

**PSC 8102: EMPIRICAL POLITICAL ANALYSIS – LINEAR REGRESSION**  
**Department of Political Science, George Washington University**

Semester: Spring 2012  
Time: Wednesdays, 6:10-8:00pm  
Location: Monroe B35

Professor Brandon Bartels  
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Office hours: Open-door policy for graduate students

**COURSE DESCRIPTION**

In this course, you will master the elements of linear regression (aka, ordinary least squares [OLS], least squares regression). The course will also expose you to broader issues in political methodology including: modes of inference and estimation, recognizing which types of methods are appropriate for different types of data structures, making tight connections between theory and methods, hypothesis testing and statistical inference, issues in measuring political concepts, and model specification. The basic course sequence is as follows:

- I. Statistical inference and preliminaries for linear regression
- II. Scalar approach to regression
- III. Matrix approach to regression
- IV. Issues in model specification
- V. Regression diagnostics and remedies

**COURSE PREREQUISITE(S)**

PSC 8101 or equivalent.

**REQUIRED TEXT**

The following book is required for the course. I will not place an order for this book through the University bookstore. You'll be much better off purchasing the book online.

Fox, John. 1997. *Applied Regression Analysis, Linear Models, and Related Methods*. Thousand Oaks, CA: Sage. ISBN-10: 080394540X.

**SOFTWARE**

We'll rely on Stata (preferably version 10 and after).

**LEARNING OUTCOMES**

As a result of completing this course, students will:

1. Possess a comprehensive understanding of the methodological issues surrounding regression models.
2. Be prudent methodological consumers and practitioners when it comes to interpreting and applying regression models.

3. Be able to write a paper or dissertation chapter—using regression methods—capable of being published in a professional journal.

## GRADING

Students are expected to complete all of the assigned readings and to attend each class. Course grades will be based on the following:

**1. Problem Sets (300 points):** Three problem sets (100 points each) will constitute half of your grade. Each problem set will require you to demonstrate your understanding of the material and the ability to make appropriate interpretations. The due dates, also noted in the Course Schedule section of the syllabus, are as follows:

**Problem Set 1:** Wednesday, February 15

**Problem Set 2:** Wednesday, March 21

**Problem Set 3:** Wednesday, April 18

Two important notes:

- All problem sets will be due at *the beginning of class* on the day they are due. *I will not accept late problem sets.* Also, these are in-depth, intense assignments, so you will not want to wait until the last minute to start them. I strongly suggest working on the assignments progressively as we get through the relevant material.
- Feel free to work with your classmates on the problem sets. Collaboration can be beneficial for mastering the material. However, *you must do your own work.* That is, while you can work together, *the final product that you hand in must be your own work.*

**2. Midterm Exam (150 points):** *Wednesday, March 7*

**3. Final Exam (150 points):** Due on **Friday, May 11**. This will resemble a problem set in that it will be on material covered after Problem Set 3. But it will also cover additional topics addressing some of the course's broader themes.

## ACADEMIC INTEGRITY

I personally support the GW Code of Academic Integrity. It states: "Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information." For the remainder of the code, see: <http://www.gwu.edu/~ntegrity/code.html>

## SUPPORT FOR STUDENTS OUTSIDE THE CLASSROOM

### *DISABILITY SUPPORT SERVICES (DSS)*

Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in the Marvin Center, Suite 242, to establish eligibility and to coordinate reasonable accommodations. For additional information please refer to: <http://gwired.gwu.edu/dss/>

### *UNIVERSITY COUNSELING CENTER (UCC) 202-994-5300*

The University Counseling Center (UCC) offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include:

- crisis and emergency mental health consultations
- confidential assessment, counseling services (individual and small group), and referrals  
<http://gwired.gwu.edu/counsel/CounselingServices/AcademicSupportServices>

## SECURITY

In the case of an emergency, if at all possible, the class should shelter in place. If the building that the class is in is affected, follow the evacuation procedures for the building. After evacuation, seek shelter at a predetermined rendezvous location.

## SCHEDULE

- I. *Statistical inference and preliminaries for linear regression*** – Fox, Ch. 1-3
  - a. Statistical inference and political methodology [1/18]
  - b. Data structures, levels of measurement, and relationships [1/18]
  - c. Descriptive representations of relationships – graphing [1/18]
  
- II. *Scalar approach to regression*** – Fox, Ch. 5-6
  - a. Simple regression and the method of ordinary least squares (OLS): Assumptions, estimation, and properties of the OLS estimator [1/25]
  - b. Simple regression: Interpretation, inference and hypothesis testing [2/1]
  - c. Simple regression: Goodness of fit [2/1]
  - d. Multiple regression: Assumptions and estimation [2/8]
  - e. Multiple regression: Interpretation, inference, hypothesis testing, and goodness of fit [2/8]

**\*\* Problem Set 1 due Wed, 2/15**
  
- III. *Matrix approach to regression*** – Fox, Ch. 9
  - a. Reviewing matrix algebra [2/15]
  - b. Deriving the OLS estimator using matrix algebra [2/15, 2/22]
  - c. Inference, properties, etc. [2/29]

**\*\* Midterm Exam: Wed, 3/7**  
**\*\* No class on March 14 (Spring Break)**
  
- IV. *Issues in model specification***
  - a. Nonlinearity and data transformation – Fox, Ch. 4 & pp. 309-318 [3/21]
  - b. Dummy variables – Fox, Ch. 7 (7.1 & 7.2) [3/21]

**\*\* Problem Set 2 due Wed, 3/21**

  - c. Interaction terms – Fox, Ch. 7 (7.3) [3/28, 4/4]
  - d. Specification error; omitted variable bias – Fox, pp. 237-238 [4/11]
  
- V. *Regression diagnostics and remedies***
  - a. Outliers and influential data – Fox, Ch. 11 [4/11]
  - b. Heteroskedasticity – Fox, Ch. 12 [4/11]

**\*\* Problem Set 3 due Wed, 4/18**

  - c. Nonnormality – Fox, Ch. 12 [4/18]

- d. Multicollinearity – Fox, Ch. 13 [4/18]
- e. Autocorrelation – Fox, Ch. 14 (14.1) [4/25]
- f. Measurement error – Fox, pp. 130-132 [4/25]
- g. Endogeneity and simultaneity bias – Fox, pp. 235-237 [4/25]

**\*\* Final Exam due on Friday, May 11**