

PSC 404: Probability and Inference

Fall 2006

Lecture: 11:05-12:20, Monday and Wednesday, Harkness 112

Course website: <http://mail.rochester.edu/~mperess/pi2006.html>

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OH: To be announced

Overview: This course offers an introduction to probability and statistics for graduate students in political science.

Textbook: The main textbook for the course is Casella and Berger, “Statistical Inference”. This book is quite expensive. Feel free to purchase a used copy (possibly of an older edition).

Other References: A number of other sources will be useful for this course.

Newbold, Carlson, and Thorne, *Statistics for Business and Economics*. Covers

Probability, statistics, and regression at a less mathematical level than Casella and Berger.

Healy, *Graduate Econometrics Review*. Covers similar material to Casella and Berger, but at a more advanced level. Available at: <http://healy.tepper.cmu.edu/~pj/papers/Healy-StatisticsReview.pdf>

Press et. al., *Numerical Recipes in C*. Provides good discussion of generating random variables (as well as many other topics in computational methods). Available at: <http://www.library.cornell.edu/nr/cbookcpdf.html>

White, *Asymptotic Theory for Econometricians*. Advanced reference for the law of large numbers and central limit theorem, with applications to regression.

Creel, *Graduate Econometric Lecture Notes*. If you are interested in a preview of material from the later courses in the political methodology sequence, take a look at these excellent lecture notes. Available at:

<http://econpapers.repec.org/scripts/redir.pl?u=http%3A%2F%2Fpareto.uab.es%2Fmcreel%2FEconometrics%2FEconometrics.pdf;h=repec:aub:autbar:575.03>

Grading: Grading will be based on a midterm (33%), a final (33%), and six homework assignments (33%).

Syllabus: I plan on covering the following topics throughout the semester. The list may be contracted or expanded based on how long things are taking. Relevant sections in the textbook are indicated in parentheses.

I. Mathematical Probability

- I.1. Set Theory (1.1)
- I.2. Probability Theory (1.2)
- I.3. Conditional Probability and Independence (1.3)

- I.4. Random Variables (1.4)
- I.5. Distribution Functions (1.5)
- I.6. Density and Mass Functions (1.6)
- I.7. Transformations (2.1)
- I.8. Expected Values and Moments (2.2-2.3)
- I.9. Common Distributions (3.1-3.3)
- I.10. Joint and Marginal, and Conditional Distributions (4.1-4.2)
- I.11. Multivariate Distributions (4.3, 4.5-4.6)
- I.12. Generating Random Variables (5.6)
- I.13. Convergence of Random Variables (3.6, 5.1-5.2, 5.5)

II. Elementary Statistics

- II.1. Sampling Distributions: Means, Proportions, and Variances (5.3)
- II.2. Properties of Point Estimators
- II.3. Hypothesis Testing and Confidence Intervals: Means, Proportions and Variances
- II.4. Hypothesis Testing: Power of a Test
- II.5. Hypothesis Testing: Differences in Means, Proportions, and Variances
- II.6. Hypothesis Testing: Tests of Distributions
- II.7. Hypothesis Testing: Simple Nonparametric Tests
- II.8. Inference for Categorical Variables

III. Mathematical Statistics

- III.1. Finding Point Estimates (7.1, 7.2, 10.1)
- III.2. Consistency and Efficiency (7.3-7.4)
- III.3. Advanced Hypothesis Testing (8.1-8.2, 10.3)
- III.4. Power and Size (8.3)
- III.5. Interval Estimation (9.1-9.3, 10.4)
- III.6. M-Estimators (10.2)
- III.7. Consistency of M-Estimators
- III.8. Asymptotic Normality of M-Estimators
- III.9. Efficiency of Maximum Likelihood Estimators