ECON 6090

Microeconomics I Notes

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Introduction

I am creating this set of unified notes for ECON 6090: Microeconomics I, as taught at Cornell University in the Fall 2024 semester. Due to unforseen departmental circumstances, this course was taught by six different professors (David Easley, Philipp Kircher, Adam Harris, Larry Blume, Levon Barseghyan, and Marco Battaglini). This structure necessarily created some confusion in notation and material, so these notes function as my attempt to create a universe of the material we learned.

I rely heavily on the notes created from Prof. Easley's course, which were originally compiled by Julien Manuel Neves and subsequently updated by Ruqing Xu and Patrick Ferguson. I additionally rely on notes and slides provided by Prof. Harris, slides provided by Prof. Blume, slides from Ted O'Donoghue provided by Prof. Barseghyan, and notes provided by Prof. Battaglini. These notes are supplemented with the canonical Microeconomic Theory textbook by Andreu Mas-Colell, Michael Whinston, and Jerry Green (hereafter, MWG); my preferred analysis textbook, Foundations of Mathematical Analysis by Richard Johnsonbaugh and W.E. Pfaffenberger; and the excellent Mathematics notes provided by Takuma Habu. All mistakes are my own.

I will occasionally make reference to the Stanford ECON 202 notes, created by Jonathan Levin, Ilya Segal, Paul Milgrom, and Ravi Jagadeesan. This will mainly be if there exists intuition that I believe is helpful.

Notation. A large part of this project is an attempt to unify the notation used by our separate professors. I default to the notation used in the Easley notes, then to MWG, and then use my own judgement. New definitions will have a word highlighted in *blue*, and theorems will be named in *red*.

Structure. The course (and these notes) are organized as follows. Prof. Easley taught an introduction to choice theory, Section 1. Prof. Kircher taught consumer theory, Section 2. Prof. Harris taught producer theory, and some concepts of market failures, Section 3. Prof. Blume introduced the theory of choice under uncertainty, Section 4, and Prof. Barseghyan continued with theoretical applications for uncertainty and expected utility maximization, Section 5. Finally, Prof. Battaglini taught on information theory, Section 6.

1 Choice (Easley)

1.1 Preference Theory

Assumption 1.1. *Let X be a finite set of objects.*
Definition. Define $\succsim$, a *preference relation* on X, as $x \succsim y \iff x$ is *at least as good as* y, for $x, y \in X$. $\succsim$ is a binary relation.
Definition. x is *strictly preferred* to y, denoted as $x \succ y$, if $x \succsim y$ and $y \not\succsim x$.
Definition. x is *indifferent* to y, denoted as $x \sim y$, if $x \succsim y$ and $y \succsim x$.
Definition. A preference relation $\succsim$ is *complete* if $\forall\, x, y \in X$, either $x \succsim y$, $y \succsim x$, or both.
Definition. A preference relation $\succsim$ is *transitive* if, $\forall\, x, y, z \in X$ where $x \succsim y$ and $y \succsim z$, $x \succsim z$.
Definition. A preference relation $\succsim$ is *rational* if it is complete and transitive.
Remark. Prof. Easley takes some issues with this definition. The main issue is that there is an English word 'rational' that has absolutely nothing to do with it. Hereafter, always read rational as 'complete and transitive'.
Remark. These are all of the abstract concepts in choice theory! From here, we will apply them, and see what we can get.
Definition. (Informal) Define a *choice structure* $C^\star$ over subsets $B \subseteq X$ as $C^\star(B, \succsim) \coloneqq \{x \in B : x \succsim y \;\forall\, y \in B\}$.
Remark. Some direct implications:

(i) If $x \in C^\star(B, \succsim)$ and $y \in C^\star(B, \succsim)$, then $x \sim y$.

(ii) Suppose that $x \in B$, $x \notin C^\star(B, \succsim)$, and $C^\star(B, \succsim) \neq \varnothing$. Then there exists $y \in B$ such that $y \succ x$.

We will now formalize the above.
Definition. Let the *power set* of X, denoted $\mathcal{P}(X)$, be the set of all subsets of X. Note that since X is finite, $\mathcal{P}(X)$ is finite.

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2 Consumer Theory (Kircher)

3 Producer Theory (Harris)

4 Uncertainty Theory (Blume)

5 Uncertainty Applications (Barseghyan)

6 Information Theory (Battaglini)