Econ 711 – Fall 2020 – Problem Set 1

Due online Monday night September 14 at midnight.

Please feel free to work together on these problems (and all homeworks), but each student needs to write up his/her own answers at the end, rather than directly copying from one master solution.

Question 1. The Law of Supply

Suppose $k = 3$, and a firm uses goods one and two as inputs and produces good three as output. (Formally, $y \in Y$ requires $y_1, y_2 \leq 0$.) For each of the following, either give an example showing it's possible or prove that it's impossible. (Feel free to use examples where Y contains only a few points.)

(a) If p_3 falls and p_1 and p_2 stay the same, can the firm's output y_3 go up?

(b) If p_1 rises and p_2 and p_3 stay the same, can the firm's output y_3 go up?

(c) (Harder:) If p_1 and p_2 both increase and p_3 stays the same, can the firm's output y_3 go up? What if p_1 and p_2 both increase by 10%?

Question 2. Rationalizability

Consider the following two "datasets":

Dataset 1		Dataset 2	
p	$y(p)$	p	$y(p)$
$(7,4)$	$(-20,40)$	$(7,4)$	$(-20,40)$
$(5,5)$	$(-50,60)$	$(5,5)$	$(-40,70)$
$(4,8)$	$(-70,90)$	$(4,8)$	$(-70,90)$

For each one, determine whether the three observations are consistent with a profit-maximizing firm. If not, explain why not. If so, draw or describe:

(a) the smallest production set that can rationalize the data

(b) the smallest *convex* production set *with free disposal and the shutdown property* that can rationalize the data

(c) the *largest* production set that can rationalize the data

Question 3. Aggregate Production

Suppose an industry consists of n profit-maximizing, price-taking firms, each with its own production set $Y_1, Y_2, \ldots, Y_n$. You observe industry-level data at several price vectors: instead of observing individual firm production $(y_1(p), y_2(p), \ldots, y_n(p))$, you observe only the sum $y_1(p) + \ldots + y_n(p)$. Will this aggregate data satisfy the Weak Axiom? Can industry production be rationalized as if it were the choice of a single profit-maximizing firm? Explain. (You may find it helpful to use an example.)