HW4

Michael B. Nattinger*

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1 Question 1

This problem asks a set of questions revolving around the concept of the law of supply. We use this law to investigate the case of a firm which uses goods one and two as inputs and good 2 as input. Formally, $y \in Y$ requires $y_1, y_2 \leq 0$. It is then immediate that $y_3 \geq 0$.

The law of supply invokes the following inequality, which will be the basis of the solutions which follow: $\Delta p \cdot \Delta y \geq 0$.

1.1 If p_3 falls and p_1, p_2 stay the same, can y_3 go up?

Let us construct our vectors $\Delta p, \Delta y$. $\Delta p = \begin{pmatrix} \Delta p_1 \\ \Delta p_2 \\ \Delta p_3 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ \Delta p_3 \end{pmatrix}, \Delta y = \begin{pmatrix} \Delta y_1 \\ \Delta y_2 \\ \Delta y_3 \end{pmatrix}$. Then, $\Delta p \cdot \Delta y \geq 0 \Rightarrow \Delta p_1 \Delta y_1 + \Delta p_2 \Delta y_2 + \Delta p_3 \Delta y_3 \geq 0 \Rightarrow \Delta p_3 \Delta y_3 \geq 0$. Since p_3 falls, $\Delta p_3 < 0 \Rightarrow \Delta y_3 \leq 0$ so y_3 cannot increase.

1.2 If p_1 rises and p_2, p_3 stay the same, can y_3 go up?

It can and we will construct an example which demonstrates the possibility. Let the set of possible production vectors be $\{(-5, -1, 30), (-1, -8, 32)\}$. For the price vector $(1, 1, 1)$ the profit maximizing production vector is $(-5, -1, 30)$ while for the price vector $(2, 1, 1)$ the profit maximizing production vector is $(-1, -8, 32)$. In this case, p_1 rises while p_2, p_3 stay the same, yet y_3 rises from 30 to 32.

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1.3 If p_1, p_2 both increase and p_3 stays the same, can y_3 go up?

1.3.1 What if both p_1, p_2 rise by 10%?

2 Question 2

3 Question 3