ECO5427 - Limited Dependent Variable Models Summer 2019
Professor Zuehlke

Course Description

Most Limited Dependent Variable (LDV) models may be characterized as classical regression models subject to incomplete information about the dependent variable. The available information may be purely qualitative in nature, or it may be a mixture of qualitative and quantitative information. Given the structure that limits observation of the dependent variable, the appropriate likelihood function is determined, and estimates are obtained by the method of Maximum Likelihood (ML). The ML estimators typically require solution of a system of non-linear implicit functions. Students are expected to go from "chalkboard to keyboard." A progressive sequence of models is presented, giving students experience working through each stage of a problem, from determination of the likelihood function and score equations, to application of the computational methods necessary to obtain estimates.

Course Objectives

At course completion, a successful student will:

- understand the implications of incomplete observation of the dependent variable for least-squares estimation.
- be able to determine the appropriate log-likelihood function for various forms of incomplete observation.
- be able to program the appropriate ML estimator, apply it to data, and interpret the results.

Textbook

G.S. Maddala, Limited Dependent and Qualitative Variables in Econometrics, Cambridge University Press, 1983, New York.

Software

The computer homework for this course is written for *Octave*. There are two reasons for this choice. First, *Octave* is basically an open source version of *Matlab*. Virtually anything written for *Matlab* will work in *Octave*, and vice versa. Second, in terms of flexibility and accuracy, matrix programming languages like *Octave*, *Matlab*, *Gauss*, and *R* are the best packages available for the estimation of LDV models.

Homework

Homework assignments based on class notes will be distributed approximately every three weeks. These assignments should help you organize your notes and prepare for exams. Computer homework will also be assigned. The computer homework form an integral part of the course and should not be neglected. They are the link between theory and practice.

Research Paper

A research paper will be assigned to give students practical experience with LDV models. The paper will be a topic of your choice, subject to my approval. A proposal of not more than 3 pages is due on 28 June. The final paper of not more than 15 pages is due on 2 August. The research paper will be one-third of your course grade.

Exams

There will be 2 exams, each having a take-home component and an in-class component. The take-home component may include some computer application. Each exam will be one-third of your course grade. The dates of the exams are:

Exam 1 - Friday, 14 June
Exam 2 - Friday, 19 July

Office Hours

Office hours are Monday, Wednesday, and Friday from 1:30-2:30 in Bellamy 253A. You may also schedule an appointment at a mutually convenient time. Office hours are reserved for students, so do not hesitate to spend as much time as you need getting help. You may telephone me at 644-5001. This is the central number for the Department of Economics. They can transfer your call, and will take a message if I am not available.

Course Mailing List

You may access the course mailing list through the *Blackboard* web site. Any mail sent to the mailing list is forwarded to me and to every student registered for the course. Private matters may be directed to my personal account, and will be kept confidential. Be forewarned, however, that if you send questions about course material to my personal account, I will often respond through the course mailing list. I generally respond to e-mail promptly; even on weekends.

Course Web Page

There is a course web page at the URL http://mailer.fsu.edu/~tzuehlke. I will use this page to post exams, homework, and any other material you may need for the course.

Academic Integrity

The academic honor system of The Florida State University 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. The penalties for violation of this code are found in the Student Conduct Code (FAC 6C2-3.04) of the Florida State University Student Handbook.

ADA Statement

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

Reading List

Textbooks

Takeshi Amemiya, Advanced Econometrics, Harvard University Press, 1985, Cambridge.

A. Colin Cameron and Pravin K. Trivedi, Microeconometrics: Methods and Applications, Cambridge University Press, 2005, New York.

Morris H. DeGroot and Mark J. Schervish, Probability and Statistics, 3rd Edition, Addison-Wesley, 2002, Boston.

Bernard W. Lindgren, Statistical Theory, 3rd Edition, MacMillan, 1976, New York.

J. Scott Long, Regression Models for Categorical and Limited Dependent Variables, Sage Publications, 1995, Thousand Oaks.

G.S. Maddala, Limited Dependent and Qualitative Variables in Econometrics, Cambridge University Press, 1983, New York.

Topics

1. Maximum Likelihood Estimation
    a. Cameron and Trivedi (5)
    b. Amemiya (4.2)
    c. Lindgren (4.5, 5.2)
    d. DeGroot and Schervish (6.5, 6.6)

2. Numerical Optimization
    a. Cameron and Trivedi (10)
    b. Amemiya (4.4)
    c. Long (3.6)

3. Bivariate and Conditional Normals
    a. DeGroot and Schervish (5.12)
    b. Lindgren (10.2.1)

4. Moments of Censored Normal
    a. Maddala (Appendix)
    b. Cameron and Trivedi (16.3.4, 16.10.1)

5. Binary Choice Models
    a. Amemiya (9.1, 9.2)
    b. Cameron and Trivedi (14)
    c. Long (3)
    d. Maddala (2)

6. Tobit Models
    a. Amemiya (10.1-10.4)
    b. Cameron and Trivedi (16.1-16.4)
    c. Long (7)
    d. Maddala (6.1-6.5)
    e. Olsen, Randall J. (1978), “Note on the Uniqueness of the Maximum Likelihood Estimator for the Tobit Model,” *Econometrica* 46, 1211-1215.
    f. Zuehlke, Thomas W. (2003), “Estimation of a Tobit Model with Unknown Censoring Threshold,” *Applied Economics* 35, 1163-1169.

7. Selection Models
    a. Amemiya (10.7,10.8)
    b. Cameron and Trivedi (16.5)
    c. Maddala (8.4, 9.1, 9.2)
    d. Olsen, Randall J. (1980), “A Least-Squares Correction for Selectivity Bias,” *Econometrica* 48, 1815-1820.
    e. Olsen, Randall J. (1982), "Distributional Tests for Selectivity Bias and a More Robust Likelihood Estimator," *International Economic Review* 23, 223-240.
    f. Zuehlke, Thomas W. and Allen R. Zeman (1991), "A Comparison of Two-Stage Estimators of Censored Regression Models," *Review of Economics and Statistics* 73, 185-188.
    g. Zuehlke, Thomas W. (1996), "Identification by Non-Linearity in Censored Regression Models," *Journal of Statistical Computation and Simulation* 54, 289-304.
    h. Zuehlke, Thomas W. (2017), "Use of Quadratic Terms in Type II Tobit Models," *Applied Economics* 49, No 17, 1706-1714.

8. Weibull Hazard Models
    a. Lancaster, Tony (1979), “Econometric Methods for the Duration of Unemployment,” *Econometrica* 47, 939-956.
    b. Zuehlke, Thomas W. (2013), "Estimation and Testing of Nonproportional Weibull Hazard Models," *Applied Economics* 45: 2059-2066.