

*SYLLABUS*

Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs. Please contact the Office for Disability Services at 614-292-3307 in room 150 Pomerene Hall to coordinate reasonable accommodations for students with documented disabilities. This and other course material is available in alternative formats upon request from the Sociology Undergraduate Student Services Office, Bricker Hall, 292-1175.

*Office Hours:* M 2:00 - 4:00 in 314 Bricker  
Th 3:30 - 5:00, and by appointment in 1010B Derby  
*Phone:* 688-3515 (*Bricker*) 688-3167 (*Derby*)  
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*Class Web Page:* <http://www.sociology.ohio-state.edu/classes/soc703/Kaufman/>

Course Content

This course builds upon the fundamentals of sociological data analysis of single equations represented by Ordinary Least Squares Regression, as taught in Sociology 649. The techniques of analysis covered in this course are appropriate for two situations frequently encountered in sociology and increasingly employed in the literature. First, the OLS assumptions of homoskedasticity and uncorrelated errors are often not appropriate. Examples include analyses of aggregated social units, of multiple social groups (subpopulations), of a time series for a single case, and of pooled time series and other "hierarchical" or nested data structures (e.g., contextual analyses of individual and structural levels). Error structures that are heteroskedastic and/or that are correlated across cases can be estimated using Generalized Least Squares principles. Second, many outcomes of interest are unordered categories which can be readily handled using logistic regression. One focus of this course is on the underlying assumptions and statistical principles of the techniques for treating these issues. A second focus is on learning computer applications, model selection and diagnostic procedures, and the appropriate interpretation of results.

## Course Goals

1. An understanding of matrix algebra sufficient for reading comprehension.
2. Appreciating the problems of using OLS regression for heteroskedastic or correlated errors.
3. Learning the statistical theory of Generalized Least Squares regression and the situations in sociological research for which its use is appropriate.
4. Knowledge of the functional form of the error structure appropriate for the most common and useful situations encountered in sociological analyses.
5. The ability to apply and discuss GLS regression results as you would in professional papers.
6. Understanding the consequences of using OLS regression for categorical dependent variables.
7. Learning the statistical theory of logistic regression and the appropriate cases for its use.
8. The ability to apply and discuss logistic regression results as you would in professional papers.
9. An ability to do logistic and generalized least squares analyses using STATA software.

## Textbooks and Readings

*Basic Math for Social Scientists. Concepts.* Timothy M. Hagle. **Optional**  
*Basic Math for Social Scientists. Problems and Solutions.* Timothy M. Hagle. **Optional**  
*Time Series Analysis*, 2nd edition. Charles W. Ostrom. **Required**  
*Logistic Regression: A Primer.* Fred C. Pampel **Required**

There is also a packet available from UniPrint, Tuttle Park Place with selected journal articles, chapters from textbooks, etc. Several readings and a quick guide to using STATA are not included in the reading packet because they are available over the web; web access locations (mainly *JSTOR*) are provided below.

## Evaluation

1. There will be six assignments. Three "hand-work" assignments will cumulatively be worth 15% of your grade. These require calculations and minimal interpretation and write-up. Three computer application assignments are each worth 15% of your grade. These entail a computer application, interpreting results, and a demonstration of understanding basic statistical principles. I believe that cooperation is the basis of good learning, and I encourage you to work together on assignments. *But you will learn more if everyone first tries it independently and then works together to solve problems and discuss questions.* **Each student must write up their own assignment individually and turn in, as relevant to the assignment, their own handwork, syntax, and output.**
2. There will be a take-home final examination which counts for 40% of your grade. The content of the examination will encompass the range of topics covered during the course and will require both computer application(s) as well as more thought-oriented and conceptual questions. *The exam is exclusively a test of individual work and you are not permitted to work together.*
3. All written *text* materials must be typed, double-spaced (with the minor exception of text written out in the handwork assignments). Those parts which are tables, calculations, formulas, and such-like may be hand-written but they must be neat and easily legible. *Always keep a copy of everything you turn in.*

**COURSE OUTLINE:** *All dates are tentative and subject to change.*

**1. Review, Background, and Matrix Algebra**

**Mar 25 - Apr 8**

Hagle, *Concepts*. Chapter 1, 2 (skim), 3 (especially 3.1& 3.3), 4 (skim), 6.1- 6.3 (skim 6.2). Parallel chapters in *Problems and Solutions* for examples to work on.

Pampel, pp. 40-45 on "Maximum Likelihood Estimation" and pp. 74-82 on "Logarithms".

Pindyck, Robert S. and Daniel L. Rubinfeld, p. 19-40 on "Elementary Statistics: A Review" (*Econometric Models & Economic Forecasts*, 3rd edition, 1991, NY: McGraw Hill).

Gujarati, Damodar N., pp. 658-665, "Rudiments of Matrix Algebra" (*Basic Econometrics*, 2nd edition, 1988, NY: McGraw Hill).

Kurt Schmidheiny (Université de Lausanne, HEC, Switzerland) *A Quick Guide to Stata 8 for Windows*. **Not in the reading packet, download from**  
[http://www.hec.unil.ch/mbrulhar/SEA2/KS\\_Stataguide\\_310.pdf](http://www.hec.unil.ch/mbrulhar/SEA2/KS_Stataguide_310.pdf)

**Assignment 1 (HAND WORK) due on or about Wednesday April 9.**

**Assignment 2 (HAND WORK) due on or about Thursday April 17.**

**2. OLS Regression & Principles of Generalized Least Squares**

**Apr 8 - Apr 17**

Gujarati, Damodar N., pp. 246-257 "The Matrix Approach to Linear Regression Model" (*Basic Econometrics*, 2nd edition, 1988, NY: McGraw Hill).

Hanushek, Eric A. and John E. Jackson, **ONLY** pp. 141-148 & 176-178 "Generalized Least Squares" (*Statistical Methods for Social Scientists*, 1976, NY: Academic).

**Assignment 3 (HAND WORK) due on or about Thursday April 24.**

### 3. Applications of GLS

Apr 17 - May 20

Hanushek and Jackson, *remainder*, pp. 149-175

#### a. Heteroskedasticity

Apr 17 - Apr 24

McClendon, McKee J., pp. 174-189 "Detection and Correction of Heteroskedasticity" (*Multiple Regression and Causal Analysis*, 1994, Itasca IL: F. E. Peacock)

Johnston, Jack and John DiNardo, pp. 162-174, "Heteroskedasticity" (*Econometric Methods*, 4th Edition, 1997, NY: McGraw-Hill).

Long, J. Scott and Laurie H. Ervin. 2000. "Using Heteroscedasticity Consistent Standard Errors in the Linear Regression Model." *The American Statistician* 54:217-224. **Not in the reading packet, download from class web page or from [http://www.indiana.edu/~jslsoc/research\\_hccm.htm](http://www.indiana.edu/~jslsoc/research_hccm.htm) .**

Kaufman, Robert L. 2002. "Assessing Alternative Perspectives on Race and Sex Employment Segregation". *American Sociological Review* 67:547-572. (See pp. 557-558 and Table 2 for a discussion of heteroskedasticity and diagnostic testing.) **Not in the reading packet, download from JSTOR at <http://www.jstor.org/> .**

**Assignment 4 due on or about Monday May 5.**

#### b. Time Series

Apr 29 - May 6

Ostrom, *Time Series Analysis*, pp. 1-42, 50-52, 58-72, 90.

Wallace, Michael. 1987. "Dying for Coal: The Struggle for Health and Safety Conditions in American Coal Mining 1930-82." *Social Forces* 66: 336-364. (See pp. 350-351 & footnote 13 for a discussion of GLS/AR2 modeling and diagnostics). **Not in the reading packet, download from JSTOR at <http://www.jstor.org/> .**

**Assignment 5 due on or about Thursday May 15.**

c. ***Nested Data Structures: Pooled Cross Sections & Contextual Analyses***  
**May 8- May 20**

Stimson, James A. 1985. "Regression in Space and Time: A Statistical Essay." *American Journal of Political Science* 29: 914-947. **Read** pp. 914-933, *skim* rest. **Not in the reading packet, download from JSTOR at <http://www.jstor.org/> .**

Johnston, Jack and John DiNardo, pp. 388-404, "Panel Data" (*Econometric Methods*, 4th Edition, 1997, NY: McGraw-Hill).

Quillian, Lincoln. 1996. "Group Threat and Regional Change in Attitudes toward African-Americans." *American Journal of Sociology* 102: 816-860. (Pp. 835-838 detail the model as a 2 component random effects model). **Not in the reading packet, download from JSTOR at <http://www.jstor.org/> .**

Kaufman, Robert L. 2002. "Assessing Alternative Perspectives on Race and Sex Employment Segregation". *American Sociological Review* 67:547-572. (See pp. 557-558 and Table 2 for a discussion of REM and diagnostic testing.) **Not in the reading packet, download from JSTOR at <http://www.jstor.org/> .**

Alderson, Arthur S. 1997. "Globalization and Deindustrialization: Direct Investment and the Decline of Manufacturing Employment in 17 OECD Nations." *Journal of World-Systems Research* 3: 1 - 34. (See pp. 20-22 for a discussion of FEM and REM and diagnostic testing in pooled time-series). **Not in the reading packet, download from JWSR website at <http://jwsr.ucr.edu/archive/vol3/v3n1a1.php> .**

**Optional (for strong advocacy of fixed-effects models)** Halaby Charles N. 2004. "Panel Models in Sociological Research: Theory into Practice." *Annual Review of Sociology* 30: 507-544. **Not in the reading packet, download from Annual Reviews at <http://arjournals.annualreviews.org/doi/abs/10.1146/annurev.soc.30.012703.110629>**

**Assignment 6 due on or about Wednesday May 28.**

#### **4. Logistic Regression**

**May 20 - May 29**

Pampel, *Logistic Regression: A Primer*. Read all (skim pp. 54-68 on Probit).

Long, J. Scott. 1997. Chapter 3: "Binary Outcomes: The Linear Probability, Probit and Logit Models". Pp. 34-84 (skip/skim sections 3.3 and 3.6) in *Regression Models for Categorical and Limited Dependent Variables*. Thousand Oaks, CA: Sage.

Kaufman, Robert L. 1996. "Comparing Effects in Dichotomous Logistic Regression: A Variety of Standardized Coefficients". *Social Science Quarterly* 77: 90-109. This is in the reading packet but a somewhat fuzzy version is also downloadable thru the SocIndex site accessible from the OSU Library's Electronic Journal Collection <http://library.ohio-state.edu/record=e1000451>.

**REVIEW Monday June 2 Time/place TBA.**

**TAKE HOME FINAL EXAM: Handed out Tuesday May 29. Two questions due Wednesday June 4 by 5:00 pm, third one due Thursday June 5 by 5:00 pm.**

***TENTATIVE SCHEDULE OF TOPICS AND LECTURES IN BRIEF***

- Mar 25 Overview types of techniques, Start Math/Stat Review
- 27 Finish Math/Stat review. Start Maximum likelihood estimation.
- April 1 Finish Maximum Likelihood. Using STATA (Example).
- 3 Start Matrix Algebra.
- 8 Finish Matrix Algebra (common matrices). Start OLS in Matrix Form.  
**Asg 1 Due Wed 4/9**
- 10 Finish OLS Assumptions, Violations, Consequences.
- 15 Start GLS Assumptions, Theory & Principles
- 17 Finish GLS Principles (Buse's  $R^2$ , EGLS vs. GLS vs. Correcting OLS).  
Heteroskedasticity Assumptions, Common Forms. Start Tests & Diagnostics.  
**Asg 2 Due 4/17**
- 22 Finish Tests and Diagnostics for Heteroskedasticity. Start  
Estimation Application
- 24 Finish Application. White's, HC3 & Omega OLS corrections. **Asg 3 Due 4/24**
- 29 Time Series Assumptions. Start Tests & Diagnostics.
- May 1 Finish tests & diagnostics. Estimation methods.  
**Asg 4 Due Mon 5/5**
- 6 Estimation Application. Newey-West & Omega OLS correction, logged variables
- 8 Nested Data Structures. Issues, Assumptions, Fixed and Random Effects Models
- 13 Tests & Diagnostics. Two-way Models.
- 15 Estimation Application. Cluster/Robust OLS Correction & Extensions.  
**Asg 5 Due 5/15**
- 20 Finish Multi-level extension. OLS with Dummy Dep var. Problems. GLS,  
Logistic, and Probit Solutions.
- 22 Logit Model Selection & Testing. Basic Interpretation
- 27 Finish Interpretation, Standardized coefficients. Start Application Example.  
**Asg 6 due Wed 5/28**
- 29 Finish Example. Quick Look at Multinomial Logistic & Extensions. Evaluation.  
**Hand-out take-home final exam questions 5/29**

**REVIEW Monday June 2, Place/Time TBA.**

**TAKE HOME FINAL EXAM: Two questions due Wed June 4, third due Thurs June 5 .**