

EC1340-Fall 2023 Problem Set 10 solutions

(Updated 31 July 2023)

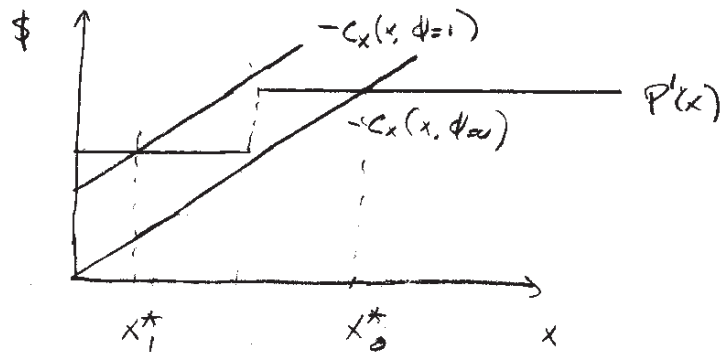
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$$a. \quad C(x, \phi) = 10 - \phi x - \frac{1}{2} x^2 \quad \phi = \begin{cases} 0 & 1/2 \\ 1 & 1/2 \end{cases}$$

$$\Rightarrow C_x(x, \phi) = -\phi - x$$

$$P(x) = sx + p \max(x-2, 0)$$

TO FIND FIRM BEHAVIOR, EQUATE $P'(x) = -C_x$,
AND FIND OPTIMAL FIRM CHOICE GRAPHICALLY.



- N.B.: LETS OF OTHER WAYS TO DRAW $P(x)$ DEPENDING ON PARAMETERS.
THEN x_0^* SOLVES

$$P'(x_0^*) = -C_x(x_0^*, \phi=0)$$

$$\Rightarrow s+p = x_0^*$$

x_1^* SOLVES

$$P'(x_1^*) = -C_x(x_1^*, \phi=1)$$

$$s = 1 + x_1^*$$

$$\Rightarrow x_1^* = s-1$$

→

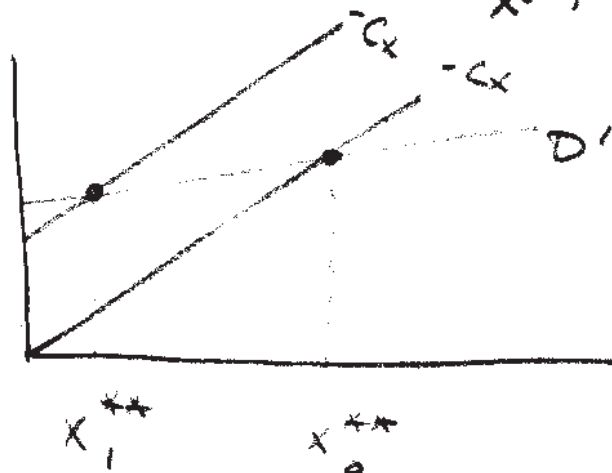
1.

$$[b] \quad D(x) = \frac{11}{10}x + \frac{1}{4}x^2$$

$$\Rightarrow D'(x) = \frac{11}{10} + \frac{1}{2}x$$

TO FIND PLANNER'S OPTIMUM IN EACH STATE,
SOLVE $\text{MIN} [D(x) + C(x, \phi)]$

$$\Rightarrow D'(x) = -C_x(x, \phi)$$



$$x_1^{**} \text{ solves } \frac{11}{10} + \frac{1}{2}x_1^{**} = 1 + x_1^{**}$$

$$\Rightarrow x_1^{**} = \frac{1}{5}$$

$$x_0^{**} \text{ solves } \frac{11}{10} + \frac{1}{2}x_0^{**} = x_0^{**}$$

$$\Rightarrow x_0^{**} = \frac{11}{5}$$

(c) CHOOSE s, p, l SO THAT

$$x_0^{**} = x_0^*$$

$$x_1^{**} = x_1^*$$

$$x_{1}^{**} = x_{1}^{*}$$

$$\Rightarrow \frac{1}{5} = S - 1 \Rightarrow S^{*} = \frac{6}{5}$$

$$x_{0}^{**} = x_{0}^{*}$$

$$\Rightarrow \frac{1}{5} = S + P \Rightarrow P^{*} = 1$$

And l AT MIDPOINT BETWEEN
 x_{0}^{*}, x_{1}^{*}

$$\Rightarrow l^{*} = \frac{6}{5}$$