

**PSC 531**  
**INTERMEDIATE GRADUATE STATISTICS**

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Park Hall 513  
Office Hours: M 12:30-2:30  
and by appointment

Course Webpage: [www.buffalo.edu/~mbenson2/PSC531.htm](http://www.buffalo.edu/~mbenson2/PSC531.htm)

**Course Description**

The primary goal of this course is to provide you with both a theoretical and working knowledge of multivariate statistical analysis using ordinary least squares (OLS) and maximum likelihood estimation (MLE) techniques. By the end of the class you should be able to understand and analyze many of the statistics used in political science journals and to apply these statistics to your own work. The majority of the classes will be divided into a theoretical, lecture component and a practical, computer lab component. Your grade will be based on three in-class exams, a quiz, several homework assignments, and a final research paper.

The course is divided into three separate sections. The first of these deals with OLS regression. After a brief review of some basic statistical concepts (PSC 508 is a pre-requisite for this course) the course will move on to the two variable regression model and then to the multivariate model. The second section of the course will focus on the assumptions we make when we use OLS regression. In short, what happens when we violate key assumptions of the statistical model and how do researchers address these problems. The final section of the course will introduce you to regression on categorical dependent variables using MLE techniques.

Please note that due to the individual nature of each class and its pace of comprehension, the syllabus serves only as a temporal guideline. Readings may be occasionally assigned earlier, later, or (very rarely) deleted. In addition, I will occasionally suggest that you read journal articles with specific examples of the statistics used in this course.

**Required Books:**

This is a very expensive course. I have no problem with you sharing books if you are an MA student. However, if you are a PhD student or are expecting to be a PhD student these texts will, without a doubt, be necessary for completion of your dissertation.

Gujarati, Damodar N. *Basic Econometrics, 4<sup>th</sup> Edition*. New York, NY: Mc Graw Hill.  
(available on [www.amazon.com](http://www.amazon.com))

Hamilton, Lawrence C. *Statistics with Stata*

Long, J. Scott. *Regression Models for Categorical and Limited Dependent Variables*.

Long, J. Scott and Jeremy Freese. *Regression Models for Categorical Dependent Variables Using Stata*.

(the above three books are available in the *Stata* bookstore only on [www.stata.com](http://www.stata.com)).

## Required Materials

Scientific Calculator

USB memory stick

A relatively recent version of *Stata* (Also available in the Park Hall computer lab)

You will also find it extraordinarily helpful to have your own computer/laptop and your own copy of *Stata* for this course.

## Requirements and policies

1) *Regular class attendance and participation.* (10%)

First is the expectation that you will be properly prepared to participate in class discussion every day. This means that you will have completed the assigned readings *before* each class, attend class regularly, and be on time for class. Absences from class will substantially reduce the “attendance and participation” component of your grade. I will ask questions of all of you during class pertaining to the readings, my lectures, and our discussions. In class exercises will also contribute to this portion of your grade. Participation is especially important in the statistical lab portion of the test.

2) *Math Quiz* (5%)

2) *3 Assignments* (15%) Late assignments will not be accepted.

3) *3 Exams* (45%) There are no make-ups for exams.

4) *Research Paper* (25%)

(late papers will be penalized 1/3 of a letter grade for every 12 hours after the due date time).

## Office Hours

My Office Hours are listed above and I can be available at other times by appointment. Please see me when problems develop rather than wait until they become intractable.

## Extensions and Incompletes

Regular progress towards a graduate degree is severely impeded when past assignments hang over one's head. Incompletes and extensions are not an entitlement. In the event that a serious problem emerges that you feel necessitates an incomplete, you must speak with me before the due date regarding this request.

## Using Data

The homework assignments and research paper will require the use of real data. Each of you is responsible for acquiring this data by him/herself. We will discuss where and how to obtain this data during the first few classes, however, you should start looking *immediately* at journal articles that interest you to get an idea about some possible data sources. The final responsibility for finding a workable data set (i.e., a data set with dependent variables at the necessary level of measurement, with adequate independent variables, etc.) rests with you and you alone. In addition, you may have to combine one or more data sets to be able to test your hypothesis proposed in your final paper. Finding data is often a long and arduous process with false starts. Consequently, you should plan on spending a lot of time finding the data that is relevant to your research paper.

## INTRODUCTION

### **January 22<sup>nd</sup>: Basic Math & Statistics Review**

#### **Introduction to Stata**

Gujarati: Appendix A

Hamilton: Ch 1

If you do not have Gujarati on this date do not worry. You will still have enough information for the quiz from class notes, reviewing Wannacott and Wannacott and (if necessary) by examining the plethora of math and beginning statistics reviews available at various locations on-line. However, you will need Gujarati before the second day of class.

## PART 1: BIVARIATE AND MULTIVARIATE REGRESSION

### **January 26<sup>th</sup>: Bivariate Regression**

**Basic Math and Statistics Quiz** at the beginning of class

Gujarati: Ch. 1-2

Long: Chapter 2

Hamilton: Ch. 2

### **January 29<sup>th</sup>: Bivariate Regression, Estimation & Extensions**

Gujarati: Ch. 3-4 (pp. 52-110), Ch. 5-6.

Hamilton: Ch 3-4

### **February 5<sup>th</sup>: Mutivariate Regression and Transformations**

Gujarati: Ch 7, Ch 8

Hamilton: Ch. 6

Assignment #1 due today at the beginning of class.

**February 9<sup>th</sup>: FIRST EXAM** (The first exam will cover Gujarati Chapters 1-8 and Hamilton Chapters 2, 3, 4, and 6.)

<b>PART 2: DUMMY VARIABLES AND VIOLATING THE ASSUMPTIONS</b>
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**February 12<sup>th</sup>: Multivariate Regression Inference and Modeling**

Gujarati: Chs. 13, 14, 15

Hamilton: Ch. 6-7

**February 19<sup>th</sup> : Multicollinearity and Heteroskedasticity**

Review Pages 435-440 in Wannacott & Wannacott

Gujarati: Ch. 10-11,

Hamilton: Ch. 7-8

Theory and hypothesis for research paper due at the beginning of class.

**February 23<sup>rd</sup>: Autocorrelation**

Gujarati: Ch. 12

Descriptive statistics for research paper due at the beginning of class.

Assignment #2 due at the beginning of class.

**February 26<sup>th</sup>: Stata Lab Day (bring your laptop if you have one)**

Data Management

Summary Statistics for at least one relevant variable due at the beginning of class.

**March 5<sup>th</sup>: SECOND EXAM** (The Second Exam will cover Gujarati Chapters 10-15 and Hamilton Chapters 6-8)

## PART 3: MAXIMUM LIKELIHOOD

### **March 9<sup>th</sup>: Introduction to Maximum Likelihood, Logit and Probit Models (Dichotomous DV's)**

Long: Chapters 1-4

Long and Freese: Chapters 1 and 2 (please read all of the assigned L & F chapters very carefully as you will be tested extensively on this material)

### **March 19<sup>th</sup>: Ordered Logit and Multinomial Logit (Ordinal and Nominal DV's)**

Long: Chapters 5-6

Long and Freese: Chapters 3 and 4

### **March 26<sup>th</sup>: Count Outcomes**

Long: Chapter 8

Long and Freese: Chapter 5, 6, 7

Initial Results for research paper due at the beginning of class.

Assignment #3 due at the beginning of class.

### **March 30<sup>th</sup>: First Half of Class:**

Presentation of final research paper results (12 minute presentation by each student followed by a question/discussion period by the professor and students.)

### **Time permitting: Maximum Likelihood: some issues with prediction**

Long and Freese: Review all previous chapters carefully

Long and Freese: Chapter 7

**April 2<sup>nd</sup>: THIRD EXAM** (This exam will cover Long Chapters 1-6, 8 and Long and Freese Chapters 1-7.)

**April 6<sup>th</sup>: RESEARCH PAPER DUE** (with .log files including highlighted final results) at 9:30 at my office (513 Park Hall) or e-mailed to me at [mbenson2@buffalo.edu](mailto:mbenson2@buffalo.edu).