L1. Introduction, Preference and Choices

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EI037: Microeconomics, Fall 2021

Today's Lecture

- Course Details
- What is Microeconomics
- Preference and Choice

Organization of the Course

- Course website:
  https://moodle.graduateinstitute.ch/course/view.php?id=2266
- Grading:
  Midterm exam (1/3 of the final grade), and a final exam (1/3 of the final grade), as well as 2 problem sets ($2 \times 1/6$ of the final grade)

  You can do problem set in groups (up to 5), let Carolina know about your group members before the next review session
- Office hours:
  Thursday 10-12 (course weeks)

Outlines

- (September 23) Preference and choice
  - How to define rational behavior?
- (September 30, October 7) Consumer theory, classical demand theory
  - What are the implications of rationality i.c.o. consumption theory?
- (October 14) Aggregate demand and welfare economics
  - Which, if any, implications are preserved when aggregate individuals?
  - How to evaluate the welfare implications of economic policy changes?
- (October 21) Production theory
  - What are the implications of rationality i.c.o. production theory?

$\rightarrow$ (October 28) Midterm exam

Outlines

- (November 4) Competitive equilibrium
  - How to understand market equilibrium?
- (November 11) Welfare theorems
  - What are the implications of competitive equilibrium for welfare?
- (November 18, 25) Strategic interactions
  - Deviate from ‘atomic’ agent
- (December 2) Market power: workhorse models
  - Deviate from perfect competition?
- (December 9) Uncertainty
  - How to describe decision problems under uncertainty?

→ [subject to date changes] QA, Final exam

Objectives

After the course, you should have developed a range of skills enabling you to understand economic concepts and use those concepts to analyze specific questions.

- Understand consumer behavior.
- Understand firm behavior.
- Analyze different types of market structures.
- Understand basic aspects of general equilibrium.
- Understand basic aspects of welfare economics.
- Understand how to apply economic principles to a range of policy questions.

Microeconomics

Microeconomics (and a large part of modern macroeconomics as well) tries to explain economic phenomena as the outcome of **individual** decision making.

The focus of the analysis is always on the **individual**:

- What are the **objectives** and **constraints** of individual behavior?
- What should a **rational** individual do in a given situation?
- How does the **interaction** between individuals in markets and organizations shape economic outcomes?
- What are the **welfare** properties of an economic allocation (based on the welfare of all concerned individuals)?

Hence, the theory of individual decision making is of crucial importance for almost all subfields in economics.

Sometimes you may find the material of the course a bit frustrating: We will develop highly abstract and sophisticated theory in order to analyze individual decision making. Despite these efforts

- the immediate return in terms of testable implications is rather small;
- some empirical predictions that can be derived are falsified by experimental and field evidence.

However, you should keep in mind that this is due to the enormous **generality** of the theory that we develop. The more general a theory,

- the less structure it imposes on the model,
- the less testable empirical predictions it implies, and
- the easier it is to find counterexamples that contradict the theory.

Nevertheless, the generality of the theory of rational individual decision making makes it an extremely useful tool that can be applied to very different contexts. If more restrictive assumptions (that stem from the specific context under consideration) are imposed, then we can get much more powerful and empirically testable results (Micro II, Trade etc..).

Today's Lecture

Preference and Choices

Literature

- MWG (1995), Chapter 1
- Kreps (1990), Chapters 1-2

- Experiment

Two Perspectives on Decision Theory

1. **Normative perspective:** What is a “rational” decision? If a decision maker has certain objectives and is facing certain constraints, which decision is optimal for him?
2. **Positive perspective:** How does actual decision making look like? Do actual decisions satisfy some “consistency” requirements?

These two perspectives correspond to two different approaches to modeling individual decision making

Preference-based approach

- takes the preferences of the individual as the starting point of the analysis
- defines “rationality” as assumptions on preferences
- solves the optimization problem of the decision maker in order to derive “decision functions” (e.g. demand functions).
- allows for welfare evaluations

Note: Preferences are not directly observable. They can only be elicited through introspection.

Choice-based approach

- takes the observed behavior of the decision maker as the primitive of the model
- makes assumptions directly on behavior (e.g., it requires that the behavior is "consistent" in some sense)
- does not allow for welfare evaluations.

Note: This approach does not speculate on unobservable preferences but is purely based on observed behavior. In principle it leaves room for more general forms of individual behavior.

At first glance these two approaches seem to be very different. However, we are going to show that they are very closely related to each other.

A Brief Description of the Two Approaches

Preference-Based Approach

The decision maker is supposed to have a preference relation $\succeq$ on the set of possible alternatives X.

$x \succeq y$: "x is at least as good as y" (for decision maker i)

- We can use the preference relation $\succeq$ to define

- the indifference relation $\sim$

$$x \sim y \Leftrightarrow x \succeq y \text{ and } y \succeq x$$

- the strict preference relation $\succ$

$$x \succ y \Leftrightarrow x \succeq y \text{ but not } y \succeq x$$

Preference-Based Approach

Definition

(Rationality) The preference relation $\succeq$ is called **rational** if it possesses the following two properties:

(i) **Completeness:** for all $x, y \in X$, we have that $x \succeq y$ or $y \succeq x$ (or both)

(ii) **Transitivity:** for all $x, y, z \in X$, if $x \succeq y$ and $y \succeq z$, then $x \succeq z$.

How strong are these assumptions?
What do they imply for $\succ$ and $\sim$?
It is difficult to work directly with preference relations. Therefore, it is very useful if $\succeq$ can be represented by a **utility function**.

Preference-Based Approach

Definition

A function $u : X \to \mathbb{R}$ **represents** the preference relation $\succeq$ if, for all $x, y \in X$,

$$x \succeq y \Leftarrow u(x) \geq u(y)$$

***Note:**

- A utility function is a purely **ordinal** concept. It only gives a ranking of the different alternatives, but the numbers of the utility function have no **cardinal** properties.
- The utility function is **not unique**. For any strictly increasing function $f : \mathbb{R} \to \mathbb{R}$, $v(x) = f(u(x))$ is a new utility function that represents the same preference relation as $u(x)$. We say: "A utility function is unique up to a positive, monotone transformation."
- **Interpersonal comparisons** of utility have no meaning.

The exist. of a utility function is closely related to the assumption of rationality.

Proposition

A preference relation $\succeq$ *can be represented by a utility function* only if *it is rational.*

Choice-Based Approach

A **choice structure** $(\mathcal{B}, C(\cdot))$ consists of two ingredients:

(i) $\mathcal{B}$ is a set of nonempty subsets of X, i.e., every element of $\mathcal{B}$ is a set $B \subset X$. B can be interpreted as the set of all sets from which the decision maker can choose (the set of all "budget sets"). Note that $\mathcal{B}$ need not contain all subsets of X. Why don't we require this?

(ii) $C(\cdot)$ is a choice rule (a correspondence), that assigns a nonempty set of chosen elements $C(B) \subset B$ for every budget set $B \in \mathcal{B}$. Note that the set $C(B)$ may have more than one element. Note further that $C(B)$ is required to be non-empty. What does this mean?

Choice-Based Approach

Example: $X = \{x, y, z\}$ and $\mathcal{B} = \{\{x, y\}, \{x, y, z\}\}$.

- $C_1(\cdot) : C_1(\{x, y\}) = \{x\}, C_1(\{x, y, z\}) = \{x, z\}$
- $C_2(\cdot) : C_2(\{x, y\}) = \{z\}, C_2(\{x, y, z\}) = \{z\}$
- $C_3(\cdot) : C_3(\{x, y\}) = \{\phi\}, C_3(\{x, y, z\}) = \{x, z\}$
- $C_4(\cdot) : C_4(\{x, y\}) = \{x\}, C_4(\{x, y, z\}) = \{y\}$

Which of these choice rules are permitted? Interpret them.

*Note: If you observe one of the non-permitted choices in data; any (other) possible interpretations?

Definition

The choice structure $(\mathcal{B}, C(\cdot))$ satisfies the **weak axiom of revealed preference**, iff the following statement holds:

> If for some $B \in \mathcal{B}$ with $x, y \in B$ we have $x \in C(B)$, then for any $B' \in \mathcal{B}$ with $x, y \in B'$ and $y \in C(B')$, we must also have $x \in C(B')$.

- In words: If x is ever chosen when y is available, then there can be no budget set containing x and y in which y is chosen and x is not.

- Which one of the examples in the previous slide satisfies the weak axiom?

- The weak axiom is a consistency requirement that restricts choice behavior in a similar way as the rationality assumption in the preference-based approach.

To better understand the weak axiom, let us define the "revealed preference relation $\succeq^*$ from the observed choice behavior in $C(\cdot)$:

Definition

x is **revealed at least as good as** y ($x \succeq^* y$) if and only if there is some $B \in \mathcal{B}$ such that $x, y \in B$ and $x \in C(B)$.

- Note that $\succeq^*$ need not be complete nor transitive.
- Note "if and only if".

Using this definition we may say that:

"x is **revealed preferred to** y" if for some $B \in \mathcal{B}$ with $x, y \in B$ we have that $x \succeq^* y$ and **not** $y \succeq^* x$.

With this terminology, we can restate the weak axiom as follows:

> **Weak Axiom of Revealed Preference:** If x is revealed at least as good as y, then y cannot be revealed preferred to x.

Relationship between Preference Relations and Choice Rules

- Suppose that a decision maker has a rational preference ordering $\succeq$. Does this imply that her decisions when facing choices from budget sets in $\mathcal{B}$ necessarily generate a choice structure that satisfies the weak axiom?
- In order to answer this question we have to derive the choice rule $C(B)$ from the preference relation $\succeq$:
- Let $C^*(B, \succeq) = \{x \in B | x \succeq y \text{ for every } y \in B\}$, i.e., if the decision maker faces a non-empty set of alternatives $B \subset X$, then her preference maximizing behavior is to choose all elements of B that are not strictly preferred by some other element of B.
- The following proposition shows that rationality of the preference ordering implies the weak axiom.

Proposition

Suppose that $\succeq$ is a rational preference relation. Then the choice structure generated by $\succeq$, $(\mathcal{B}, C^*(\cdot, \succeq))$ satisfies the weak axiom

Relationship between Preference Relations and Choice Rules

Suppose now that an individual's choice behavior satisfies the weak axiom. Does this imply that she has a rational preference relation $\succeq$ that "rationalizes" her choices? (We say that a rational preference relation $\succeq$ **rationalizes** $C(\cdot)$ relative to $\mathcal{B}$ iff $C(B) = C^*(B, \succeq)$ for all $B \in \mathcal{B}$.)

$\rightarrow$ In general the answer to this question is **No!**

Relationship between Preference Relations and Choice Rules

To see this, consider the following **example:**

- $X = \{x, y, z\}$
- $\mathcal{B} = \{\{x, y\}, \{y, z\}, \{x, z\}\}$
- $C(\{x, y\}) = \{x\}, C(\{y, z\}) = \{y\}, C(\{x, z\}) = \{z\}$

Verify that this choice structure satisfies the weak axiom. Nevertheless, we cannot have rationalizing preferences. Why?

The problem with this example is that the set $\{x, y, z\} \notin \mathcal{B}$. (Why don't we require this?)

However, the following proposition shows that if $\mathcal{B}$ includes "enough" subsets of X, then the answer to our second question is **Yes!**

Relationship between Preference Relations and Choice Rules

Proposition

(Arrow, 1959) *If* $(\mathcal{B}, C(\cdot))$ *is a choice structure such that*

- *the weak axiom is satisfied, and*
- $\mathcal{B}$ *includes all subsets of* X *of up to three elements,*

then there exists exactly one rational preference relation $\succeq$ *that rationalizes* $C(\cdot)$ *relative to* $\mathcal{B}$*.*

Proof: MWG, Proposition 1.D.2.

Proof:

Conclusions

1. If we can observe the individual's choice behaviour for **all possible subsets** of X, then the rationality assumption of the preference-based approach and the weak axiom of the choice-based approach are completely equivalent.
2. However, in reality we only observe an individual's choices for **some subsets** of X. In this case the rationality assumption implies the weak axiom but not vice versa.