ECON 4320 Comprehensive Notes

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November 5, 2024

Contents

1 Introduction **1**
- **1.1 Course Overview** . . . **1**
- **1.2 Course Outline** . . . **1**
- **1.3 On Models** . . . **2**

2 Standard choice **2**
- **2.1 Resnick (1987), ch. 1** . . . **2**
- **2.2 Model primitives** . . . **3**
- **2.3 Preferences** . . . **3**
  - 2.3.1 Utility representations . . . 3
  - 2.3.2 From Mas-Colell, Whinston, and Green . . . 3
- **2.4 Choices** . . . **3**
- **2.5 WARP** . . . **3**
- **2.6 Preferences and WARP, connected** . . . **3**
- **2.7 Classical demand theory** . . . **3**

3 Decision making under uncertainty **3**
- **3.1 Back to Resnick** . . . **4**
- **3.2 Subjective expected utility—Savage (1954)** . . . **4**
  - 3.2.1 SEU properties . . . 4
  - 3.2.2 SEU, formally . . . 4
- **3.3 Ellsberg paradox** . . . **4**
- **3.4 Maxmin expected utility—Gilboa and Schmeidler** . . . **4**
- **3.5 Awareness of unawareness—Karni and Vierø (2017)** . . . **4**
- **3.6 Case-based decision theory—Gilboa and Schmeidler (1995)** . . . **4**

4 Decision making under risk **4**
- **4.1 Expected utility** . . . **4**
- **4.2 Preferences for risk** . . . **4**
- **4.3 Kahneman and Tversky (1979)** . . . **4**
- **4.4 Rank dependent utility—Quiggin (1982, 1993)** . . . **4**
- **4.5 Cumulative prospect theory** . . . **4**
- **4.6 CPT axioms—Chateauneuf and Wakker (1999)** . . . **4**
- **4.7 Disappointment aversion—Gul (1991)** . . . **4**

5 Limited attention **4**
- **5.1 Sparse maximization—Gabaix (2014)** . . . **4**

1 Introduction

1.1 Course Overview

This course is designed to:

1. familiarize you with *what* models of decision making exist in economics, and
2. develop skills in *how* to model decision making.

This will be done through lectures, problem sets, and presenting papers on topics in decision theory. Students will also research new models or develop economic questions and answer them.

1.2 Course Outline

1. Introductions to decision science
   (a) What is "decision theory"?
   (b) Should we study what people do or study what they *should* do?
2. Standard choice
   (a) Model primitives: preferences or choices?
   (b) What does "rationality" look like?
3. Choice under uncertainty
   (a) How do/should we make choices when the state of the world is unknown?
   (b) Philosophical approaches to uncertainty (ignorance)
   (c) Subjective expected utility and ambiguity aversion
   (d) Case-based decision theory
4. Choice under risk
   (a) How do/should we make choices when there is risk, but we know objective probabilities?
   (b) Choice axioms: normative or descriptive?
   (c) Rank dependent utility, cumulative prospect theory, salience
5. Limited Attention
   (a) Humans have limited information processing capacity

(b) How does this affect choice?

(c) What does "rationality" look like if we allow for people to not pay full attention?

(d) Sparse maximization, salience, limited consideration, rational inattention

6. Heuristics

(a) In (nearly) all of the above, we typically assume a certain level of "rationality"

(b) What happens if people use decision shortcuts, or heuristics?

1.3 On Models

Decision theorists and economists are interested in both how people make decisions and how they *should* make decisions (if they were ideally rational). This is typically done by producing models. But what *is* a model?

A model is a theoretical representation of reality; they come in many forms, often mathematical. Decision-making models are the primary interest of decision theorists. They often satisfy the following properties:

- **Simplified:** certain aspects that exist in real life are excluded from the model.
- **Tractable:** it can be solved using relatively simple methods.
- **As-if:** decision makers can be modeled "as if" they behave according to the model.

A good method for building a model might begin by constructing a highly simplified example. This can help to develop the foundational understanding necessary to work out a toy model.

Once you have a good starting point, work to generalize the model. Consider the simplifications you made to produce the example, and start to revert them. The goal of generalizing the model is to increase its flexibility; the level of "flexibility" may depend on the particular problem of interest.

Once understood, consult the literature on the problem. How have other people chosen to construct their models? How are they similar and different from yours, and why?

2 Standard choice

2.1 Resnick (1987), ch. 1

It's important to note that Resnick approaches decision theory from his background as a philosopher rather than an economist. This perspective influences both his terminology and objectives. In the preface, he contextualizes decision theory as a broad field that encompasses utility theory, game theory, and social choice theory. His stated aim is to "put forward an exposition of the theory that pays particular attention to matters of logical and philosophical interest," reflecting his

focus on theoretical foundations and their associated philosophical impact rather than economic applications.

Chapter one then opens by defining decision theory. It is usual to divide decision theory into two main branches: descriptive decision theory, which seeks to find out how decisions *are* made; and normative (or prescriptive) decision theory, which seeks to prescribe how decisions *ought* to be made. The latter study ideally rational agents. That is not to say these branches are completely separated, however—for instance, when studying chess players' strategies to develop guidelines for novice players.

2.2 Model primitives

Preferences vs. Choices.

First, properties of preferences.

Utility? not always the primitive. Often, it is a preference relation. But under certain assumptions, you can represent a preference using a utility function.

2.3 Preferences

2.3.1 Utility representations

2.3.2 From Mas-Colell, Whinston, and Green

2.4 Choices

2.5 WARP

2.6 Preferences and WARP, connected

2.7 Classical demand theory

3 Decision making under uncertainty

Most decisions we face on a day-to-day basis involve some degree of uncertainty. Whether that comes in deciding which stock to invest in, what movie to watch, or what job to accept, the actual probability of each outcome is not known. Consider: when we discuss risk, everyone agrees on the probabilities; when discussing uncertainty, there is disagreement. That is, when analyzing someone's actions, we cannot make any statements *a priori* regarding their beliefs.

3.1 Back to Resnick

3.2 Subjective expected utility—Savage (1954)

Karni (2005)

3.2.1 SEU properties

3.2.2 SEU, formally

3.3 Ellsberg paradox

3.4 Maxmin expected utility—Gilboa and Schmeidler

3.5 Awareness of unawareness—Karni and Vierø (2017)

3.6 Case-based decision theory—Gilboa and Schmeidler (1995)

4 Decision making under risk

4.1 Expected utility

4.2 Preferences for risk

4.3 Kahneman and Tversky (1979)

4.4 Rank dependent utility—Quiggin (1982, 1993)

4.5 Cumulative prospect theory

4.6 CPT axioms—Chateauneuf and Wakker (1999)

4.7 Disappointment aversion—Gul (1991)

5 Limited attention

5.1 Sparse maximization—Gabaix (2014)