

## DSCI 922 - ADVANCED REGRESSION

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The prerequisites are a basic knowledge of calculus, statistics, and linear algebra. For example, a sufficient background would be Math 121 or 124 and Business Statistics courses, 920 and 921.

The following seven books will be useful:

Davidson & MacKinnon, *ECONOMETRIC THEORY & METHODS*, Oxford University Press  
Greene, *ECONOMETRIC ANALYSIS* (McGraw-Hill)  
Judge, et al., *INTRODUCTION TO THEORY & PRACTICE OF ECONOMETRICS*, (Wiley)  
Judge, et al., *THE THEORY AND PRACTICE OF ECONOMETRICS* (Wiley)  
Johnston, *ECONOMETRIC METHODS*, (McGraw-Hill)  
Maddala, *ECONOMETRICS*, (McGraw-Hill)  
Schmidt, *ECONOMETRICS*, (Marcel Dekker)

In addition, occasional references will be made to:

Theil, *PRINCIPLES OF ECONOMETRICS* (Wiley)  
Kmenta, *ELEMENTS OF ECONOMETRICS* (Macmillan)  
Dhrymes, *ECONOMETRICS* (Harper and Row)  
Dhrymes, *INTRODUCTORY ECONOMETRICS* (Springer-Verlag)

**If you choose to buy one book, I recommend Davidson & MacKinnon.**

**These books will be made available. The next pages provide a course outline with sources.**

### Objective of Course

This course gives students experience in conducting empirical research using regression analysis, with applications in business research. It covers the basic body of knowledge necessary to understand how to apply regression analysis. The focus is on understanding the theory, so that students can apply the theory to analyze data that suffer from problems which make classical Ordinary Least Squares (OLS) regression inappropriate. This course differs from the typical econometrics course by its emphasis on analyzing market data to test hypotheses in business research. Students are required to analyze a number of different datasets throughout the course, to gain experience in analyzing business data that are characterized by violations of the ideal conditions behind OLS. Upon completion of this course, students will have worked with data to identify and address problems such as autocorrelated errors, multicollinearity, heteroskedasticity, endogeneity, seemingly unrelated regressions, and panel data.

“I hear and I forget, I see and I remember, I do and I understand.” Confucius

### Course Grading

Your grade will be determined from take-home exams and case studies that involve data analysis. The exams will involve applying the theory discussed in class to solve problems and establish your understanding of concepts & issues. The case studies will involve scrutinizing and manipulating data sets that I provide, to identify and address data problems germane to the course material and to gain experience applying the methodologies discussed in class. You will write up your results for each case study in the form of a short paper (2 pages, maximum) that you will "submit" to me for review. I encourage all students to interact and share your thoughts on these take-home exams and case studies. I also expect each student to write each take-home exam and perform the data analyses her- or himself, and submit his or her own individual papers. Class participation is expected. Note that it is the quality and not simply the frequency of participation that is important.

Course Documents are available at: <http://finpko.faculty.ku.edu/myssi/index.php?dir=FIN922/>.

Course Outline:

This course should progress through section 3 below, plus a few topics from sections 4 & 5.

0. Matrix Algebra Review
1. Statistical Review
2. Regression Under Ideal Conditions
3. Non-Ideal Conditions and Related Topics
  - a. Restrictions
  - b. Non-normal Disturbances
  - c. Multicollinearity
  - d. Non-Zero Mean
  - e. Generalized Least Squares
  - f. Heteroskedasticity
  - g. Autocorrelation
  - h. Robust Estimation of  $\text{Cov}(\beta)$
  - i. Stochastic Regressors
  - j. Seemingly Unrelated Regressions
4. Simultaneous Equation Models
  - a. Introduction
  - b. Identification
  - c. Single Equation Estimators (ILS, 2SLS, LIML, etc.)
  - d. Systems Estimators (3SLS, FIML, etc.)
  - e. Comparisons of Estimators
  - f. Recursive Models
  - g. Reduced Form Estimation
  - h. Dynamic Models
  - i. Autocorrelation in Simultaneous Equation Models
  - j. Oversize Model Problem
5. Miscellaneous Topics
  - a. Distributed Lags
  - b. Qualitative Variables, Discrete and Limited Dependent Variables
  - c. Panel Data; Pooling Cross-Section and Time-Series Data
  - d. Ridge Regression and Stein Rule Estimators
  - e. Non-Linear Models
  - f. Model Choice
  - g. Rational Expectations Models
  - h. Time-Series Models (Stationarity, Unit Roots, Cointegration, ARMA, ARCH, GARCH)
  - i. Bayesian Methods
  - j. Causality Tests and Other Specification Error Tests
  - k. Disequilibrium Models and Switching Regressions
  - l. Random Coefficients
  - m. Unobservable Variables

## Reading List

Journal abbreviations in this list are as follows:

ECON = Econometrica; JEC = Journal of Econometrics; IER = International Economic Review;  
 JASA = Journal of the American Statistical Association; JRSS = Journal of the Royal Statistical Society;  
 AESM = Annals of Economic and Social Measurement; RESTAT = Review of Economics and Statistics;  
 RESTUD = Review of Economic Studies.

Topic numbers correspond to those in the course outline.

0. Chiang, Fundamental Methods of Mathematical Economics, Ch. 4-5; Davidson and MacKinnon, Ch. 1, Section 1.4; Johnston, Ch. 4; Theil, Ch. 1.
2. Davidson and MacKinnon, Ch. 1, Section 1.6, Chs. 2 and 3; Schmidt, appendix; Kmenta, Ch. 1-6; Theil, Ch. 2.
3. Schmidt, Ch. 1; Theil, 3.1-3.7; Johnston, Ch. 1-3, 5.1-5.5.
- 3A. Davidson and MacKinnon, Ch. 4; Kmenta, 11.2; Judge, Ch. 3.
- 3B. Kmenta, Introduction to Ch. 8; Judge, Ch. 7; Maddala, 13.9-13.10; Schmidt, 2.4.
- 3C. Schmidt, 2.3; Johnston, 5.7, 11.1; Judge, Ch. 12; Maddala, 10.1-10.2.
- 3D. Schmidt, 12.2; Maddala, 9.5-9.6; Kmenta, 10.4.
- 3E. Davidson and MacKinnon, Ch. 7; Johnston, 7.1-7.2; Schmidt, 2.5; Theil 6.1; 8.6.
- 3F. Davidson and MacKinnon, Ch. 5, Section 5.5, Ch. 7, Section 7.5; Judge, Ch. 5; Johnston, Ch. 8; Maddala, 12.5-12.8.
- 3G. Davidson and MacKinnon, Ch. 6, Sections 6.1, 6.6, Ch. 7, Sections 7.6-7.9; Judge, Ch. 4; Johnston, 7.3; Maddala, 12.2-12.4, Kmenta, 8.1.
- 3H. Davidson and MacKinnon, Ch. 8; Greene, Ch. 10.
- 3I. Schmidt, Ch. 3; Kmenta, 8.3; Maddala, 9.4; 13.1-13.8; Theil, 8.7, 12.2; Johnston, Ch. 9, 10.3.
- 3J. Davidson and MacKinnon, Ch. 12, Sections 12.1-12.2; Schmidt, 2.6; Judge, Ch. 6; Theil, 7.1-7.3.
- 4A. Theil, 9.1-9.3; Johnston, 12.1; Schmidt, 4.1-4.3.

- 4B. Schmidt, 4.4; Theil, 9.4; 10.2; Johnston, Ch. 12.
- 4C. Davidson and MacKinnon, Ch. 8, Section 8.3; Schmidt, 4.5-4.8; Theil 9.5, 10.3-10.4; Johnston, 13.2-13.4; Kmenta, 13.3.
- 4D. Davidson and MacKinnon, Ch. 12, Sections 12.4-12.6; Theil, 10.5-10.7; Schmidt, 5.1-5.3; Johnston, 13.6.; Kmenta, 13.4.
- 4E. Johnston, 13.8; Theil, 10.8.
- 4F. Goldberger, 7.10; Kmenta, 13.5; Johnston, 13.1; Theil, 9.6.
- 4G. Schmidt, 5.4.
- 4H. Kmenta, 13.6; Theil, 9.7.
- 4I. Fair, ECON, 1970; Amemiya, ECON, April 1966; Fair, RESTAT, 1972; Hatanaka, JEC, May 1976; Hatanaka, IER, Oct. 1975; Godfrey, ECON, Sept. 1976; Deistler and Schrader, ECON, Mar. 1979; Harvey and Phillips, ECON, April 1980; Kohn, ECON, Sept. 1979.
- 4J. Brundy and Jorgenson, RESTAT, 1971; Johnston, 13.5; Sargan, IER, Feb. 1975.
- 5A. Maddala, Ch. 16; Judge, Part 6; Kmenta, 11.4; Johnston, 10.1-10.2; Sims.
- 5B. Davidson and MacKinnon, Ch. 11, Sections 11.1-11.2; Johnston, 6.1, 11.3; Maddala, 9.2, 9.7; Judge, Ch. 14; Theil, 12.5; Heckman, Hausman and Wise, ECON, March 1978.
- 5C. Davidson and MacKinnon, Ch. 7, Section 7.10; Maddala, Ch. 14; Judge, Ch. 8; Kmenta, 12.2.
- 5D. Judge, relevant parts of Ch. 3 and 12; Schmidt, pp. 48-54.
- 5E. Kmenta, 11.3; Maddala, 9.8; Judge, Ch. 17.
- 5F. Judge, Ch. 11; Zarembka; Theil, 12.1; Koch and Ragan, *Economic Inquiry*, Jan. 1986.
- 5G. Nelson, IER, Oct. 1975; McCallum, IER, June 1976; Revankar, ECON, Sept. 1980, Wallis, ECON, Jan. 1980; Hoffman and Schmidt, JEC, Feb. 1981.
- 5H. Davidson and Mackinnon, Chs. 13 and 14; Enders, Applied Econometric Time Series, 1995; Maddala, 15.8; Box and Jenkins, Time Series Analysis; Zellner and Palm, JEC, May 1974; Koch and Yang, JASA, June 1986.
- 5I. Maddala, Ch. 18; Theil, 12.9.

- 5J. Sims, AER, 1972; Hausman, ECON, Nov. 1978; Geweke, JEC, April 1978; Feige and Pearce, RESTAT, April 1979; Zarembka, Frontiers in Econometrics, Ch. 1; Thursby and Schmidt, JASA, Sept. 1977; Wu, ECON, 1973; Ramsey and Schmidt, JASA, Sept. 1976.
- 5K. Fair and Jaffee, ECON, May 1972; Fair and Kelejian, ECON, Jan. 1974; Amemiya, ECON, July 1974; Maddala and Nelson, ECON, Nov. 1974; Goldfeld and Quandt, JEC, Nov. 1975; Hartley and Mallela, ECON, July 1977; Kiefer, ECON, Mar. 1978; Quandt, IER, June 1978; Ito, ECON, Jan. 1980; Quandt and Ramsey, JASA, Dec. 1978; Kiefer, ECON, July 1979; Farley, Hinich and McGuire, JEC, Aug. 1975; Schmidt, ECON, 1982.
- 5L. Maddala, Ch. 17; Judge, Ch. 9; Theil, 12.4.
- 5M. Goldberger, ECON, Nov. 1972; Zarembka, Frontiers in Econometrics, Ch. 7; Zellner, IER, 1970; Geraci, JEC, Aug. 1976; Geraci, ECON, July 1976; Hsiao, IER, June 1976; Hsiao, ECON, Mar. 1979.