Problem Set #6

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Question 1: Rationalizing Demand

Suppose we observe the following "data":

w	p	x
100	(5,5,5)	(12,4,4)
100	(7,4,5)	(9,3,5)
100	(2,4,1)	(27,9,10)
150	(7,4,5)	(15,5,5)

(a) Under Walras's law, $p_i \cdot x_i = w \; \forall i$. Then, we can calulate:

$$5 * 12 + 5 * 4 + 4 * 5 = 100 = w$$
$$7 * 9 + 4 * 3 + 5 * 5 = 100 = w$$
$$2 * 27 + 4 * 9 + 10 = 100 = w$$
$$7 * 15 + 4 * 5 + 5 * 5 = 150 = w$$

Thus, the data are consistent with Walras's Law.

(b) Given that Walras's Law is satisfied for each observation, $x^i > x^j \Rightarrow p \cdot x^i > p \cdot x^j$ for any $p >> 0$, and all price vectors in our data are strictly positive, we can conclude the following:

i. $x^3 > x^i \; \forall i \neq 3$ implies that: 1) all other goods bundles were affordable at p^3, and 2) x^3 was unaffordable at all $p^i \neq p^3$. Thus, $x^3 \succ^D x^i \; \forall i \neq 3$.

ii. $x^4 > x^1$ implies that 1) x^1 was affordable at p^4, and 2) x^4 was not affordable at p^1. Thus, $x^4 \succ^D x^1$.

iii. Since $p^4 = p^2$ and $w^4 > w^2$, 1) x^2 was affordable when x^4 was chosen, and 2) x^4 was not affordable when x^2 was chosen. Thus, $x^4 \succ^D x^2$.

iv. $p^1 \cdot x^2 = 85 < 100$, so $p^1 \cdot x^2 < p^2 \cdot x^2$, and x^2 was chosen at p^2. Therefore, $x^2 \succ^D x^1$

v. $p^2 \cdot x^1 = 120 > w^2$, so x^1 was not affordable when x^2 was chosen. Thus, $\neg(x^2 \succsim^D x^1)$

Taken together, these preference relations indicate:

$$x^3 \succ^D x^4 \succ^D x^1 \succ^D x^2$$

Where it is not possible to have any preference relation "loops". Therefore, these data satisfy GARP. By Afrias's theorem, satisfying GARP is a sufficient condition for conluding that these data can be rationalized by a continuous, monotonic, and concave utility function.