

Intermediate Micro HW 1

June 5, 2016

1 Nonconvex Indifference Curves

1. What does it mean for a set to be convex?

Layman's terms: A set is convex if no line drawn between two contained points exits the set.

Mathematically: X is convex iff $x, y \in X \Rightarrow \lambda x + (1 - \lambda)y \in X \forall \lambda \in [0, 1]$

2. What does it mean for indifference curves to be convex?

Layman's terms: Convex indifference curves mean a person exhibits diminishing marginal utility, and trades off smoothly among their potential choices.

Mathematically: An indifference curve is convex if the upper level set (the set of all higher indifference curves) is convex.

3. Think of a real-life decision problem where indifference curves can reasonably be nonconvex. Explain why you think the ICs are nonconvex in this situation.

Open-ended

2 Didi Chuxing and Uber

Consider the problem of getting around Xi'An over the course of your month-long stay here.

For the purposes of the exercise, you only have two choices for any given trip – Didi Chuxing (herein Didi) and Uber.

1. Argue that Didi and Uber are perfect substitutes. To do so, you'll need to explain what perfect substitutes are, and why this setting applies to Didi and Uber.

Open-ended

2. Now argue that Didi and Uber are *not* perfect substitutes. Which description do you think is more accurate?

Open-ended

3. Fix your income at ¥30000 per month. Let the price of an Uber be p_u per mile and that of Didi p_d . Assuming perfect substitutes, describe the demand function as a function of the price pair (p_u, p_d) .

If $p_u > p_d$, $u = 0$ and $d = \frac{30000}{p_d}$. Similarly if $p_d > p_u$. If $p_u = p_d$, we are content with any combination of u and d , as long as we exhaust our income.

3 Textbook Exercises

- Varian Exercise 4.3

Take the line $y = kx$ through the origin. Take $x < x'$. Then $y = kx < y' = kx'$. Therefore $u(x, y) < u(x', y')$. Thus (x, y) and (x', y') cannot be on the same indifference curve.

- Varian Exercise 4.4

$\sqrt{x_1 + x_2}$ is a monotonic transformation of utility for perfect substitutes. Ditto $13x_1 + 13x_2$.

- Varian Exercise 5.5

This utility function is a monotonic transformation of $u(x_1, x_2) = x_1^{\frac{1}{5}} x_2^{\frac{4}{5}}$. That is, it's simply Cobb-Douglas. We know that income shares are determined by the exponents. $\frac{4}{5}$ will go towards good 2.