**POS-5746, Quantitative Analysis**, Spring 2007
Thursday, 9:30 – 12:15, Room 113 BEL

Instructor: William Berry, Room 547 BEL, Tel: 644-7321, Office Hours: Tues. 12:45 – 1:45 pm, Thur. 8:15 – 9:15 am. e-mail: wberry@fsu.edu. You may also try calling me at home (222-8203) any day between 8 am and 9 pm.

Assistant: Joe Young, Room 550 BEL, Tel: 644-7311, Office Hours: Mon. & Wed. 9:30-11:30 am. email: jkyoung@mailer.fsu.edu.

This course is the third in a four-course empirical methods sequence in the Political Science Department. The primary focus will be on regression analysis. We will examine this technique, its assumptions, and the consequences of violating these assumptions in actual empirical research. This approach will prompt us to examine measurement error, specification error, multicollinearity, heteroscedasticity, nonlinearity and nonadditivity. We will also devote some attention to the extension of regression techniques to the multi-equation context (through consideration of recursive causal models).

The class sessions for this seminar will involve two different types of formats. The first of these will be the traditional lecture format, in which I will present material to the class about some technique or research problem. The second format will be – for lack of a better word – a "workshop."

For these workshops, two types of readings will be assigned:

(1) basic readings -- which discuss the general nature of a technique or a problem -- and

(2) applications -- actual political science studies using the technique or dealing with the problem. Some of these are offered as good examples of research, while others are illustrations of "what not to do."

I expect the typical workshop to unfold as follows. I will start class by answering any questions you might have about the "basic readings" assigned for that week. Then, for the rest of seminar session, (i) we will discuss the assigned "applications" -- their strengths and weaknesses, (ii) I will present other political science illustrations, (iii) we may go over parts of the written exercises you will have worked on the week before, and (iv) we will work on other exercises together.

Clearly, for this "workshop" approach "to work" for you, you must thoroughly understand the basic reading assigned for each week. Without such understanding, it will be impossible for you to apply the techniques and approaches we learn about in the workshop sessions. I expect that for nearly all of you, this understanding will require at least two times through the "basic readings;" I also expect that for many of you, this might even involve THREE or FOUR readings. To allow you to go through the readings several times if necessary, I have purposely kept the number of pages of basic reading assigned low.

Furthermore, for nearly all of you – and for myself – adequate preparation for these workshops will require (as distasteful as it may sound) some memorization!!! The basic readings will typically present some formulas, and some basic statements about the proper way in which a particular statistical coefficient is to be interpreted. In order to be able to forge ahead in the workshops and make this time useful, we will all need to know these formulas and coefficient interpretations (especially the interpretations) before starting the workshops. And sadly, for must of us -- again, including me -- these formulas and interpretations are not always intuitively obvious; they often simply must be memorized.

If you do the "basic reading" prior to a workshop, and find yourself totally confused, please do not wait to the workshop session to ask questions to clear up the confusion; instead, see me as soon as possible. Hopefully, we can settle the confusion before class, so you can get something out of the workshop.

Also, while I happen to believe that the core textbook for this course -- a book by Gujarati -- is the most "user-friendly" of the econometrics texts on the market, there are several other econometrics books that offer lucid treatments of topics similar to those presented by Gujarati. In sections below entitled parallel readings, I offer a list of comparable treatments in other econometrics texts. If after multiple readings of the assigned material, a particular

topic remains unclear, it might be worthwhile to review some of these parallel readings to see the topic developed from a slightly different perspective.

I do hope these workshops "work." I'm convinced from past experience that we need to go through the applications and exercises to make the material of the course sink in. But unless we can master the basic readings on our own, so that I don't have to go over them in class, there simply will not be the time to go through the applications and exercises.

A Few Final Comments:

(1) A sure-cut way to make life miserable for you and me is to delay attempting to master the course material until the end of the semester. Unlike many "substantive" seminars, you cannot delay your work until the last few weeks in the semester and expect the course to "come together." The material for the course is (to use an overused – but very accurate – expression) cumulative; if you don't master the material on a week by week basis; it won't come together at the end. I know you've heard this before, but for this class it's true!

(2) You need to be very attentive throughout the course to the proper language for describing quantitative research findings. It is not enough to read the material, say to yourself "this makes sense," and turn attention to something else. You need to know the material well enough to be able to discuss it and write about it using the standard language for communication. So, when reading, be very careful to note the precise phrasing and sentence structure used by the authors.

Required Texts (all are on sale at the university bookstore):

1. Michael Lewis-Beck, Applied Regression: An Introduction (Sage).
2. Damodar N. Gujarati, Basic Econometrics, 4th. ed. (McGraw-Hill).
3. William Berry and Stanley Feldman, Multiple Regression in Practice (Sage).
4. William Berry, Understanding Regression Assumptions (Sage).
5. Edward Carmines and Richard Zeller, Reliability and Validity Assessment (Sage).

Most other required readings for the course are in articles that can be accessed on line from JSTOR or from eJournals at the FSU Library web site. The remaining required readings are on reserve at a location identified by the instructor.

Other Econometrics Textbooks (for Parallel Readings)

Hanushek and Jackson, Statistical Methods for Social Scientists, 1977, Academic Press.
Johnson, Johnson & Buse, Econometrics: Basic & Applied, 1987, MacMillan.
Kelejian and Oates, Introduction to Econometrics, 3rd edit., 1989. Harper & Row.
Kmenta, Elements of Econometrics, 2nd. edit., 1986, MacMillan.
Maddala, Introduction to Econometrics, 2nd edit., 1992, MacMillan.
Neter, Wasserman and Kutner, Applied Linear Regression Models, 1989, Irwin.
Wonnacott and Wonnacott, Econometrics, 2nd. edition, 1979, Wiley.
Woolridge, Introductory Econometrics, 2nd edition, 2003, Thomson.
Ramanathan, Introductory Econometrics with Applications, 5th edition, 2002, Thomson.

Course Requirements: You are expected to read all books and articles assigned except those designated as "supplementary readings" or "parallel readings." In addition to the reading assignments, students are expected to complete the following requirements:

(1) an in-class midterm exam and a 4-hour final exam. Both exams will have both a closed-book component (testing your understanding of basic concepts), and an open-book portion (covering more specialized topics).

(2) brief written exercises relating to the topics of the course (to be assigned some weeks). These exercises will not be graded; but I would encourage you to turn in the exercises for me to correct. To take advantage of this offer to correct your exercises, I ask that you fulfill two conditions: (i) you complete the exercises by the

date assigned, and (ii) if several of you work on a problem together, turn in only one copy of your answer, so I don't have to correct the same answer more than once.

(3) a paper relying on multiple regression analysis.

(i) For political science students, this will be an extension of the research design paper you wrote for Methods I in the fall, and you will continue to work with the same faculty supervisor you worked with last semester. Your final grade on this assignment will be an unweighted average of a score assigned by your faculty supervisor and a score assigned by me.

(ii) For students in other departments, you will work solely with me on the paper.

For all students, the paper should include the following

(a) A presentation of several hypotheses about the causal relationships among a set of theoretical concepts, and at least a minimal theoretical justification for the hypotheses. [As the instructor for POS 5746, I am not interested in an extensive literature review or an elaborate theoretical argument. I need to see just enough discussion and citations to literature to show me that you have thought about the hypotheses and can justify that they are plausible. Students outside of political science may confine themselves to this minimal presentation. Political science students will need to have more elaborate presentations that satisfy their faculty supervisor, since they are supposed to produce a first-year research paper, and not just an assignment for this class. When I grade papers written by political science students, I will give less weight to this section of the paper than to sections c, d and e.

(b) A discussion of the indicators used to measure the concepts in the hypotheses, and a brief defense of the appropriateness of the indicators as measures of the theoretical concepts. Students outside of political science may confine themselves to this minimal presentation. Political science students will need to have more elaborate presentations that satisfy their faculty supervisor. When I grade papers written by political science students, I will give less weight to this section of the paper than to sections c, d and e.

(c) A specification of a regression model incorporating the indicators of the concepts in your hypotheses, and predictions about the values that the coefficients of the model should take on if your hypotheses are true.

(d) The statistical results obtained by applying regression to a sample of data. [I do not want you to report and interpret every single coefficient from the computer output. Report (and give a substantive interpretation of) only those coefficients that you believe are important for interpreting the statistical results to test your hypotheses, and conveying substantive conclusions to readers.]

(e) An evaluation of the appropriateness of your regression technique for your data set. [What (if any) assumptions of the technique are violated when the technique is used with your data? What are the implications of violating these assumptions? What, if anything, can be done to overcome the resulting problems?] As part of this, you should consider whether data constraints forced the exclusion of some variables from your model. If so, you should discuss as specifically as possible the impact of such specification errors on your statistical results.

**I strongly recommend that you turn in a draft of parts a, b and c of your paper -- along with a brief description of the sources of your data – by no later than March 1.** (Political science students must check with their faculty supervisor to see if they want to see this draft of the paper.) I will make comments on this draft that you may wish to take into account in preparing your final draft. **The final draft of the entire paper is due by Noon on Monday, April 23.** (Political science students must check with their faculty supervisor to arrange a due date acceptable to that individual.)

Turn in to me – along with your completed paper – the final computer output(s) that generated the

statistical results you report. [Please number the pages of your output.] However, do not refer to the computer output in your paper; construct your own tables of statistical coefficients to refer to in the body of your paper.

While the major determinant of the length of your paper should be the length of space required to adequately discuss the topics called for, I expect that most students outside of political science who write good papers will end up with 12 to 15 double-spaced pages plus tables and any figures. Political students will require longer papers (20 – 30 pages) to accommodate the more extensive treatments of theoretical and measurement issues required as part of the expectation for the first-year research paper.

Political science students will be required to present their first-year papers to the full department toward the end of the semester in a half-hour time slot. Specific days and times will be determined later. Students should make an oral presentation of about 10 minutes, leaving 15-20 minutes for questions and answers.

(4) class participation & preparation (especially during the workshop sections). Preparation grades will be based on occasional pop quizzes on fundamental concepts in the course.

Grading: Requirements will be weighted as follows to determine your final grade:

final exam .....….32.5%
paper .....32.5%
midterm exam .....25.0%
class participation and preparation.....10.0%

Students intending to pursue a Ph.D. in the Department of Political Science should be aware of the Department's policy regarding performance in this course: "Students are required to achieve a grade of B or higher in [POS 5746]. Students receiving a B- in [the course] are permitted to continue in the sequence, but are required to retake the course at its next availability. Students receiving a grade of C+ or lower are required to retake the course before taking any other course in the equence, except POS 5750" (Graduate Handbook).

Policy on Missed Exams: Students are expected to take exams on the dates specified. Excused absences from exams will be treated differently than unexcused absences. Absences are "excused" only when a student (1) misses an exam as a result of a family or medical emergency [or some other reason acceptable to the instructor], (2) notifies the instructor in a timely fashion of the reason for the absence, and (3) provides documentation of the emergency conditions when requested by the instructor. When the reason for the absence is predictable earlier than one week before the exam, "a timely fashion" means at least one week prior to the date of the exam. When the reason for an absence becomes predictable only during the last week before the exam, "a timely fashion" means by no later than the first working day after the absence becomes predictable. When the reason for the absence is not predictable until the day of the exam, "a timely fashion" means by no later than Noon on the day following the exam. Students notifying the instructor of a predictable or emergency absence shall make a reasonable effort to contact the instructor directly by telephoning or visiting his office and talking to him directly. If the instructor cannot be reached in person, students must leave a message on his answering machine or send an e-mail message explaining the circumstances and how the instructor can contact the student. If the student is physically incapable of contacting the instructor (e.g., because of illness), the student is responsible for making certain that a friend or relative contact the instructor instead. Any missed exam in which the student fails to meet all three conditions above is an "unexcused" absence. Students with an unexcused absence will receive a failing grade on the missed exam. In the case of excused absences, the instructor will either (i) use the average grade earned on all other exams as the grade for the missed exam, or (ii) require the student to take a make-up exam. If the instructor decides to require a make-up, he may give the student an exam identical to the exam he or she missed or one different but covering similar material. Furthermore, the form of the make-up exam (i.e., computational problems, essay, short answer) need not be the same as the form of the exam missed by the student, but will be an exam viewed by the instructor as being equally difficult. Any student missing an exam is not allowed to discuss the missed exam with any other individual until he or she has taken a make-up exam or been notified by the instructor that no make-up exam will be given.

Statement Concerning American Disabilities Act: Students with disabilities needing academic accommodations

should: (1) register with and provide documentation to the Student Disability Resource Center (SDRC); and (2) bring a letter to the instructor from SDRC indicating that the student needs academic accommodations. This must be done within the first week of class.

Reminder of the Academic Honor Code: The Academic Honor System of FSU "is based on the premise that each student has the responsibility (1) to uphold the highest standards of academic integrity in the student's own work, (2) to refuse to tolerate violations of academic integrity in the University community, and (3) to foster a high sense of integrity and social responsibility on the part of the University community." Students are expected to avoid all activities which would violate the honor code (as delineated in the FSU General Bulletin).

Policy on Plagiarism: Any student found to be guilty of plagiarism on any class assignment or exam will be given an F for the course. Furthermore, the instructor will notify appropriate University authorities of his finding of plagiarism.

Course Outline and Reading Assignments: In the following list, when an author is referred to without additional citation, I am referring to a reading the full citation of which is listed under the sections "Required Texts" or "Parallel Texts."

Abbreviations for journals are as follows:

AJPS = American Journal of Political Science
AJS = American Journal of Sociology
APSR = American Political Science Review
JP = Journal of Politics
PA = Political Analysis
PM = Political Methodology
SF = Social Forces
SMR = Sociological Methods and Research

## Background Concepts & Review of Statistics -- January 11

**Required Reading**
Gurarati, Appendix A.
[If some of the material in Appendix A was new, you should also read:
Gujarati, Essentials of Econometrics, chs. 2-4.]

## Review of the Bivariate Regression Model -- January 18

**Required Reading**
Lewis-Beck, pp. 9-38.
Gujarati, chs 2-5, pp. 164-75.
Berry, pp. 1-2.

Parallel Reading
Kmenta, ch. 7
Kelejian, ch. 2, sect. 3.1
Neter, chs. 2-4
Maddala, ch. 3.
Johnson, chs. 1-3
Woolridge, ch. 2.
Ramanathan, ch. 3.

## The Multivariate Regression Model -- January 25

**Required Reading**
Lewis-Beck, pp. 47-54, 63-66, 71-73.
Berry and Feldman, ch. 1.
Gujarati, pp. 202-23, 229-33 & ch. 8.
Berry, chs. 2-4, & pp. 22-24

Parallel Reading
Hanushek, chs. 2-3, sections 4.1-4.2.
Kmenta, sections 10-1 to 10-2
Kelejian, ch. 4
Neter, ch. 7, sections 8.1-8.4
Maddala, sections 4.1-4.8 & 4.10
Johnson, ch. 4
Woolridge, chs. 3-5.
Ramanathan, ch. 4.

## Multivariate Regression, cont'd / Dummy Independent Variables – February 1

**Required Reading**
Lewis-Beck, 66-71 [on dummies].
Gujarati, pp. 297-306 [on dummies].
Robert Stein, "The Allocation of Federal Aid Monies," APSR, 75 (June 1981): 334-343 (especially 334-40) [an application of regression] (**JSTOR**)
Tate, "Personal Attribute Models of the Voting Behavior of U.S. Supreme Court Justices, APSR, 75 (June 1981): 355-367 [another application] (**JSTOR**)

Parallel Readings (on dummy independent variables)
Hanushek, pp. 101-06.
Kmenta, pp. 460-67.
Kelejian, sect. 5.2
Neter, sect. 10.1
Maddala, sect. 8.2
Johnson, pp. 182-95.
Woolridge, pp. 218-31.
Ramanathan, ch. 7.

## Matrix Algebra & A Matrix Development of Regression -- February 8

**Required Reading**
Gujarati, Appendix B [on matrix algebra]
Gujarati, Appendix C [a matrix presentation of regression]

Parallel Readings
Hanushek, sect. 5.3 [on matrix algebra]
Neter, sections 6.9-6.13 [a matrix presentation of regression]
Wonnacott, sections 12-1 to 12-5 [a matrix presentation of regression]
Johnson, pp. 412-22 [a matrix presentation of regression]
Woolridge, Appendix D [on matrix algebra] and Appendix E [a matrix presentation of regression].

## WORKSHOP: Testing Contextual Hypotheses: Nonlinearity & Nonadditivity -- February 15

**Required Basic Reading**
Berry and Feldman, pp. 51-64.

Lewis-Beck, pp. 43-47.
Gujarati, pp. 175-93, 226-29, 317-19.

**Required Applications (Nonlinearity)**
Jackman, "On the Relationship of Economic Development to Democratic Performance," AJPS, 7 (August 1973): 611-21. (**JSTOR**)

Parallel Readings: Nonlinearity & Nonadditivity
Kelejian, sections 3.2 & 5.3
Hanushek, sect. 4.6, & pp. 106-08
Maddala, sect. 8.3
Netter, sections 10.2-10.3
Kmenta, pp. 468-73.
Johnson, pp. 195-98 & ch. 11
Woolridge, pp. 187-195, 232-39.
Ramanathan, ch. 6.

## WORKSHOP: Nonadditivity -- February 22

**Required Basic Reading**
Berry and Feldman, pp. 64-72.
Lewis-Beck, pp. 54-56.
Gujarati, pp. 223-26, 306-12.
Berry, pp. 60-66.
Friedrich, "In Defense of Multiplicative Terms in Multiple Regression Equations," AJPS (November 1982): 797-833. (**JSTOR**)
Brambor, Clark and Golder, "Understanding Interaction Models: Improving Empirical Analyses," PA (2006): 63-82. **(eJournals)**
**Required Applications**
Giles and Dantico, "Political Participation and Neighborhood Context Revisited," AJPS, 26 (Feb. 1982): 144-150. (**JSTOR**)

Supplementary Reading: Nonadditivity
Braumoeller, "Hypothesis Testing and Multiplicative Interaction Terms," International Organization (Fall 2004): 807-20.
Althauser, "Multicollinearity and Nonadditive Regression Models," in Blalock, Causal Models in the Social Sciences (Aldine), pp. 453-72.
Gerald Wright, Jr., "Linear Models for Evaluating Conditional Relationships," AJPS (May 1976): 349-73.

## WORKSHOP: Specification Error – March 1

**Required Reading**
Lewis-Beck, pp. 56-58.
Berry, 27-45.
Berry and Feldman, ch. 2.
Gujarati, pp. 215-17, 506-24.
Johnson, pp. 422-25 [a matrix approach]

Parallel Readings
Kmenta, pp. 442-49
Kelejian, sect. 6.4
Hanushek, sect. 4.5
Maddala, sect. 4.9
Johnson, ch. 13.
Wonnacott, pp. 414-15 [a matrix approach]

Supplementary Reading
John Deegan, "Consequences of Model Misspecification in Regression Analysis, Multivariate Behavioral Research (1976): 237-48.

## SPRING VACATION: NO CLASS -- March 8

## MIDTERM EXAM -- March 15 (Date Tentative) [covers material through **2/22**]

## WORKSHOP: Measurement Error and Reliability -- March 22

**Required Reading**
Carmines and Zeller, pp. 1-16, 29-32, 37-51.
Berry, pp. 49-60.
Berry and Feldman, ch. 3.
Gujarati, pp. 524-28.

Parallel Readings
Kmenta, sect. 9-1
Johnson, pp. 324-32.
Woolridge, section 9.3.

Supplementary Reading
Bohrnstedt and Carter, "Robustness in Regression Analysis," in Costner, Sociological Methodology (1971).
Blalock, Wells and Carter, "Statistical Estimation with Random Measurement Error," in Borgatta and Bohrnstedt, Sociological Methodology 1970, pp. 75-103.
Hubert Blalock, ed., Measurement in the Social Sciences, part II.

## WORKSHOP: Heteroscedasticity (and a bit on Autocorrelation) -- March 29

**Required Basic Reading**
Berry, 67-83.
Berry and Feldman, ch. 6.
Lewis-Beck, pp. 38-42.
Gujarati, ch. 11 & pp. 441-60.
Downs and Rocke, "Interpreting Heteroscedasticity," AJPS, 23 (Nov. 1979): 816-28. (**JSTOR**)
Wonnacott, pp. 431-35 [a matrix approach].

Parallel Reading
Kmenta, sect. 8-2
Kelejian, sect. 6-3.
Maddala, ch. 5
Johnson, pp. 292-307
Woolridge, chs. 8, 12.
Ramanathan, chs 8-9.

Supplementary Readings on Heteroscedasticity
Peter Lemieux, "Heteroscedasticity and Causal Inference in Political Research," PM, 3 (1976): 287-316.

## WORKSHOP: Multicollinearity – April 5

**Required Basic Reading**
Lewis-Beck, pp. 58-63.
Berry, pp. 24-27.
Berry and Feldman, ch. 4.
Gujarati, ch. 10.

Wonnacott, pp. 352-54 [a matrix approach]

**Required Applications**
Skim again the article by Stein, APSR, 75 (June 1981): 334-343. (**JSTOR**)

Parallel Readings
Kmenta, sect. 10-3
Kelejian, sect. 6.1
Neter, sect. 8.5
Hanushek, sect. 4.4
Maddala, ch. 7
Johnson, ch. 12
Ramanathan, ch. 5.

Supplementary Reading
Robert Gordon, "Issues in Multiple Regression," AJS (1968): 592-616.

## Recursive Causal Models and Path Analysis -- April 12

**Required Reading**
Asher (2nd ed), pp. 7-16, 30-50.
Vernon Greene, "An Algorithm for Total and Indirect Causal Effects," PM, 4 (1977): 369-82.

Supplementary Reading
Duncan, Introduction to Structural Equation Models, pp. 1-66.
Blalock, Theory Construction.

## WORKSHOP: Causal Models -- April 19

**Required Reading**
Michael Lewis-Beck, "The Relative Importance of Socioeconomic and Political Variables for Public Policy," APSR, 71 (June 1977): 559-566. (**JSTOR**)
Beck and Jennings, "Pathways to Participation," APSR (March 1982): 94-108. (**JSTOR**)

## FINAL EXAM – Tuesday, April 24, 8:00 am – 12:00