

COURSE SYLLABUS

- COURSE:** AGEC 5403 Quantitative Methods for Agribusiness Applications
Fall 2009
- PREREQUISITE:** Graduate Standing or consent.
- RELATED COURSES:**
- Regression analysis: AGEC 4113 Agric Prices Forecasting, AGEC/ECON 5613 Econometrics I; INEG 5393 Appl Regr Anal for Eng; AGST 5713 Appl Regr Anal for Agric Sci
 - Math (linear) programming: INEG 3613 Intro Opns Rsch, INEG 5613 Optimization Theory I
 - Computer simulation: INEG 4623 Intro Simul, INEG 5443 Dec Models
- INSTRUCTOR:** Lucas D. Parsch
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E-MAIL: lparsch@uark.edu
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- MEETING TIME:** MWF 2:30 a.m.-3:20 p.m., AGRI 332
- OFFICE HOURS:**
- Tuesdays and Thursdays are the best time to see me.
 - MWF between 10:30 and 2:30 are the worst times to see me.
 - At other times, I am generally in the office.
 - An appointment is not necessary but a call to schedule may save you time if I have other commitments.
 - I encourage you to see me for help with class materials and to ask questions during class because it enables everyone to hear and to learn from your questions.
- TEXTBOOK:**
- Albright, S. Christian, Wayne L. Winston, and Christopher Zappe (AWZ). 2009. Data Analysis and Decision Making with Microsoft Excel. 3d edition revised. Thomson-Southwestern Publishing, Mason OH. Chapters 1, 2, 3, (4 optional), 11, 12, 13. (AWZ, 2006. 3d edition also OK).
- Ragsdale, Cliff T. 2008. Spreadsheet Modeling and Decision Analysis. Fifth Edition Revised. Thomson-Southwestern Publishing, Mason OH. Chapters 1, 2, 3, 4, (5 optional). Previous editions 2005, 2007 also OK.
- Anderson, David R., Dennis J. Sweeney, Thomas A. Williams, and Kipp Martin. 2008. An Introduction to Management Sciences: Quantitative Approaches to Decision Making. 12th Edition. Thomson-Southwestern Publishing, Mason OH. (Previous edition 2006 also OK).
Chapter 12
- TEXTBOOK PURCHASE:** The textbooks above will be available for purchase online on a chapter-by-chapter basis from www.ichapters.com Because we will not cover all chapters in the textbooks, this is probably the least expensive way to acquire the readings. Purchase of eChapters from the above website gives you an electronic version of the chapter which can be viewed online and printed out

onto hardcopy in Adobe PDF format. The electronic version is time-dated for six months and requires that security software be installed onto your computer to give you access to the chapters. This is done automatically when you purchase the eChapters, so be sure to purchase the chapters from the same computer on which you expect to retrieve and view each document. Chapters can be purchased all at once, or one at a time as needed. A credit card may be necessary to make the purchase. Prices for each chapter are as follows:

Albright, Winston, Zappe (AWZ in course outline)
eChapter 0: Table of Contents (free download)
eChapter 1: Introduction, an Overview of the Book (free download)
eChapter 2: Describing Data: Graphs and Tables, \$8.95
eChapter 3: Describing Data: Summary Measures, \$8.95
eChapter 4: Getting the Right Data (optional), \$8.95
eChapter 11: Regression Analysis: Estimating Relationships, \$8.95
eChapter 12: Regression Analysis: Statistical Inference, \$8.95
eChapter 13: Time Series Analysis and Forecasting, (optional) \$8.95
Entire hard copy text = \$159.99; eTextbook (6 mos) = \$88.99.

Ragsdale (Rag in course outline)
eChapter 0: Table of Contents (free download)
eChapter 1: Introduction to Modeling and Decision Analysis (free dwlnd)
eChapter 2: Introduction to Optimization and Linear Programming, \$10.49
eChapter 3: Modeling and Solving LP Problems in a Spreadsheet, \$10.49
eChapter 4: Sensitivity Analysis and the Simplex Method, \$10.49
eChapter 5: Network Modeling (optional), \$10.49
Entire hard copy text = \$177.99. eTextbook (6 mos) = \$104.99.

Anderson, Sweeney, Williams, Martin (ASWM in course outline)
eChapter 0: Table of Contents (free download)
eChapter 1: Introduction (free download)
eChapter 12: Simulation, \$9.49
Entire hard copy text = \$177.99; eTextbook = \$104.99.

Cost of all “required” eChapters = \$76.76
Cost of all “required” and “optional” eChapters = \$105.15

NOTE (text, software): *Other purchase options and textbook editions.* New or used, hardcopy versions of the above textbooks may also be purchased from other online vendors such as www.amazon.com. Each of the textbooks above is revised regularly by the publisher. However, the content and subject matter typically does not change substantively from one edition to the next. Thus, recent, previous editions of the textbooks (see references above) are acceptable for use in this course.

Software and Excel versions. New, current versions of the three textbooks above reference (i.e., are written for) Excel 2007 whereas the earlier versions of the textbooks correspond to Excel 2003. Thus, “screen-saves” and commands in each textbook reference the corresponding 2007 or 2003 Excel version. Although students may choose the version of the textbook

based on which version of Excel they use on their personal computer, both, lecture notes for this course as well as software available in the university-wide General Access Computer Labs (GACL) including AFLS B108 will be Excel 2007. The AEAB Computer Lab in AGRI 218A and the computers in AGAX 303 also contain Microsoft Office 2007.

Third-party software. The Palisade Decision Tools and StatTools Suite is a commercial piece of third-party add-in software developed for use with Excel. This software may be shrink-wrapped and packaged on a CD-Rom and included with the AWZ text. However, because most of the computer exercises for the course can be done using the stand-alone (native) Excel, we will not use the Palisades and StatTools software in the course. Thus, if your copy of AWZ comes without the Palisades and StatTools software, that is OK.

Exercises requiring SIMETAR. In the final simulation segment of the course, several computer exercises will require the use of a commercial, third-party Excel add-in software called SIMETAR. This software will be made available to AGECE 5403 students for use on the computers in the AEAB Computing Laboratory in 218A AGRI Building. SIMETAR contains many—if not most—of the features found on the @RISK simulation software found on the Palisades CD.

COURSE RATIONALE AND OBJECTIVES:

Primary Objective. The primary objective of the course is to provide students with knowledge of, and hands-on exposure to, the major tools used by agricultural economists and business consultants in analyzing problems related to the management of agricultural businesses, farm firms, and large corporations as well as researching policy issues in the public sector. These tools include:

- regression analysis
- mathematical (linear) programming
- simulation modeling (risk analysis)

The course is application-oriented and operates under the premiss that an understanding of when and how to use quantitative tools is enhanced by solving and analyzing example problems with the aid of a computer. Although the course is taught from an applied perspective, a portion of the classroom materials is targeted at providing students with the conceptual basis which links the use of these tools to economic theory.

Course history. Over a number of years, the course has evolved from a theoretical treatment of the neoclassical theory of production economics to its present approach of applying quantitative techniques to analyzing management problems. Initially, the course had as its central topic the theory of the firm, i.e., production economics. As such, it dealt primarily with the producer side of microeconomic theory by developing those concepts which give rise to the supply curve in the competitive market model. Virtually all of the neoclassical treatment of the theory of the firm (with its corresponding calculus-based analytic solutions) has been eliminated from the course in order to devote more time to problem-solving applications using numeric and statistical techniques on the computer. Because the course has its roots in agricultural production economics, some of the

examples may still be taught from the perspective of the farm-firm. However, as the course evolves, more business and agribusiness examples will supplement or replace farm-firm examples.

Changing needs and marketable skills. In part, the evolution of the course was dictated by the changing needs of the soon-to-be-employed graduate students who have enrolled in the course. An applied discipline like agricultural economics bears a responsibility of providing its graduates with marketable skills. As economic and business systems become increasingly complex, they require solutions to problems which are only analyzed with increasingly sophisticated quantitative techniques, which are, in turn, employed by increasingly better trained analysts and managers. Thus, the targeted output of the course is better trained students who will become the analysts and managers of tomorrow.

Major quantitative tools studied. The broad objective of the course is to provide an understanding of how the basic economic theory can be applied to do problem solving research. To this end, the course is divided into three major sections, corresponding to three quantitative techniques:

- (1) Estimation of **linear regression** models using Ordinary Least Squares. The linkage between raw empirical data and economic analysis is drawn by using linear regression to statistically estimate and economically interpret economic and business relationships.
- (2) Optimization using mathematical programming. **Linear programming** problems are solved using the simplex algorithm to demonstrate how the theory of marginal analysis is effectively practiced when problems become too large or complex to solve using calculus.
- (3) Risk and uncertainty. Students are introduced to stochastic **Monte Carlo simulation** and other alternative approaches researchers use (E-V analysis, decision theory, stochastic dominance) when the perfect knowledge assumption of the neo-classical model no longer holds.

Exposure to these and other topics will not only help students to read the literature, understand research findings, and interpret consultant reports, but more importantly, will teach them how to go about analyzing, solving, and comprehending current problems in agricultural and business economics.

COURSE PROCEDURES:

- **Grade Composition.** Weighting for the final course grade will be according to the following schedule:

Homework (6-10)	10% of final grade
Two Mid-term Exams	50% of final grade
Final Exam	40% of final grade

- **Percentile breaks.** The tentative percentile break points for grades will be:

Percentile Breaks	Grade Points	Percentile Breaks	Grade Points
Score (%) \geq 90 = A	4.00	65 > Score (%) \geq 60 = C	2.00
90 > Score (%) \geq 85 = A-	3.67	60 > Score (%) \geq 55 = C-	1.67
85 > Score (%) \geq 80 = B+	3.33	55 > Score (%) \geq 50 = D+	1.33
80 > Score (%) \geq 75 = B	3.00	50 > Score (%) \geq 45 = D	1.00
75 > Score (%) \geq 70 = B-	2.67	45 > Score (%) \geq 40 = D-	0.67
70 > Score (%) \geq 65 = C+	2.33	40 > Score (%) = F	0.00

- **“Curved grades.”** I reserve the right to adjust percentile breaks downwards, i.e. to use a “curve” in grading, and in fact, this is typically what happens in this course. Nevertheless, there will be no “curving” of an individual exam or homework exercise. If there is a curve, it will be applied during calculation of final grades. Final grades for individual “borderline” cases may be adjusted for class participation and attitude as well as trend and consistency in performance.
- **Final Grade.** Once the final exam has been given (see date below) the course is over. No additional, supplementary work over and beyond the materials described above in this syllabus will be accepted as evidence of proficiency in the materials covered in the course, nor for the purpose of altering the final grade. The final grade in the course will be based on materials submitted by the date of the final exam.
- **Exams.** Two mid-term exams and a final exam are typical for the course. All exams are closed-book in-class. A calculator may be used in all exams. Laptop computers, cell phones, and other hand-held electronic communication devices are not permitted during exams. Whereas mid-term exams cover materials from specific sections of the course, the final exam is comprehensive.
- **Final Exam Date.** Final comprehensive exam:
Saturday, 12 December 2009, 10:00 a.m. - 12:00 noon
Friday, 30 October 2009, last day to drop course with W grade
- **Homework assignments and software.** Homework exercises are an integral learning tool in the course. Approximately 6 - 10 homework exercises will be assigned throughout the semester. These include a broad range of problems which require computer solution and presentation of results.

Most of the homework assignments will employ spreadsheet software including statistical and numeric routines which come packaged with Microsoft Excel. These include regression analysis using Excel’s Analysis Toolpak, linear programming using Excel Solver, and simple stochastic simulation using Excel paste functions.

A number of the assignments—i.e., those for advanced, multi-variate, stochastic simulation—will require third party add-in software to Excel. This software is SIMETAR, which will be available in the AEAB Computer Lab in AGRI 218A.

In addition to problem solving exercises, extensive use will be made of spreadsheet software (Excel) for generating tables and graphics, and presentation software (Power-Point) for making presentations (time permitting). Students will be required to submit homework results using word-processing software (e.g., Word or WordPerfect). Professional presentation of results is expected in all homework exercises.

Students using university GACL computer labs to complete homework assignments will need to complete them using Excel 2007 which corresponds to the most recent “revised” edition of the course textbooks. Students who have earlier editions of the textbooks may want to complete exercises in Excel 2003 on their own personal computer.

- **Late homework exercises.** Homework exercises not turned in at class time on the due date will not be accepted.
- **Lecture Notes and Website.** Normally, lecture notes in Adobe PDF or PowerPoint format will be made available to students for downloading from the class WebCT/Blackboard website at <http://courses.uark.edu> prior to class. In addition, distribution of other class materials may be made available over the class website. Students will need a university account to access class materials on the website.
- **Disability (CEA).** If you need accommodation due to a disability, please make arrangements to contact the Center for Educational Access at: <http://www.uark.edu/ua/csd/> or 479.575.3104 and discuss this with me after class or in my office.
- **Inclement weather.** Class will be cancelled whenever University offices are officially closed as a result of bad weather. You should always use your own best judgement about the risks of coming to class during bad weather in those cases when the University is not officially closed. If you are to miss class because of inclement weather, you should inform the instructor by email or telephone, before class begins.
- **Textbook and Readings.** The required textbooks are listed above. If necessary, additional readings for purchase may be required or made available in the hardcopy or as Adobe PDF files on the class website. A list of readings corresponding to topics covered in class is found under “Course Outline, Topics, Readings” below. Numeric notations in the course outline refer to chapter sections in the AWZ, Rag, and ASWM textbooks cited above.

Topics in the table are tentative in that more time may be spent on some and less on others. Due to time constraints, some topics may not be covered at all.

AGEC 5403 Quantitative Methods for Agbusiness Decisions
Course Outline, Topics, Readings† - Fall 2009

Wk	Date	No	Lecture Subject or Topic	Readings (AWZ, Rag, ASWM)	Exercise
A Introduction and Data					
1.1	24-Aug	1	Overview of course: Organization, operation, goals	AWZ Preface, 1.1-1.3	Excel_Tutorial.doc
1.2	26-Aug	2	Data concepts	AWZ 2.1-2.2, 4.2	Rich Apps 1-2.pdf
1.3	28-Aug	3	Summarizing data: visual	AWZ 2.3-2.5, 2.7	Data 1
2.1	31-Aug	4	Summary measures of data 1	AWZ 3.1-3.5, 12.3.4	
2.2	2-Sep	5	Summary measures of data 2; Excel autofilter	AWZ 3.6-3.8, 3.10; 4.1-4.4	Data 2
B Regression Analysis					
2.3	4-Sep	1	Simple regression: Least squares model	AWZ 11.1-11.3	
3.1	7-Sep		Labor Day Holiday		
3.2	9-Sep	2	Goodness of fit 1: R^2	AWZ 11.4.3, 12.3.4	
3.3	11-Sep	3	Goodness of fit 2: RMSE	AWZ 11.4.2, 12.3.4	Reg 1
4.1	14-Sep	4	Multiple regression	AWZ 11.5	
4.2	16-Sep	5	Hypothesis testing 1: Inference, significance	AWZ 12.3	
4.3	18-Sep	6	Hypothesis testing 2: Inference, significance	AWZ 12.3	
5.1	21-Sep	7	Dummy variables 1: Intercept shifter	AWZ 11.6, 11.6.1	
5.2	23-Sep	8	Dummy variables 2: Slope shifter, interaction	AWZ 11.6.2	
5.3	25-Sep	9	Non-linear transformations 1: Polynomial	AWZ 11.6.3	
6.1	28-Sep	10	Non-linear transformations 2: Log and CD	AWZ 11.6.3	
6.2	30-Sep	11	Non-linear transformations 3: CD Issues	AWZ 11.6.3	Reg 2
6.3	2-Oct	12	Trend and seasonality	AWZ 13.4, 13.9	
7.1	5-Oct	13	Other topics: Issues, specification, problems	AWZ 12.4, 12.5, 12.9.1, 12.10	
7.2	7-Oct	14	Exam 1: Periods 1.2 to 6.3		
C Linear Programming					
7.3	9-Oct	1	Introduction to linear programming	Rag 2.0-2.4; Rag 3.0-3.1	
8.1	12-Oct	2	A minimization problem	Rag 2.5-2.10	
8.2	14-Oct	3	A maximization problem	Rag 2.5-2.10	
8.3	16-Oct	4	Linear programming in Excel: Solver	Rag 3.2-3.7, 4.0-4.6	
9.1	19-Oct	5	Parametric programming and sensitivity analysis	Rag 4.0-4.6	LP 1
9.2	21-Oct	6	Tableau formulation and setup 1		
9.3	23-Oct	7	Tableau formulation and setup 2		
10.1	26-Oct	8	Whole farm business planning example	Rag 4.0-4.6	
10.2	28-Oct	9	Miscellaneous topics and issues	Rag 2.11-2.11.4	
10.3	30-Oct	10	Product-mix and blending models	Rag 3.8, 3.11	
11.1	2-Nov	11	Transportation and trans-shipment models	Rag 3.10, Rag 5.1	LP 2
11.2	4-Nov	12	Financial and investment models	Rag 3.9	
11.3	6-Nov	13	Exam 2: Periods 7.2 to 11.2		
D Simulation and Risk					
12.1	9-Nov	1	Introduction to risk	ASWM 12.0-12.1; AWZ 7.2	
12.2	11-Nov	2	Introduction to simulation: An example	ASWM 12.0-12.1; AWZ 5.1, 16.1, 16.2	
12.3	13-Nov	3	A simulation example (cont'd)	ASWM 12.0-12.1	
13.1	16-Nov	4	Decision rules and the payoff matrix	AWZ 7.1, 7.2, 7.3	
13.2	18-Nov	5	Introduction to simulation	AWZ 5.3, 5.4, 16.1, 16.2	Sim 1
13.3	20-Nov	6	Input probability distributions	AWZ 16.3-16.4	
14.1	23-Nov	7	Simulation with built-in Excel tools	ASWM 12.1	
14.2	25-Nov		Academic Holiday: Fall Break		
14.3	27-Nov		Thanksgiving Holiday		
15.1	30-Nov	8	Simulation with SIMETAR	Simetar User Guide	
15.2	2-Dec	9	Simulation with multiple sources of risk	Simetar User Guide	
15.3	4-Dec	10	Simulation with correlated inputs (financial portfolio)		
16.1	7-Dec	11	Interpretation, presentation of results		Sim 2
16.2	9-Dec	12	Dead Day		
16.3	12-Dec		Final Exam: 10:00 a.m. - 12:00 noon	Comprehensive	

†Tentative course outline. Topics, dates, and length of time spent on each topic may change. Midterm exam dates may be revised given the actual class time to cover the lecture material. Readings = chapter sections in Albright, Winston, Zappe. 2009 (AWZ); Ragsdale, 2008 (Rag); and Anderson, Sweeney, Williams, Martin. 2008 (ASWM).