mathcal{L}}{\partial \rho^{t+1} \lambda_{t+1}} = X_t + rX_t(1 - X_t/K)^{\beta} - Y_t - X_{t+1} = 0 \tag{5}$$

When $r = 1, K = 1, \beta = 1/2$, then

$$G(X) = X(1 - X)^{1/2} \tag{6}$$

$$G'(X) = (1 - X)^{1/2} + X[-\frac{1}{2}(1 - X)^{-1/2}] \tag{7}$$

So you can plug **??** into **??** and you have your three FOCs.