

Bowdoin College
Department of Economics

ECON 2323: The Economics of Information, Uncertainty, and Communication
Spring 2019

“The most valuable commodity I know of is information.”
—Gordon Gekko

Time & Class Location: T,Th 2:50-4:15, Hubbard 213

Professor: Dan Stone

Email: dstone@bowdoin.edu

Office & Office Hours: Hubbard 108; M and W 2:00-3:30. If you'd like to meet with me and can't make it at those times, don't hesitate to email to set up an appointment.

QR Tutor and email: Gideon Moore, gmoore@bowdoin.edu

Prerequisite: Intro microeconomics (Econ 1101 or equivalent). We're going to have some first-year students for whom this is their first college econ course, and some second semester econ senior majors. So, a wide range of backgrounds. If you have taken probability theory or more advanced microeconomic theory courses, then some of the material will be review for you—please understand that I need to present this material in a way that is appropriate for the majority of students, who are seeing it for the first time. I expect/hope that even if you have seen some of the material before, you will still benefit from seeing it again from a different perspective.

Course description: Most basic models in economics assume that decision-makers have full information and no uncertainty. This class explores how many social and economic phenomena can be better understood by relaxing this assumption. In the real world, lack of uncertainty for decision-makers is the exception, not the rule. Uncertainty is fundamental to many situations, and in many others plays a subtle but crucial role in driving people's choices and social outcomes.

The main topics we will study in this course are positive and normative models of belief formation and decision-making under uncertainty, and game theoretic models of interactions of economic agents with asymmetric information. Throughout the course we will use basic probability theory and Bayesian updating in our models, so we will spend the first week or two getting up to speed on these tools. In the next few weeks after that we'll cover individual decision theory (choice under uncertainty), and in the month or so after that we'll cover strategic (game theoretic) choice in the presence of asymmetric information. In the last 1/3 of the course we will cover selected applications and extensions in more depth.

Learning goals: Learning goals include learning textbook economic concepts relating to individual decision-making under uncertainty (risk preferences, value of insurance/diversification/information), strategic decision-making under uncertainty (models of private information - adverse selection/moral hazard/auctions – and models of communication - signaling/cheap talk/disclosure) and learning at a somewhat deeper level about several specific applications (advertising, political media, aspects of finance).

Another important learning goal is that this course will enhance your understanding of probability theory and Bayesian updating (especially Bayesian updating!), perhaps via simulation in Excel (always a nice skill to improve on). This will be useful for data analysis work you do in the future (in or outside the classroom), and also for thinking about your own beliefs under uncertainty ‘IRL’ – your understanding of randomness and uncertainty, how to form and revise beliefs in terms of probabilities under uncertainty, and then make good decisions in those situations. The following excerpt from *Superforecasting* (a book that we’ll be reading) highlights the challenge, and importance, of thinking about probabilities clearly.

In March 1951 National Intelligence Estimate (NIE) 29-51 was published. “Although it is impossible to determine which course of action the Kremlin is likely to adopt,” the report concluded, “we believe that the extent of [Eastern European] military and propaganda preparations indicate that an attack on Yugoslavia in 1951 should be considered a serious possibility.” ...But a few days later, [Sherman] Kent was chatting with a senior State Department official who casually asked, “By the way, what did you people mean by the expression ‘serious possibility’? What kind of odds did you have in mind?” Kent said he was pessimistic. He felt the odds were about 65 to 35 in favor of an attack. The official was startled. He and his colleagues had taken “serious possibility” to mean much lower odds.

Disturbed, Kent went back to his team. They had all agreed to use “serious possibility” in the NIE so Kent asked each person, in turn, what he thought it meant. One analyst said it meant odds of about 80 to 20, or four times more likely than not that there would be an invasion. Another thought it meant odds of 20 to 80 - exactly the opposite. Other answers were scattered between these extremes. Kent was floored.

Superforecasting does an excellent job of explaining why we *don’t* intuitively think about uncertainty in terms of probabilities – and both why and how we *should* often try to do so. Note that this is not just about forecasting – it’s about belief formation more generally (i.e., also forming beliefs about a fact or event that has occurred but is unobserved to us).

A final goal is that, given that we will be using game theoretic tools for much of the term, this class will make you a better strategic thinker, especially in contexts involving asymmetric information – i.e., how to draw inferences on the information of others from their actions, and how to strategically protect your own information and influence the beliefs of others.

Format and grading: Your course numeric grade will be determined as follows: 15% HW; 10% class participation; and 25% for each of three tests. The dates of homeworks and tests are in the course schedule below. Class participation grade will be based on attendance, engagement in class, and likely some in-class activities. Doing the readings, being focused and engaged during class-time, reviewing notes after class and working carefully on homework and classwork problems are key things you should do to be successful in this class. If material from class is unclear to you, work on clarifying them outside of class – with the texts, classmates, QR tutor and/or me.

Communication/feedback: Given that much of our course content is about communication—I certainly appreciate its value—and will do what I can to make the communication channels clear in both directions. Don't hesitate to come to my office hours to discuss anything or let me know any questions. If you can't make office hours don't hesitate to email me to set up an appointment. If you have questions on how you are doing grade-wise or would like additional feedback at any point during the semester, please let me know. I will try to give you substantial feedback throughout the term, in class (especially with clicker questions), homeworks, and tests, and through one-on-one communication.

Required books:

Games, Strategy and Decision Making, 2E, by Joseph Harrington. I encourage you to rent this if you can't find a used copy online, especially since we're only using a relatively small number of chapters. Superforecasting, by Philip Tetlock and Dan Gardner. This one should be pretty inexpensive to buy and I think worthwhile. Again, feel free to buy online.

Other readings (referred to in course schedule below) include:

-Ch. 4 ("Probability judgment"), Angner

Other references for intro probability theory and Bayes' rule:

<http://statsthinking21.org/>

<https://seeing-theory.brown.edu/>

https://arbitral.com/p/bayes_rule/?l=1zq

-Ch. 17 ("Choice in the Presence of Risk") of *Microeconomics: An Intuitive Approach*, Nechbya

-Ch. 8 ("The Efficient Mkt Hypothesis") of *Essentials of Investments, 8/e*, Bodie, Kane, and Marcus Barberis, N. "Thirty Years of Prospect Theory in Economics: A Review and Assessment." *Journal of Economic Perspectives*, 2013.

Bronnenberg, Bart J., et al. "Do Pharmacists Buy Bayer? Informed Shoppers and the Brand Premium." *The Quarterly Journal of Economics* 130.4 (2015): 1669-1726.

Gentzkow, Shapiro, and Stone. "Media bias in the marketplace: theory," *Handbook of Media Economics* (2015).

Hollis, N. "Why Good Advertising Works (Even When You Think It Doesn't)" *The Atlantic*, 2011.

Malkiel, B. "The Efficient Market Hypothesis and its Critics," *Journal of Economic Perspectives* (2003).

Milgrom, P. "What the seller won't tell you: Persuasion and disclosure in markets." *Journal of Economic Perspectives*, 2008.

Paulos, John Allen. "The Mathematics of Changing Your Mind". The New York Times, 8-5-2011.

Renault, R. "Advertising in Markets." *Handbook of Media Economics*, 2015.

Selections from Elephant in the Brain (Simler and Hanson, 2018) on advertising, signaling

Course schedule and readings (subject to change)

Part I: Belief formation and individual choice under uncertainty

- 22-Jan Syllabus, Probability theory 101; Angner
- 24-Jan Prob theory ctd; Angner
- 29-Jan Bayesian updating (Angner, Paulos, arbitral guide to Bayes)
- 31-Jan Expected utility theory and decision-making under risk; risk preferences, certainty equivalent (Nechbya)
- 5-Feb Expected utility theory applications (insurance, portfolio diversification/hedging)
- 7-Feb Instrumental value of information
- 12-Feb Prospect theory, Barberis, **HW 1** due
- 14-Feb Catch-up, review
- 19-Feb **Test 1**

Part II: Interactive choice under uncertainty

- 21-Feb Intro game theory Harrington, Chs. 1-2
- 26-Feb Sequential games with private information; Harrington, Ch 10
- 28-Feb Adverse selection, moral hazard
- 5-Mar Communication games – strategic signaling; Harrington, Ch. 11
- 7-Mar I'm out of town (presenting some work on the road)

Spring break (!)

- 26-Mar Signaling ctd (intuitive criterion and/or counter-signaling)
- 28-Mar Communication – cheap talk; Harrington, Ch. 12
- 2-Apr Communication – strategic disclosure; Milgrom, **HW 2** due
- 4-Apr Catch up, review
- 9-Apr **Test 2**

Part III: Applications and extensions.

- 11-Apr Advertising, firm behavior and information
- 16-Apr Advertising and firm behavior ctd; first section of Bronnenberg et al; Simler and Hanson
- 18-Apr Media and political information; Gentzkow et al
- 23-Apr Media Ctd
- 25-Apr Financial info - efficient market hypothesis, prediction mkts; Bodie et al
- 30-Apr Finance ctd - herding and contagion; **HW 3** due
- 2-May Forecasting/belief formation ctd/Brier scores/Good Judgment Project (Tetlock/Gardner chs 3, 5); (non-instrumental) information utility; communication/persuasion experiments ?
- 7-May Catch-up/review; (Tetlock/Gardner chs 6-8)
- Test 3:** Friday, May 17, 1:30-4:30