ECON 100A - Section Notes
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Reading Response

- The first Reading Response is due today for those of you who did not make it to section on Tuesday. This is on Thaler, Richard. 2016. "Behavioral Economics: Past, Present, and Future." American Economic Review, 106 (7): 1577-1600.

WARP & IIA

What follows is a tiny bit of formalization of the ideas discussed in lecture. Again: no stress at all! You will not need such level of formality in your exams but it is of course excellent practice to think deeper about these notions. It can also give you a better sense of what econ theory actually looks like. We will be doing some little bit of practice on this on Thursday so you could (if you want) read it slowly after section and come back with questions.

Let X be a set of alternatives (e.g., bundles). A *choice correspondence* C assigns to each feasible set $B \in$ a nonempty set $C(B) \subseteq B$ of chosen elements. Define the *(direct) revealed preference* relation R^0 by

$$x \, R^0 \, y \quad \iff \quad \exists B \in \text{ with } x \in C(B) \text{ and } y \in B.$$

Intuition: if y was available in B but x was chosen, then x is revealed at least as good as y.

Def: We say that C satisfies *the Weak Axiom of Revealed Preference (WARP)* if for all $x \neq y$,

$$x \, R^0 \, y \text{ and } y \, R^0 \, x \quad \Longrightarrow \quad \text{impossible.}$$

Equivalently: there are no two-element cycles in revealed preference between distinct alternatives.

Remark: Given observations $\{(p^t, m^t, x^t)\}_{t=1}^T$ with $x^t \in \arg\max\{u(x) : p^t \cdot x \leq m^t\}$, WARP requires: for any s, t,

$$\left[p^t \cdot x^t \geq p^t \cdot x^s\right] \text{ and } \left[p^s \cdot x^s \geq p^s \cdot x^t\right] \Longrightarrow x^t = x^s.$$

(i.e. if x^s was affordable when x^t was chosen, and vice versa, the two observed choices cannot be different.)

Def: We say that C satisfies *Independence of Irrelevant Alternatives (IIA)* if for all $A \subseteq B$ and all $x \in A$,

$$x \in C(B) \Longrightarrow x \in C(A).$$

Equivalently: $C(B) \cap A \subseteq C(A)$. Removing unchosen options from B should not overturn the choice of x among the survivors. Note that this IIA is an *individual choice* axiom (often called Sen's α) (not for instance some Arrow's social-choice IIA)

Prop: If C is single-valued (a choice *function*) and satisfies IIA, then C satisfies WARP. ***Proof Sketch*** (beyond the scope of this class: students interested by research, come discuss!) Take $x \neq y$ with xR^0y and yR^0x. Then there exist B_1, B_2 with $x = C(B_1)$, $y \in B_1$ and $y = C(B_2)$, $x \in B_2$. Apply IIA when contracting both B_1 and B_2 to $\{x, y\}$: from B_1 we must still choose x; from B_2 we must still choose y. Single-valuedness gives a contradiction unless $x = y$.

Note: If C is not single-valued this proposition is not valid anymore: can you find a failure example? In the other direction, the implication is always true. Could you prove it?

- **WARP violation (pairwise cycle).** Budgets $B_1 = \{a, b\}$ with $C(B_1) = \{a\}$ and $B_2 = \{a, b\}$ with $C(B_2) = \{b\}$. Then aR^0b and bR^0a with $a \neq b$.
- **IIA violation ("irrelevant" alternative flips the choice).** Let $B = \{a, b, c\}$ with $C(B) = \{a\}$. Consider $A = \{a, b\} \subset B$ but $C(A) = \{b\}$. Since $a \in C(B) \cap A$ yet $a \notin C(A)$, IIA fails.
- **How to test WARP on data.** For each pair (s, t), check affordability both ways:

  $$p^t \cdot x^s \leq m^t \quad \text{and} \quad p^s \cdot x^t \leq m^s.$$

  If both hold and $x^t \neq x^s$, WARP is violated.

Practice

To begin with (I know we did that already, sorry: I just want to make sure you are super ready for the midterm!!) let's start by going over the similar style of questions as last week but with a couple of (slightly harder) utility functions. For the following:

1. $u(x_1, x_2) = x_1^3 x_2$ (course pack problem 1.4.2)
2. $u(x_1, x_2) = 3\ln(x_1) + \ln(x_2)$
3. $u(x_1, x_2) = 4\ln(x_1) + 2\ln(x_2)$ (course pack problem 1.4.3.a)
4. $u(x_1, x_2) = \max\{x_1, x_2\}$ (course pack problem 2.4.3.b)

Can you:

1. Draw the indifference curves?
2. Graphically check (using the indifference curves you just drew) whether the preferences satisfy monotonicity and convexity?

3. Find the marginal rate of substitution?

Finally for today, re-introducing the idea of budget set that we discussed last time: imagine that person A has utility function $u(x_1, x_2) = x_1^4 x_2$ and person B has utility function $u(x_1, x_2) = 12\ln(x_1) + 3\ln(x_2)$. For what budget sets, if any, will the two people make the same optimal choice? Carefully explain your answer.