RUTGERS UNIVERSITY
Bloustein School of Planning and Public Policy

Course 34:970:630: Discrete Methods
Spring 2021

Class Meetings: Synchronous Meetings on Mondays 6:10 – 8:40 pm.

Professor: Radha Jagannathan
CSB Room 483
33 Livingston Ave, New Brunswick
Phone: 908-359-2631 (Cell)
Email: radha@rutgers.edu
Office Hours: Via Zoom: Mondays & Tuesdays 4:00 – 6:00 pm

Teaching Assistant: Pranay Kumar
Phone: (302)-290-7898
Email: pk480@scarletmail.rutgers.edu
Office Hours: Wednesdays: 4:30- 6.30 PM and Thursdays: 4:30-6.30 PM Via Zoom

---

Course Description

Many variables of interest to planners and policy makers are measured as categorical variables with two or several levels which may or may not be ordered. Traditional (OLS) methods are often unsuited for the analysis of such variables because many OLS regression assumptions can be violated when analyzing such categorical variables. Although we will start the course with forms of traditional OLS regression, a major part of the semester will be devoted on methods for analyzing categorical and limited dependent variables. While theoretical and statistical underpinnings of these methods will be discussed in class, emphasis will be on actual application of a variety of these statistical methods to issues and problems faced in the social/behavioral sciences. The usual class approach will be to discuss 1) the motivation for a particular statistical technique, 2) data and specification/ estimation of the statistical model, and 3) model assessment and interpretation of the results.

This course focuses on three of the "required components" under "Planning Skills" for the Planning Advisory Board (PAB) accreditation of planning schools:

- 2a – research: tools for assembling and analyzing ideas and information from prior practice and scholarship, and from primary and secondary sources.
- 2b – written, oral and graphic communication (ability to prepare clear, accurate and compelling text, graphics and maps for use in documents and presentations);

- 2c – quantitative and qualitative methods (data collection, analysis and modeling tools for forecasting, policy analysis, and design of projects and plans).

Learning Objectives

Specific course objectives include the following:

1. To introduce the student to a set of statistical techniques and software that will facilitate linear regression analysis and analysis of categorical and limited dependent variables.
2. To provide the student with hands-on experience using these statistical techniques.
3. To enable the student in conducting his/her own empirical analysis of a categorical/limited dependent variable and to use and evaluate the work of others.

Upon successful completion of the course, the student should gain a strong understanding of a) linear regression, b) binary and ordered logit and probit, and c) multinomial logit models. This will be accomplished through lectures, readings, class discussions, STATA lab work, completion of problem sets and a final project.

Course Requirements

1. Complete assigned reading
2. Complete 3 problem sets
3. Complete a midterm exam
4. Present final paper to class
5. Complete final paper

The Final Paper

For the final paper, students will be expected to complete a journal-length research paper (approximately 15-20 pages excluding tables and figures). Given the time constraints of the course, it is assumed that students will use a cleaned public use data set (examples include General Social Survey, Current Population Survey, American Housing Survey, the Census, etc.) that is accessible and of interest to the student. The data set must contain categorical variables that can be conceptually defended as outcome measures or dependent variables. Paper should follow APA guidelines, and contain at least a limited literature review. Use alternative methods when possible and compare results. For example, when analyzing a binary outcome, you can use the linear probability model, the logit model, and the probit model and compare and discuss results from each. Another example might be a contrast of multinomial, ordered and conditional logit models.

Detailed guidelines for the final paper appear on the last page of the syllabus.

Course Grade

Student's performance assessment in the course will be done as follows:

1. Three Problem Sets, all of which are linked to Learning Objectives 1, 2, and 3 will each carry 10 points for a total of 30 points.
2. A midterm exam that will test progress towards the achievement of Learning Objectives 1, 2, and 3 will carry 25 points.
3. Presentation of your final paper that will incorporate elements of all three Learning Objectives will be worth 10 points.
4. The final paper that will represent the culmination of all three Learning Objectives will carry 35 points.

Course grade scale

A (100-90), B+ (89-87), B (86-80), C+ (79-77), C (76-70), F (69-0).

Percentages in parentheses.

Course Pre-requisites

This course assumes that the student has theoretical and practical knowledge of multiple regression and that the student is familiar with a statistical software package. Students will be introduced to Stata in this course.

Texts

1. Regression Models for Categorical and Limited Dependent Variables (1997) by J. Scott Long. Thousand Oaks, CA: Sage. **[SL]**

2. Introduction to Econometrics (2015) by Stock and Watson. Addison Wesley. **[SW]**

3. Interpreting Probability Models: Logit, Probit, and Other Generalized Linear Models (1994) by T. F. Liao. Thousand Oaks, CA: Sage. **[Liao]**

Highly Recommended

4. Regression Models for Categorical Dependent Variables Using Stata (2014) by J. Scott Long and Jeremy Freese. Stata Press.

References

Other slightly more advanced books that discuss the topics in this course include:

1) Limited Dependent and Qualitative Variables in Econometrics (1983) by Madalla. Cambridge University Press.
2) A Guide to Econometrics (2003) by Peter Kennedy. MIT Press.

3) Econometric Analysis (1993) by Greene. Macmillan.

Readings: All are posted on Canvas course site

Camasso, M. J. and R. Jagannathan (2016). "The Future of the Family Cap: Fertility Effects in 18 Years Post-Implementation." *Social Service Review,* 90(2): 264-304.

Crowley, J., R. Jagannathan, and G. Falchettore (2012). " The Effect of Child Support Enforcement on Abortion in the United States." *Social Science Quarterly*, 93: 153-172.

Camasso, Michael J. and Radha Jagannathan (2001). "Flying Personal Planes: Modeling the Airport Choices of General Aviation Pilots Using Stated Preference Methodology." *Human Factors* 43:392-404.

Gennetian, L. A., Bos, J. M., and Morris, P. A. (2002). Using Instrumental Variable Analysis to Learn More from Social Policy Experiments. *MDRC Working Paper on Research Methodology*. New York, NY: Manpower Demonstration Research Corporation.

Hoffman, S. D., and G. J. Duncan (1988). "Multinomial and Conditional Logit Discrete-Choice Models in Demography." *Demography* 25:415-427.

Humphreys, K., C. S. Phibbs, and R. H. Moos (1996). "Addressing Self-selection Effects in Evaluations of Mutual Help Groups and Professional Mental Health Services: An Introduction to Two-stage Sample Selection Models." *Evaluation and Program Planning* 19(4): 301-308.

Jagannathan, R. (2001) "Relying on Surveys to Study Abortions: Some Cautionary Evidence." *American Journal of Public Health* 91(11):1825-1831.

Jagannathan, R., M. J. Camasso, and M. Killingsworth. (2004a). "Do Family Caps on Welfare Affect Births Among Welfare Recipients? Reconciling Efficacy and Effectiveness Estimates of Impact Through a Blended Design Strategy." *American Journal of Evaluation* 25:295-319.

Jagannathan, R., M.J. Camasso, and M. Killingsworth. (2004b) "New Jersey's Family Cap Experiment: Do Fertility Impacts Differ by Racial Density?" *Journal of Labor Economics* 22:(2): 315-346.

Jagannathan, R., Camasso, M. J. and McLanahan, S. (2005). "Welfare Reform and the Formation of No-parent Families: Pinpointing Affected Child Populations." *Social Science Quarterly* 86:1080-1103.

Jagannathan, R., M. J. Camasso and U. Sambamoorthi. (2010a). "Experimental Evidence of Welfare Reform Impact on Clinical Anxiety and Depression Levels Among Poor Women." *Social Science and Medicine*, 71(1):152-160.

Jagannathan, R., M. J. Camasso, and C. Harvey. (2010b). "The Price Effects of Family Caps on Fertility Decisions of Poor Women." *Journal of Social Service Research*, 36(4): 346-361.

Jagannathan, R., M. J. Camasso, M. Bagavandas, J. Tosun, and K. Sadagopan. (2017) "Family, Society, and the Individual: Determinants of Youth Entrepreneurship in South India." *Journal of Global Entrepreneurship Research*.

Soss, J., Schram, S.F., Vartanian, T., and O'Brien, E. (2001) Setting the Terms of Relief: Explaining State Policy Choices in the Devolution Revolution. *American Journal of Political Science*. 45:378-395.

Course Topic Outline

Week 1 January 25
The Linear Regression Model – A Review of simple regression, multiple regression, regression assumptions, and hypothesis testing
Read (**SW)** Chapters 2, 5-7.

Week 2 February 1
The Linear Regression Model – Regression assumptions in more detail
Read (**SW)** Chapters 5-6

Week 3 February 8 - (Problem set one posted – due 3/1)
The Linear Regression Model - Dealing with non-linearity on the right-hand side (the independent variables)
Read (**SW)** Chapter 8

Week 4 February 15
Regression and Issues of Internal and external validity
Read (**SW)** Chapter 9

Introduction to Stata

Week 5 February 22
Dealing with specification problems: Instrumental variables regression
Read (**SW)** Chapter 12
Read Gennetian, Bos and Morris (2002)
Read Jagannathan et al (2010b)

Week 6 March 1 (Problem set two posted – due 3/22)
Introduction to regression with panel data
Read (**SW)** Chapter 10
Read (Camasso & Jagannathan, 2009)
Read (Crowley et al., 2012)

Week 7 March 8
Binary Dependent Variable Analysis – Linear Probability Model (LPM)
Read (**Liao**). Chapter 3.

Introduction to Logistic Regression
Read (**SL**) Chapters 3 & 4

Week 8 March 15 SPRING BREAK - NO CLASS

Week 9 March 22
Binary Dependent Variable Analysis – Logistic Regression continued
Read (**Liao**) Chapter 3

Read (Jagannathan, 2001)

Week 10 March 29
Binary Dependent Variable Analysis – Probit Regression
Read Jagannathan, Camasso, Killingsworth (2004a)
Read Jagannathan, Camasso, McLanahan (2005)
Read Jagannathan et al. (2017)

Week 11 April 5 (Problem set 3 posted – due 4/19)
Binary Dependent Variable Analysis – Logit & Probit Regression (Contd..)
Read Jagannathan, Camasso, Killingsworth (2004b)
Read Jagannathan et al. (2010a)

Week 12 April 12 MIDTERM EXAM

Week 13 April 19
Polytomous (multi-category) Dependent Variable Analysis (Ordered Logit/Probit)
Read (**SL**) Chapter 5
Read (**Liao**) Chapter 5

Week 14 April 26
Polytomous (multi-category) Dependent Variable Analysis (Multinomial Logit and Conditional Logit)
Read (**SL**) Chapter 6
Read (**Liao**) Chapter 6
Read Camasso et al. (2004)
Read Camasso & Jagannathan (2001)
Read Hoffman & Duncan (1988)

Week 15 May 3
Class Presentation of final paper

MAY 10 Final paper due

Guidelines for writing the final paper

The final paper should be 15-20 pages in length, typed and double spaced. Tables and Figures should be attached as separate pages. The paper should contain the following components – other components can be added as the student views necessary:

1. Title Page – lists paper title, author's name, date submitted, acknowledgements.

2. Introduction/Problem Statement – In one-two pages tell the reader why you are doing this research? Why is it important? Here you establish what focal variable relationship you are interested in and what others have said about this issue.
   3 points

3. Theoretical Framework – Here you describe the theoretical guidance for your empirical analysis. For example, the rational choice theory is often used to guide empirical analysis of marriage, crime, childbearing, etc. Any hypotheses that you have generated from the theory specified should be stated here. Have others led you to these hypotheses?
   2.5 points

4. Research Design – The focus here is how the observations have been collected. That is, were observations collected through a randomized experiment or an observational study? Are the data cross-sectional, longitudinal (time series or panel)?
   2.5 points

5. Data and Measures – Describe the sample, data sources, key variables, how variables are measured, and distributions of respondents on these variables. Use tables to show descriptive statistics (counts, means, standard deviations, minimum, maximum, etc.) for these key variables. The reader needs to know who you are studying, what specifically about the respondents you are studying, and what variability exists.
   5 points

6. Analytic Strategy – Tell the reader what statistical procedures you are using, the rationale for the use of such procedures, and any assumptions you are making about the procedures and the data. You should pay special attention to this component of the paper since it forms the crux of the course.
   10 points

7. Results – Describe what you have found. Tables/Figures are very important here.
   10 points

8. Discussion and Conclusions – Describe how this research has advanced our knowledge of your focal variable relationship. Have any hypotheses been rejected (accepted)? Why do you think your results are what they are? Did they

confirm (deny) what others have found? Any research limitations? Any suggested further research?
2 points

9. Attach Relevant Output as Attachment 1