

# Microeconomic Theory I: A Notebook

*With Jonathan Libgober*

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Check my [Github Page](#), or [email me](#)!

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## HERE WE GO!

This is my learning notebook of Microeconomic Theory I (Course number: ECON601 at USC Economics). As one of the core courses in an economic Ph.D. curriculum, Microeconomic Theory I is beyond important to my research. Therefore, I would love to use this notebook as a commitment mechanism, to document lecture notes, discuss session and office hour intuitions, reading summaries, my personal questions regarding the topics and more. By building a file from scratch, hopefull I could have a more systematic and sophisticated understanding on the content of this course.

I thank Prof. Jonathan Libgober at USC Economics for leading the discussion of the course and providing intuitive ways to understand microeconomic theory. Please check his webpage [here](#), he is such fun.

I also appreciate the time and effort my TA Qitong Wang put into this course, guiding me through discussing sessions and problem sets. When I have questions, he is always there to help.

Following the structure of the course, this notebook will cover three aspects of microeconomic theories: (a) individual decision making, (b) game theory, (c) mechanism design and contract theory. Apart from Jonathan's lecture notes, I will also summarize the reading materials, including: [Mas-Colell et al. \(1995\)](#)'s *Microeconomic Theory*, [Mailath \(2018\)](#)'s *Modelling Strategic Behavior*<sup>1</sup>, [Fudenberg and Tirole \(1991\)](#)'s *Game Theory*, [Myerson \(1991\)](#)'s *Game Theory: Analysis of Conflicts*, [Bolton and Dewatripont \(2005\)](#)'s *Contract Theory*, [Mailath and Samuelson \(2006\)](#)'s *Repeated Games and Reputation* and [Osborne and Rubinstein \(1994\)](#)'s *A Course in Game Theory*. Other materials will also be referred to along the way.

Building this notebook is truly a memorable journey for me. I would love to share this review and all the related materials to anyone that finds them useful. And unavoidably, I would make some typos and other minor mistakes (hopefully not big ones). So I'd really appreciate any correction. If you find any mistakes, please send the mistakes to this email address [saizhang.econ@gmail.com](mailto:saizhang.econ@gmail.com), BIG thanks in advance!

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<sup>1</sup>Latest version (May 2021) available [here](#).

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**Part I**

**Individual Decision Making**

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# CHAPTER 1

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## PREFERENCES AND CHOICES, UTILITIES

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The first chapter summarizes the basic setting of individual decision making: preferences, choices and utilities. The main reference is Chapter 1 of [Mas-Colell et al. \(1995\)](#).

In this chapter, we will focus on 3 domains:

<b>choice</b>	given a set $A$ , what choice from $A$ is made
<b>preference</b>	given alternatives $x, y$ , which does the decision maker prefers
<b>utility</b>	given an object $X$ , how much does the DM likes $X$ (as a number)

The starting point of individual decision problem is a *set of possible (mutually exclusive) alternatives* from which the individual must choose. To model decision making process on this set of alternatives, one can:

- either start from the tastes, i.e., *preference relations* of individuals, and set up the patterns of decision making with preferences
- or, start from the actual actions of individuals, i.e. *choices*, to deduct a pattern of decision making

With this two major approaches in mind, we know what's coming: the *rationality* of preferences and the central assumption of choices, the *Weak Axiom of Revealed Preference (WARP)*. And of course, the two approaches and two basic assumptions are parallel, so we need to figure out how link the (underlying) preferences and (observed) choices.

## 1.1 Preference Relations

We start from the basic: weak preference relation, i.e.,  $\succeq$ .

**Definition 1.1.** A weak preference relation  $\succeq$  on a set  $X$  is a subset of  $X \times X$ . If  $(x, y) \in \succeq \Rightarrow x$  is at least as good as  $y$ , written as  $x \succeq y$

## 1.2 Choice Rules

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## 1.3 Linking Preferences with Choices

## 1.4 Chap1Sec4

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## CHAPTER 2

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### FUNDAMENTALS OF CONSUMER THEORY



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## CHAPTER 3

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### LAGRANGE MAXIMIZATION AND DUALITY

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## CHAPTER 4

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### MONOTONE COMPARATIVE STATICS

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## CHAPTER 5

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### EXPECTED UTILITY AND DECISIONMAKING UNDER UNCERTAINTY

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## CHAPTER 6

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### AGGREGATION AND THE EXISTENCE OF A REPRESENTATIVE CONSUMER

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## CHAPTER 7

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### PRODUCER THEORY

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## CHAPTER 8

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### STOCHASTIC CHOICE

# **Part II**

## **Game Theory**

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## CHAPTER 9

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### NASH EQUILIBRIUM AND BAYESIAN NASH EQUILIBRIUM



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## CHAPTER 10

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### RATIONALIZABILITY AND DOMINANT STRATEGIES

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## CORRELATED EQUILIBRIUM

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## CHAPTER 12

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### DYNAMIC GAMES AND REFINEMENTS

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## CHAPTER 13

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### REPEATED GAMES/FOLK THEOREM

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## CHAPTER 14

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### RECURSIVE METHODS IN REPEATED GAMES

## **Part III**

# **Mechanism Design and Contract Theory**

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## CHAPTER 15

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### ARROW'S THEOREM AND SOCIAL CHOICE

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## CHAPTER 16

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### BOUNDARIES OF THE FIRM AND COASE'S THEOREM



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## CHAPTER 17

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### IMPLEMENTATION CONCEPTS

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## CHAPTER 18

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### THE REVELATION PRINCIPLE

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## CHAPTER 19

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### AUCTIONS AND OPTIMAL AUCTIONS

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## CHAPTER 20

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### EFFICIENT IMPLEMENTATION

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## CHAPTER 21

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### MORAL HAZARD

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## CHAPTER 22

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### FULL IMPLEMENTATION

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