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Washington University in St. Louis  
Department of Political Science

**PS 581. Quantitative Political Methodology I**

Spring 2012  
Tu 10:00-12:00  
Seigle Hall 106

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**Instructor**

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Office hours: M 13:30-15:00

## Introduction

The first course in the methods sequence at Washington University introduces the linear regression model as a fundamental tool in political analysis. The course underscores applications with the kind of data that are likely to be encountered in applied research. We will cover the assumptions that underlie the linear regression model, issues of estimation and inference, and methods used to diagnose and correct gross violations of linear regression assumptions, mostly relying on **R** to carry out computations. My expectation is that at the end of the semester you should be savvy readers of published research and tasteful users of linear models.

## Requirements and Evaluation

Aside from the obvious requirements—class attendance, punctuality, and reading ahead in preparation for lectures—you are required to work on twelve problem sets. Many of these sets come directly from suggested exercises in Faraway's textbook (see below), but I will supplement them with applications in Political Science. I expect to include a varied mix of applied and theoretical exercises. Problem sets account for 70% of the course grade. I will distribute problem sets every Tuesday, and will expect to receive *hard copies* of your homework by Tuesday the week after, *prior* to class. In

addition, I expect you to email me a Sweave copy of your assignment simultaneously. Late assignments *will not* be accepted. I have scheduled a midterm exam for March 22 and a final take-home exam during the reading period. Each of these counts for 15% of the grade. Given that assignments should be turned at regularly scheduled dates, and given that the midterm and final exams also have a date fixed and known *ex ante*, I do not allow ‘incompletes’ in this class.

## Readings

Avail yourself of a copy of Julian J. Faraway’s *Linear Models with R* (Chapman & Hall/CRC, 2005). Data and errata are available at <http://www.maths.bath.ac.uk/~jjf23/LMR>. In R, make sure to upload the `faraway` library to access data and examples. You should also upload John Fox’s `car` library.

We will complement Faraway’s textbook with selected articles available at Jstor. Some of the following texts (listed loosely in increasing order of mathematical sophistication) might prove useful in understanding, and/or expanding upon, the materials presented in class. Indeed, I will resort to some of these in preparing lectures:

Alan Agresti and Barbara Finlay, *Statistical Methods for the Social Sciences*, Prentice Hall, 3rd. ed., 1997.

Damodar Gujarati, *Basic Econometrics*, McGraw-Hill/Irwin, 4th. ed., 2002.

Peter Kennedy, *A Guide to Econometrics*, MIT Press, 5th ed., 2003.

Jan Kmenta, *Elements of Econometrics*, University of Michigan, 1986.

David A. Freedman, *Statistical Models. Theory and Practice*, Cambridge University Press, 2005.

Paul A. Ruud, *An Introduction to Classical Econometric Theory*, Oxford University Press, 2000. Kmenta

A. Colin Cameron and Pravin K. Trivedi, *Microeconometrics. Methods and Applications*, Cambridge University Press, 2005.

William H. Greene, *Econometric Analysis*, Prentice Hall, 5th. ed., 2002.

## Software

We will use statistical software extensively in this class. There is a wide variety of statistical packages that can help you fit models and calculate statistics, but for the purposes of this class you will invest in learning R, an open-source implementation of the programming environment and statistical software S. R is an extremely flexible object-oriented language, but since it is not menu-driven it has a steeper learning curve than canned software such as SPSS or Stata. R can be downloaded for free for Windows, Macintosh, and Linux operating systems from <http://www.r-project.org> (make sure to download the latest version.) The R manual is available online

at the same address. The texts by Venables and Ripley (2002), Fox (2002), and Daalgard (2002) provide useful introductions, but you should find Faraway (2005) to be sufficient for all course matters.

## Course Schedule

Date	Main topic	Readings	Hwk
1/17	Overview	F Ch.1, App. A and B	1
1/24	OLS–Introduction	K Ch.7 (203–222)	2
1/31	OLS–Multiple regression	K Ch.10 (392–399)	3
2/7	Gauss-Markov theorem	F Sect.2.1-2.6, 2.9 K Ch.7 (222-231) K Ch.10 (399-409)	4
2/14	Hypothesis testing	F Ch.3, Gill 1999 K Ch.7 (231–251) K Ch. 10 (409–422; 426–430)	5
2/21	Goodness of fit	F Sect.2.7-2.8, 3.1-3.3	6
2/28	Anova	F Ch.13 and 14, Brambor 2006	
3/6	Midterm exam		7
3/20	Influential data	F Chs.4 and 7 K Ch.10 (422–426)	8
3/27	Heteroskedasticity	F Ch.6	9
4/3	Serial correlation	F Ch.6, Clarke 2005	10
4/10	Model misspecification	K Ch. 10 (430–455)	11
4/17	Principal components	F Chs.5 and 9	12
4/24	Logit/Probit	Fox 1997, Ch.15	

K=Kmenta, F=Faraway

## Other references

- Thomas Brambor, William R. Clark, Matt Golder, “Understanding Interaction Models: Improving Empirical Analyses”, *Political Analysis*, 14, pp. 63-82, 2006.
- Kevin A. Clarke, “The Phantom Menace: Omitted Variable Bias in Econometric Research”, *Conflict Management and Peace Science*, 22, 2005, pp. 341-352.
- John Fox, *Applied Regression, Analysis, Linear Models, and Related Methods*. Sage Publications, 1997.
- Jeff Gill, “The Insignificance of Null Hypothesis Significance Testing”, *Political Research Quarterly*, 52 (3), 1999, 647-674.