

Economics of Uncertainty
01:220:481
Rutgers University, Department of Economics
Fall 2022
Professor Barry Sopher

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Office Hours: Standard “drop in” office hours will be 12pm-1pm and 3pm-4pm on Thursday. I will be in my virtual office via Zoom at this time. Hours by arrangement are possible too, if you cannot make this time or need to discuss something privately. You can always email with short and simple questions as well. I endeavor to answer with 24 hours, and typically much sooner than that. As a rule, there will be no in-person office hours except possibly by arrangement.

Class meets Monday and Thursday 10:20pm-11:40, in Murray 212.

Prerequisites: Calculus II (01:640:136 or 152), Statistics (01:960:211 or 285), and Intermediate Microeconomics (01:220:320).

The Final exam will be on Thursday, December 22, 8am-11am.

Introduction

This is an Upper-Level Elective in the economics curriculum. In this course we will explore the important topics of uncertainty and information in economics. While the standard course in microeconomics focuses on a static world with complete information and certainty, we will focus on more typical and realistic situations in which economic decisions must be made without complete knowledge about current or future conditions. The main objective of the course is to introduce students to the standard model of decision making under uncertainty, the *expected utility* model, to explore various aspects of this standard model in detail, and then proceed to investigate various questions concerning uncertainty and information in individual decision making and in market interactions in economics, when decision makers are modeled as expected utility maximizers. These include (but are not limited to) the following:

What is the Expected Utility model and where did it come from? What is the risk-bearing optimum of the individual in a market with state uncertainty? How can we measure risk attitudes? How does uncertainty affect market equilibrium? How can welfare implications of different market allocations be analyzed in a world with uncertainty? How should one’s beliefs change when new information arrives? When does it make sense to pay for additional information? When is it possible for information held by others to be revealed to you?

The theory we will be studying is foundational to a great deal of important work in economics, particularly related to financial markets, insurance and contracts. The course is a core course of the Certificate in Economic Theory and is an elective course for the Certificate in Financial Economics. It is also an elective course for the Certificate in Computational Economics and Data Analytics. If you are taking this course with the Computational Certificate in mind, then you should do a computational project for your research project in the course. More detail on this below.

Texts

There is one required book for the course: *Economic and Financial Decisions under Risk*, by Louis Eeckhoudt, Christian Gollier, and Harris Schlesinger, 1st edition, Princeton University Press, 2005.

ISBN 0-691-09655-4 for the hardback, ISBN 0-691-12215-6 for the paperback.

This book has been ordered at the Rutgers Barnes and Noble, and is widely available from online vendors. I cannot in honesty say if it is yet available at the Rutgers store, nor what kind of arrangements are needed to get the book from them, but you should be able to call them and find out.

The book by Eekhoudt, et al., is evidently a nearly proper subset of another book, *The Economics of Risk and Time* by Gollier, 2001, MIT Press. This larger and more technical book is a great resource if you are really interested in the mathematical technicalities of the subject, but it is going to be overkill for most of you, so there is no need to rush out and buy it. Overachievers only. In the past the book used was: *The Analytics of Uncertainty and Information*, by Sushil Bikhchandani, Jack Hirshleifer and John G. Riley, 2nd edition, Cambridge University Press. This is still a fine book, and you may find it about, but it is now a little bit outdated, so I do not require it. There are a few standard elements in this book that I will make use of, but it is not necessary to buy the book.

Other Reading Material

The basic theory that we will be investigating in this course was developed in the middle of the 20th century, with the finer points completed by about 1970. Individuals such as John von Neumann, Kenneth Arrow, John Pratt and Gerard Debreu made the fundamental contributions which are the focus of our study, though there are much earlier scholars, such as Daniel Bernoulli (1700-1782), who made important contributions. The fundamental model of expected utility is a building block for the study of many economic phenomena of importance, such as financial markets, but also insurance, life cycle allocation of work and consumption, and macroeconomics.

Related Courses in the Economics Curriculum

There is a separate course, the Markets, Games and Information (01: 220:483), which explores topics of information in greater detail. We will be focusing upon informational issues as they relate to individual decision making and to market equilibrium resulting from such decisions, while the other course focuses upon informational issues as they relate to strategic decision making—for example, the question of how to design contracts when different parties have different information, and there are a small number of decision makers interacting. Another course, Game Theory and Economics (01:220:482) also touches on related issues, as does the course Behavioral and Experimental Economics (01:220:480). The course Networks and Complexity in Economics (01:220:488) takes a distinctly computational approach to the study of strategic behavior, emphasizing an evolutionary approach. These courses may be taken in any order. The current course is fundamental, however, as the expected utility model lies at the heart of a great deal of modern economic theory.

Learning Objectives

The specific objectives for this course touch on all of the general learning goals that the Department of Economics has established. Students will learn the vocabulary of analyzing economic behavior under uncertainty, and will be expected to be able to accurately explain the functioning of markets and the behavior of individual decision makers using this vocabulary (Economic Literacy). Students will learn the quantitative methods for modeling and drawing implications from models in light of the features of these models that introduce uncertainty and informational dimensions into decision making (economic numeracy). Students will learn about the implications of the analysis they do for the welfare and functioning of the larger society, and will learn to consider how various alternative government policies may affect these items of concern (economic citizenship). Finally, through an independent empirical or computational research project, students will engage in the preliminary stages of formulating a research question (economic scholarship).

Organization of the Course and Grading

There will be three exams: two midterms and a final exam. Besides the exams, the other main requirement of the course will be to conduct an empirical and/or computational research project on a topic of interest to you within the scope of the course. Your choice of a project must be approved by me. More details on the research project requirement appear below. The midterms will count 25% each, and the final exam will count 25% towards your final grade. The research project will count for 25% of your grade as well. Letter grades will be assigned to exams and the research project, and your final course grade will be determined by the following schema: First, each assessment will have a certain number of possible “points” possible, and I will determine after each assessment how points earned correspond to a letter grade (A, B+, B, C+, C, D, F). The number of points needed to earn a given grade may be different on different assessments. At the end, once all assessments are done, the letter grades will be assigned numerical values on a four point scale as follows: A=4, B+=3.5, B=3, C+=2.5, C=2, D=1, F=0. Your final course grade will be determined by the average of the four numerical values, x , thus assigned, as follows:

Course Letter Grade	Average numerical score on Assessments	For example (marginal cases)
A	$3.75 \leq x \leq 4.0$	A, A, B+, B+
B+	$3.25 \leq x < 3.75$	B+, B+, B, B
B	$2.75 \leq x < 2.75$	B, B, C+, C+
C+	$2.25 \leq x < 2.75$	C+, C+, C, C
C	$1.75 \leq x < 2.25$	C, C, C, D
D	$.75 \leq x < 1.75$	D, D, D, F
F	$x < .75$	D, D, F, F

Homework assignments: There are no homework assignments as such (i.e. that are turned in to be graded). However, I will recommend that you do the problems at the end of each chapter as we progress

through the text, and will make a point of addressing most, if not all, of the questions, working out some in detail, at other times indicating the way to approach the problem and what can be expected as the solution. Sometime you just need to confirm that a certain answer is the solution. In any case, having worked at these problems and attended to my comments on them is the best sort of preparation you can do for exams (along with working through the text and attending class).

Important Dates

Midterm exam 1: Thursday, October 6, 2022.

Empirical/Computational Research Project “proposal”: due Thursday, October 20, 2022, to be returned to you by Thursday, October 27, 2022.

Midterm exam 2: Monday, November 7, 2022

Empirical/Computational Research Project “empirical strategy”: due Thursday, November 10, October 27, 2022, to be returned to you by Thursday, November 17, 2022.

Empirical/Computational Research Project “empirical analysis—rough draft of project”: due Monday, November 28, 2022, to be returned to you by Monday, December 5, 2022.

Empirical/Computational Research Project “final version”: The completed research paper will be due by the last day of class, Monday, December 12, 2022.

Final Exam: Thursday, 12/22/22, 8:00 am – 11:00 am

Topics and Readings

Here is a tentative schedule of topics and readings. Additional readings, besides the textbook maybe be added. Dates of exams are firm. Topics to be covered and timing of topics may be adjusted.

Approximate schedule of topics

EFDR==Economic and Financial Decisions under Risk—the text for the class.

Week 1 and 2: Introduction to the expected utility model. Reading is the article by Bernoulli (see “FILES” in Canvas), followed by Chapter 1 of EFDR.

Weeks 3 and 4: Measures of Risk and Stochastic Dominance. Chapter 2 of EFDR.

Week 5: Review and Midterm 1 (**Midterm 1 will be on Thursday, October 6, 2022**)

Week 6: Insurance. Chapter 3 of EFDR

Week 7: Portfolio Choice. Chapter 4 of EFDR

Week 8: Contingent Claims Markets. Chapter 5 in EFDR.

Week 9: Consumption and Saving. Chapter 6 of EFDR

Week 10: Review and Midterm 2 (**Midterm 2 will be on Monday, November 7, 2022**)

Week 11: Dynamic Portfolio Management. Chapter 7 of EFDR

Week 12: The Value of Information. Chapter 8 of EFDR.

Week 13: Efficient Allocation of Risks. Chapter 10 of EFDR

Week 14: Alternative Decision Criteria. Chapter 13 of EFDR.

PAPER DUE on Monday, 12/12/22, last day of class

FINAL EXAM Thursday, 12/22/22, 8:00 am – 11:00 am

Research Paper

One of the requirements of the course is to conduct an empirical and/or computational research project. Here are some more details and guidelines for the project. The usual approach will be for you to find a scholarly article on a topic of interest to you to serve as the starting point for your project. I will point out examples of articles that can serve this purpose in class but, in general, you should be finding a topic for yourself, and not waiting for me to give you one. Articles referred to by the authors of the textbook are a good place to look. The project is to conduct an empirical (i.e., data-based) and/or computational (i.e., simulation-based, with artificial agents) analysis which investigates or tests a hypothesis, presumably one that the article you have chosen provides, or one that is at least partly motivated by the article you choose. The data could be data you collect yourself, or it could be data reported on in another article, or in the article that is the basis for the project. The data could be experimental or non-experimental. The emphasis in an empirical analysis will be on how or whether observed behavior corresponds to the hypothesis you are focusing on. If you choose to conduct a computational exercise as your project, or as part of your project, then the emphasis will be more on exploring different ways of modeling decision makers, and the resulting behavior you observe and how it corresponds to your hypothesis.

Time Line for the Research Project

By October 20 I would like you to give me a brief proposal stating what topic you are interested in, what issues interest you, and the article that will be the basis for your project. By November 10 I would like you to update your proposal with more details on the “empirical strategy” you will be following in conducting your project. By November 28 I would like you to turn in a rough draft of your project with your preliminary empirical or computational results. Finally, by December 12, your final project report is due. This should include any updates to previous work you have turned in, as well as a complete overview of the project and interpretation of the results. Note that each of these assignments builds on the previous one, so that you are gradually putting together the pieces of your project as the semester progresses, rather than doing everything at the last minute.

Grading Rubric The following matrix is meant to provide you with guidance on my expectations for different aspects of the empirical/computational project. It is important to attend class, keep up with written assignment deadlines over the course of the semester. As we progress through the semester, you will be given “interim” scores in the different categories, as appropriate. That is, for example you will get a score on your research question early in the semester, based on your proposal, but a score for your “empirical strategy” will come later, when you update your proposal with more details of how you plan to test your research question. The empirical analysis scores will begin once the data work, as such, has begun, as summarized in your rough draft. And so on. The scores are “interim” in the sense that they can be improved upon by later efforts. For example, the project proposal is due on October 13, and you will get a provisional score on this. With the “Empirical Strategy” report on October 27, you will get a provisional score on that category. To the extent that your original research question was a bit vague, and has been sharpened up in the empirical strategy assignment, your score for the research question might improve. Similarly, the Preliminary Empirical Analysis Report will lead to a score in that category, and other, previous, category scores may be updated. The final report is due on December 12, and you will get final scores on all four categories from this. A score can be between categories (e.g., a 3.5 between Excellent and Good). Note that the Rubric lends itself directly to assigning a letter grade for the Research project, in the same way that the overall course grade is determined, as outlined above.

Rubric for Empirical/Computational Project	Excellent	Good	Fair	Poor
Research Question/Proposal	4	3	2	1
Empirical Strategy	4	3	2	1
Preliminary Empirical Analysis Report (rough draft)	4	3	2	1
Final Report/Interpretation	4	3	2	1
General definitions (for all categories: each criteria can be applied to any category)				
Excellent	Clearly defined objectives, Evidence of originality of thinking, Thorough examination with no obvious gaps in understanding, Correct use of methods of analysis, Well-integrated and synthesized write-up, Appropriate citation.			
Good	Achieves most of the criteria for Excellent, but could use improvement in one or two categories.			
Fair	Achieves some of the criteria for Excellent, but could use improvement in three or four categories			
Poor	Achieves criteria for Excellent in one or two categories, at best.			

Academic integrity

Cheating on exams and plagiarism in written work are the two main areas where violations of academic integrity occur. You should be familiar with the university policy on academic integrity:

<http://nbacademicintegrity.rutgers.edu/home-2/academic-integrity-policy/>

Resources on academic integrity for Students:

<https://nbprovost.rutgers.edu/academic-integrity-students>

Student-Wellness Services: Some of these services may be provided remotely during Fall 2022.

Counseling, ADAP & Psychiatric Services (CAPS)

(848) 932-7884 / 17 Senior Street, New Brunswick, NJ 08901 / <http://health.rutgers.edu/medical-counseling-services/counseling/>

CAPS is a University mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professionals within Rutgers Health services to support students' efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community, and consultation and collaboration with campus partners.

Crisis Intervention : <http://health.rutgers.edu/medical-counseling-services/counseling/crisis-intervention/>

Report a Concern: <http://health.rutgers.edu/do-something-to-help/>

Violence Prevention & Victim Assistance (VPVA)

(848) 932-1181 / 3 Bartlett Street, New Brunswick, NJ 08901 / www.vpva.rutgers.edu/

The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To reach staff during office hours when the university is open or to reach an advocate after hours, call 848-932-1181.

Disability Services

(848) 445-6800 / Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854 / <https://ods.rutgers.edu/>

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: <https://ods.rutgers.edu/students/registration-form>

Everything else: <https://success.rutgers.edu/>