Sociology 362, Statistics for Sociologists III, Spring, 2016
TuTh 9:30AM - 10:45AM, Van Hise 201
Summary Period: 5/9/2016, Monday, 7:45-9:45am

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Lab 301:Tu 1:20- 3:15pm Soc Sci 3218

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Lab 302:Tu 3:30-5:25pm Soc Sci 3218

Prerequisites: Sociology 361, "Statistics for Sociologists II," or equivalent. Junior standing. Prior experience with Stata is desirable but not required.

Required Text: Jeffrey M. Wooldridge, Introductory Econometrics, A Modern Approach. 5th ed., 2013. South-Western/Cengage. (Minor supplementary texts may be added, as announced in class.)

Topics: Review of multiple regression; properties of estimators; general linear restrictions; logit, probit and Poisson regression; instrumental variables; two-stage least squares; panel data; fixed and random effects.

Details: This is a second course in regression analysis that assumes students have mastered the material in Sociology 361 or its equivalent. A main difference from 361 is that probability will be the starting point for developing regression concepts; this was mostly implicit in 361. We will do a brief survey of needed probability concepts such as random variables; joint, marginal and conditional distributions; and expectation, variance and covariance of different kinds of distributions. We will also review some basic concepts from mathematical statistics, such as random sampling, properties of estimators, and general methods of estimation including the method of moments, maximum likelihood, and least squares. Some basic ideas such as hypothesis tests and confidence intervals will not be covered; students are expected to understand these as prerequisite material.

The level of mathematics required is modest. Basic high school algebra and familiarity with transformations such as logarithms is essential. No knowledge of calculus is required, though some discussions of quantitative variables will explain calculus results in intuitive terms. No knowledge of matrix (or linear) algebra is required, though occasional use will be made of matrix notation as a space-saving device.

Learning objectives: Students completing the class should be able to understand and apply many of the more advanced regression methods in use in sociological research, making it possible for them to do more definitive research. In particular:

Objective 1. Attain fluency in basic mathematical probability and statistics notation, and certain important theorems. Assessed by in-class examination.

Objective 2. Achieve understanding of the assumptions and proper empirical interpretation of multiple regression models on non-experimental data. Assessed by in-class examination.

Objective 3. Achieve understanding of the assumptions and proper empirical interpretation of certain models for non-continuous outcomes (logit, probit, Poisson). Assessed by take-home data analysis exam.

Objective 4. Achieve understanding of the assumptions and proper empirical interpretation of models taking advantage of across-time, non-experimental data. Assessed by take-home data analysis exam.

Objective 5. Achieve understanding of the assumptions and proper empirical interpretation of instrumental variables and two-stage least squares. Assessed by take-home data analysis exam.

Objective 6. Master Stata commands to estimate and evaluate the models of objectives 3-5. Assessed by take data analysis exams.

Take-home exams: Three or so take-home exams will require students to do tightly-focussed data analyses, as might be assigned to a member of a research team. The data provided are typically synthesized to exhibit a particular structure suitable for the exercise. (That is, the data are not from an actual population.) The exams will consist of a research question, a Stata data set, and reference to similar analyses found in the lectures or the text. Each exam requires writing up a short memorandum of results, with supporting Stata output. In order to encourage students not to take too long on these assignments the due date will be just a day or two after the exam materials are distributed.

In-class quizzes: Three or so in-class, noncumulative quizzes covering material in appendices B and C and the textbook chapters. Dates for the exams will be determined as we progress through the material, the first coming after the appendices have been covered. These quizzes should each take half a class period.

Other in-class assessments: As seems appropriate, in-class assessments may occur without prior notice. These may take the form of short quizzes on particular concepts or written reactions to course material. Formal grading will be limited to credit for doing a serious job on the assessment, or not, and will be a component of the class participation score.

Homework assignments: Homework exercises for each chapter of the text are assigned below (or will be assigned later). **Due dates:** Exercises are due at the beginning of the lecture exactly one week following the completion of the chapter. If the chapter is wrapped up on a Tuesday, the homework is due the next Tuesday, for example. This rule will be adjusted at the end of the term to avoid having assignments due after classes end. Your TA may change due date requirements.

Term paper and final exam: There is no term paper and no final exam.

Web resources: The Learn@UW website for Soc 362 will be used for posting notes, and possibly other material from lecture and lab. Check it frequently.

Computing resources: You are required to use Stata for most homework assignments and the take-home exams. (Exceptions will be noted.) Although other packages are quite good choices for the methods in this class, there is a surprising amount of variation in the exact model specifications that are used across the programs, which makes it easier for all if we stick to a single program.

There will be no general instruction in Stata, but your TA and staff members of the Social Science Computing Cooperative (SSCC) will provide consultation on the use of Stata for course assignments. Stop by 4226 Sewell Social Sciences Building and look for the yellow SSCC Consultant or red Stat Consultant sign, or send a message to helpdesk@ssc.wisc.edu. Make sure to say you are enrolled in this course. Some details of Stata use for particular models will be covered in class.

Computer lab sessions: Most or all of the weekly lab sessions will be held in a computer lab, 3218 Sewell Social Science Bldg., instead of the room listed in the Registrar's course schedule. Check for messages from your TA to be sure you know where to go.

Computing outside the lab: SSCC computers with Stata and SAS are available for course assignment use via the web. You can check the SSCC website for advice on how best to get access from your home or from other campus computer labs or wifi connections.

Compute independently: All assignments are to be based on computer code independently written and run by each individual student. In addition, each assignment's written analysis must be the independent work of the individual student. Evidence of borrowing or copying between or among students will be (heavily) penalized. However, students are welcome to consult with each other *in general terms* about strategies for completing the various assignments. You **must turn in your own computer output** with each assignment that requires the use of a computer. Of course, all your written work must be completely your own.

Computers/Phones in Lecture and Lab: When lab is held in the computer lab, you obviously will be on the computer. When the lecture or the lab is held in classrooms, do not use a laptop, tablet or phone. Don't distract others, including the instructor.

Mid-lecture break: The professor recognizes that minds get weary in classes like this, and hopes to break for 3 - 5 minutes about midway through each session. In that time students can leave the room, meditate, etc. They should take a breather, instead of making calls on their phones. Class will resume pretty promptly when the announced

interval is up; students who find class back under way when they return are asked to seat themselves as quietly as possible.

Lab attendance: Lab attendance will be taken every week and will be given consideration as part of your qualitative discretionary grade. You may attend either lab section.

Purposes of Lab:
1. Go over material covered in the previous week's lecture.
2. Provide advice and a foundation to complete homework assignments.
3. Learn statistical programming to help you conduct social science research.

Lab assignments: From time to time additional assignments may be made in lab. No late assignments will be accepted. Assignments will be due at the beginning of lab. Early assignments can be emailed to the TA or dropped off in the TA's Sociology office mail folder (8th floor). Do not submit them to the professor.

Grading: Take-home exams: 30% in total; in-class quizzes: 30% total; homework assignments: 30%. The other 10% will come from your classroom and lab participation as qualitatively assessed by your TA and professor.

Office Visits: If you are habitually shy or quiet in class or lab please visit your TA and/or professor in office hours so we can get to know who you are and discuss any problems or issues you may have. If you're not shy, come anyway.

Departmental Notice: The Department of Sociology regularly conducts student evaluations of all teaching assistants near the end of the semester. Students who have more immediate comments, complaints or concerns about the teaching assistant may report them either to Professor Christine Schwartz, Associate Chair, or Professor Pamela Oliver, Chair, 8128 Social Science.

Reading Assignments: Please come to class to stay current on the expected coverage in following class sessions. You are expected to have read the relevant textbook material before each lecture after the first class session

Homework Assignments by Chapter. (Topics in *italics* are considered basic review material and will be covered barely in lecture, if at all.)

Chapter 1. The Nature of Econometrics and Econometrics Data -- basic review material
Appendix A. Basic Mathematical Tools -- basic review material

Appendix B. Fundamentals of Probability.
    Homework: 1, 3, 7, 9, 10

Appendix C.1-C.4 [Basics of Estimation]
    Homework: 1, 3

Appendix C.5-C.7 [Confidence intervals and hypothesis tests; notation] -- basic review

Chapter 2. The Simple Regression Model [omit section 2.6]
    Homework: 1, 2, 3, 4, 11; C3, 4, 8

Chapter 3. Multiple Regression Analysis: Estimation
    Homework: 2, 5, 6-10; C2, 4, 5, 9

Chapter 4. Multiple Regression Analysis: Inference
    Homework: 2, 5, 6, 8, 9, 12, C2, C5

Omitted chapters:
    Omitted Chapter 5. Multiple Regression Analysis: OLS Asymptotics, is beyond
    our mathematical scope.

    Omitted Chapters 6 through 8. These concern important practical issues (e.g.,
    rescaling, transformations of variables, dummy independent variables,
    interactions, heteroskedasticity) that were well covered in Soc 361. Students will
    be expected to be familiar with all of these topics during the remainder of the
    course. In particular, the skills in these omitted chapters may be useful in doing
    the take-home exams.

Chapter 9. More on Specification and Data Issues
    Homework: 1-5, C1, C3

Chapter 17, sections 17.1 (logit and probit models) and 17.3 (Poisson regression), with
additional material on multinomial logistic models.

Chapter 13. Pooling Cross Sections across Time: Simple Panel Data Methods
    Homework: 1-5, C2, C5, C7

Chapter 14. Advanced Panel Data Methods
    Homework:

Chapter 15. Instrumental Variables Estimation and Two Stage Least Squares
    Homework:

Note all or parts of the following chapters will be omitted: 16. Simultaneous equations
models; 17.2 (Tobit) 17.4 (Censored and Truncated regression); 18. Advanced time
series models; 19. Empirical projects.