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Preliminary Syllabus[1]
Introduction to Quantitative Analysis
POLI 797
Spring 2012
Th 3-5:30, Machmer e23

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Office Hours:	Tu 11:00–12:30, Th 11:00–12:30, Th 2:00-3:00

Course Description: This course is an introduction to statistical research methods for political science. The material covered will include probability theory, descriptive statistics, data visualization, the principles of statistical inference, and linear regression. Upon completion, students will be able to understand, evaluate and criticize the use of basic statistical methods for social science research. The course will also serve as a useful prerequisite for more advanced research methods courses.

Required Books:

1. Weiss, Neil A. *Introductory Statistics.* 9th Edition. Pearson.

2. Berry, William D. and Stanley Feldman. 1985. *Multiple Regression in Practice.* Quantitative Applications in the Social Sciences. Sage.

Software: The "official" software of the course is the free and open source `R` statistical programming software (R Development Core Team, 2009). It is required that all problem sets and analyses reported in the research paper be completed using `R` . The use of the commercial program `STATA` will be required on some assignments. This software is available in the computer lab on the fourth floor of Thompson, as well as in many OIT labs.

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[1]Note: This syllabus is subject to change at the instructor's discretion.

Problem Sets: There will be a weekly problem set. The problem set due each week will require students to implement a subset of the methods covered in the previous week on a dataset of their choice. Students should select datasets that contain variables related to their research interests. Please let me know immediately if you are having any problems finding a datasets. There are publicly maintained classic datasets for many subfields, replication data archives for a number of political science journals, and, of course, the Dataverse (`thedata.org`). Within one week after the first class meeting (i.e., prior to the due date for the first problem set), students should consult with me regarding appropriate datasets. The datasets can be changed from week to week, with my approval, up to the "research proposal" date (see the schedule below). The research paper will be written using one or more of the datasets to which the student commits in the research proposal.

Research Paper: Students are required to complete a research paper by the end of the semester. The paper is expected to be original research – applying and/or critiquing the methods covered in the course. The topic and research design will be proposed by the student and approved by me. By 'original research', I do not mean to exclude replications and extensions of previous studies. It would be completely appropriate for students to replicate and extend a previously published analysis, as long as the objective of the study is an original contribution to the relevant literature.

Exams: Exams will be in-class and closed book. Students may use a calculator as well as an 8.5×11 sheet of paper with one side of notes. I will provide a sheet of essential equations.

Collaboration: Collaboration is an increasingly regular aspect of research in political science (Biggs, 2008). Collaboration on data-analytic projects poses some unique challenges that it would be great for students to master within the supervisory context of a course. Students are strongly encouraged to collaborate on problem sets and/or their research papers. It would be perfectly appropriate for a group (or pair) of students to form a team early on in the semester – answering all of the problem sets using the same data and writing the paper together. Team-produced papers and homeworks will be held to a higher standard, but certainly not to the degree that collaborative efforts will be penalized.

Preparation and Submission of Data and Code: One of the basic tenets of valid scientific inquiry is that the research be replicable. The first step in the replication process is to recover the numbers reported in the research using the purported data and methods. The submission of the answers to the problem sets and the research paper must include a thoroughly commented script (i.e., code) file, as well as the data needed to run the numbers.

Grading:

- Problem Sets – 40%

- Research Paper – 30%

- Midterm Exam – 15%

- Final Exam – 15%

Course Schedule: The schedule below gives the required reading. The readings listed for a particular date should be read before class time that day. For supplemental readings not listed above, full citations can be found below in the references section. Among countless others, the methods covered in this course have been used to study of such varied and important topics as the time to coalition government formation in comparative politics, international trade in international relations, social welfare spending in public policy, and party polarization in American politics. Thus, I will assign additional supplemental readings, in the form of substantive articles, throughout the semester.

1. 1/26, Basic Description: Measurement and Visualization

   - Weiss, Ch. 1, 2 & 3

2. 2/2, Probability and Random Variables

   - Weiss, Ch. 4

3. 2/9, Random Variables

   - Weiss, Ch. 5 & 6

4. 2/16, Sampling Distributions

   - Weiss, Ch. 7
   - Notes on the Non-Parametric Bootstrap

5. 2/23, **Proposal Due** Inference For a Single Population Mean

   - Weiss, Ch. 8 & 9

6. 3/1, Inference for Two Population Means, Standard Deviations and Proportions

- Weiss, Ch. 10, 11 & 12

7. 3/8, **Midterm Exam** (up to 3/1), Chi-Square Methods

   - Weiss Ch. 13

8. 3/16, Correlation, ANOVA and Regression I

   - Weiss, Ch. 14

9. 4/5, Correlation and Regression II

   - Weiss, Ch. 15

10. 4/12, Assumptions in Ordinary Least Squares Regression

    - Berry & Feldman, All

11. 4/19, Outliers, Robustness and Median Regression

    - Harden and Desmarais (2011)

12. 4/26, Essential Critiques of Statistical Research

    - Ward, Greenhill and Bakke (2010)
    - Shmueli (2010)
    - Achen (2005)
    - Schrodt (2010)

13. TBA, **Final Exam**

Attendance: There is no grade assigned for attendance or participation. However, it is strongly *expected* that students will make every effort to be in attendance and will be prepared to discuss the reading.

Late Submission Policy: A penalty of 20% will accrue for each (rounded up) day that an assignment is late.

Learning or Psychological Disabilities: The University of Massachusetts Amherst is committed to providing an equal educational opportunity for all students. If you have a

documented physical, psychological, or learning disability on file with Disability Services (DS) or Psychological Disabilities Services (PDS), you may be eligible for reasonable academic accommodations to help you succeed in this course. These services can be reached at (413)545-0892 and `ds@educ.umass.edu`. If you have a documented disability that requires an accommodation, please notify me within the first two weeks of the semester so that we may make appropriate arrangements.

Academic Honesty: The integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research. Academic honesty is therefore required of all students at the University of Massachusetts Amherst. Academic dishonesty (cheating, fabrication, plagiarism, facilitating dishonesty) is prohibited in all programs of the University. Activity in this course is governed by the Universitys Academic Regulations and Code of Student Conduct (including rules on academic honesty). By registering for classes, you are assumed to be aware of both. They can be accessed at:
`www.umass.edu/registrar/media/academicreg.pdf`
`www.umass.edu/dean_students/code_conduc`

References

Achen, Christopher H. 2005. "Let's Put Garbage-Can Regressions and Garbage-Can Probits Where They Belong." *Conflict Management and Peace Science* 22(4):327–339.

Biggs, Jeffrey. 2008. "Allocating the Credit in Collaborative Research." *PS: Political Science & Politics* 41(01):246–247.

Harden, Jeffrey J. and Bruce A. Desmarais. 2011. "Linear Models with Outliers." *State Politics & Policy Quarterly* 11(4):371–389.

R Development Core Team. 2009. *R: A Language and Environment for Statistical Computing.* Vienna, Austria: R Foundation for Statistical Computing. ISBN 3-900051-07-0.
URL: *http://www.R-project.org*

Schrodt, Philip A. 2010. "Seven Deadly Sins of Contemporary Quantitative Political Analysis." *SSRN eLibrary* .

Shmueli, Galit. 2010. "To Explain or to Predict?" *Statistical Science* 25(3):289–310.

Ward, Michael D, Brian D Greenhill and Kristin M Bakke. 2010. "The perils of policy by p-value: Predicting civil conflicts." *Journal of Peace Research* 47(4):363–375.