

University of Maryland, College Park
Smith School of Business

Preliminary Syllabus
BMGT 883
Applied Multivariate Analysis II
Spring 2005

Professor: P. Zantek
Office: 4349 Van Munching Hall
Class Meets: Tue/Thu 11:00 am – 12:15 pm
Office Hours: Tue/Thu 3:30 – 4:30 pm

Telephone: 301-405-8644
pzantek@rhsmith.umd.edu
www.rhsmith.umd.edu/dit/

COURSE DESCRIPTION

A continuation of BMGT 882. Topics include generalized least squares, seemingly unrelated regressions, simultaneous-equations models, principal components, factor analysis, structural-equations models with latent variables (covariance structure analysis), and specification testing.

PREREQUISITE

- **BMGT 882** (it has been the instructor's experience that students lacking this prerequisite have difficulty in BMGT 883)

COURSE MATERIALS

- BMGT 883 course packet
- Rencher, *Methods of Multivariate Analysis* (2nd edition), Wiley, 2002 ISBN 0-471-41889-7
- Course notes (to be distributed by instructor)

USEFUL REFERENCES

- Bollen, *Structural Equations with Latent Variables*, Wiley, 1989
- Davidson and MacKinnon, *Estimation and Inference in Econometrics*, Oxford, 1993
- Greene, *Econometric Analysis* (4th (or later) edition), Prentice-Hall
- Johnston and DiNardo, *Econometric Methods* (4th edition), 1997
- Lattin, Carroll, & Green, *Analyzing Multivariate Data*, Duxbury, 2003 (LCG)

CLASS MEETINGS

Class meetings consist primarily of lectures and discussions of examples/applications.

EXPECTATIONS

You are expected to attend each class, to contribute substantively in class, and to always exhibit mutual respect.

SOFTWARE

An important part of the course is the use of contemporary software for statistical analysis. Several software packages for performing multivariate analysis are available (e.g., MINITAB, SAS, SPSS); each has its strengths and weaknesses. In this course, we use SAS for Windows (Release 8.01 or higher). Some advantages of SAS include its numerical accuracy and the fact that it implements a wide variety of methods. You are required to become familiar with the aspects of the software covered in class, including the interpretation of output.

For exercises and projects, you are permitted to use software other than SAS if you wish, but doing this has disadvantages; for example, the format of the software output will differ from that given in class. Please note that the instructor cannot provide assistance with software other than SAS.

EXERCISES

You will be assigned several exercises during the semester. Some of the exercises will be graded.

PROJECT

Each student is required to define and complete a research project that entails applying at least two of the methods covered in this course (and/or BMGT 882) to a data set. The data set and the topic of the project are of your choosing. You are encouraged to select a topic that is related to your research interests. **Two hard copies** of a report on your project are due by May 6. The report is to include the following: introduction, research problem/question(s), model and/or hypotheses to be tested, description of the sample and data, methodology, empirical results, summary and conclusions, and references. The report should be approximately 6-10 pages in length (not including tables and figures), double-spaced, and in 12-point, Times New Roman font; please use one-inch margins. Of course, you may not submit any projects that are similar to those submitted for BMGT 882.

ACADEMIC INTEGRITY

The University's *Code of Academic Integrity* is designed to ensure that the principles of academic honesty and integrity are upheld. All students are expected to adhere to this Code. The Smith School does not tolerate academic dishonesty. All acts of academic dishonesty will be dealt with in accordance with the provisions of this code. Please visit the following website for more information on the University's Code of Academic Integrity:

http://www.inform.umd.edu/CampusInfo/Departments/JPO/AcInteg/code_acinteg2a.html

The University of Maryland Honor Pledge reads:

“I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination.”

Unless you are specifically advised to the contrary, this pledge statement should be handwritten and signed on the front cover of all documents submitted for evaluation in this course. Students who fail to write and sign the Pledge will be asked to confer with the instructor.

GRADING POLICY

Your final grade for the course is based on your performance in the individual exercises, project, and two examinations. The weights given to each of these components are as follows:

Individual Exercises	15%
Individual Project	15%
Midterm Examination	35%
Final Examination	35%

No make-up examinations are provided.

COURSE WEBSITE

The Internet will be used to provide course-related information such as data sets and SAS programs. Courses offered by the Smith School use the ‘Blackboard’ web course environment. You may login to your course(s) by going to <http://bb.rhsmith.umd.edu>. Please note that your University Directory (LDAP) username and password are required to access Blackboard courses. To find your username, visit <https://ldap.umd.edu/cgi-bin/chpwd?searchbyumid>. To set or change your password, visit <https://ldap.umd.edu/cgi-bin/chpwd>.

Students are required to maintain their current e-mail address in Testudo, as Blackboard uses this address to send course-related e-mail. (Since e-mail addresses are imported from Testudo into Blackboard, it is not possible to update e-mail addresses from within Blackboard.)

Additional information about R. H. Smith Blackboard is available from <http://www.rhsmith.umd.edu/blackboard>.

INCLEMENT WEATHER

In the event of inclement weather, please check with the University to see if classes are cancelled. Cancellations are announced on the University’s website (<http://www.umd.edu/>).

SCHEDULE

The following schedule is *tentative*. It is subject to change by announcement.

Tentative Schedule

Jan	27	Thu	Introduction; Review of Ordinary Least Squares Regression	Ch. 10 Rencher
Feb	1	Tue	Ordinary Least Squares: Block F Test (Partial F Test)	Ch. 10 Rencher
	3	Thu	Multivariate Regression	Ch. 10 Rencher
	8	Tue	Multivariate Regression (cont'd)	Ch. 10 Rencher
	10	Thu	Multivariate Regression (cont'd)	Ch. 10 Rencher
	15	Tue	Generalized Least Squares (GLS)	
	17	Thu	Seemingly-Unrelated Regressions (SUR)	
	22	Tue	Simultaneous-Equations Models	
	24	Thu	Simultaneous-Equations Models: Simultaneous-Equations Bias	
Mar	1	Tue	Simultaneous-Equations Models: Instrumental Variables	
	3	Thu	Simultaneous-Equations Models: Two-Stage Least Squares	
	8	Tue	Simultaneous-Equations Models: Hausman Specification Test	
	10	Thu	Simultaneous-Equations Models: The Identification Problem	
	15	Tue	Simultaneous-Equations Models: Rank and Order Conditions	

17 Thu Midterm Examination

	22	Tue	No Class—Spring Break	
	24	Thu	No Class—Spring Break	
	29	Tue	Simultaneous-Equations Models: Empirical Identification Tests	
	31	Thu	Simultaneous-Equations Models: Overidentifying Restrictions	
Apr	5	Tue	Principal Components: Derivation and Component Properties	Ch. 12 Rencher
	7	Thu	Principal Components: Interpreting the Components	Ch. 12 Rencher
	12	Tue	Principal Components: Number of Components	Ch. 12 Rencher
	14	Thu	Principal Components: Metric Multidimensional Scaling	
	19	Tue	Exploratory Factor Analysis: The Orthogonal Factor Model	Ch. 13 Rencher
	21	Thu	Exploratory Factor Analysis: Estimation of Model	Ch. 13 Rencher
	26	Tue	Exploratory Factor Analysis: Number of Factors	Ch. 13 Rencher
	28	Thu	Exploratory Factor Analysis: Testing Model Fit	Ch. 13 Rencher
May	3	Tue	Exploratory Factor Analysis: Rotation Project Due May 6	Ch. 13 Rencher
	5	Thu	Confirmatory Factor Analysis: Model, Checking Identification	Bollen, LCG
	10	Tue	Confirmatory Factor Analysis: Estimation of Model	Bollen, LCG
	12	Thu	Confirmatory Factor Analysis: Inference, Assessing Model Fit	Bollen, LCG

Final Exam (comprehensive)

SOME READINGS OF INTEREST

Regression, GLS, and SUR

Greene (2000, pp. 614-621)
 Christensen & Greene (1976)
 Harter, Krishnan, & Slaughter (2000)
 Dewan & Kraemer (2000)

Simultaneous-Equations Models

Anderson, Banker, & Ravindran (2000)
 Dewan & Kraemer (2000)
 Greene (2000, pp. 652-677, 682-684, and 688-696)
 Harter, Krishnan, & Slaughter (2000)
 Ratchford & Srinivasan (1993)

Structural Equations with Latent Variables

Bollen (1989, pp. 1-39, 319-323)
 Bollen (1989, pp. 80-94, 104-108, 246-256, 328-333)
 Bollen (1989, pp. 263-269, 281-296)
 Bollen (1989, pp. 256-262, 269-281, 296-305, 226-246)

ADDITIONAL REFERENCES

Agresti, A. (1990), *Categorical Data Analysis*, New York: Wiley.
 Anderson, M. C., Banker, R. D., and Ravindran, S. (2000), "Executive Compensation in the Information Technology Industry," *Management Science*, 46, 530-547.
 Anderson, T. W. (1984), *An Introduction to Multivariate Statistical Analysis*, New York: Wiley.
 Bagozzi, R. P. (1980), *Causal Models in Marketing*, New York: Wiley.
 Bentler, P. M. (1990), "Comparative Fit Indices in Structural Models," *Psychological Bulletin*, 107, 238-246.
 Bentler, P. M., and Bonett, D. G. (1980), "Significance Tests and Goodness of Fit in the Analysis of Covariance Structures," *Psychological Bulletin*, 88, 588-606.
 Browne, M. W. (1982), "Covariance Structures," in D. M. Hawkins (ed.), *Topics in Multivariate Analysis*, Cambridge, Massachusetts: Cambridge University Press, pp. 72-141.
 Browne, M. W. (1984), "Asymptotic Distribution Free Methods in Analysis of Covariance Structures," *British Journal of Mathematical and Statistical Psychology*, 37, 62-83.
 Christensen, Laurits, and Greene, William H. (1976), "Economies of Scale in U.S. Electric Power Generation," *Journal of Political Economy*, 84, 655-676.
 Davidson, R., and MacKinnon, J. G. (1993), *Estimation and Inference in Econometrics*, New York: Oxford University Press.
 Dewan, S., and Kraemer, K. L. (2000), "Information Technology and Productivity,"

- Management Science*, 46, 548-562.
- Fisher, F. M. (1966), *The Identification Problem in Econometrics*, New York: McGraw-Hill.
- Fornell, C., and Bookstein, F. L. (1982), "Two Structural Equation Models: LISREL and PLS Applied to Consumer Exit-Voice Theory," *Journal of Marketing Research*, 19, 440-452.
- Fornell, C., and Larcker, D. F. (1981), "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error," *Journal of Marketing Research*, 18, 39-50.
- Gouriéroux, C., and Monfort, A. (1981), "Asymptotic Properties of the Maximum Likelihood Estimator in Dichotomous Logit Models," *Journal of Econometrics*, 17, 83-97.
- Harter, D. E., Krishnan, M. S., and Slaughter, S. A. (2000), "Effects of Process Maturity on Quality, Cycle Time, and Effort in Software Product Development," *Management Science*, 46, 451-466.
- Hausman, J. A. (1978), "Specification Tests in Econometrics," *Econometrica*, 46, 1251-1271.
- Johnston, J. (1984), *Econometric Methods* (3rd edition), New York: McGraw-Hill.
- Johnston, J., and DiNardo, J. (1997), *Econometric Methods* (4th edition), New York: McGraw-Hill.
- Jöreskog, K. G. (1970), "A General Method for Analysis of Covariance Structures," *Biometrika*, 57, 239-251.
- Jöreskog, K. G. (1973), "A General Method for Estimating a Linear Structural Equation System," in A. S. Goldberger and A. D. Duncan (eds.), *Structural Equation Models in The Social Sciences* (pp. 85-112), New York: Seminar Press.
- Maddala, G. S. (1983), *Limited-Dependent and Qualitative Variables in Econometrics*, New York: Cambridge University Press.
- Neter, J., Kutner, M. H., Nachtsheim, C. J., and Wasserman, W. (1996), *Applied Linear Statistical Models* (4th edition), Chicago: Irwin.
- Parks, R. W. (1967), "Efficient Estimation of a System of Regression Equations When Disturbances are Both Serially and Contemporaneously Correlated," *Journal of the American Statistical Association*, 62, 500-509.
- Ratchford, B. T., and Srinivasan, N. (1993), "An Empirical Investigation of Returns to Search," *Marketing Science*, 12, 73-87.
- Robinson, P. M. (1974), "Identification, Estimation, and Large Sample Theory for Regressions Containing Unobservable Variables," *International Economic Review*, 15, 680-692.
- Wu, D.-M., (1973), "Alternative Tests of Independence Between Stochastic Regressors and Disturbances," *Econometrica*, 41, 733-750.
- Zellner, A. (1962), "An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests of Aggregation Bias," *Journal of the American Statistical Association*, 57, 318-368.
- Zellner, A., and Theil, H. (1962), "Three-Stage Least Squares: Simultaneous Estimation of Simultaneous Equations," *Econometrica*, 30, 54-78.