UNIVERSITY OF MICHIGAN

Sociology 610
Statistical Methods II
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This course is the second portion of the two-semester sequence required of all sociology department graduate students. It consists of two weekly class sessions plus a lab-discussion. In the first semester we covered basic concepts of probability, sampling distributions, confidence intervals, and statistical inference. This term our focus is on multivariate techniques, especially multiple linear regression. The lab sessions will be used to discuss problems encountered in the lectures and written assignments and to refine students' statistical computing skills. The course assumes knowledge of the material covered in Sociology 510. It assumes no mathematical knowledge beyond high school algebra, but students will have an opportunity to develop elementary skills in more advanced mathematical techniques.

Requirements

Requirements for this course include homework (problem-solving) assignments, a term project (to be described in class), and midterm and final examinations. The primary text is *Applied Linear Regression Models* (fourth edition), by Kutner, Nachtsheim, and Neter. I am using this book for the first time, so I cannot predict how useful you will find it, but I suspect that you will experience it as more user-friendly than the previous text we had used. I strongly urge you to purchase the book. Although it is expensive, you should view it as an investment, one that you may find yourself using as a reference long after you have completed this course. I have also included some assigned readings from the previous text, *Applied Regression Analysis, Linear Models, and Related Methods* by John Fox. Fox's book provides more detailed treatment of several important topics than that provided by Kutner et al. For those of you who would like a simple, more narrative, introduction to multiple regression, I have ordered copies of *Multiple Regression: A Primer*, by Paul D. Allison. This book is not a substitute for Kutner et al., but it may serve as a useful supplement. Finally, I have ordered one book in the Sage Quantitative

Applications in the Social Sciences Series: Herbert B. Asher, *Causal Modeling*. Purchase of this book is also strongly recommended. The books are available at the Shaman Drum Bookstore, 313 South State Street. Access to a calculator is also strongly recommended. All readings, including those in the textbooks and those listed as recommended, are optional. If you can absorb the material without doing the readings, that is fine. But you are responsible for the material in the readings.

COURSE OUTLINE[1]

January 4: Introduction to the course

January 9: Review- levels of measurement, sampling theory, hypothesis testing, analysis of variance

Reading: reread the materials in your 510 text

January 11: Simple regression

Reading: Kutner et al., pp. 2-26; Recommended: Allison, pp. 97-115

January 16: Statistical inference in regression

Reading: Kutner et al., pp. 40-50, 63-77

January 18: An introduction to multiple regression: causality and partial correlation

Reading: Kutner et al., pp. 214-217, 268-271; Recommended: Allison, pp. 1-46

January 23: The mathematics of multiple regression I: the normal equations

Reading: Kutner et al., pp. 17-18, 256-271

January 25: An introduction to matrix algebra

[1] This outline provides an approximate description of topics and dates. Historically I have tended to deviate from it, in ways that cannot be predicted at the beginning of the term. Except for the exam dates, I can therefore not promise that the described topics and dates will match. There is also a possibility this term that I will add new material during the second half of the course. That will depend on the speed at which we cover the topics listed here.

Reading: Kutner et al., pp. 176-191

January 30: Multiple regression in matrix form

Reading: Kutner et al., pp. 197-208, 222-228

February 1: Analysis of variance as regression: dummy variables

Reading: Kutner et al., pp. 313-319; Fox, pp. 155-161, 135-144

February 6: Two-way analysis of variance

Reading: Fox, pp. 328-335

February 8: Analysis of covariance

Reading: Kutner et al., pp. 306-309, 311-319; Fox, pp. 192-195; Recommended: Allison, pp. 166-170

February 13: Regression diagnostics I: Outliers and influential observations

Reading: Kutner et al., pp. 390-400

February 15: Regression diagnostics II: Multicollinearity

Reading: Kutner et al., pp. 278-289, 406-410; Recommended: Allison, pp. 137-150

February 20: Review; MIDTERM EXAMINATION DISTRIBUTED

February 22: Exam in progress; no class

February 27, March 1: Vacation

March 6: Multiple regression assumptions

Reading: Kutner et al., pp. 26-27, 102-103; Fox, pp. 295-307; Recommended: Allison, pp. 119-134

March 8: Heteroskedasticity and weighted least squares

Reading: Kutner et al., pp. 132-134, 421-431

March 13, 15: Generalized least squares

Reading: Kutner et al., pp. 481-495

March 20: Polynomial regression

Reading: Kutner et al., pp. 294-305; Recommended: Allison, pp. 153-166

March 22, 27: An introduction to structural equation models

Reading: Asher, pp. 29-61

March 29, April 3, 5: Maximum likelihood estimation and logistic regression

Reading: Kutner et al., pp. 555-567, 570-582, 586-589, 608-618

April 10: An introduction to event-history analysis

Reading: Paul D. Allison, *Event History Analysis*, pp. 9-42

April 12: Review; FINAL EXAMINATION DISTRIBUTED

April 17: Final examination due.