EXPLORE PROJECT GUIDE

Here, I am happy to provide details and pedagogical motivation for the topics I implement in Explore projects across the curriculum. My aim is to give sufficient background on each topic so instructors who wish to use the topic in an Explore project can do so confidently. This guide can be used as a blueprint, or as a jumping off point for new directions as readers see fit. The description in each topic can be pared down or augmented based on the time constraints (or allowances) in your particular classroom setting. For each topic, I provide a) a list of the references I use; b) a discussion of the material; and c) suggested courses in which to implement the topic. I welcome any feedback regarding iterations of this project!

1. Criticisms of expected utility

References: Kahneman and Tversky (1979), Angner (2012)

This topic covers behavioral criticisms of standard expected utility theory. Kahneman and Tversky is a centerpiece in the field of behavioral economics, and is both conceptually accessible and technically challenging for undergraduates; different selections from the comprehensive Angner book can be targeted if the instructor would like to emphasis particular criticisms. Material for this topic could include: loss aversion; Allais' Paradox; reference points; certainty effect; prospect theory; reflection effect; and weighting function. Since the material in Kahneman and Tversky is likely standard coverage in a course on behavioral economics, but is in many ways best understood in contrast to standard expected utility, this topic is best suited for a course in

Intermediate Microeconomics where the basics of expected utility are presented but criticisms are either briefly mentioned or omitted altogether.

Quantitative skills: preference notation ($\succ, \succcurlyeq$), using the notation of functions with both expected utility and (Bernoulli) utility functions, concavity and convexity of functions (risk attitudes, prospect theory value function)

2. Auction theory

References: Watson (2008) Chapter 27; Klemperer (2004) Introduction and Chapter 1; Dixit, Skeath, and Reiley (2009) Chapter 17

Auction theory encompasses a vast collection of models and applications. Klemperer, though a bit technical, offers an extensive in-words literature review, while Dixit et al. provides a more concise summary of the standard auction types: sealed-bid, first-price, second-price, and the like. Watson has several accessible models of auctions, including equilibrium bidding strategies. Mathematical models in auction theory can quickly get bogged down in technical discussions. Therefore, students assigned this topic are often encouraged to focus on exploring (1) the wide array of auction types, including both canonical auction types and special considerations such as multi-unit auctions, common-value auctions, and risk attitudes; and (2) the numerous real-world applications of the variety of types. An advanced group might be able to discuss differences in equilibrium bids across types, revenue equivalence, or winner's curse in common-value auctions.[1]

[1] Auction theory groups have often held in-class live auctions, one even endowing "bidders" in the class with Skittles the bidders used to bid on bookstore items in a variety of auction formats. In one memorable auction, bidders each had 20 Skittles to bid on a particularly noteworthy item. The auction theory group was selling that particular item via second-price sealed bid auction. The winning bidder was the sole student who bid 21 Skittles for the item, knowing if her bid was the sole winning bid, she would only have to pay a maximum price of 20 Skittles - which she could afford!

The concepts of willingness to pay, reservation price, revenue, and efficiency make auction theory an easy tie in to Intermediate Micro, and if not covered in a game theory course, this topic is a must-have.

Quantitative skills: optimization (optimal strategy choice), functions (best response functions, bid functions), subscript notation (for bidder indeces), probability theory (common value auctions)

3. Giffen goods

Reference: Jensen and Miller (2008)

Giffen goods incorporate the familiar consumer theory elements of income and substitution effects, utility maximizing bundles, and demand curves. This topic is ideal for an Intermediate Micro course where Giffen goods are not taught in the section on consumer theory. Since Giffen goods are often taught at this level, nearly all undergraduate textbooks for Intermediate Micro have sections on Giffen goods; these sections can serve as helpful stepping stones for course resources.

Quantitative skills: graphing skills, including level curves as indifference curves, utility maximization problem and (potentially) expenditure minimization problem (substitution and income effects)

4. Matching markets

References: Osborne (2004) Chapter 8.7; Roth and Sotomayor (1990) Chapter 2

The section in Osborne provides an accessible lesson in two-sided one-to-one matching (marriage markets) and the Gale-Shapley algorithm for students who have familiarity with the basics of consumer preferences. Stable matching (i.e. the core) can be well-framed in relation to

the concept of Nash equilibrium, comparing the absence of unilateral deviation (in NE) with the absence of a deviating pair in the core. Matching markets provide ample opportunities for students to explore the question "why this matters", discussing the array of applications from residency matching, labor markets, and kidney chains to roommate matching, greek life matching, and dating applications. The practical success stories of matching theory (as well as the relatively recent Roth and Shapley Nobel win) pair well with the low-barrier-to-entry theoretical material in Osborne. This topic works well in any course where individual preferences are discussed.

Quantitative skills: functional notation (such as using mu to denote a matching function), preference notation ($\succ, \succcurlyeq$), set theoretic notation (sets of individuals to be matched), use of subscript indeces to denote individuals

5. Social choice theory

References: Kreps (1990) p. 174-180; Maskin and Sen (2014); Varian (2010) p. 632-634

This topic can be one of the most challenging to motivate properly. Students often struggle addressing the question "what unique question does this approach address?" There is broad introduction in Part 1 of Maskin and Sen, though the emphasis of this book is ultimately on The Arrow Impossibility Theorem, as well as in Dixit, Skeath and Reiley's chapter on "Strategy and Voting." I tend to emphasize two broad classes of problems social choice theory helps to solve: everyday choice problems (a family deciding where to go out for dinner), and political voting problems. The most critical foundational point for this topic is that social choice is about attempting to synthesize **individual preferences** into one preference (or choice) for the entire group.

There are several points of emphasis groups can focus on here, including the variety of voting mechanisms (plurality, majority, Borda) and voting paradoxes (Condorcet paradox, Arrow). This topic is also ripe for in-class activities: student groups have often gotten the class to vote on topics in small groups or as a whole, illustrating different outcomes under different mechanisms and illustrating the challenges in preference aggregation. This topic is ideal for implementation when consumer preferences are well-understood, particularly if properties like transitivity and completeness of preferences can be tied to the paradoxes (such as Condorcet, which leads to social choice cycling and a violation of the transitivity of the social choice rule.)

Quantitative skills: preference notation ($\succ, \succcurlyeq$), set theoretic notation (sets of individuals to be matched)

6. Nudge

Reference: Sunstein and Thaler (2009)

Standard material in any behavioral economics course. Since the readings themselves are the least technical readings of any of the projects listed, I typically assign the first 100 pages of Nudge. Students are then asked to identify both the broad principles behind the nudge (libertarian paternalism, cognitive biases), and select some examples of effective nudges and the biases they address to present to the class. This topic complements rational choice theory in Intermediate Micro extremely well.

7. Problems with probability

References: Azcal (2004); Angner (2012) p. 69-80; Gilboa (2007)

Angner brings many of the behavioral criticisms of probability judgment to the forefront, including the Linda problem, while Azcal's contributions range from the Birthday Paradox (p. 70) to Bayesian updating (p. 95). I typically include copies of my own notes on Monty Hall and Ellsberg Paradox (where Gilboa complements). Many topics on behavioral criticisms and cognitive biases in decision making under risk are likely to be covered in a behavioral econ course, but are apt as Explore project potential in Intermediate Micro when risk and expected utility have been introduced.

Quantitative skills: probability theory and notation (independent draws, distribution functions), Bayes' Theorem and conditional probability, set theoretic notation (sample space)

8. Repeated games

Reference: Watson (2008)

Watson here serves as an advanced undergraduate game theory chapter on repeated games, discussing strategy choice, discount rates, and folk theorems. Since material on repeated games is standard in my Game theory course, I primarily use this project in Intermediate Micro to buttress coverage of collusion in imperfect competition and cartel behavior. The topic requires some basic game theory knowledge, such as Nash equilibrium and 2x2 games, while net present value and discounting can be valuable touchstones as well. The focus can be geared toward infinitely-repeated games or finitely-repeated games, and I often include my lecture notes on both finite repetition and probabilistic end period of repeated games.

Quantitative skills: finite and infinite geometric series (payoff streams), summation notation, ordered pairs and higher dimension vectors (n-dimensional or infinite dimensional strategies in dynamic games)