University of Maryland
Department of Criminology and Criminal Justice

CCJS 621
General Linear Models in Criminal Justice Research

Spring 2019

Time and Place:
Class: Mondays, 4:00 – 6:45 PM, Room 0121 Frances Scott Key Hall
Discussion Session: To be determined.

Instructor:
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Course Prerequisites: Prior exposure to statistics at the level of CCJS 620. Familiarity with personal computers and the BSOS computing lab will be assumed. Assistance with Stata will be provided within the context of the class.

Required Texts:
Wooldridge, Jeffrey M., Introductory Econometrics A Modern Approach, 6th ed., Cengage Learning (pdf available on ELMS).

Supplemental Texts:

Kennedy, Peter. A Guide to Econometrics, 5th ed., The MIT Press.
The previous text, Pindyck and Rubenfeld is out of print; however, the lectures are based on that book. It might be helpful to get your hands on a copy. The last page of this syllabus provides the sections associated with each topic.

Course Objectives: This course is an in-depth exploration of applied linear regression analysis. Linear regression analysis and inferential statistics, more generally, are based on the desire to get estimates of the relationship between two or more variables. We would like these estimates to have certain desirable characteristics, such as unbiasedness and efficiency (or at least consistency). In the classical linear regression model, coefficient estimates have these characteristics in order to

make certain rigorous assumptions about the causal relationship being modeled and the data being used. It is possible to prove this using algebra in the bivariate case and matrix algebra in the more general multivariate case. When these assumptions are violated, it is sometimes possible to provide "fixes." The validity of these fixes is also subject to mathematical proof.

On the simplest level, the study of econometrics involves learning how to apply the various techniques on the computer and interpret the results. While this is necessary and sufficient in some cases, it often leaves the student unable to handle all but the simplest of situations. Therefore, as a general rule it is a good idea to go to the next level, which involves understanding the theoretical issues involved in the basic model using the simplest possible case, the bivariate model, as well as at least a passing understanding of the more general model with matrix algebra. It is the opinion of this department that some fluency with the theoretical issues using simple algebra, familiarity with the general model using matrix algebra, and fluency with the computer application of multivariate regressions and the probit/logit models is the minimum required knowledge for completion of a master's degree in criminology and criminal justice.

Course Requirements: Your grades will be based on your performance on periodic homework assignments, one project, and two examinations, according to the weighting listed below. The exams will be open notes and open book, and they will be strictly limited to 2 hours and 45 minutes.

You may cooperate on homework assignments; however, each student must turn in a separate assignment, and each student is responsible for the content of that assignment. To receive full credit, you must show all of your work and include your Stata output.

The project can be a preliminary analysis of the dataset chosen as part of your master's thesis proposal. The project will be completed in three stages and will be peer reviewed.

The exams will tend to concentrate on theory. The homework and project will tend to concentrate on application. The final exam will focus on the material since the midterm exam. However, understanding of this material will require you to integrate knowledge from the earlier part of the course.

All homework assignments are to be handed in at 4 pm of the date due. Late homework assignments will be docked 20% of the total points each day they are late. For example, a paper handed in on Wednesday will lose 40 points out of 100 before it is graded.

15%, Homework

25%, Project

60%, Two Exams (each exam 30%)

Grade Distribution:

A+	98% - 100%	B-	80% - 81%	D	62% - 67%
A	92% - 97%	C+	78% - 79%	D-	60% - 61%
A-	90% - 91%	C	72% - 77%	F	Less than 60
B+	88% - 89%	C-	70% - 71%		
B	82% - 87%	D+	68% - 69%		

In Class Expectation:
I expect all students to:

a) Attend class regularly.
b) Read the assigned material before class.
c) Ask for clarification when I confuse you.
d) Be prepared to answer and ask questions during class. We all learn better when we discuss the material instead of just listening to me talk.
e) Attend weekly discussion.
f) Come to office hours if you need assistance or if you just want to chat.

Optional Activity: Because I believe that a large barrier to understanding this material is fear, I am planning an informal activity every first Monday after class. You are all invited to meet Michelle and I around 7:15 for food and conversation at Nando's PERi-PERi.

Academic Integrity: People suspected of violating the university guidelines on academic integrity will be notified of my concern and then dealt with according to the official printed policy of the University of Maryland.

Students with Disabilities: If you have a documented physical or learning disability, I am willing to make the necessary accommodations. Please contact me by February 19, 2018 so that we can discuss these accommodations.

Religious Observances: The University of Maryland policy on religious observance states that students should not be penalized in any way for participation in religious observances and that, whenever feasible, they should be allowed to makeup academic assignments that are missed due to such absences. However, the student must personally hand the instructor a written notification of the projected absence within two weeks of the start of the semester. The request should not include travel time.

Explanation of Required Paper:

Each student will complete a project which demonstrates knowledge of the methods learned in class. This paper may take the form of an empirical section "attached" to a thesis proposal or the actual thesis using pre-existing data. **The class introduction will provide an overview of how to download data from ICPSR.** Thus, the intention is that you will actually work with the data that you intend to use in your thesis. Of course, this might prove impossible. For example, those of you who are collecting your own data will need to find another related dataset to analyze. It is also possible that the dataset might be very large and complicated. It is appropriate to use a small subset

of the data, or a related, more accessible dataset. The point of the project is not to finish your thesis, but rather to get you started, and give you some practice working with data within the context of a problem.

The due dates for each segment are listed below.

PART 1 (due February 18)
2 page double-spaced description of the data including a short description of the problem, a theoretical justification of the hypothesized relationship, identification of the data source, current status of data (e.g., downloaded, in the mail, etc.), an enumeration of the sample (number of observations), a description of the strengths and weaknesses of the sample relative to the problem at hand, and a list of the relevant variables including their measurement units. **Be sure to delineate your unit of analysis and your conceptual independent and dependent variables.** The dependent variable can be either continuous or binary and you should have a minimum of 30 observations. The problem should be stated in terms of causality where you are interested in the causal impact of ONE independent factor on ONE dependent variable, while keeping in mind that your analysis will fall short of establishing causality.

PART 2 (due March 25)
4 page double-spaced written description of the data. Tables and figures should be attached at the end of the document and Tables should be made in Word—not just pasted output. As a guide, look at tables in Criminology. The emphasis should be on qualitatively describing the relationship between 2 key variables using tables and graphs, but should also include exploration of the other independent variables to identify possible problems in the regression. For example, high correlation between the independent variables will lead to problems with multicolinearity, and skew in the dependent variable could lead to non-normal error terms. There should NOT be any regression output in this part of the project. This version will be shared with an anonymous peer reviewer who will provide comments in addition to my comments (please exclude your name from your uploaded file). Be sure to start with a brief description of the problem you are addressing, the theoretical motivation for hypothesis, and a brief introduction to the data. This is especially important if you change your project topic from part 1 and because the outside reviewer will not be familiar with your topic. (Peer reviews are due on April 1)

PART 3 (due April 29)
6-8 page (double spaced) written description (with attached tables) of a multivariate regression with hypothesis test(s) on the variable(s) of interest. In addition, tests on the assumptions should be performed in relation to the estimate for the primary independent variable and addressed if there is a problem. Furthermore, model diagnostics should be performed in order to determine if your findings are driven by any outliers. Finally, a written description of ways to improve the analysis with alternative methods should be included. If your dependent variable is dichotomous, this is the section where you will describe your logit or probit model. The econometric reasoning for each approach should be made explicit. As always, be sure to introduce your problem and explain the nature of the data.

Weekly Outline:

Class	Date	Topic	Reading
1	1/28	Class Introduction and review of random variables, estimators, probability distributions, hypothesis testing, & confidence intervals	
2	2/4	Model assumptions, properties of regression estimators, inference, analysis of variance **Nando's PERi-PERi**	Ch. 2 (skim 2-4)
3	2/13	Assumptions, estimation, statistics, and tests	Ch. 3 (skim 3-3)
4	2/18	Continued from above **PROJECT, PART I IS DUE**	Same as above
5	2/25	Matrix algebra	handout
6	3/4	Multicolinearity, standardized coefficients, variations on functional form, and hypothesis testing **Nando's PERi-PERi**	2-4, Ch. 4, Ch. 6
7	3/11	**MIDTERM EXAM**	
	3/18	**SPRING BREAK**	
8	3/25	Dummy variables, piecewise regression **PROJECT, PART II IS DUE (NO NAMES)**	7-1 to 7-4
9	4/1	Violations: heteroscedasticity, specification error, and serial correlation **PROJECT PART II PEER REVIEWS ARE DUE** **Nando's PERi-PERi**	Ch. 8, 3-3, 9-1, 12-1 to 12-3
10	4/8	Continued from above	Same as above
11	4/15	A brief introduction to time series and regression diagnostics	Ch. 10-1, 10-2, 11-1, 9-5c
12	4/22	Introduction to qualitative dependent variables (logit/probit/Tobit)	7-5, 17-1
14	4/29	Continued from above	Same as above
15	5/6	Project Presentations **PROJECT, PART III IS DUE** **Nando's PERi-PERi**	
16	5/13	Project Presentations	
	5/20	**FINAL EXAM**	

NOTE: This syllabus provides a general plan for the course; deviations may be necessary.

Pindyck and Rubinfeld Topics and Pages:

Topic	Reading
Class Introduction and review of random variables, estimators, probability distributions, hypothesis testing, & confidence intervals	2.1-2.5, A2.1
Model assumptions, properties of regression estimators, inference, analysis of variance	1, 3
Assumptions, estimation, statistics, and tests	4.1-4.3, A4.1, A4.2
Multicolinearity, standardized coefficients, variations on functional form, and hypothesis testing	4.4, 4.5, 5.1, 5.3
Dummy variables, piecewise regression	5.2, 5.4, A5.1
Violations: heteroscedasticity, specification error, and serial correlation	6.1, 7.1-7.3, 6.2
A brief introduction to time series and regression diagnostics	Handout and 7.4