Syllabus: Economics 806, Part 2
Evolutionary Game Theory

Course Description

This course is about population games and evolutionary dynamics. I will cover the deterministic part of the theory quickly, so as to focus on stochastic evolutionary dynamics and stochastic stability.

Readings

The main readings for the course will be my chapter in the *Handbook of Game Theory* (2015), the last three chapters of my book (2010), and a very long forthcoming paper in *Theoretical Economics* that I wrote with Mathias Staudigl.

My book presents much of the basic theory of Markov chains without proofs. For a rigorous treatment of the basics, I highly recommend Norris (1998). I list a number of other good references about the relevant parts of probability theory below.

Course Requirements

There will be three problem sets that will be collected and graded. They will come after units 2, 4, and 6 in the course outline below. Ideally these will be turned in via e-mail.

In the last three lectures, pairs of students will lead presentations on a recent paper in evolutionary game theory. Everyone will be a member of one such pair. Those who are not presenting will read the paper, and then prepare and turn in a list of three questions/comments/points for discussion. The idea is that the presentations will not be straight lectures, but rather will include a lot of back-and-forth between the presenters and the rest of us. The points of all of this are (i) to expose you to current work on a diverse topics in evolutionary game theory; (ii) to have you read work that is not in a fully-digested form; (iii) to get you thinking about what makes for a well-written paper; (iv) to give you experience with presenting.

A list of possible papers to present is below. Most of these papers are recent work by new PhDs. You are welcome to choose papers off of the list, subject to my approval, and I am happy to suggest papers on particular topics. First come, first served.
Course Outline

1. (1 lecture) The basic model: population games, revision protocols, the stochastic evolutionary process, mean dynamics
   Readings: Handbook article, Sec. 1–3. Also: PGED, Ch. 1–4.

2. (3 lectures) Deterministic evolutionary dynamics: families, properties, convergence, nonconvergence
   Readings: Handbook article, Sec. 5–10. Also: PGED, Ch. 4–9.

3. (2 lectures) Probability theory and Markov chains
   Readings: PGED, Appendices 10.A and 11.A. Also: Norris.

4. (1.5 lectures) The stochastic evolutionary process: stationary distributions
   Readings: PGED, Ch. 10–11.

5. (2.5 lectures) The stochastic evolutionary process: stochastic stability
   Readings: PGED, Ch. 12.

6. (1 lecture) The stochastic evolutionary process: large deviations

7. (3 lectures) Presentations

References

Main references

More good books on Markov chains and processes

More good references on limiting stationary distributions, stochastic stability, and large deviations
Some suggestions of papers for presentations

Deterministic models (from most theoretical to most applied)


Stochastic models (from most theoretical to most applied)


